Infrastruct CS Ltd
Consulting Civil Engineers

Infrastruct CS Ltd
The Stables,
High Cogges Farm,
High Cogges,
Witney,
Oxon,
OX29 6UN
Tel: 01993 709709
Email: info@infrastructcs.co.uk
Web: www.infrastructcs.co.uk

31st January 2023

REF: 5214-OTP-ICS-RP-C-03.001

OXFORD TECHNOLOGY PARK, UNIT 8, 9 ,10 & 11 – DRAINAGE STATEMENT

1.0 PROPOSED FOUL DRAINAGE ARRANGEMENT

1.1 Foul water flows from:-

- Unit 8 is to drain by gravity into the 150mm drain along the main access road, to the east of the plot.
- Unit 9 is to drain by gravity into the 150mm drain along the main access road, to the west of the plot.
- Unit 10 is to drain by gravity into the 150mm drain along the main access road, to the east of the plot.
- Unit 11 is to drain by gravity into the 150mm drain along the main access road, to the west of the plot.

1.2 From there it will be conveyed to a pumping station serving the whole industrial estate, and pumped into the Thames Water sewer.

1.3 A pipe networks within the site are to remain private.

1.4 All internal SVP's and soil stacks must be roddable to allow for underground Y-Junction connections.

2.0 PROPOSED SURFACE WATER DRAINAGE STRATEGY

2.1 The surface water drainage systems for Units 8, 9, 10 & 11 have been designed to accommodate the flows generated by a 1 in 100-year event plus an allowance of 40% for climate change.

2.2 An initial engineering appraisal for the whole park was carried out by Haydn Evans Consulting in November 2013. The ground conditions indicate a topsoil layer of 200-400mm over fractured rock. Non fractured rock was encountered between 1.5 and 2.2mbgl. Infiltration tests to BRE365 were carried out and results were good in general, ranging from 5E-6m/s to 1.84E-4m/s. The permeable paving solution for surface water was proposed as a viable alternative.

2.3 In Autumn 2018 (October and November), a groundwater monitoring report was prepared by RSK Environment Ltd. The depth varied within the park but in some areas

Table 1: Enzygo groundwater monitoring data Autumn 2018

Location	X	Y		18.10.18		24.10.18		31.10.18		14.11.18	
			GL (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)
BH1				1.3	-	1.26	-	1.19	-	1.01	-
BH2	447627.305	214814.004	69.118	0.93	68.188	1.1	68.018	1.21	67.908	1.13	67.988
BH3	447539.634	214698.974	69.621	1.11	68.511	1.2	68.421	1.32	68.301	1.27	68.351
BH4	447646.099	214755.091	68.884	0.89	67.994	1.02	67.864	1.12	67.764	1.08	67.804
BH5	447567.268	214619.444	70.344	2.32	68.024	2.34	68.004	2.47	67.874	2.54	67.804
BH6	447662.021	214663.078	69.998	2.34	67.658	2.45	67.548	2.55	67.448	2.56	67.438

Notes: X/Y-grid coordinates, GL-Ground Level, bgl-Below ground level, aOD-Above ordinance datum

the water table was found as shallow as 0.89mbgl.

A second round of visits took place in Spring 2019 with values even higher. The monitoring identified groundwater as shallow as 68.81m AOD in the west and 68.31m AOD in the east.

Table 2: RSK groundwater monitoring data Spring 2019

Location	X	Y		25.03.19		09.04.19		23.04.19		07.05.19	
			GL (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)
BH1				-	-	-	-	-	-	-	-
BH2	447627	214814	69.118	0.87	68.248	0.89	68.228	-	-	-	-
BH3	447539	214698	69.621	0.94	68.681	1.27	68.351	1.53	68.091	1.37	68.251
BH4	447646	214755	68.884	0.77	68.114	2.82*	66.064*	1.26	67.624	0.90	67.984
BH5	447567	214619	70.344	1.53	68.814	1.89	68.454	2.02	68.324	1.68	68.664
BH6	447662	214663	69.998	1.69	68.308	-	-	2.44	67.558	2.15	67.848

Notes: X/Y-grid coordinates, GL-Ground Level, bgl-Below ground level, aOD-Above ordinance datum
Notes: * results from BH4 on the 9.4.19 have not been considered as part of the overall assessment

2.4 Another Phase 2 Geo-Environmental report was produced by Enzygo Ltd in January 2019 for the north-eastern corner, near plots 1, 3 and 5. In there, groundwater is noted to be as shallow as 0.6mblg. Soakage tests were abandoned as a result.

Table 6.1 Ground and groundwater conditions check sequence of solid geology

Strata	Summary Description	Depths Encountered (m)
Made Ground	Firm consistency brown/orange brown silty sandy gravelly cobbly clay	GL to 0.80
Weathered Cornbrash Formation	Light brown sandy gravelly cobbles of limestone	0.50 to 3.20
	Soft orange brown silty sandy gravelly cobbly clay	0.30 to 2.10
Cornbrash Formation	Medium strong light brown/light grey limestone	6.60 to 9.80
Weathered Forest Marble Formation	Stiff light blueish grey silty gravelly clay	2.50 to 10.00
Groundwater	BH1 and BH2, SA1 to SA4, SA4a	GL to 0.60

2.5 Since all the above testing was not site specific for these new units 8, 9, 10 &11, further soakage tests were carried out to BRE365 standards in October 2022, to a depth of 0.9m due to the presence of groundwater at depth, as stated above.

In line with CIRIA 753 – The SuDS Manual, section 25.3. The most conservative value of the three repetitions was used for each Unit. The soakage rates used in design calculations are as follows:

- Unit 8: 2.43E-5m/s
- Unit 9: 1.89E-5m/s
- Unit 10: 4.37E-5m/s
- Unit 11: 1.74E-5m/s

All results can be found in Appendix D.

2.6 The SuDS hierarchy has been followed in line with the SuDS manual and Oxfordshire LLFA guidance. It indicates that new developments should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

- store rainwater for later use
- **use infiltration techniques, such as porous surfaces in non-clay areas**
- discharge rainwater direct to a watercourse
- discharge rainwater to a surface water sewer/drain
- discharge rainwater to the combined sewer.

2.7 A similar approach has been used for Units 8,9 & 10, whereas 11 has some particularities.

- For Unit 8 both the front car park and rear yard will be built as permeable paving to allow water to get directly into the OGCR subbase and, from there, it percolate into the ground. Both the front car park and rear service yard areas have 450mm and 500mm depth respectively, installed horizontal throughout to maximise water storage capacity. Roof runoff will be conveyed via independent pipe networks from each rainwater pipe into the same gravel layer.

- As above, for Unit 9 both the front car park and rear yard will be built as permeable paving to allow water to get directly into the OGCR subbase and, from there, it percolate into the ground. Both the front car park and rear service yard areas have 450mm and 600mm depth respectively, installed horizontal throughout to maximise water storage capacity. Roof runoff will be conveyed via independent pipe networks from each rainwater pipe into the same gravel layer.

- As above, for Unit 10 both front car park and rear yard will be built as permeable paving to allow water to get directly into the OGCR subbase and, from there, it percolate into the ground. Both the front car park and rear service yard areas have 450mm and 600mm depth respectively, installed horizontal throughout to maximise water storage capacity. Roof runoff will be conveyed via independent pipe networks from each rainwater pipe into the same gravel layer.

- For Unit 11, the front car park will be built as permeable paving to allow water to get directly into the OGCR subbase and, from there, it percolate into the ground. The rear car park will be partially permeable and partially in impermeable bitmac. However, both yard areas have a gravel layer installed horizontal throughout to maximise water storage capacity, both 450mm deep. Roof runoff, like in all other units, will be conveyed via independent pipe networks from each rainwater pipe into the same gravel layer, and dispersed using rainwater diffusers.

  To collect the runoff from the bitmac areas a linear channel has been proposed (ACO Monodrain PD150D 20.0), as well as two Ridgistorm X4 Stormwater Treatment Systems to improve water quality.

  See Appendix B for Drainage layout of all 4 units.

2.8 The estimated runoff rate from all sites is 0 l/s. Some overland flows might be expected for storms beyond the design event, however these are difficult to quantify. They will not impact other buildings as they are at a higher elevation than the road network.

2.9 All parking bays are to be constructed in permeable block paving to increase the water quality. This is where oil spillage is most likely to occur and the open graded crushed rock in the subbase will break down hydrocarbons before they percolate into the ground.

2.10 A catchment area plan has been produced where almost all site areas are included. Urban creep has not been considered as this is an industrial site and, more importantly, there is no extra areas to include in the catchment. See Appendix C

2.11 Full water quality discussion in line with CIRIA 753 - SUDS manual is in Appendix A.

2.12 The surface water networks will remain private, to be maintained as per the SuDS Maintenance Guide produced separately.

Yours sincerely

M. BLANCO
MEng GMICE
DIRECTOR

Authorised by

A. J. GRIFFITHS
BEng (Hons) MCIHT
DIRECTOR

Appendix A- Water quality

According to the CIRIA SUDS Manual, the pollution hazard level for car parks is low, and the simple index approach should be used.

TABLE 4.3 Minimum water quality management requirements for discharges to receiving surface waters and groundwater

Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries[2]	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources*[1]	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources*[1]	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources1* In England and Wales, Risk Screening[4] must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA (2009)	
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit[3]. Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required[5].	

Table 4.3 of the SUDS Manual CIRIA C753. Page 63.

The method is guided by the land use and SuDS performance evidence. The steps to be followed are outlined below.

BOX 26.2 Steps of the simple index approach

Step 1 – Allocate suitable pollution hazard indices for the proposed land use

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected[1] surface waters or groundwater, consider the need for a more precautionary approach

Note:

1 Designated as those protected for the supply of drinking water (Table 4.3).

Box 26.2 of the SUDS Manual CIRIA C753. Page 567.

Step 1: Pollution hazard indices are presented in table 26.2 below. These indices range from 0 (no pollution hazard for this contaminant) to 1 (high pollution hazard for this contaminant type).

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Table 26.2 of the SUDS Manual CIRIA C753. Page 568.

Step 2: To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index. In this case the principal destination of the runoff is the ground, so table 26.4 should be used.

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater

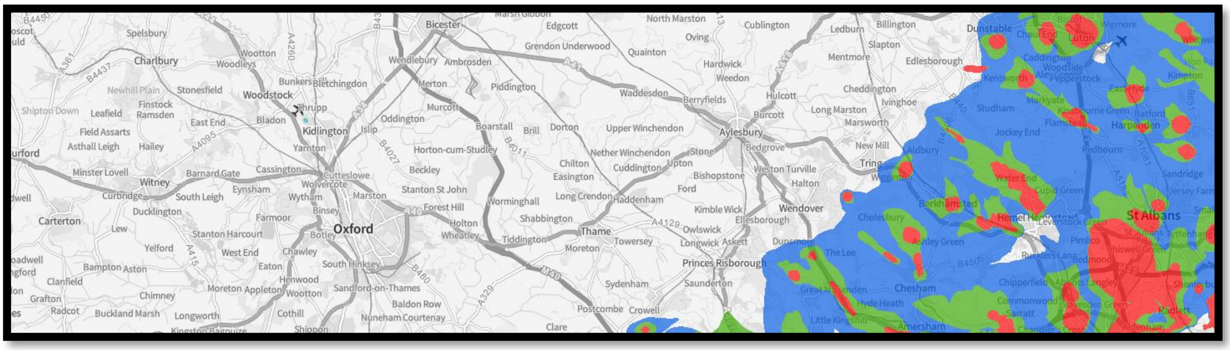
Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates[1]	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.6[4]	0.5	0.6
A soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.8[4]	0.8	0.8
Proprietary treatment systems[5, 6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

Table 26.3 of the SUDS Manual CIRIA C753. Page 569.

In Units 8, 9 & 10, as well as the front car park of Unit 11, permeable paving is sufficient to address water quality. In these units, the mitigation indices are equal to the hazard indices which means the water quality treatment is adequate.

For the rear yard of Unit 11 a proprietary product is necessary to improve water quality, and the Ridgistorm X4 Stormwater Treatment System has been chosen.

Step 3: Where the discharge is to protected groundwater, a more precautionary approach is needed. The site falls outside Source Protection Zone 1 and therefore no extra protection measures are needed.



Source Protection Zones map. Oxford is outside any protection zone.

RIDGISTORM-X4 Stormwater Treatment System Data Sheet

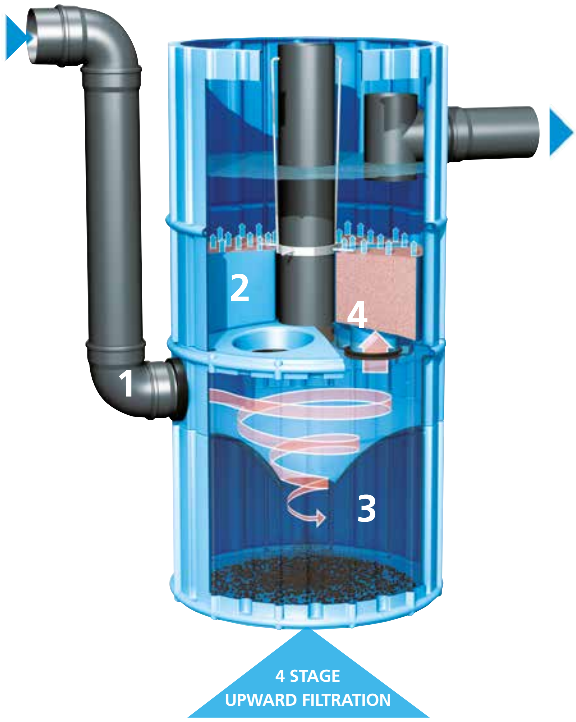
RIDGISTORM-X4 is a chamber containing a 4 stage treatment device, used for the treatment of surface water run-off, providing high levels of contaminant removal, including hydrocarbons and heavy metals. Utilising a number of processes the RIDGISTORM-X4 Stormwater Treatment System consistently provides proven levels of protection for the downstream elements of the drainage system and local environment.

1 **Sedimentation:** Water is induced into a radical flow within the dynamic separator at the base of the unit, promoting sedimentation of solid particles.

2 **Filtration:** Water flows up from the separator and through removable filter elements. The filter elements remain saturated, minimising the risk of the filter elements clogging.

3 **Chemical Separation:** While passing through the filter unit, dissolved chemical pollutants are removed through a process of adsorption, absorption and precipitation.

4 **Oil Retention:** Water is finally discharged via an oil trap assembly which is designed to retain free floating oils in the event of a major spill.



Applications

RIDGISTORM-X4 is capable of cleaning surface water run-off from roofs, car parks, roads and heavily trafficked areas. The RIDGISTORM-X4 Stormwater Treatment System is a low maintenance solution for all surface water applications.

Key Features and Benefits

- Advanced 4 stage filtration system
- Treats water from roofs, car parks and roads
- Separates and removes silt heavy particles, oil, phosphorus and heavy metal pollutants
- Low maintenance – no moving parts
- Facilitates compliance with Water Framework Directive
- Surface water filter complying with DIN 1989-2 Type A
- Supplied within a pre-fabricated chamber delivered to site ready-to-install or as a stand alone unit
- Step irons to BS EN 13101 and ladders to BS EN 14396
- Integral lifting points available on request to improve Health and Safety of handling and installation
- Chamber is strong but light in weight, minimising Health and Safety risks.

RIDGISTORM-X4

PHYSICAL PROPERTIES	HEAVY TRAFFIC	TRAFFIC	ROOF
Height mm	1985	1985	1985
Diameter mm*	980	980	980
Chamber material**	PE	PE	PE
Weight kg*	122	122	122
Recommended max. catchment area m²	500	750	1000
Number of filter elements	4	4	4
Weight/element kg	54	34	34
Pipe connections mm	200	200	200

*Unit typically supplied within a pre-fabricated chamber. However these measurements may increase dependant on the proposed unit's general arrangements.
**Majority of components are polyethylene (PE), however other materials are used in the unit manufacture.

Polypipe Civils
Charnwood Business Park, Loughborough, Leicestershire LE11 1LE
Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: civils@polypipe.com
www.polypipe.com/civils

Polypipe

Performance

RIDGISTORM-X4 Stormwater Treatment System Chambers are fabricated from Ridgistorm-XL pipework, which is manufactured to meet the material requirements of BS EN 13476:2007 (Part 1-3). Filters have no moving parts and have an average expected lifespan of 2 years (based on nominal usage).

Stormwater treatment

RIDGISTORM-X4 has been designed to remove heavy particles, silt and nutrients and heavy metals such as copper, zinc and cadmium from the surface water to provide an environmentally sound solution which benefits the natural watercourse and increases biodiversity.

Improved surface water quality

RIDGISTORM-X4 minimises pollution of the natural watercourse and enables clean surface water run-off to be discharged from site. In line with new legislation and guidelines such as the Water Framework Directive (WFD), RIDGISTORM-X4 offers a regulatory-compliant solution for dealing with the issues of water quality.

Source control

RIDGISTORM-X4 improves water quality even before discharge from site by treating surface run-off as close to its source as possible. Once it has passed through the RIDGISTORM-X4 filter and used in conjunction with attenuation and flow control devices from Polypipe, water run-off can be discharged from site at an agreed rate, reducing the risk of downstream flooding.

