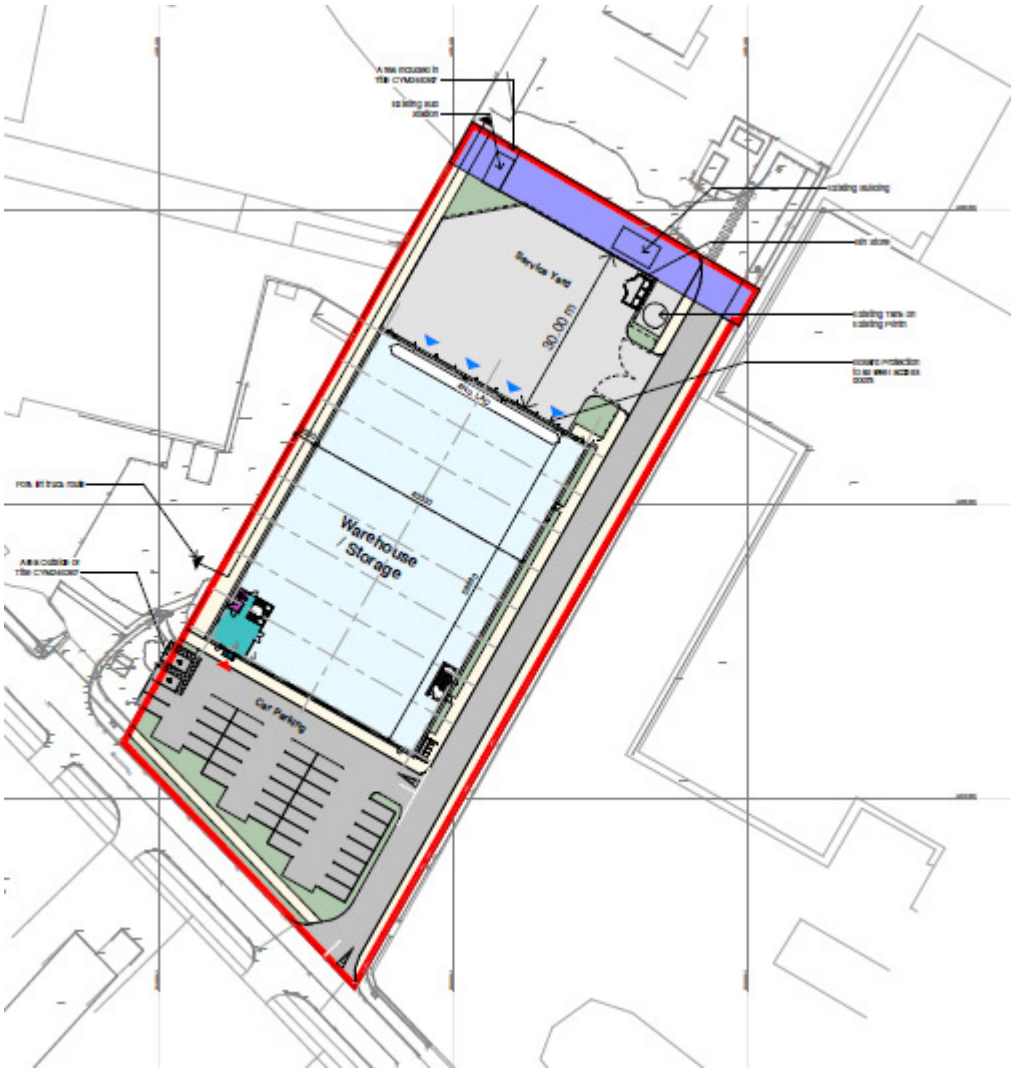
DRAINAGE STRATEGY

PROPERTY ADDRESS
Village Bakery , Wrexham Industrial Estate

CLIENT
Village Bakery

REPORT REFERENCE
6595-ADS-XX-XX-RP-S-500

DATE
OCTOBER 21



EXECUTIVE SUMMARY

Item	Assessment	Criteria
1.	Site Classification	BROWNNFIELD
2.	Existing Brownfield surface water run off rate	32.5l/s (Qbar)
3.	Proposed surface water peak flow run off rate	18 l/sec (45% betterment) M100-15 to M100-720 + 40% CCF
6.	Outfall	Discharge to existing public sewer via existing onsite manhole
7.	Flooding assessment	M100-15 to M100-720 + 40% CCF
8.	Storage assessment	M100-15 to M100-720 + 40% CCF
9.	Total Storage required	156m3
10.	Storage System	Pluvial crates & stone fill beneath car parking areas
11.	Interceptor	Klargester Full retention interceptor.
12.	Foul water discharge	Discharge to public foul water sewer via new connection onto existing on site foul network

1. Introduction

1.1. ADS structural have been appointed to prepare a drainage strategy in support of a proposed commercial development on the Village Bakery site, Wrexham Industrial Estate.