Low maintenance

The advanced 4 stage filtration system within RIDGISTORM-X4 utilises no moving parts, providing a low maintenance solution for all surface water run-off applications. The filters within the unit only need to be replaced on average every two years, providing an easily maintainable solution on-site.

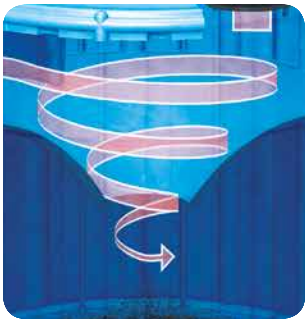
Easy to install

Polypipe can supply RIDGISTORM-X4 as a standalone unit, or housed within a pre-fabricated chamber. When housed within a chamber, the units are constructed off-site and delivered to site ready to install, making installation quicker, safer and easier with a much lower development footprint.

Function Principles

1. Contaminated surface water run-off is fed into the basal section of the filter. The angled inlet generates a radial flow pattern.

2. The hydrodynamic separator converts the radial flow to generate particle sedimentation to remove heavy debris and silt from the contaminated water. The sediment is then retained in a silt trap chamber below the separator for easy maintenance and access.



3. The filter element is housed in the central section of the RIDGISTORM-X4. The filter element is specifically designed for traffic, heavy traffic or roof applications and filters out fine materials in an up-flow process. Dissolved materials are absorbed by the filter, which will need to be replaced every two years on average.

4. Situated above the filter element is an oil retention unit which removes the remaining contaminants from the surface water run-off. The clean water then flows via the outlet to the soakaway or watercourse.

Polypipe Civils
Charnwood Business Park, Loughborough, Leicestershire LE11 1LE
Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: civils@polypipe.com
www.polypipe.com/civils

Polypipe

RIDGISTORM-X4 Traffic

Surface water filter complying with
DIN 1989-2 Type A
For drained traffic areas to 750m^2
Connections: at DN150 or DN200.
4 filter elements:
Material: Filter Substrate: Traffic
Weight per element: 16kg

RIDGISTORM-X4 Heavy Traffic

Surface water filter complying with
DIN 1989-2 Type A
For drained traffic areas to 650m^2
Connections: at DN150 or DN200
4 filter elements:
Material: Filter Substrate: Heavy Traffic
Weight per element: 32kg

RIDGISTORM-X4 Roof

Surface water filter complying with
DIN 1989-2 Type A
For drained traffic areas to 1000m^2
Connections: at DN150 or DN200
4 filter elements:
Material: Filter Substrate: Roof
Weight per element: 16kg

PARAMETER	UNIT	MAIN ROAD, DISTRIBUTOR		AIMS OF LAWA [1]	DRINKING WATER [2]	SEEPAGE [3]	RIDGISTORM-X4
		FROM	TO	PERMISSIBLE LIMIT	PERMISSIBLE LIMIT	CONTROL VALUE	AIM[5]
PHYSIO-CHEMICAL PARAMETERS				**90-PERCENTILE**			
Electrical conductivity	[uS/cm]	110	2400	-	2500	-	<1500
pH value	[-]	6.4	7.9	-	6.5 - 9.5	-	7.0 - 9.5
NUTRIENTS							
Phosphorous (Pges)	[mg/L]	0.23	0.34	-	-	-	0.20
Ammonium (NH_4)	[mg/L]	0.5	2.3	-	0.5	-	0.3
Nitrate (NO_3)	[mg/L]	0.0	16.0	-	50.0	-	-
HEAVY METALS							
Cadmium (Cd)	[µg/L]	0.3	13.0	1.0	5.0	5.0	<1.0
Zinc (Zn)	[µg/L]	120	2.000	500	-	500	<500
Copper (Cu)	[µg/L]	97	104	20	2000	50	<50[4]
Lead (Pb)	[µg/L]	11	525	50	10	25	<25[4]
Nickel (Ni)	[µg/L]	4	70	50	20	50	<20
Chromium (Cr)	[µg/L]	6	50	50	50	50	<50
ORGANIC SUBSTANCES							
Polynuclear aromatic hydrocarbons (PAK)	[µg/L]	0.2	17.1	-	0.1 (6 compounds)	0.2	<0.2
Petroleum-derived hydrocarbons (MKW)	[mg/L]	0.1	6.5	-	-	0.2	<0.2

1 Aims of the German working group on water issues of the Federal States and the Federal Government (LAWA) for surface water usage as potable drinking water (1998).
2 Permissible limit of the German Drinking Water Ordinance (2001).
3 Control value for seepage of the German Federal Soil Protection Act an Ordinance (1999) according to §8 1,2.
4 For copper and lead roofs a second treatment step is necessary.
5 The aims of the system refer to average annual loads.

Critical parameter, treatment necessary	
Treatment may be necessary, not generally	
No critical parameter	

For further information please see Technical Datasheet available on our website www.polypipe.com/toolbox

Polypipe Civils
Charnwood Business Park, Loughborough, Leicestershire LE11 1LE
Tel: +44 (0) 1509 615100 Fax: +44 (0) 1509 610215 Email: civils@polypipe.com
www.polypipe.com/civils

Appendix B- Drainage Layouts

DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

BURIED UTILITIES RISK NOTE

- Buried utilities are present on and in the vicinity of the site.
- The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place.
- Any RAMS shall address safe procedures for protection and working in the proximity of services.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

CDM RESIDUAL RISK ITEM
Drainage pipes, manhole rings covers and fittings.
Risk of Manual handling injury.

CDM RESIDUAL RISK ITEM
Contact with waste water when making drainage connections.
Risk of infection from Weils disease etc.

CDM RESIDUAL RISK ITEM
Above Ground activities.
Possibility of objects falling from operations at high level onto persons working or passing below.

CDM RESIDUAL RISK ITEM
Works within confined spaces.

Foul Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
F0	68.717	70.30	1.58	Existing	-	150.0	150	22.5
F1	68.867	70.15	1.28	1200Ø PCC	D400	150.0	150	16.5
F2	68.977	70.15	1.17	1200Ø PCC	D400	90.0	150	15
F3	69.144	70.28	1.14	1200Ø PCC	A15	90.0	150	55
F4	69.755	70.28	0.53	PPIC	A15			
F1	68.867	70.15	1.28	1200Ø PCC	D400	100.0	150	15
F5	69.017	70.28	1.26	1200Ø PCC	A15	80.0	150	56
F6	69.717	70.28	0.56	PPIC	A15			
F1	68.867	70.15	1.28	1200Ø PCC	D400	80.0	150	57.5
F7	69.586	70.28	0.69	PPIC	A15			
F2	68.977	70.15	1.17	1200Ø PCC	D400	80.0	150	57
F8	69.690	70.28	0.59	PPIC	A15			

Surface Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
S1	69.570	70.15	0.58	Diffuser	-	150.0	150	6.5
S2	69.613	70.15	0.54	PPIC S/T	D400	150.0	150	7
S3	69.660	70.28	0.62	PPIC	A15	150.0	150	6.5
S4	69.703	70.28	0.58	PPIC	A15			
S5	69.570	70.15	0.58	Diffuser	-	150.0	150	5
S6	69.603	70.15	0.55	PPIC S/T	D400	150.0	150	7
S7	69.650	70.28	0.63	PPIC	A15	150.0	150	7
S8	69.697	70.28	0.58	PPIC	A15			
S10	69.570	70.20	0.63	Diffuser	-	150.0	150	4.5
S11	69.600	70.28	0.68	PPIC S/T	D400	80.0	150	8
S12	69.700	70.28	0.58	PPIC	A15			
S15	69.570	70.20	0.63	Diffuser	-	150.0	150	8.5
S16	69.627	70.20	0.57	PPIC S/T	D400	80.0	150	8.5
S17	69.733	70.28	0.55	PPIC	A15			
S18	69.570	70.20	0.63	Diffuser	-	150.0	150	6.5
S19	69.613	70.20	0.59	PPIC S/T	D400	150.0	150	6.5
S20	69.657	70.28	0.62	PPIC	A15			

DESIGNER NOTE
Rainwater pipe locations to be confirmed

DESIGNER NOTE
Soakage rate used = 2.43x10-5 m/s, the worst result of the tree tests to BRE365 caried out on site in October 2022 (0.08748 m/h)

DESIGNER NOTE
Monitoring wells recorded groundwater levels between 0.9m and 2.5m bgl during investigation for Unit 1, to the north of this site. See report SHF.1733.001.GE.R.002.A prepared by Enzygo in June 2020. To be further investigated with groundwater monitoring in winter within the site boundary.

(08) - 5214-OTP-ICS-08-XX-M2-C-0200_Drainage Design

NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

Drainage Key

Sewers

	Foul water drain (private/non adoptable)
	Surface water drain (private/non adoptable)
	Existing foul water sewer (Adopted)

Chamber Key

FW/SW

FW	SW	
mac	mac	Mini access chamber (mac) - 300mmØ
		PPIC - 475mmØ*
		P.C.C. units/brick*
DM	DM	Adoptable demarcation manhole within 1m of boundary
		Manhole Depth: 1.25m to 1.5m* Depth: 1.55m to 3.0m*

* General note
(Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

	Rain water down pipe (roddable access)
	Soil vent pipe/soil stack
ST	Silt Trap (ST) with removable silt bucket
S1/F1	Manhole reference number
	Linear drainage channel
	RWP cellular discharge/collection unit (DU) (Permavoid or similar)
FFL XX.XX	Finished Floor Level (FFL)
	Block paving - permeable
	Flood exceedance routing
	Impermeable barrier to stop lateral movement of water

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	16/11/2022

DRAWING TITLE
Drainage Design

SHEET NO.
1/1

PROJECT
Building 8
Oxford Technology Park
Kidlington, Oxon

CLIENT
HILL STREET HOLDINGS

Infrastruct CS Ltd

SCALE @ A1
1:250
0m 6.25m 12.5m

ENGINEER MBD
DRAFT SNN
APPROVED RJW

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5214	S2	INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP	ICS	08	XX	DR	C	0200	P01

The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk

DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

CDM RESIDUAL RISK ITEM
Drainage pipes, manhole rings covers and fittings.
Risk of Manual handling injury.

CDM RESIDUAL RISK ITEM
Contact with waste water when making drainage connections.
Risk of infection from Weils disease etc.

CDM RESIDUAL RISK ITEM
Above Ground activities.
Possibility of objects falling from operations at high level onto persons working or passing below.

CDM RESIDUAL RISK ITEM
Works within confined spaces.

BURIED UTILITIES RISK NOTE

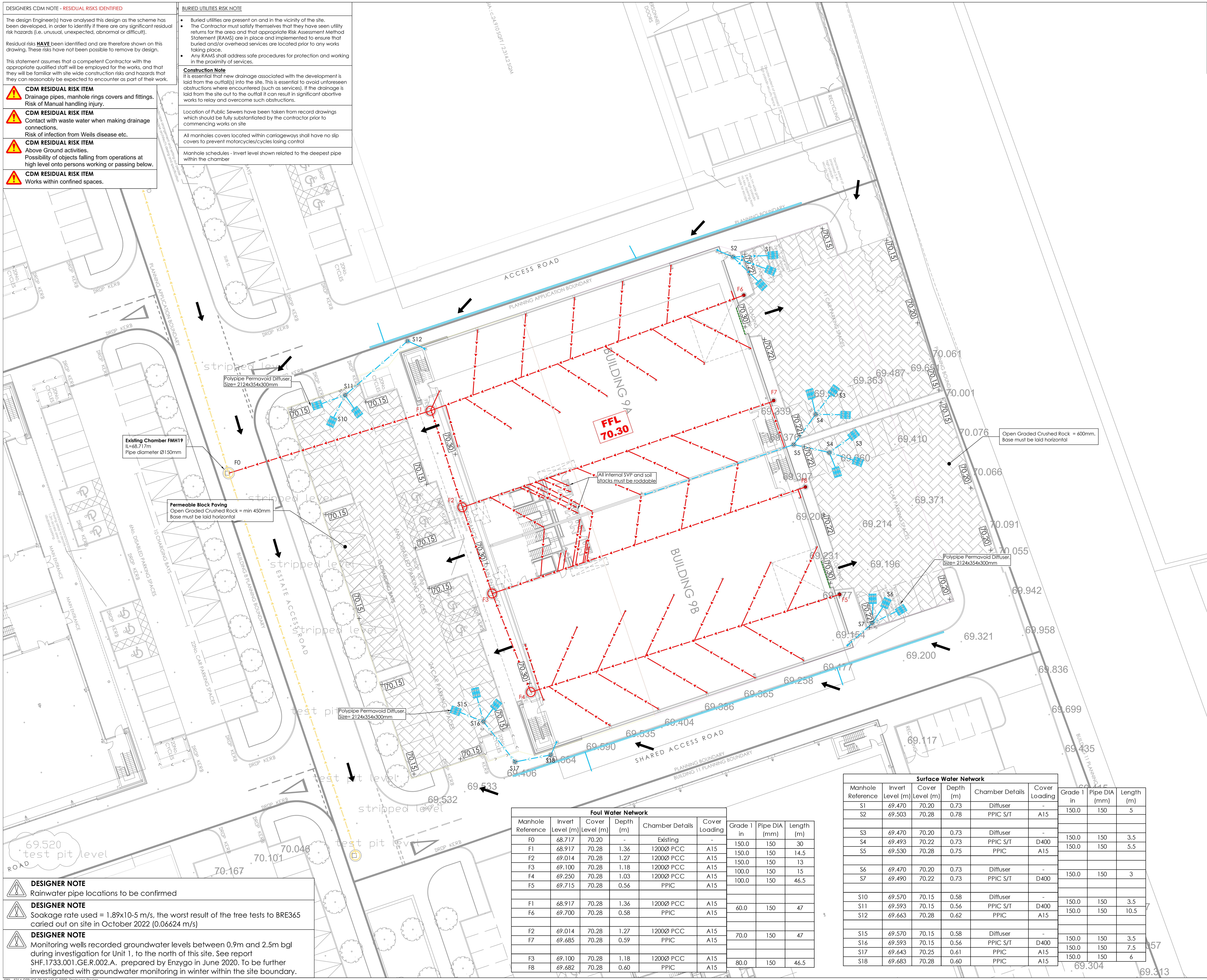
- Buried utilities are present on and in the vicinity of the site.
- The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place.
- Any RAMS shall address safe procedures for protection and working in the proximity of services.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber



DESIGNER NOTE
Rainwater pipe locations to be confirmed

DESIGNER NOTE
Soakage rate used = 1.89x10-5 m/s, the worst result of the tree tests to BRE365 caried out on site in October 2022 (0.06624 m/s)

DESIGNER NOTE
Monitoring wells recorded groundwater levels between 0.9m and 2.5m bgl during investigation for Unit 1, to the north of this site. See report SHF.1733.001.GE.R.002.A. prepared by Enzygo in June 2020. To be further investigated with groundwater monitoring in winter within the site boundary.

Foul Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
F0	68.717	70.20	-	Existing	-			
F1	68.917	70.28	1.36	1200Ø PCC	A15	150.0	150	30
F2	69.014	70.28	1.27	1200Ø PCC	A15	150.0	150	14.5
F3	69.100	70.28	1.18	1200Ø PCC	A15	150.0	150	13
F4	69.250	70.28	1.03	1200Ø PCC	A15	100.0	150	15
F5	69.715	70.28	0.56	PPIC	A15	100.0	150	46.5
F1	68.917	70.28	1.36	1200Ø PCC	A15			
F6	69.700	70.28	0.58	PPIC	A15	60.0	150	47
F2	69.014	70.28	1.27	1200Ø PCC	A15			
F7	69.685	70.28	0.59	PPIC	A15	70.0	150	47
F3	69.100	70.28	1.18	1200Ø PCC	A15			
F8	69.682	70.28	0.60	PPIC	A15	80.0	150	46.5

Surface Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
S1	69.470	70.20	0.73	Diffuser	-			
S2	69.503	70.28	0.78	PPIC S/T	A15	150.0	150	5
S3	69.470	70.20	0.73	Diffuser	-			
S4	69.493	70.22	0.73	PPIC S/T	D400	150.0	150	3.5
S5	69.530	70.28	0.75	PPIC	A15	150.0	150	5.5
S6	69.470	70.20	0.73	Diffuser	-			
S7	69.490	70.22	0.73	PPIC S/T	D400	150.0	150	3
S10	69.570	70.15	0.58	Diffuser	-			
S11	69.593	70.15	0.56	PPIC S/T	D400	150.0	150	3.5
S12	69.663	70.28	0.62	PPIC	A15	150.0	150	10.5
S15	69.570	70.15	0.58	Diffuser	-			
S16	69.593	70.15	0.56	PPIC S/T	D400	150.0	150	3.5
S17	69.643	70.25	0.61	PPIC	A15	150.0	150	7.5
S18	69.683	70.28	0.60	PPIC	A15	150.0	150	6

N
W E
S

NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

Drainage Key

Sewers

- Foul water drain (private/non adoptable)
- Surface water drain (private/non adoptable)
- Existing foul water sewer (Adopted)

Chamber Key

FW/SW

- mac — Mini access chamber (mac) - 300mmØ
- PPIC - 475mmØ*
- P.C.C. units/brick*
- DM — Adoptable demarcation manhole within 1m of boundary
- Manhole Depth: 1.25m to 1.5m* Depth: 1.55m to 3.0m*

* General note
(Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

- Rain water down pipe (roddable access)
- Soil vent pipe/soil stack
- ST — Silt Trap (ST) with removable silt bucket
- S1/F1 — Manhole reference number
- Linear drainage channel
- DU — RWP cellular discharge/collection unit (DU) (Permavoid or similar)
- FFL XX.XX — Finished Floor Level (FFL)
- Block paving - permeable
- Flood exceedance routing
- Impermeable barrier to stop lateral movement of water

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	16/11/22

DRAWING TITLE: Drainage Design
SHEET NO. 1/1

PROJECT
Building 9
Oxford Technology Park
Kidlington, Oxon

CLIENT
HILL STREET HOLDINGS

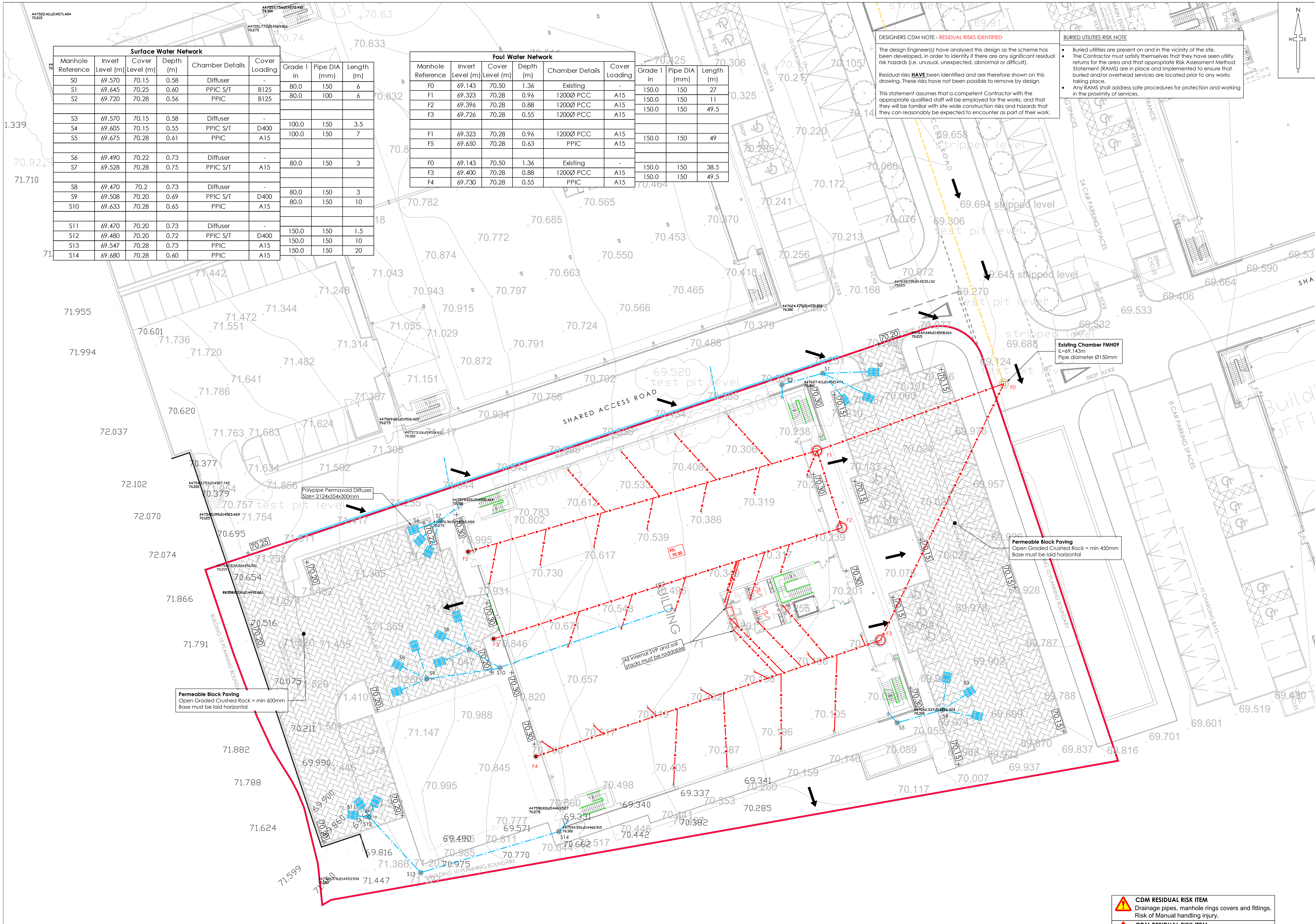
Infrastruct CS Ltd

The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk

SCALE @ A1 1:250 (0m 6.25m 12.5m)
ENGINEER MBD
DRAFT SNN
APPROVED RJW

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5214	S2	INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP	ICS	09	XX	DR	C	0200	P01



Surface Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
S0	69.570	70.15	0.58	Diffuser	-	80.0	150	6
S1	69.645	70.25	0.60	PPIC S/T	B125	80.0	100	6
S2	69.720	70.28	0.56	PPIC	B125			
S3	69.570	70.15	0.58	Diffuser	-	100.0	150	3.5
S4	69.605	70.15	0.55	PPIC S/T	D400	100.0	150	7
S5	69.675	70.28	0.61	PPIC	A15			
S6	69.490	70.22	0.73	Diffuser	-	80.0	150	3
S7	69.528	70.28	0.75	PPIC S/T	A15			
S8	69.470	70.2	0.73	Diffuser	-	80.0	150	3
S9	69.508	70.20	0.69	PPIC S/T	D400	80.0	150	10
S10	69.633	70.28	0.65	PPIC	A15			
S11	69.470	70.20	0.73	Diffuser	-	150.0	150	1.5
S12	69.480	70.20	0.72	PPIC S/T	D400	150.0	150	10
S13	69.547	70.28	0.73	PPIC	A15	150.0	150	20
S14	69.680	70.28	0.60	PPIC	A15			

Foul Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
F0	69.143	70.50	1.36	Existing	-	150.0	150	27
F1	69.323	70.28	0.96	1200Ø PCC	A15	150.0	150	11
F2	69.396	70.28	0.88	1200Ø PCC	A15	150.0	150	49.5
F3	69.726	70.28	0.55	1200Ø PCC	A15			
F1	69.323	70.28	0.96	1200Ø PCC	A15	150.0	150	49
F5	69.650	70.28	0.63	PPIC	A15			
F0	69.143	70.50	1.36	Existing	-	150.0	150	38.5
F3	69.400	70.28	0.88	1200Ø PCC	A15	150.0	150	49.5
F4	69.730	70.28	0.55	PPIC	A15			

DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

BURIED UTILITIES RISK NOTE

- Buried utilities are present on and in the vicinity of the site.
- The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place.
- Any RAMS shall address safe procedures for protection and working in the proximity of services.

NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

Drainage Key

Sewers

- Foul water drain (private/non adoptable)
- Surface water drain (private/non adoptable)
- Existing foul water sewer (Adopted)

Chamber Key

FW/SW

- Mini access chamber (mac) - 300mmØ
- PPIC - 475mmØ*
- P.C.C. units/brick*
- Adoptable demarcation manhole within 1m of boundary
- Manhole Depth: 1.25m to 1.5m* Depth: 1.55m to 3.0m*

* General note
(Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

- Rain water down pipe (roddable access)
- Soil vent pipe/soil stack
- ST: Silt Trap (ST) with removable silt bucket
- S1/F1: Manhole reference number
- Linear drainage channel
- RWP cellular discharge/collection unit (DU) (Permavoid or similar)
- FFL XX.XX: Finished Floor Level (FFL)
- Block paving - permeable
- Flood exceedance routing
- Impermeable barrier to stop lateral movement of water

CDM RESIDUAL RISK ITEM
Drainage pipes, manhole rings covers and fittings.
Risk of Manual handling injury.

CDM RESIDUAL RISK ITEM
Contact with waste water when making drainage connections.
Risk of infection from Weils disease etc.

CDM RESIDUAL RISK ITEM
Above Ground activities.
Possibility of objects falling from operations at high level onto persons working or passing below.

CDM RESIDUAL RISK ITEM
Works within confined spaces.

DESIGNER NOTE
Rainwater pipe locations to be confirmed

DESIGNER NOTE
Soakage rate used = 4.37x10-5 m/s, the worst result of the tree tests to BRE365 caried out on site in October 2022 (0.15732 m/h)

DESIGNER NOTE
Monitoring wells recorded groundwater levels between 0.9m and 2.5m bgl during investigation for Unit 1, to the north of this site. See report SHF.1733.001.GE.R.002.A. prepared by Enzygo in June 2020. To be further investigated with groundwater monitoring in winter within the site boundary.

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	16/11/22

DRAWING TITLE: Drainage Design
SHEET NO.: 1/1

PROJECT:
Building 10
Oxford Technology Park
Kidlington, Oxon

CLIENT: HILL STREET HOLDINGS

Infrastruct CS Ltd

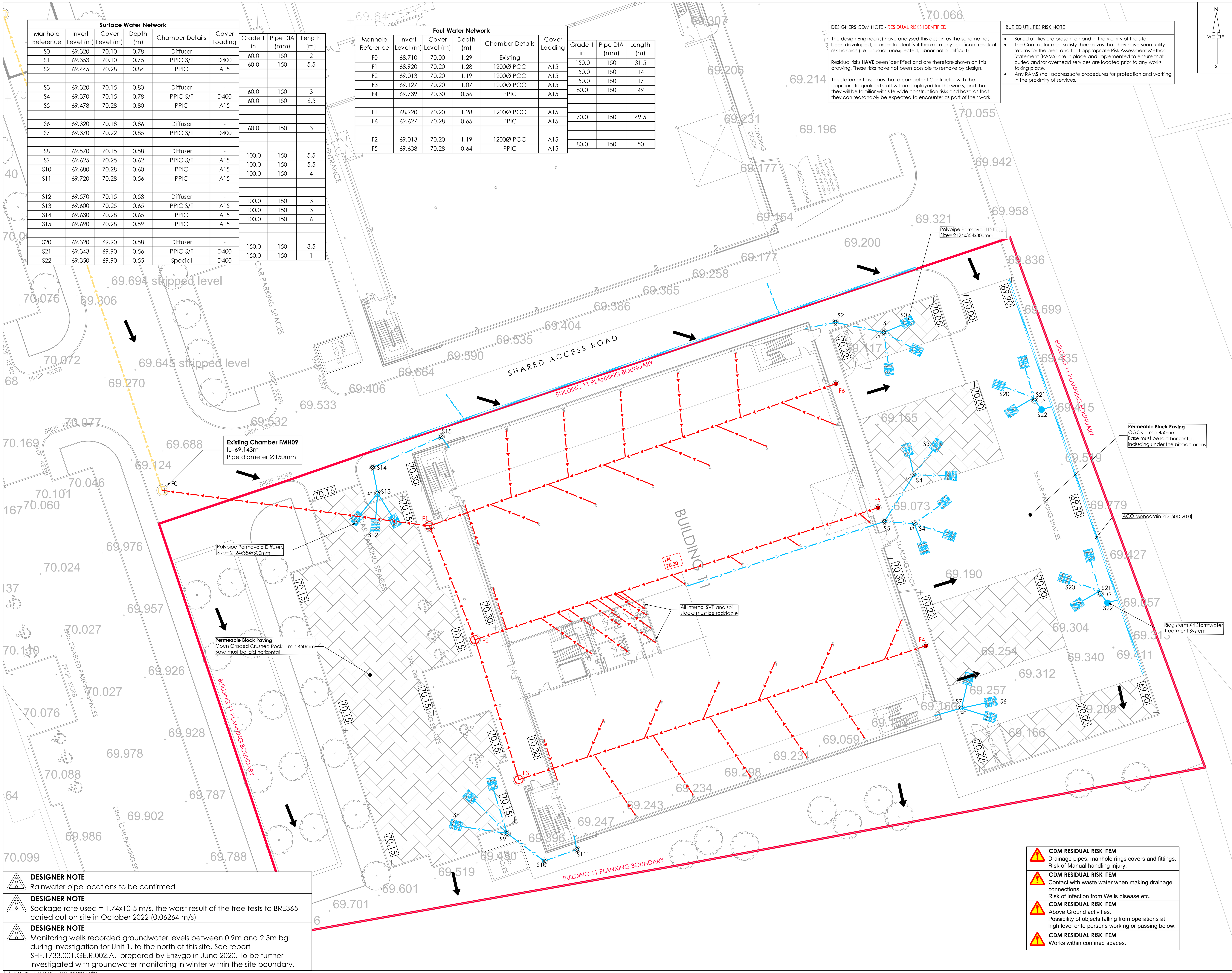
The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk

SCALE @ A1: 1:250 (0m, 6.25m, 12.5m)

ENGINEER: MBD
DRAFT: SNN
APPROVED: RJW

PROJECT NUMBER: 5214 | STATUS: S2 | ISSUE PURPOSE: INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP	ICS	10	XX	DR	C	0200	P01



Surface Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
S0	69.320	70.10	0.78	Diffuser	-			
S1	69.353	70.10	0.75	PPIC S/T	D400	60.0	150	2
S2	69.445	70.28	0.84	PPIC	A15	60.0	150	5.5
S3	69.320	70.15	0.83	Diffuser	-			
S4	69.370	70.15	0.78	PPIC S/T	D400	60.0	150	3
S5	69.478	70.28	0.80	PPIC	A15	60.0	150	6.5
S6	69.320	70.18	0.86	Diffuser	-			
S7	69.370	70.22	0.85	PPIC S/T	D400	60.0	150	3
S8	69.570	70.15	0.58	Diffuser	-			
S9	69.625	70.25	0.62	PPIC S/T	A15	100.0	150	5.5
S10	69.680	70.28	0.60	PPIC	A15	100.0	150	5.5
S11	69.720	70.28	0.56	PPIC	A15	100.0	150	4
S12	69.570	70.15	0.58	Diffuser	-			
S13	69.600	70.25	0.65	PPIC S/T	A15	100.0	150	3
S14	69.630	70.28	0.65	PPIC	A15	100.0	150	3
S15	69.690	70.28	0.59	PPIC	A15	100.0	150	6
S20	69.320	69.90	0.58	Diffuser	-			
S21	69.343	69.90	0.56	PPIC S/T	D400	150.0	150	3.5
S22	69.350	69.90	0.55	Special	D400	150.0	150	1

Foul Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
F0	68.710	70.00	1.29	Existing	-			
F1	68.920	70.20	1.28	1200Ø PCC	A15	150.0	150	31.5
F2	69.013	70.20	1.19	1200Ø PCC	A15	150.0	150	14
F3	69.127	70.20	1.07	1200Ø PCC	A15	150.0	150	17
F4	69.739	70.30	0.56	PPIC	A15	80.0	150	49
F1	68.920	70.20	1.28	1200Ø PCC	A15			
F6	69.627	70.28	0.65	PPIC	A15	70.0	150	49.5
F2	69.013	70.20	1.19	1200Ø PCC	A15			
F5	69.638	70.28	0.64	PPIC	A15	80.0	150	50

DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

BURIED UTILITIES RISK NOTE

- Buried utilities are present on and in the vicinity of the site.
- The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place.
- Any RAMS shall address safe procedures for protection and working in the proximity of services.

NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

Drainage Key

Sewers

- Foul water drain (private/non adoptable)
- Surface water drain (private/non adoptable)
- Existing foul water sewer (Adopted)

Chamber Key

FW/SW

- Mini access chamber (mac) - 300mmØ
- PPIC - 475mmØ*
- P.C.C. units/brick*
- Adoptable demarcation manhole within 1m of boundary
- Manhole
  Depth: 1.25m to 1.5m*
  Depth: 1.55m to 3.0m*

* General note
(Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

- Rain water down pipe (roddable access)
- Soil vent pipe/soil stack
- Silt Trap (ST) with removable silt bucket
- S1/F1 — Manhole reference number
- Linear drainage channel
- RWP cellular discharge/collection unit (DU) (Permavoid or similar)
- FFL XX.XX — Finished Floor Level (FFL)
- Block paving - permeable
- Flood exceedance routing
- Impermeable barrier to stop lateral movement of water

CDM RESIDUAL RISK ITEM
Drainage pipes, manhole rings covers and fittings.
Risk of Manual handling injury.

CDM RESIDUAL RISK ITEM
Contact with waste water when making drainage connections.
Risk of infection from Weils disease etc.

CDM RESIDUAL RISK ITEM
Above Ground activities.
Possibility of objects falling from operations at high level onto persons working or passing below.

CDM RESIDUAL RISK ITEM
Works within confined spaces.

DESIGNER NOTE
Rainwater pipe locations to be confirmed

DESIGNER NOTE
Soakage rate used = 1.74x10-5 m/s, the worst result of the tree tests to BRE365 caried out on site in October 2022 (0.06264 m/s)

DESIGNER NOTE
Monitoring wells recorded groundwater levels between 0.9m and 2.5m bgl during investigation for Unit 1, to the north of this site. See report SHF.1733.001.GE.R.002.A. prepared by Enzygo in June 2020. To be further investigated with groundwater monitoring in winter within the site boundary.