1.2. The national Grid reference for the site is SJ375497 and the nearest postcode to the site is LL13 9UH

1.3. The subject site is an irregularly shaped plot of land, of approximately 0.54 hectares, that was formerly a commercial premise with offices. Commercial premises have been demolished with the car parking to the front of the site remaining.

1.4. An existing working drainage network on the site has been established & therefore for the purposes of the drainage strategy the site is to be classed as brownfield.

1.5. This Drainage Strategy has been prepared on behalf of Village Bakery ("the Applicant") to support the proposed development consisting of a commercial building with first floor offices, associated parking and service yards. The total area of the buildings is 2,800 sqm and the total site area is approximately 5,400 sqm. The site plan, 21077-C4P-AV-00-DR-A-501 can be found in Appendix A

2. Proposed Drainage Strategy

2.1. In order to demonstrate the development is of low risk the report should show:

- That it will be feasible to restrict surface water run-off to a minimum of 60% of the predevelopment brownnfield run-off rate for all events up to the 1 in 100 year storm (including a 40% allowance for climate change) and set out how this will be achieved
- How sustainable drainage techniques (SuDS) will be used with any obstacles to their use clearly justified

2.2. Climate change (CC) will be taken into account by increasing the rainfall intensity by 40% in line with the Environment Agency and NPPF Technical Guidance.

3. Existing Site Drainage

3.1. As mentioned previously, An existing working drainage network on the site has been established. There are gullies and manholes clearly shown on the topographical survey which discharge into a separate sewer network within the estate road. The topographical survey and constraints plan can be found within Appendix B.

3.2. The Existing Brownfield run off rates for the northern portion of the site are as follows

Return period	Peak flow (l/s)
QBar	32.5
1 in 1 year	22.3
1 in 30 year	54.1
1 in 100 year	70.8

4. Consideration of the Sustainable Drainage Systems and Water Quality

4.1. Following the Hierarchy of Sustainable Drainage Systems (SUDS) the following options must be considered

- Soakways for roof run-off and permeable surfacing for roads, drives, car parks and private access roads
- Discharge to local watercourse
- Discharge to local sewer
- Discharge to adjacent land drains and ponds

4.2. The first option to be considered must be infiltration into the ground. Even when there are alternative sewer connections or water courses available, infiltration must be utilised unless it is unfeasible.

4.3. Whilst infiltration testing has not been carried out at this stage, local knowledge of the industrial estate suggests that the ground consists generally of stiff clay soils which would not be considered suitable for infiltration.

4.4. The second option to be considered must be discharge to a local watercourse.

4.5. There are no known watercourses within the vicinity of the site

4.6. The third option is discharge to a public surface water sewer

4.7. The topographical survey and constraints plans provided by the architect suggest a working separate foul and surface water sewer network bounds the site with existing connection to the same.

4.8. Section 4.7 provides a suitable solution for the discharge of surface water from the development.

4.9. Current guidance promotes sustainable water management through the use of SuDS. SuDS measures should be used to control the surface water runoff from the proposed development site therefore managing the flood risk to the site and surrounding areas from surface water run off.

A hierarchy of techniques is identified:

- Prevention – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
- Source Control - control of runoff at or very near its source (such as the use of rainwater harvesting, permeable paving, soakaways and/or green roofs).

- Site Control - management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole site, swales and/or infiltration trenches).

- Regional Control - management of runoff from several sites, typically in a detention pond, basins, tanks and/or wetland.

It is generally accepted that the implementation of SUDS as opposed to conventional drainage systems, provides several benefits by:

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;

- reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;

- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;

- reducing potable water demand through rainwater harvesting;

- improving amenity through the provision of public open spaces and wildlife habitat; and

- replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

The most appropriate attenuation system will need to satisfy three main characteristics, firstly, provide the required volume of storage, secondly, minimise the loss of developable land and thirdly, where possible provide local amenity. The application of the SuDS Manual requires that the runoff from sites is not only restricted to meet the pre-development runoff characteristics but also that SuDS systems are utilised to improve the quality of the runoff prior to outfall to watercourses. The SuDS Manual and Environment Agency guidance applies a sustainability hierarchy to the various types of SuDS systems, this is summarised in Table A below

Table A - Sustainability Hierarchy

Most Sustainable	SuDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife
	Green / Living roofs /	X	X	X
	Basins and ponds - Constructed wetlands - Balancing ponds	X	X	X
	Filter strips and swales	X	X	X
	Infiltration Devices	X	X	X
	Permeable Surfaces and Filter Drains - Gravelled areas	X	X	
Least Sustainable	Tanked systems - Over-sized pipes/tanks - Cellular storage	X		

Systems at the top of the hierarchy provide a combination of attenuation, treatment and ecology and are deemed the most sustainable options. There are always specific scenarios where systems are more suitable than others and at this stage it is not possible to guide the development towards a particular strategy.