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	16/11/22

DRAWING TITLE: Drainage Design — SHEET NO. 1/1

PROJECT: Building 11, Oxford Technology Park, Kidlington, Oxon

CLIENT: Hill Street Holdings

Infrastruct CS Ltd

The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk

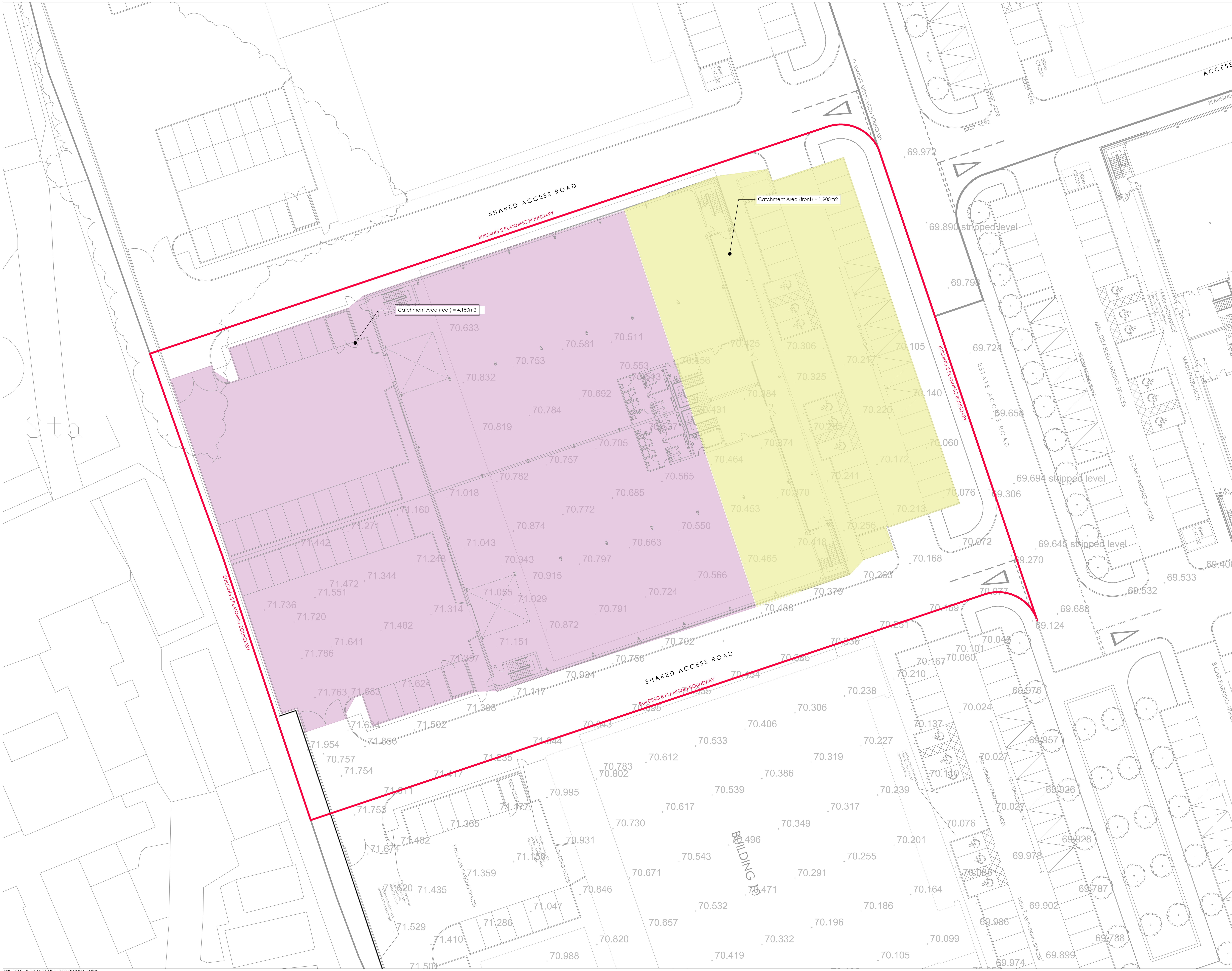
SCALE @ A1: 1:250 (0m — 6.25m — 12.5m)

ENGINEER: MBD — DRAFT: SNN — APPROVED: RJW

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5214	S2	INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP	ICS	11	XX	DR	C	0200	P01

Appendix C- Catchment Area Plans



NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	31/01/23

DRAWING TITLE
Catchment Area

SHEET NO.
1/1

PROJECT
Building 8
Oxford Technology Park
Kidlington, Oxon

CLIENT
HILL STREET HOLDINGS

Infrastruct CS Ltd

SCALE @ A1
1:200
0m 5m 10.0m

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5214	S2	INFORMATION

ENGINEER
MBD
DRAFT
SNN
APPROVED
RJW

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP	ICS	08	XX	DR	C	0500	P01

The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk

NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	31/01/23

DRAWING TITLE: Catchment Area

SHEET NO.: 1/1

PROJECT: Building 9, Oxford Technology Park, Kidlington, Oxon

CLIENT: HILL STREET HOLDINGS

Infrastruct CS Ltd

SCALE @ A1: 1:250 (0m, 6.25m, 12.5m)

ENGINEER: MBD

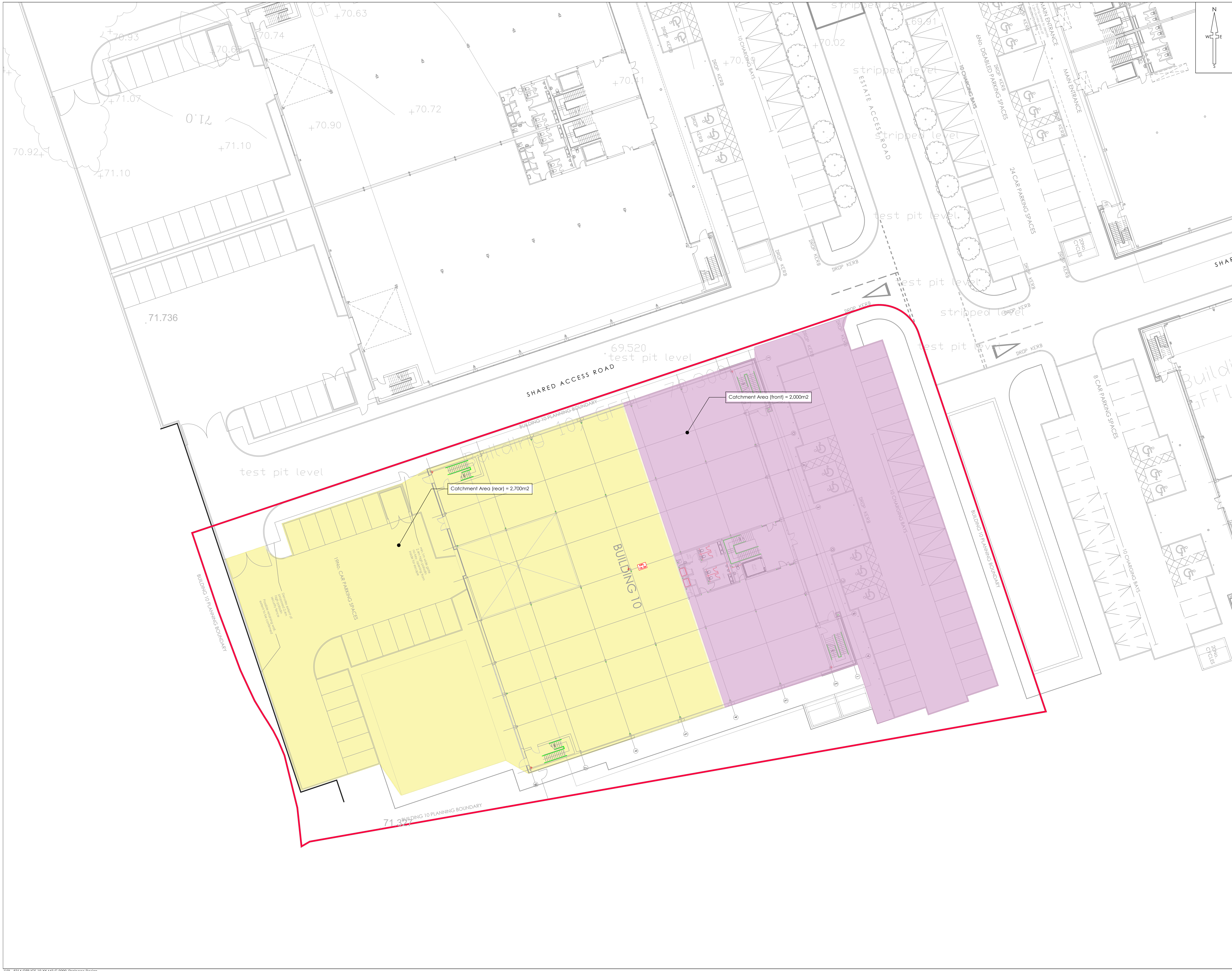
DRAFT: SNN

APPROVED: RJW

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5214	S2	INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP	ICS	09	XX	DR	C	0500	P01

(09) - 5214-OTP-ICS-09-XX-M2-C-0200_Drainage Design



N

NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	31/01/23

DRAWING TITLE: Catchment Areas
SHEET NO.: 1/1

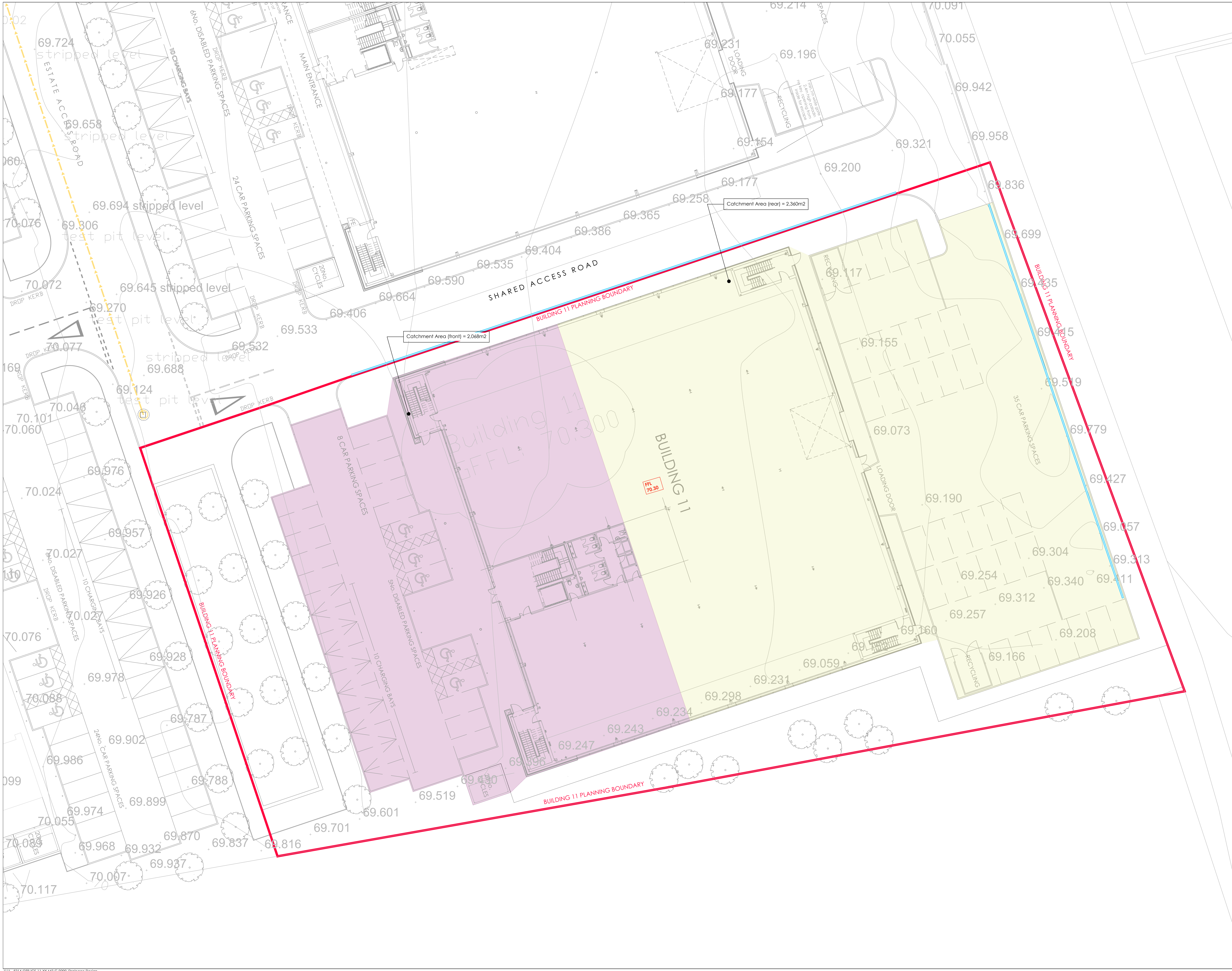
PROJECT
Building 10
Oxford Technology Park
Kidlington, Oxon

CLIENT: HILL STREET HOLDINGS
Infrastruct CS Ltd

SCALE @ A1: 1:250 (0m – 6.25m – 12.5m)
ENGINEER: MBD
DRAFT: SNN
APPROVED: RJW

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5214	S2	INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP	ICS	10	XX	DR	C	0400	P01



NOTES

1. All dimensions and levels are in metres unless otherwise noted
2. This drawing is to be read in conjunction with the relevant Architect's/Engineer's drawings, specifications and CDM documentation
3. This drawing has been produced electronically and may have been photo reduced or enlarged when copied. Work to figured dimensions only (DO NOT SCALE - EXCEPT FOR PLANNING PURPOSES). All dimensions to be checked on site. Any errors or omissions to be reported to the engineer immediately.
4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	31/01/23

DRAWING TITLE: Catchment Area

SHEET NO.: 1/1

PROJECT: Building 11, Oxford Technology Park, Kidlington, Oxon

CLIENT: Hill Street Holdings

Infrastruct CS Ltd

The Stables, High Cogges Farm, High Cogges, Witney, OX29 6UN - Tel: 01993 709709: info@infrastructcs.co.uk

SCALE @ A1: 1:250 (0m, 6.25m, 12.5m)

ENGINEER: MBD
DRAFT: SNN
APPROVED: RJW

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5214	S2	INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP	ICS	11	XX	DR	C	0500	P01

Appendix D- Soakage Testing Results

Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Test Reference:	B8.1
Site:	Unit 8
Client:	Hill Street
Test Date:	26/09/2022
Results logged by:	R.Ireanius

Calculations By:	RJW
Calculation Date:	13/10/2022
Length (m) =	1.40
Width (m) =	0.80
Depth (m) =	0.90

Infrastruct CS Ltd

File ref:	4929-OTP-13-001-BRE365 B8.1.xlsx

First Fill	
Time [Mins]	Test 1 Depth [m]
0.00	0.28
5.00	0.33
10.00	0.37
15.00	0.41
20.00	0.44
25.00	0.47
30.00	0.49
35.00	0.51
40.00	0.54
45.00	0.56
50.00	0.58
55.00	0.60
60.00	0.62

Second Fill	
Time [Mins]	Test 2 Depth [m]
0.00	0.08
5.00	0.12
10.00	0.16
15.00	0.20
20.00	0.22
25.00	0.25
30.00	0.27
35.00	0.30
40.00	0.32
45.00	0.35
50.00	0.37
55.00	0.39
60.00	0.41

Third Fill	
Time [Mins]	Test 3 Depth [m]
0.00	0.18
5.00	0.20
10.00	0.22
15.00	0.24
20.00	0.26
25.00	0.28
30.00	0.30
35.00	0.32
40.00	0.34
45.00	0.36
50.00	0.38
55.00	0.40
60.00	0.42

RESULTS

Volume Vp75 - 25 [m³]	0.28000
Area A_{p50} [m²]=	2.7480
Time t_{p75-25} [s] =	3338
Surface Water Soil infiltration rate [m/s]	3.053E-05
Treated Effluent Soil infiltration rate $(V_{p)}$ [s/mm]	13.35
Surface Water Soil infiltration rate [m/hr]	0.110

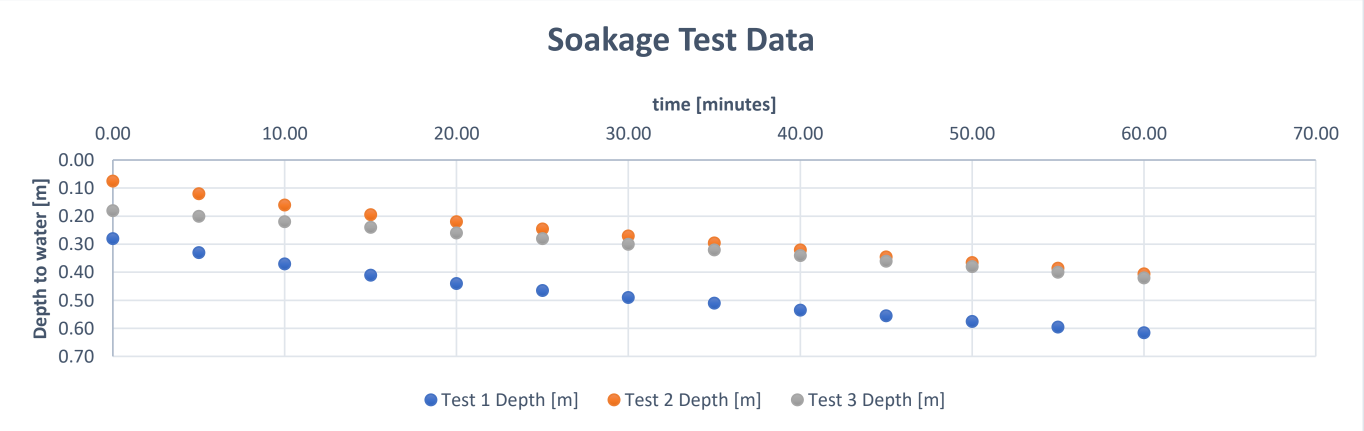
RESULTS

Volume Vp75 - 25 [m³]	0.37240
Area A_{p50} [m²]=	3.2870
Time t_{p75-25} [s] =	4526
Surface Water Soil infiltration rate [m/s]	2.503E-05
Treated Effluent Soil infiltration rate $(V_{p)}$ [s/mm]	13.61
Surface Water Soil infiltration rate [m/hr]	0.090

RESULTS

Volume Vp75 - 25 [m³]	0.31080
Area A_{p50} [m²]=	3.0670
Time t_{p75-25} [s] =	4163
Surface Water Soil infiltration rate [m/s]	2.435E-05
Treated Effluent Soil infiltration rate $(V_{p)}$ [s/mm]	15.00
Surface Water Soil infiltration rate [m/hr]	0.088

Slowest Soil Infiltration Rate [m/s] = 2.435E-05



Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Test Reference:	B9.1
Site:	Unit 9
Client:	Hill Street
Test Date:	27/09/2022
Results logged by:	R.Ireanius

Calculations By:	RJW
Calculation Date:	13/10/2022
Length (m) =	1.40
Width (m) =	0.80
Depth (m) =	0.90

Infrastruct CS Ltd

File ref:	4929-OTP-13-001-BRE365 B9.1.xlsx

First Fill	
Time [Mins]	Test 1 Depth [m]
0.00	0.23
10.00	0.30
10.00	0.37
30.00	0.42
40.00	0.45
50.00	0.47
60.00	0.50
70.00	0.53
80.00	0.56
90.00	0.59
100.00	0.62
110.00	0.65
120.00	0.68

Second Fill	
Time [Mins]	Test 2 Depth [m]
0.00	0.29
10.00	0.35
20.00	0.41
30.00	0.45
40.00	0.48
50.00	0.51
60.00	0.54
70.00	0.57
80.00	0.60
90.00	0.63
100.00	0.66
110.00	0.67
120.00	0.68

Third Fill	
Time [Mins]	Test 3 Depth [m]
0.00	0.25
10.00	0.32
20.00	0.37
30.00	0.42
40.00	0.46
50.00	0.50
50.00	0.53
60.00	0.56
70.00	0.59
80.00	0.63
90.00	0.66
100.00	0.67
110.00	0.67

RESULTS

Volume Vp75 - 25 [m³]	0.29680
Area A_{p50} [m^2]=	2.9020
Time t_{p75-25} [s] =	5550
Surface Water Soil infiltration rate [m/s]	1.843E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	20.94
Surface Water Soil infiltration rate [m/hr]	0.066

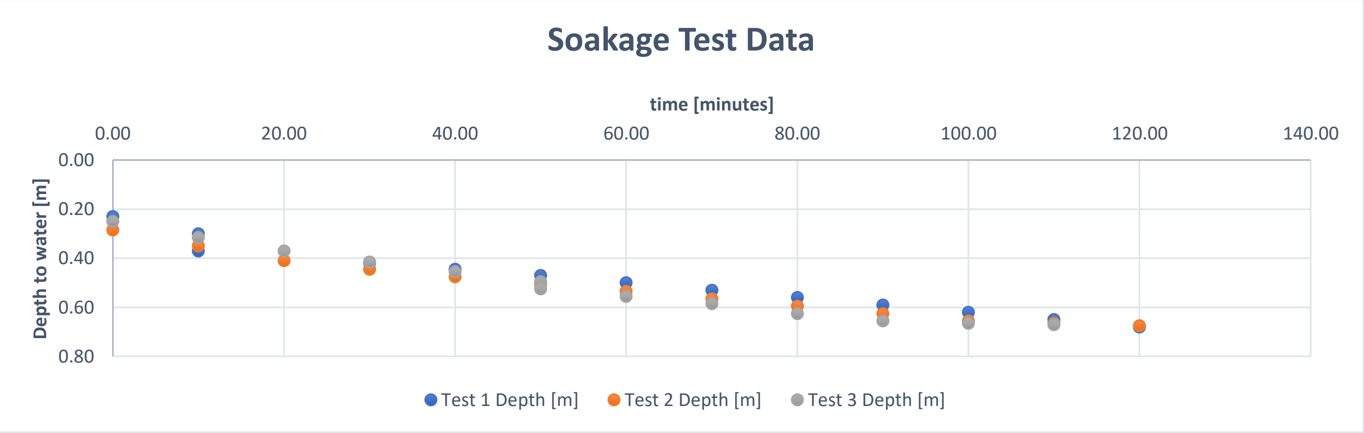
RESULTS

Volume Vp75 - 25 [m³]	0.28280
Area A_{p50} [m^2]=	2.7150
Time t_{p75-25} [s] =	5304
Surface Water Soil infiltration rate [m/s]	1.964E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	21.00
Surface Water Soil infiltration rate [m/hr]	0.071

RESULTS

Volume Vp75 - 25 [m³]	0.29680
Area A_{p50} [m^2]=	2.8140
Time t_{p75-25} [s] =	3883
Surface Water Soil infiltration rate [m/s]	2.716E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	14.65
Surface Water Soil infiltration rate [m/hr]	0.098

Slowest Soil Infiltration Rate [m/s] = 1.843E-05



Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Test Reference:	B10.1
Site:	Unit 10
Client:	Hill Street
Test Date:	28/09/2022
Results logged by:	R.Ireanius

Calculations By:	RJW
Calculation Date:	13/10/2022
Length (m) =	1.40
Width (m) =	0.80
Depth (m) =	0.90

Infrastruct CS Ltd

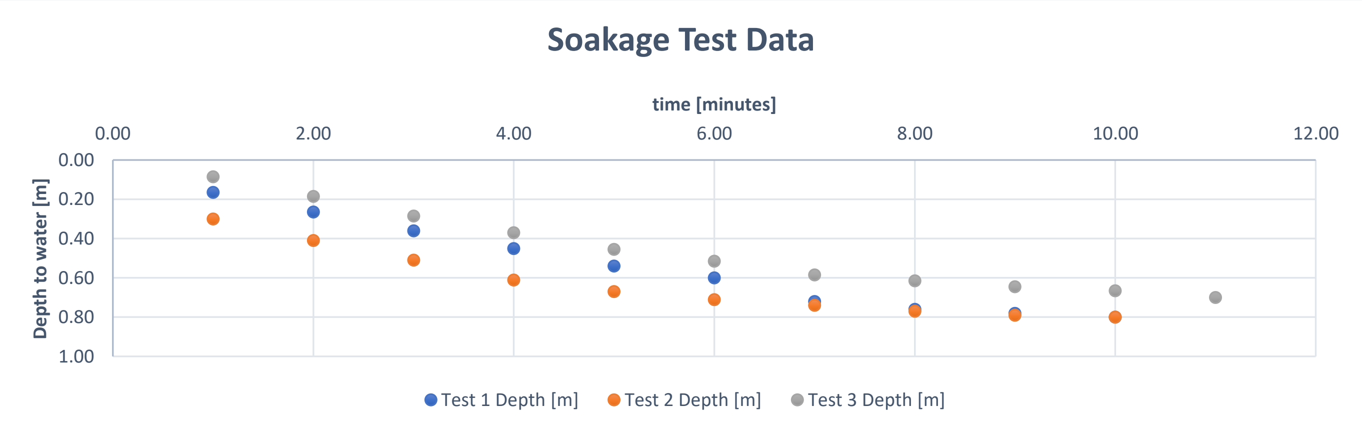
File ref:	4929-OTP-13-001-BRE365 B10.1.xlsx

First Fill		Second Fill		Third Fill	
Time [Mins]	Test 1 Depth [m]	Time [Mins]	Test 2 Depth [m]	Time [Mins]	Test 3 Depth [m]
0.00	0.17	0.00	0.30	0.00	0.09
10.00	0.27	10.00	0.41	10.00	0.19
20.00	0.36	20.00	0.51	20.00	0.29
30.00	0.45	30.00	0.61	30.00	0.37
40.00	0.54	40.00	0.67	40.00	0.46
50.00	0.60	50.00	0.71	50.00	0.52
60.00	0.72	60.00	0.74	60.00	0.59
70.00	0.76	70.00	0.77	70.00	0.62
80.00	0.78	80.00	0.79	80.00	0.65
90.00	0.80	90.00	0.80	90.00	0.67
				100.00	0.70

RESULTS

	Test 1	Test 2	Test 3
Volume Vp75 - 25 [m³]	0.35560	0.28000	0.34440
Area A_{p50} [m^2]=	2.9570	2.6600	3.3530
Time t_{p75-25} [s] =	2235	1785	2345
Surface Water Soil infiltration rate [m/s]	5.380E-05	5.897E-05	4.379E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	7.04	7.14	7.63
Surface Water Soil infiltration rate [m/hr]	0.194	0.212	0.158

Slowest Soil Infiltration Rate [m/s] = 4.379E-05



Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Test Reference:	B11.1
Site:	Unit 11
Client:	Hill Street
Test Date:	29/09/2022
Results logged by:	R.Ireanius

Calculations By:	RJW
Calculation Date:	13/10/2022
Length (m) =	1.40
Width (m) =	0.80
Depth (m) =	0.90

Infrastruct CS Ltd

File ref:	4929-OTP-13-001-BRE365 B11.1.xlsx

First Fill	
Time [Mins]	Test 1 Depth [m]
0.00	0.05
10.00	0.13
10.00	0.20
30.00	0.28
40.00	0.35
50.00	0.39
60.00	0.43
70.00	0.47
80.00	0.49
90.00	0.52
100.00	0.54
110.00	0.56
120.00	0.58

Second Fill	
Time [Mins]	Test 2 Depth [m]
0.00	0.09
10.00	0.13
20.00	0.17
30.00	0.20
40.00	0.25
50.00	0.30
60.00	0.34
70.00	0.38
80.00	0.41
90.00	0.44
100.00	0.47
110.00	0.50
120.00	0.51

Third Fill	
Time [Mins]	Test 3 Depth [m]
0.00	0.20
10.00	0.26
20.00	0.31
30.00	0.36
40.00	0.40
50.00	0.43
60.00	0.47
70.00	0.50
80.00	0.53
90.00	0.54
100.00	0.56
110.00	0.58
120.00	0.60

RESULTS

Volume Vp75 - 25 [m³]	0.35280
Area A_{p50} [m²]=	3.4740
Time t_{p75-25} [s] =	4860
Surface Water Soil infiltration rate [m/s]	2.090E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	15.43
Surface Water Soil infiltration rate [m/hr]	0.075

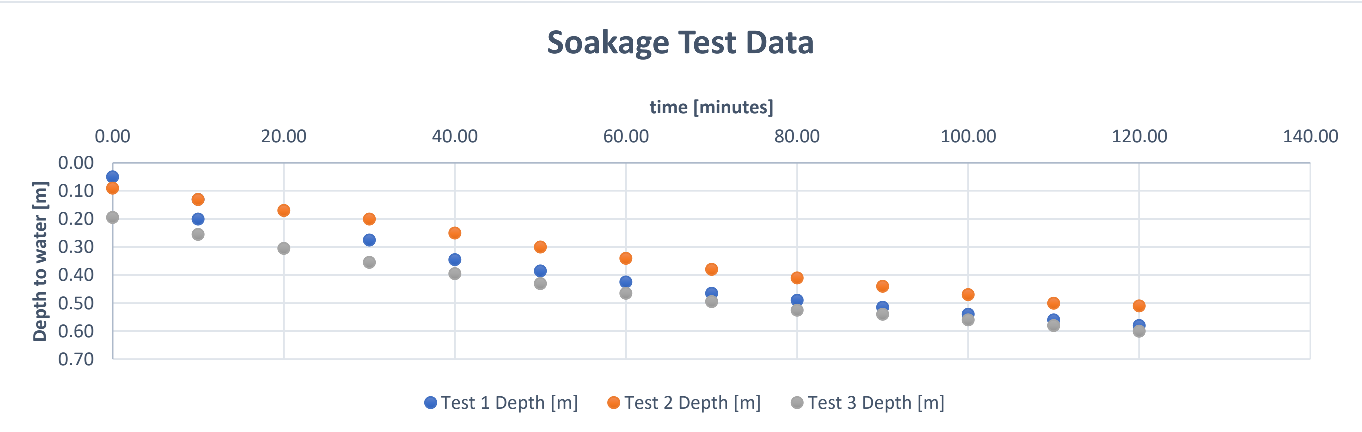
RESULTS

Volume Vp75 - 25 [m³]	0.27440
Area A_{p50} [m²]=	3.6060
Time t_{p75-25} [s] =	3800
Surface Water Soil infiltration rate [m/s]	2.003E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	15.51
Surface Water Soil infiltration rate [m/hr]	0.072

RESULTS

Volume Vp75 - 25 [m³]	0.30520
Area A_{p50} [m²]=	3.0230
Time t_{p75-25} [s] =	5798
Surface Water Soil infiltration rate [m/s]	1.741E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	21.28
Surface Water Soil infiltration rate [m/hr]	0.063

Slowest Soil Infiltration Rate [m/s] = 1.741E-05



Appendix E- Calculations

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 71 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
15 min Summer	69.785	0.215	9.7	51.5	O K
30 min Summer	69.840	0.270	9.7	64.8	O K
60 min Summer	69.872	0.302	9.7	72.4	O K
120 min Summer	69.871	0.301	9.7	72.3	O K
180 min Summer	69.855	0.285	9.7	68.4	O K
240 min Summer	69.834	0.264	9.7	63.3	O K
360 min Summer	69.792	0.222	9.7	53.3	O K
480 min Summer	69.754	0.184	9.7	44.3	O K
600 min Summer	69.721	0.151	9.7	36.3	O K
720 min Summer	69.693	0.123	9.7	29.4	O K
960 min Summer	69.650	0.080	9.7	19.3	O K
1440 min Summer	69.617	0.047	9.1	11.2	O K
2160 min Summer	69.605	0.035	6.8	8.3	O K
2880 min Summer	69.598	0.028	5.4	6.6	O K
4320 min Summer	69.590	0.020	3.9	4.8	O K
5760 min Summer	69.586	0.016	3.1	3.8	O K
7200 min Summer	69.583	0.013	2.6	3.1	O K
8640 min Summer	69.581	0.011	2.2	2.7	O K
10080 min Summer	69.580	0.010	2.0	2.4	O K
15 min Winter	69.785	0.215	9.7	51.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Time-Peak (mins)
15 min Summer	138.153	0.0	17
30 min Summer	90.705	0.0	31
60 min Summer	56.713	0.0	60
120 min Summer	34.246	0.0	90
180 min Summer	25.149	0.0	124
240 min Summer	20.078	0.0	158
360 min Summer	14.585	0.0	224
480 min Summer	11.622	0.0	288
600 min Summer	9.738	0.0	350
720 min Summer	8.424	0.0	408
960 min Summer	6.697	0.0	520
1440 min Summer	4.839	0.0	736
2160 min Summer	3.490	0.0	1100
2880 min Summer	2.766	0.0	1468
4320 min Summer	1.989	0.0	2188
5760 min Summer	1.573	0.0	2936
7200 min Summer	1.311	0.0	3672
8640 min Summer	1.129	0.0	4400
10080 min Summer	0.994	0.0	5024
15 min Winter	138.153	0.0	17

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	69.840	0.270	9.7	64.9	O K
60 min Winter	69.873	0.303	9.7	72.6	O K
120 min Winter	69.866	0.296	9.7	71.1	O K
180 min Winter	69.841	0.271	9.7	65.1	O K
240 min Winter	69.810	0.240	9.7	57.6	O K
360 min Winter	69.749	0.179	9.7	42.9	O K
480 min Winter	69.696	0.126	9.7	30.4	O K
600 min Winter	69.655	0.085	9.7	20.4	O K
720 min Winter	69.627	0.057	9.7	13.7	O K
960 min Winter	69.613	0.043	8.3	10.2	O K
1440 min Winter	69.601	0.031	6.1	7.5	O K
2160 min Winter	69.593	0.023	4.4	5.4	O K
2880 min Winter	69.588	0.018	3.5	4.3	O K
4320 min Winter	69.583	0.013	2.5	3.1	O K
5760 min Winter	69.580	0.010	2.0	2.4	O K
7200 min Winter	69.579	0.009	1.7	2.1	O K
8640 min Winter	69.577	0.007	1.4	1.7	O K
10080 min Winter	69.577	0.007	1.3	1.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	31
60 min Winter	56.713	0.0	58
120 min Winter	34.246	0.0	94
180 min Winter	25.149	0.0	132
240 min Winter	20.078	0.0	168
360 min Winter	14.585	0.0	236
480 min Winter	11.622	0.0	298
600 min Winter	9.738	0.0	352
720 min Winter	8.424	0.0	396
960 min Winter	6.697	0.0	500
1440 min Winter	4.839	0.0	736
2160 min Winter	3.490	0.0	1092
2880 min Winter	2.766	0.0	1472
4320 min Winter	1.989	0.0	2204
5760 min Winter	1.573	0.0	2864
7200 min Winter	1.311	0.0	3720
8640 min Winter	1.129	0.0	4320
10080 min Winter	0.994	0.0	5056

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.190

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.190

Time Area Diagram

Total Area (ha) 0.000

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.000

Model Details

Storage is Online Cover Level (m) 70.150

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.08748	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	80.0
Max Percolation (l/s)	222.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.570	Membrane Depth (m)	0

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 76 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	69.811	0.241	19.4	115.8	O K
30 min Summer	69.874	0.304	19.4	146.2	O K
60 min Summer	69.914	0.344	19.4	164.9	O K
120 min Summer	69.915	0.345	19.4	165.5	O K
180 min Summer	69.899	0.329	19.4	157.7	O K
240 min Summer	69.877	0.307	19.4	147.4	O K
360 min Summer	69.834	0.264	19.4	126.8	O K
480 min Summer	69.794	0.224	19.4	107.7	O K
600 min Summer	69.758	0.188	19.4	90.4	O K
720 min Summer	69.726	0.156	19.4	75.1	O K
960 min Summer	69.676	0.106	19.4	50.7	O K
1440 min Summer	69.622	0.052	19.4	25.1	O K
2160 min Summer	69.608	0.038	14.9	18.3	O K
2880 min Summer	69.601	0.031	12.0	14.7	O K
4320 min Summer	69.592	0.022	8.7	10.6	O K
5760 min Summer	69.588	0.018	6.9	8.4	O K
7200 min Summer	69.585	0.015	5.7	7.0	O K
8640 min Summer	69.583	0.013	5.0	6.0	O K
10080 min Summer	69.581	0.011	4.4	5.3	O K
15 min Winter	69.811	0.241	19.4	115.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	18
30 min Summer	90.705	0.0	32
60 min Summer	56.713	0.0	60
120 min Summer	34.246	0.0	94
180 min Summer	25.149	0.0	126
240 min Summer	20.078	0.0	160
360 min Summer	14.585	0.0	228
480 min Summer	11.622	0.0	292
600 min Summer	9.738	0.0	356
720 min Summer	8.424	0.0	416
960 min Summer	6.697	0.0	530
1440 min Summer	4.839	0.0	738
2160 min Summer	3.490	0.0	1100
2880 min Summer	2.766	0.0	1468
4320 min Summer	1.989	0.0	2200
5760 min Summer	1.573	0.0	2928
7200 min Summer	1.311	0.0	3672
8640 min Summer	1.129	0.0	4304
10080 min Summer	0.994	0.0	5000
15 min Winter	138.153	0.0	17

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	69.875	0.305	19.4	146.4	O K
60 min Winter	69.915	0.345	19.4	165.4	O K
120 min Winter	69.911	0.341	19.4	163.9	O K
180 min Winter	69.887	0.317	19.4	152.3	O K
240 min Winter	69.856	0.286	19.4	137.2	O K
360 min Winter	69.792	0.222	19.4	106.6	O K
480 min Winter	69.735	0.165	19.4	79.3	O K
600 min Winter	69.687	0.117	19.4	56.3	O K
720 min Winter	69.650	0.080	19.4	38.2	O K
960 min Winter	69.617	0.047	18.4	22.7	O K
1440 min Winter	69.604	0.034	13.3	16.5	O K
2160 min Winter	69.595	0.025	9.8	12.0	O K
2880 min Winter	69.590	0.020	7.7	9.4	O K
4320 min Winter	69.584	0.014	5.5	6.7	O K
5760 min Winter	69.581	0.011	4.4	5.3	O K
7200 min Winter	69.579	0.009	3.6	4.5	O K
8640 min Winter	69.578	0.008	3.2	3.9	O K
10080 min Winter	69.577	0.007	2.8	3.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	31
60 min Winter	56.713	0.0	58
120 min Winter	34.246	0.0	96
180 min Winter	25.149	0.0	134
240 min Winter	20.078	0.0	172
360 min Winter	14.585	0.0	242
480 min Winter	11.622	0.0	306
600 min Winter	9.738	0.0	362
720 min Winter	8.424	0.0	414
960 min Winter	6.697	0.0	500
1440 min Winter	4.839	0.0	748
2160 min Winter	3.490	0.0	1100
2880 min Winter	2.766	0.0	1468
4320 min Winter	1.989	0.0	2124
5760 min Winter	1.573	0.0	2864
7200 min Winter	1.311	0.0	3672
8640 min Winter	1.129	0.0	4232
10080 min Winter	0.994	0.0	5008

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.420

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.420

Time Area Diagram

Total Area (ha) 0.000

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.000

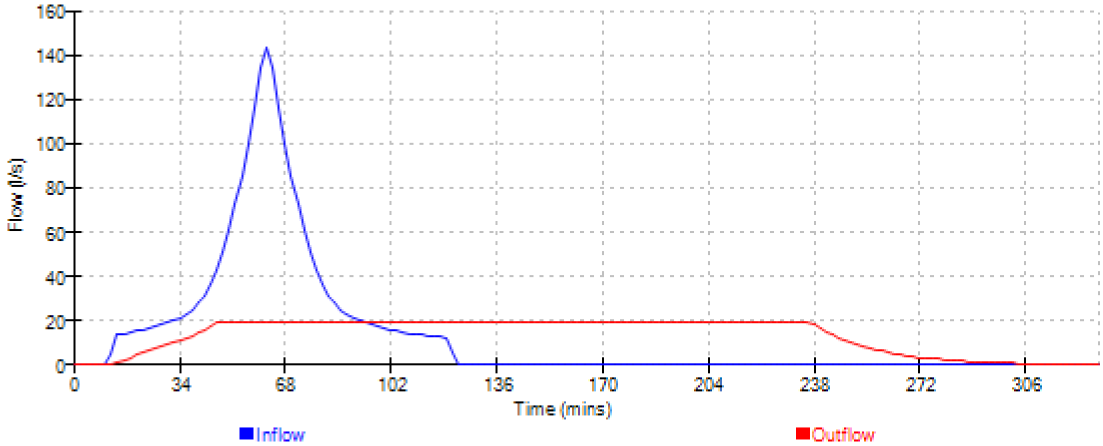
Model Details

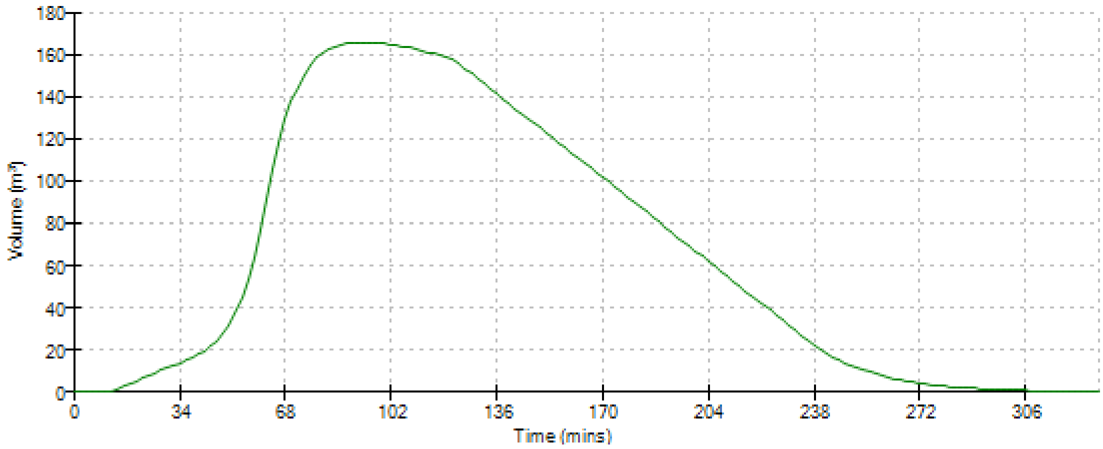
Storage is Online Cover Level (m) 70.200

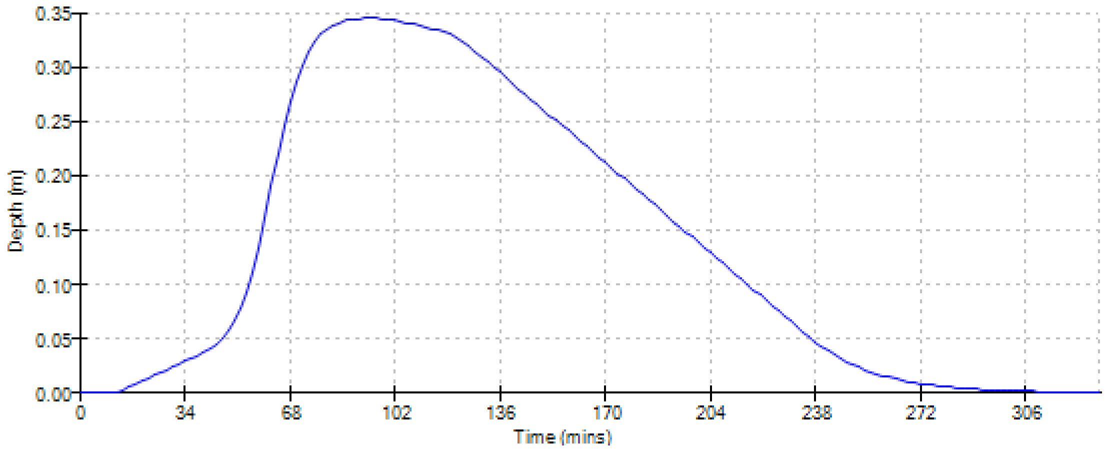
Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.08748	Width (m)	20.0
Membrane Percolation (mm/hr)	1000	Length (m)	80.0
Max Percolation (l/s)	444.4	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.570	Membrane Depth (m)	0

Event: 120 min Summer







Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 103 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	69.808	0.238	7.8	60.6	O K
30 min Summer	69.874	0.304	7.8	77.5	O K
60 min Summer	69.922	0.352	7.8	89.9	O K
120 min Summer	69.935	0.365	7.8	93.0	O K
180 min Summer	69.925	0.355	7.8	90.4	O K
240 min Summer	69.909	0.339	7.8	86.4	O K
360 min Summer	69.875	0.305	7.8	77.8	O K
480 min Summer	69.843	0.273	7.8	69.5	O K
600 min Summer	69.812	0.242	7.8	61.6	O K
720 min Summer	69.783	0.213	7.8	54.2	O K
960 min Summer	69.732	0.162	7.8	41.2	O K
1440 min Summer	69.659	0.089	7.8	22.8	O K
2160 min Summer	69.618	0.048	7.5	12.2	O K
2880 min Summer	69.608	0.038	6.0	9.8	O K
4320 min Summer	69.598	0.028	4.3	7.1	O K
5760 min Summer	69.592	0.022	3.5	5.6	O K
7200 min Summer	69.589	0.019	2.9	4.7	O K
8640 min Summer	69.586	0.016	2.5	4.1	O K
10080 min Summer	69.584	0.014	2.2	3.6	O K
15 min Winter	69.808	0.238	7.8	60.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	18
30 min Summer	90.705	0.0	32
60 min Summer	56.713	0.0	62
120 min Summer	34.246	0.0	104
180 min Summer	25.149	0.0	136
240 min Summer	20.078	0.0	168
360 min Summer	14.585	0.0	236
480 min Summer	11.622	0.0	304
600 min Summer	9.738	0.0	368
720 min Summer	8.424	0.0	434
960 min Summer	6.697	0.0	556
1440 min Summer	4.839	0.0	780
2160 min Summer	3.490	0.0	1104
2880 min Summer	2.766	0.0	1468
4320 min Summer	1.989	0.0	2204
5760 min Summer	1.573	0.0	2928
7200 min Summer	1.311	0.0	3656
8640 min Summer	1.129	0.0	4400
10080 min Summer	0.994	0.0	5056
15 min Winter	138.153	0.0	18

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	69.874	0.304	7.8	77.6	O K
60 min Winter	69.924	0.354	7.8	90.2	O K
120 min Winter	69.935	0.365	7.8	93.1	O K
180 min Winter	69.920	0.350	7.8	89.3	O K
240 min Winter	69.898	0.328	7.8	83.6	O K
360 min Winter	69.849	0.279	7.8	71.1	O K
480 min Winter	69.800	0.230	7.8	58.8	O K
600 min Winter	69.756	0.186	7.8	47.4	O K
720 min Winter	69.716	0.146	7.8	37.2	O K
960 min Winter	69.653	0.083	7.8	21.2	O K
1440 min Winter	69.614	0.044	6.8	11.1	O K
2160 min Winter	69.602	0.032	5.0	8.0	O K
2880 min Winter	69.595	0.025	3.9	6.4	O K
4320 min Winter	69.588	0.018	2.9	4.6	O K
5760 min Winter	69.584	0.014	2.2	3.6	O K
7200 min Winter	69.582	0.012	1.8	3.1	O K
8640 min Winter	69.580	0.010	1.6	2.6	O K
10080 min Winter	69.579	0.009	1.4	2.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	32
60 min Winter	56.713	0.0	60
120 min Winter	34.246	0.0	114
180 min Winter	25.149	0.0	140
240 min Winter	20.078	0.0	178
360 min Winter	14.585	0.0	252
480 min Winter	11.622	0.0	322
600 min Winter	9.738	0.0	386
720 min Winter	8.424	0.0	448
960 min Winter	6.697	0.0	556
1440 min Winter	4.839	0.0	744
2160 min Winter	3.490	0.0	1100
2880 min Winter	2.766	0.0	1452
4320 min Winter	1.989	0.0	2192
5760 min Winter	1.573	0.0	2824
7200 min Winter	1.311	0.0	3680
8640 min Winter	1.129	0.0	4360
10080 min Winter	0.994	0.0	5032

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.215

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.215

Time Area Diagram

Total Area (ha) 0.000

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.000

Model Details

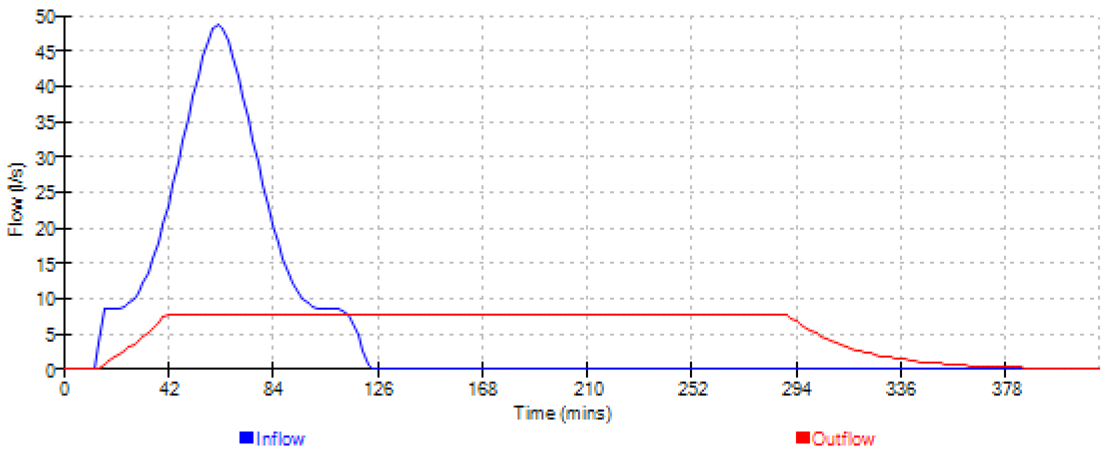
Storage is Online Cover Level (m) 70.150

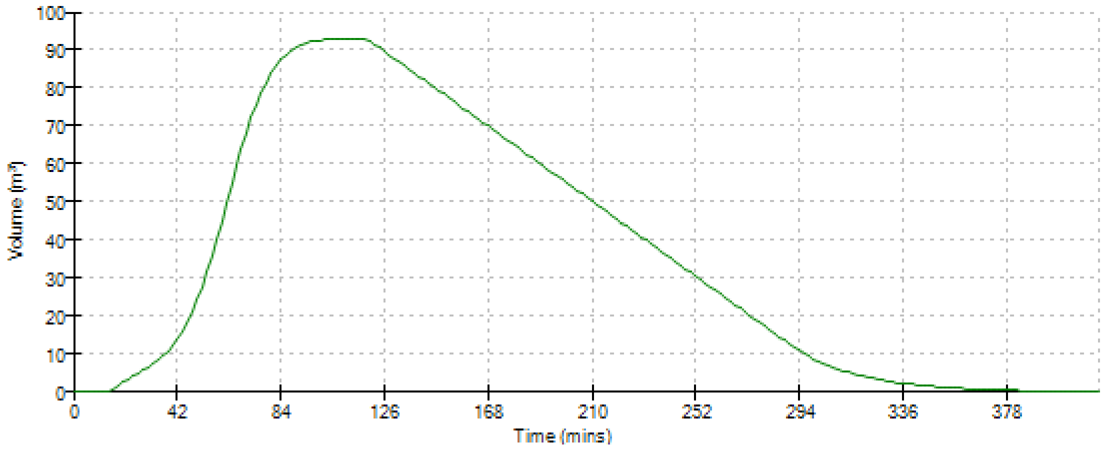
Porous Car Park Structure

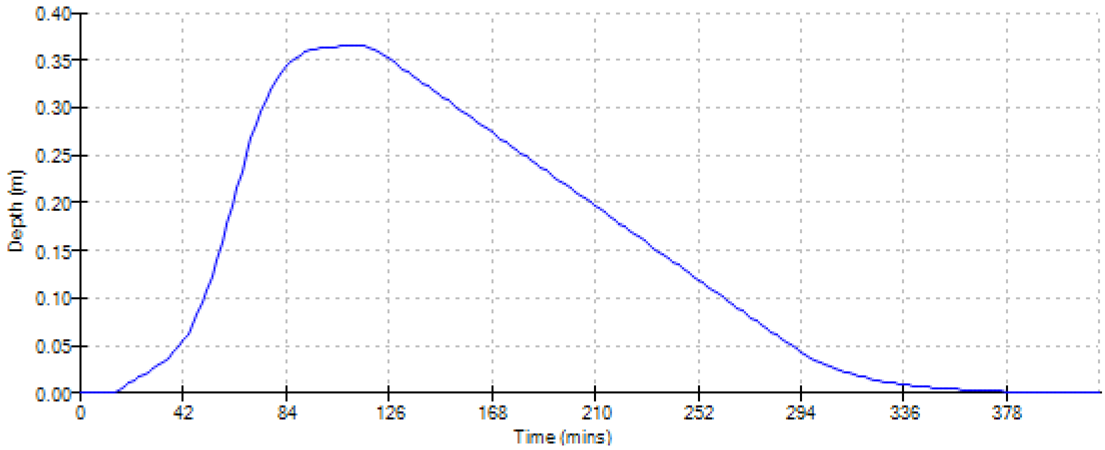
Infiltration Coefficient Base (m/hr)	0.06624	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	85.0
Max Percolation (l/s)	236.1	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.570	Membrane Depth (m)	0

Infrastruct CS Ltd		
The Stables High Cogges, Witney Oxfordshire, OX29 6UN	Unit 9 Front Car Park Oxford Technology Park	
Date 15/11/2022 File 5214 - OTP9 - POROUS CA...	Designed by RSI Checked by MBD	
Innovyze	Source Control 2020.1.3	

Event: 120 min Winter







Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 151 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	69.791	0.321	9.2	96.2	O K
30 min Summer	69.882	0.412	9.2	123.5	O K
60 min Summer	69.955	0.485	9.2	145.6	O K
120 min Summer	69.988	0.518	9.2	155.3	O K
180 min Summer	69.978	0.508	9.2	152.4	O K
240 min Summer	69.961	0.491	9.2	147.3	O K
360 min Summer	69.925	0.455	9.2	136.6	O K
480 min Summer	69.891	0.421	9.2	126.2	O K
600 min Summer	69.857	0.387	9.2	116.0	O K
720 min Summer	69.824	0.354	9.2	106.2	O K
960 min Summer	69.763	0.293	9.2	87.8	O K
1440 min Summer	69.660	0.190	9.2	57.1	O K
2160 min Summer	69.561	0.091	9.2	27.3	O K
2880 min Summer	69.520	0.050	9.2	15.1	O K
4320 min Summer	69.507	0.037	6.8	11.0	O K
5760 min Summer	69.499	0.029	5.4	8.7	O K
7200 min Summer	69.494	0.024	4.5	7.2	O K
8640 min Summer	69.491	0.021	3.8	6.2	O K
10080 min Summer	69.488	0.018	3.4	5.4	O K
15 min Winter	69.791	0.321	9.2	96.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	18
30 min Summer	90.705	0.0	33
60 min Summer	56.713	0.0	62
120 min Summer	34.246	0.0	120
180 min Summer	25.149	0.0	152
240 min Summer	20.078	0.0	182
360 min Summer	14.585	0.0	248
480 min Summer	11.622	0.0	316
600 min Summer	9.738	0.0	384
720 min Summer	8.424	0.0	450
960 min Summer	6.697	0.0	578
1440 min Summer	4.839	0.0	822
2160 min Summer	3.490	0.0	1148
2880 min Summer	2.766	0.0	1468
4320 min Summer	1.989	0.0	2196
5760 min Summer	1.573	0.0	2928
7200 min Summer	1.311	0.0	3648
8640 min Summer	1.129	0.0	4296
10080 min Summer	0.994	0.0	5136
15 min Winter	138.153	0.0	18

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	69.882	0.412	9.2	123.7	O K
60 min Winter	69.957	0.487	9.2	146.1	O K
120 min Winter	69.992	0.522	9.2	156.5	O K
180 min Winter	69.979	0.509	9.2	152.7	O K
240 min Winter	69.957	0.487	9.2	146.1	O K
360 min Winter	69.908	0.438	9.2	131.4	O K
480 min Winter	69.857	0.387	9.2	116.1	O K
600 min Winter	69.806	0.336	9.2	100.9	O K
720 min Winter	69.758	0.288	9.2	86.5	O K
960 min Winter	69.672	0.202	9.2	60.5	O K
1440 min Winter	69.549	0.079	9.2	23.6	O K
2160 min Winter	69.511	0.041	7.6	12.4	O K
2880 min Winter	69.503	0.033	6.0	9.8	O K
4320 min Winter	69.494	0.024	4.4	7.1	O K
5760 min Winter	69.489	0.019	3.4	5.6	O K
7200 min Winter	69.486	0.016	2.9	4.7	O K
8640 min Winter	69.483	0.013	2.4	4.0	O K
10080 min Winter	69.482	0.012	2.2	3.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	32
60 min Winter	56.713	0.0	60
120 min Winter	34.246	0.0	116
180 min Winter	25.149	0.0	168
240 min Winter	20.078	0.0	188
360 min Winter	14.585	0.0	264
480 min Winter	11.622	0.0	338
600 min Winter	9.738	0.0	410
720 min Winter	8.424	0.0	476
960 min Winter	6.697	0.0	600
1440 min Winter	4.839	0.0	808
2160 min Winter	3.490	0.0	1104
2880 min Winter	2.766	0.0	1468
4320 min Winter	1.989	0.0	2168
5760 min Winter	1.573	0.0	2880
7200 min Winter	1.311	0.0	3712
8640 min Winter	1.129	0.0	4408
10080 min Winter	0.994	0.0	5072

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.330

Time From:	(mins) To:	Area (ha)
0	4	0.330

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

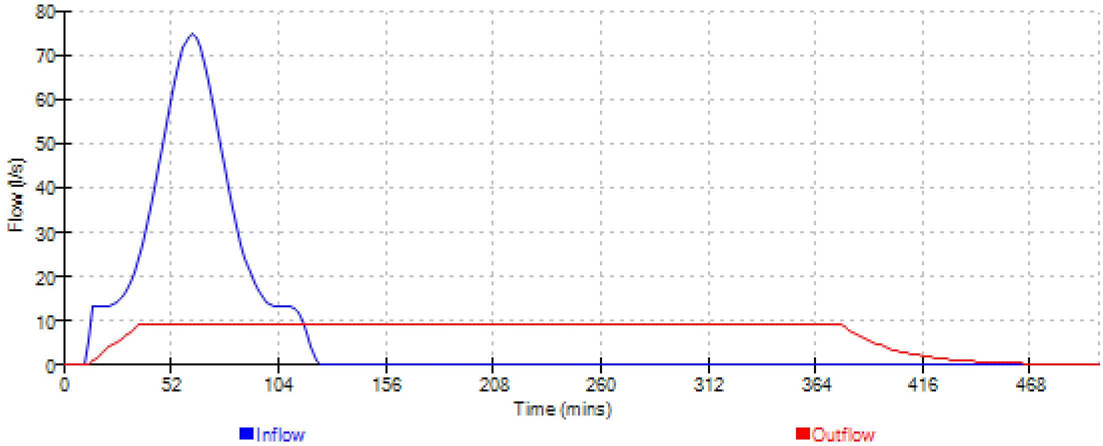
Model Details

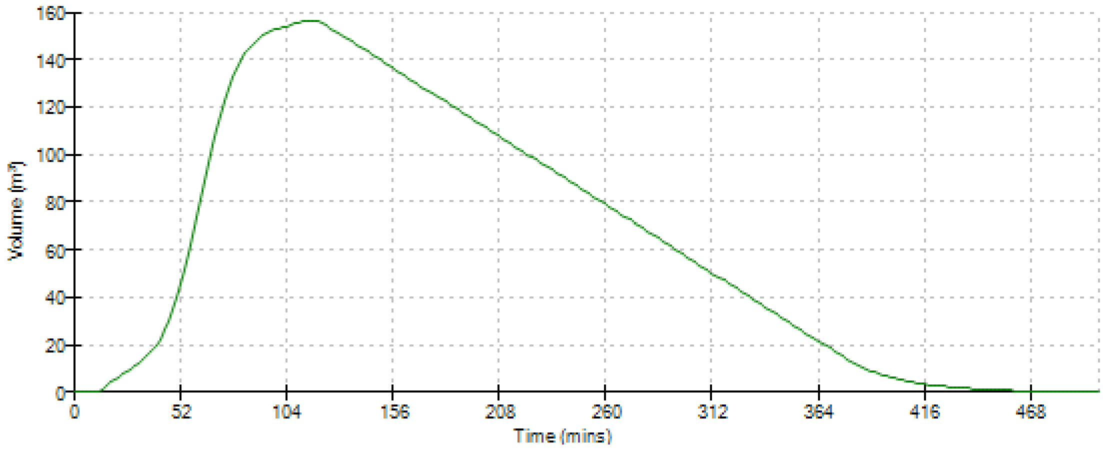
Storage is Online Cover Level (m) 70.150

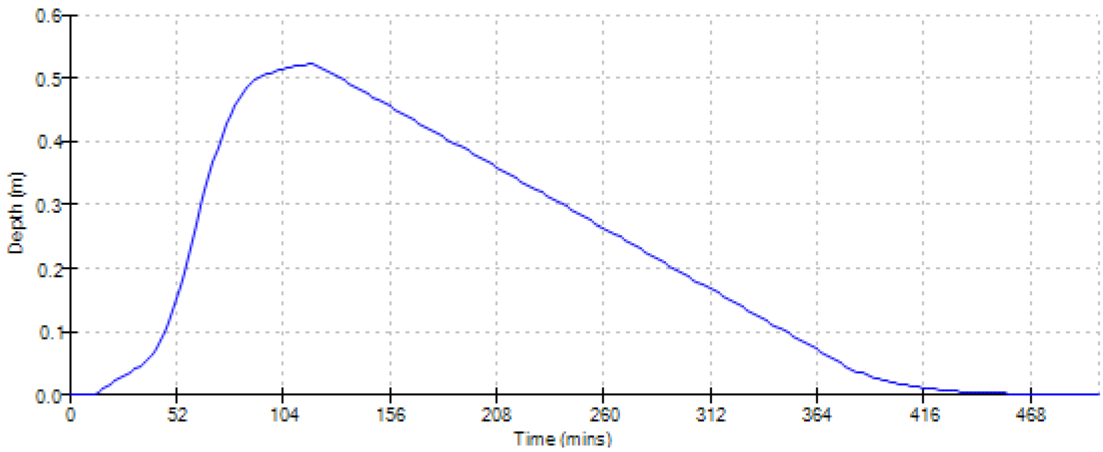
Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.06624	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	100.0
Max Percolation (l/s)	277.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.470	Membrane Depth (m)	0

Event: 120 min Winter







Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 33 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	69.766	0.196	18.4	49.3	O K
30 min Summer	69.803	0.233	18.4	58.8	O K
60 min Summer	69.814	0.244	18.4	61.5	O K
120 min Summer	69.792	0.222	18.4	55.9	O K
180 min Summer	69.759	0.189	18.4	47.7	O K
240 min Summer	69.727	0.157	18.4	39.7	O K
360 min Summer	69.675	0.105	18.4	26.5	O K
480 min Summer	69.640	0.070	18.4	17.7	O K
600 min Summer	69.621	0.051	18.4	13.0	O K
720 min Summer	69.615	0.045	16.6	11.3	O K
960 min Summer	69.607	0.037	13.5	9.2	O K
1440 min Summer	69.597	0.027	9.8	6.8	O K
2160 min Summer	69.590	0.020	7.2	4.9	O K
2880 min Summer	69.586	0.016	5.8	3.9	O K
4320 min Summer	69.581	0.011	4.1	2.8	O K
5760 min Summer	69.579	0.009	3.2	2.2	O K
7200 min Summer	69.578	0.008	2.8	1.9	O K
8640 min Summer	69.576	0.006	2.3	1.6	O K
10080 min Summer	69.576	0.006	2.1	1.4	O K
15 min Winter	69.765	0.195	18.4	49.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	16
30 min Summer	90.705	0.0	29
60 min Summer	56.713	0.0	46
120 min Summer	34.246	0.0	80
180 min Summer	25.149	0.0	112
240 min Summer	20.078	0.0	144
360 min Summer	14.585	0.0	204
480 min Summer	11.622	0.0	258
600 min Summer	9.738	0.0	312
720 min Summer	8.424	0.0	370
960 min Summer	6.697	0.0	492
1440 min Summer	4.839	0.0	734
2160 min Summer	3.490	0.0	1096
2880 min Summer	2.766	0.0	1468
4320 min Summer	1.989	0.0	2180
5760 min Summer	1.573	0.0	2936
7200 min Summer	1.311	0.0	3608
8640 min Summer	1.129	0.0	4400
10080 min Summer	0.994	0.0	5056
15 min Winter	138.153	0.0	16

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	69.803	0.233	18.4	58.6	O K
60 min Winter	69.808	0.238	18.4	60.0	O K
120 min Winter	69.770	0.200	18.4	50.4	O K
180 min Winter	69.721	0.151	18.4	38.0	O K
240 min Winter	69.677	0.107	18.4	26.8	O K
360 min Winter	69.622	0.052	18.4	13.0	O K
480 min Winter	69.611	0.041	15.1	10.4	O K
600 min Winter	69.605	0.035	12.8	8.8	O K
720 min Winter	69.600	0.030	11.1	7.6	O K
960 min Winter	69.594	0.024	8.9	6.1	O K
1440 min Winter	69.588	0.018	6.5	4.4	O K
2160 min Winter	69.583	0.013	4.7	3.2	O K
2880 min Winter	69.580	0.010	3.8	2.5	O K
4320 min Winter	69.577	0.007	2.7	1.8	O K
5760 min Winter	69.576	0.006	2.1	1.4	O K
7200 min Winter	69.575	0.005	1.7	1.2	O K
8640 min Winter	69.574	0.004	1.6	1.0	O K
10080 min Winter	69.574	0.004	1.4	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	29
60 min Winter	56.713	0.0	48
120 min Winter	34.246	0.0	84
180 min Winter	25.149	0.0	118
240 min Winter	20.078	0.0	148
360 min Winter	14.585	0.0	194
480 min Winter	11.622	0.0	252
600 min Winter	9.738	0.0	312
720 min Winter	8.424	0.0	370
960 min Winter	6.697	0.0	490
1440 min Winter	4.839	0.0	734
2160 min Winter	3.490	0.0	1080
2880 min Winter	2.766	0.0	1480
4320 min Winter	1.989	0.0	2180
5760 min Winter	1.573	0.0	2880
7200 min Winter	1.311	0.0	3600
8640 min Winter	1.129	0.0	4360
10080 min Winter	0.994	0.0	5056

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.200

Time From:	(mins) To:	Area (ha)
0	4	0.200

Time Area Diagram

Total Area (ha) 0.000

Time From:	(mins) To:	Area (ha)
0	4	0.000

Model Details

Storage is Online Cover Level (m) 70.150

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.15730	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	84.0
Max Percolation (l/s)	233.3	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.570	Membrane Depth (m)	0

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 59 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	69.809	0.339	17.5	81.2	O K
30 min Summer	69.886	0.416	17.5	99.9	O K
60 min Summer	69.920	0.450	17.5	107.9	O K
120 min Summer	69.904	0.434	17.5	104.2	O K
180 min Summer	69.870	0.400	17.5	95.9	O K
240 min Summer	69.831	0.361	17.5	86.7	O K
360 min Summer	69.758	0.288	17.5	69.2	O K
480 min Summer	69.695	0.225	17.5	53.9	O K
600 min Summer	69.641	0.171	17.5	41.0	O K
720 min Summer	69.598	0.128	17.5	30.6	O K
960 min Summer	69.540	0.070	17.5	16.9	O K
1440 min Summer	69.512	0.042	14.8	10.2	O K
2160 min Summer	69.501	0.031	10.7	7.4	O K
2880 min Summer	69.495	0.025	8.7	5.9	O K
4320 min Summer	69.488	0.018	6.2	4.2	O K
5760 min Summer	69.484	0.014	5.0	3.4	O K
7200 min Summer	69.482	0.012	4.1	2.8	O K
8640 min Summer	69.480	0.010	3.6	2.4	O K
10080 min Summer	69.479	0.009	3.1	2.1	O K
15 min Winter	69.809	0.339	17.5	81.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	17
30 min Summer	90.705	0.0	31
60 min Summer	56.713	0.0	54
120 min Summer	34.246	0.0	86
180 min Summer	25.149	0.0	120
240 min Summer	20.078	0.0	154
360 min Summer	14.585	0.0	220
480 min Summer	11.622	0.0	282
600 min Summer	9.738	0.0	342
720 min Summer	8.424	0.0	398
960 min Summer	6.697	0.0	504
1440 min Summer	4.839	0.0	734
2160 min Summer	3.490	0.0	1100
2880 min Summer	2.766	0.0	1460
4320 min Summer	1.989	0.0	2156
5760 min Summer	1.573	0.0	2912
7200 min Summer	1.311	0.0	3648
8640 min Summer	1.129	0.0	4352
10080 min Summer	0.994	0.0	4960
15 min Winter	138.153	0.0	17

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	69.888	0.418	17.5	100.2	O K
60 min Winter	69.921	0.451	17.5	108.3	O K
120 min Winter	69.894	0.424	17.5	101.7	O K
180 min Winter	69.841	0.371	17.5	89.0	O K
240 min Winter	69.783	0.313	17.5	75.2	O K
360 min Winter	69.678	0.208	17.5	49.9	O K
480 min Winter	69.594	0.124	17.5	29.8	O K
600 min Winter	69.537	0.067	17.5	16.1	O K
720 min Winter	69.518	0.048	16.7	11.4	O K
960 min Winter	69.508	0.038	13.4	9.1	O K
1440 min Winter	69.498	0.028	9.7	6.6	O K
2160 min Winter	69.490	0.020	7.1	4.8	O K
2880 min Winter	69.486	0.016	5.5	3.7	O K
4320 min Winter	69.481	0.011	3.9	2.8	O K
5760 min Winter	69.479	0.009	3.2	2.2	O K
7200 min Winter	69.478	0.008	2.7	1.8	O K
8640 min Winter	69.477	0.007	2.4	1.6	O K
10080 min Winter	69.476	0.006	2.0	1.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	31
60 min Winter	56.713	0.0	58
120 min Winter	34.246	0.0	92
180 min Winter	25.149	0.0	128
240 min Winter	20.078	0.0	164
360 min Winter	14.585	0.0	230
480 min Winter	11.622	0.0	286
600 min Winter	9.738	0.0	332
720 min Winter	8.424	0.0	370
960 min Winter	6.697	0.0	492
1440 min Winter	4.839	0.0	730
2160 min Winter	3.490	0.0	1092
2880 min Winter	2.766	0.0	1468
4320 min Winter	1.989	0.0	2204
5760 min Winter	1.573	0.0	2904
7200 min Winter	1.311	0.0	3544
8640 min Winter	1.129	0.0	4392
10080 min Winter	0.994	0.0	4976

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.300

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.300

Time Area Diagram

Total Area (ha) 0.000

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.000

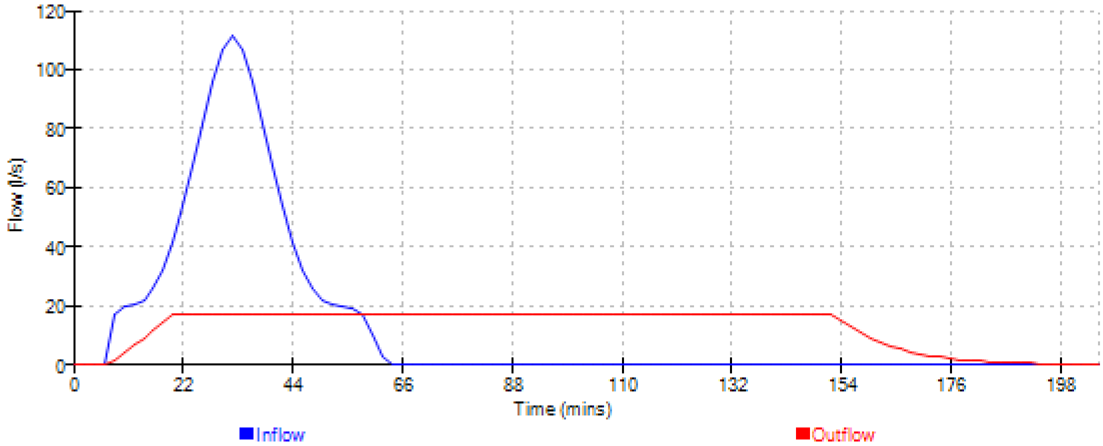
Model Details

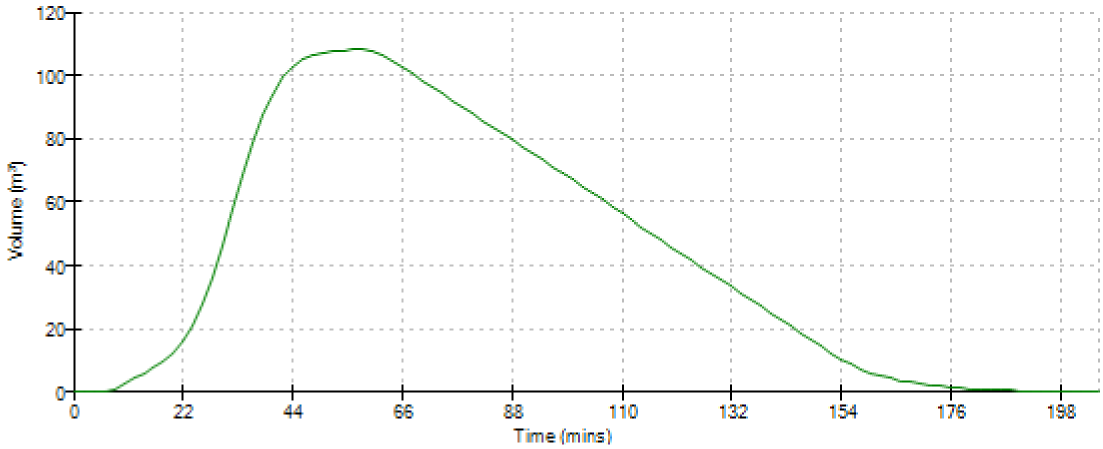
Storage is Online Cover Level (m) 70.200

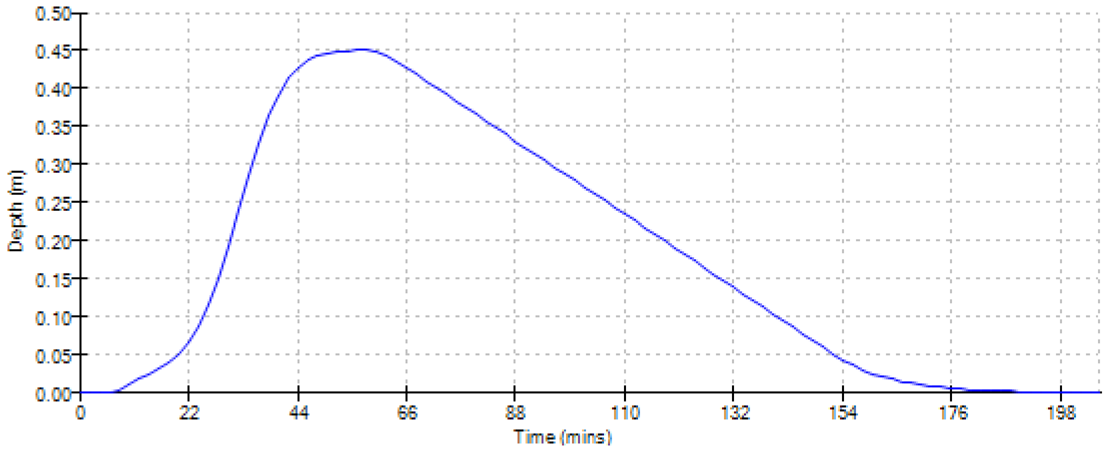
Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.15730	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	80.0
Max Percolation (l/s)	222.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.470	Membrane Depth (m)	0

Event: 60 min Winter







Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 90 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	69.766	0.196	7.0	46.9	O K
30 min Summer	69.820	0.250	7.0	60.0	O K
60 min Summer	69.858	0.288	7.0	69.1	O K
120 min Summer	69.866	0.296	7.0	71.0	O K
180 min Summer	69.857	0.287	7.0	68.8	O K
240 min Summer	69.842	0.272	7.0	65.3	O K
360 min Summer	69.811	0.241	7.0	57.9	O K
480 min Summer	69.782	0.212	7.0	50.8	O K
600 min Summer	69.754	0.184	7.0	44.2	O K
720 min Summer	69.729	0.159	7.0	38.2	O K
960 min Summer	69.687	0.117	7.0	28.0	O K
1440 min Summer	69.633	0.063	7.0	15.2	O K
2160 min Summer	69.612	0.042	5.9	10.2	O K
2880 min Summer	69.604	0.034	4.8	8.2	O K
4320 min Summer	69.595	0.025	3.4	5.9	O K
5760 min Summer	69.590	0.020	2.7	4.7	O K
7200 min Summer	69.586	0.016	2.3	3.9	O K
8640 min Summer	69.584	0.014	2.0	3.4	O K
10080 min Summer	69.583	0.013	1.8	3.0	O K
15 min Winter	69.765	0.195	7.0	46.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	18
30 min Summer	90.705	0.0	32
60 min Summer	56.713	0.0	60
120 min Summer	34.246	0.0	98
180 min Summer	25.149	0.0	130
240 min Summer	20.078	0.0	164
360 min Summer	14.585	0.0	232
480 min Summer	11.622	0.0	298
600 min Summer	9.738	0.0	362
720 min Summer	8.424	0.0	426
960 min Summer	6.697	0.0	540
1440 min Summer	4.839	0.0	764
2160 min Summer	3.490	0.0	1104
2880 min Summer	2.766	0.0	1468
4320 min Summer	1.989	0.0	2200
5760 min Summer	1.573	0.0	2920
7200 min Summer	1.311	0.0	3672
8640 min Summer	1.129	0.0	4312
10080 min Summer	0.994	0.0	5136
15 min Winter	138.153	0.0	18

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	69.820	0.250	7.0	60.0	O K
60 min Winter	69.858	0.288	7.0	69.2	O K
120 min Winter	69.863	0.293	7.0	70.4	O K
180 min Winter	69.850	0.280	7.0	67.2	O K
240 min Winter	69.829	0.259	7.0	62.1	O K
360 min Winter	69.783	0.213	7.0	51.2	O K
480 min Winter	69.740	0.170	7.0	40.9	O K
600 min Winter	69.702	0.132	7.0	31.7	O K
720 min Winter	69.669	0.099	7.0	23.9	O K
960 min Winter	69.625	0.055	7.0	13.3	O K
1440 min Winter	69.609	0.039	5.4	9.2	O K
2160 min Winter	69.598	0.028	3.9	6.7	O K
2880 min Winter	69.592	0.022	3.1	5.3	O K
4320 min Winter	69.586	0.016	2.3	3.8	O K
5760 min Winter	69.583	0.013	1.8	3.0	O K
7200 min Winter	69.581	0.011	1.5	2.5	O K
8640 min Winter	69.579	0.009	1.3	2.2	O K
10080 min Winter	69.578	0.008	1.1	1.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	32
60 min Winter	56.713	0.0	60
120 min Winter	34.246	0.0	100
180 min Winter	25.149	0.0	138
240 min Winter	20.078	0.0	176
360 min Winter	14.585	0.0	248
480 min Winter	11.622	0.0	314
600 min Winter	9.738	0.0	376
720 min Winter	8.424	0.0	434
960 min Winter	6.697	0.0	522
1440 min Winter	4.839	0.0	750
2160 min Winter	3.490	0.0	1100
2880 min Winter	2.766	0.0	1468
4320 min Winter	1.989	0.0	2244
5760 min Winter	1.573	0.0	2840
7200 min Winter	1.311	0.0	3744
8640 min Winter	1.129	0.0	4408
10080 min Winter	0.994	0.0	5096

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.170

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.170

Time Area Diagram

Total Area (ha) 0.000

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.000

Model Details

Storage is Online Cover Level (m) 70.150

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.06264	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	80.0
Max Percolation (l/s)	222.2	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.570	Membrane Depth (m)	0

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 125 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	69.580	0.260	9.6	85.9	O K
30 min Summer	69.654	0.334	9.6	110.2	O K
60 min Summer	69.711	0.391	9.6	129.0	O K
120 min Summer	69.731	0.411	9.6	135.5	O K
180 min Summer	69.722	0.402	9.6	132.6	O K
240 min Summer	69.707	0.387	9.6	127.6	O K
360 min Summer	69.674	0.354	9.6	116.9	O K
480 min Summer	69.642	0.322	9.6	106.4	O K
600 min Summer	69.612	0.292	9.6	96.3	O K
720 min Summer	69.582	0.262	9.6	86.6	O K
960 min Summer	69.529	0.209	9.6	69.0	O K
1440 min Summer	69.446	0.126	9.6	41.5	O K
2160 min Summer	69.379	0.059	9.6	19.4	O K
2880 min Summer	69.364	0.044	8.4	14.4	O K
4320 min Summer	69.352	0.032	6.1	10.5	O K
5760 min Summer	69.345	0.025	4.8	8.3	O K
7200 min Summer	69.341	0.021	4.1	6.9	O K
8640 min Summer	69.338	0.018	3.5	6.0	O K
10080 min Summer	69.336	0.016	3.1	5.3	O K
15 min Winter	69.580	0.260	9.6	85.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	18
30 min Summer	90.705	0.0	32
60 min Summer	56.713	0.0	62
120 min Summer	34.246	0.0	114
180 min Summer	25.149	0.0	142
240 min Summer	20.078	0.0	174
360 min Summer	14.585	0.0	242
480 min Summer	11.622	0.0	310
600 min Summer	9.738	0.0	376
720 min Summer	8.424	0.0	442
960 min Summer	6.697	0.0	568
1440 min Summer	4.839	0.0	796
2160 min Summer	3.490	0.0	1124
2880 min Summer	2.766	0.0	1468
4320 min Summer	1.989	0.0	2204
5760 min Summer	1.573	0.0	2936
7200 min Summer	1.311	0.0	3648
8640 min Summer	1.129	0.0	4392
10080 min Summer	0.994	0.0	5136
15 min Winter	138.153	0.0	18

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	69.654	0.334	9.6	110.3	O K
60 min Winter	69.712	0.392	9.6	129.4	O K
120 min Winter	69.733	0.413	9.6	136.4	O K
180 min Winter	69.719	0.399	9.6	131.8	O K
240 min Winter	69.700	0.380	9.6	125.3	O K
360 min Winter	69.653	0.333	9.6	109.9	O K
480 min Winter	69.606	0.286	9.6	94.3	O K
600 min Winter	69.561	0.241	9.6	79.4	O K
720 min Winter	69.519	0.199	9.6	65.5	O K
960 min Winter	69.447	0.127	9.6	41.9	O K
1440 min Winter	69.370	0.050	9.5	16.3	O K
2160 min Winter	69.356	0.036	6.9	11.9	O K
2880 min Winter	69.349	0.029	5.5	9.4	O K
4320 min Winter	69.341	0.021	4.0	6.8	O K
5760 min Winter	69.336	0.016	3.1	5.3	O K
7200 min Winter	69.334	0.014	2.6	4.5	O K
8640 min Winter	69.332	0.012	2.2	3.8	O K
10080 min Winter	69.330	0.010	2.0	3.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	32
60 min Winter	56.713	0.0	60
120 min Winter	34.246	0.0	116
180 min Winter	25.149	0.0	146
240 min Winter	20.078	0.0	184
360 min Winter	14.585	0.0	258
480 min Winter	11.622	0.0	330
600 min Winter	9.738	0.0	398
720 min Winter	8.424	0.0	462
960 min Winter	6.697	0.0	578
1440 min Winter	4.839	0.0	740
2160 min Winter	3.490	0.0	1100
2880 min Winter	2.766	0.0	1448
4320 min Winter	1.989	0.0	2200
5760 min Winter	1.573	0.0	2936
7200 min Winter	1.311	0.0	3672
8640 min Winter	1.129	0.0	4248
10080 min Winter	0.994	0.0	5064

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.950
Region	England and Wales	Cv (Winter)	0.950
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.300

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.300

Time Area Diagram

Total Area (ha) 0.000

Time From:	**(mins) To:**	**Area (ha)**
0	4	0.000

Model Details

Storage is Online Cover Level (m) 69.900

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.06264	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	110.0
Max Percolation (l/s)	305.6	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	69.320	Membrane Depth (m)	0

Event: 120 min Winter