The usual approach is to consider the 'SUDS train' where each of the above options are considered in turn until a suitable solution is found. Thus, source control techniques such as soakaways, rainwater harvesting and/or infiltration trenches, if suitable on a site, are considered preferable to permeable conveyance and passive treatment systems such as tanks or ponds. The various options are considered in outlined in Table B below

Table B - SuDS Techniques

SuDS Technique	Comments	Suitability for Development
Green / Living Roofs / Living Wall	A green roof is a multi-layered system that covers the top of a building with soil and vegetation and which can provide a degree of rainstorm attenuation and a reduction in site runoff. Can be used to reduce the volume and rate of runoff so that other SuDS techniques in the scheme can be significantly reduced in size.	Not suitable for commercial developments.
Basins / Ponds	Provides storage of runoff and flow attenuation. Vegetated surfaces can be used to support the prevention of runoff from the site for small rainfall events (interception) and improve water quality associated with the removal of sediment and buoyant materials.	Not the required area available, especially given the side slopes need to be 1 in 4 max. Without the space the volume attenuated would be very small to be virtually insignificant.
Filter Strips / Swales	Good removal of urban pollutants, reduces runoff rates and volumes.	Not enough open/green space for their workable inclusion or being able to tie in with depths of connecting buried pipes.
Infiltration Devices (e.g. soakaways)	Reduces total runoff volume from the development.	Soakaways are not suitable due to site ground conditions and limited space.
Permeable Surfaces and Filter Drains	Permeable surfaces together with their associated substructures are an efficient means of intercepting runoff, reducing the volume and frequency of runoff and providing a treatment medium.	Whilst possible, as there is no infiltration potential it would merely be a storage option with only 30% voids. It is far more cost effective and maintainable to collect surface water and use attenuation tanks
Tanked systems	Ideal for sites with insufficient space for basins etc., provide a volume of below ground storage with a high void ratio.	Potential to be installed under the main central area with clearance from the foundations.
Flow reduction	Manages and reduces the flood risk to the local surface water sewers and watercourses.	A hydrobrake can be installed downstream of attenuation tanks and control flows to the the agreed brownfield run off rates.

5. Proposed Drainage Design

5.1. Preliminary calculations have been undertaken at this stage to model and analyse a proposed surface water drainage network. It can be demonstrated that the peak flows from our system can be restricted to provide a minimum of 40% betterment in relation to the existing brownfield run off rates.

Discharge Rates

PN	RP(yrs)/ CC(%)	Pre-development Rate (l/s)	Post-development Rate (l/s)	Pass/Fail
1.005	1yr +0%	22.3	7.1	✓
1.005	30yr +0%	54.1	12.4	✓
1.005	100yr +40%	70.8	18.0	✓

Micro Drainage

OK

Help

5.2. The storage to be provided is 156m3 to cater for storms up to and including the 1 in 100 yr 6 hour storm event +40% CCF. The calculations are shown within Appendix C in addition to pipe sizing and flood analysis of the underground gravity system.

5.3. General arrangement drainage drawings have been provided showing proposed FFL's, cover levels, invert levels, pipe sizes, tank sizes and outfall locations. The information can be found within Appendix D.

5.4. The solution being presented seeks to utilise a traditional piped drainage system. Whilst not the most sustainable solution, at this stage and given the mass of the proposed building and associated concrete hardstanding services yards, it is one that we are confident could be delivered at detailed design. Whilst all SUDS techniques will be fully appraised at detailed design stage, this section of the reports simply stands to ensure a sustainable solution is theoretically deliverable.

5.5. Flows from the service yards will be directed through full retention separators designed in accordance with current legislation and the suppliers maintenance agreements will be included with the O&M manuals.

5.6. The connections and flow rates are subject to agreement with Welsh Water during the planning process.

5.7. Foul water runs will discharge to the public foul sewer within subject to agreement with Welsh Water during the planning process.

5.8. Below ground storage will be provided up to and including the 1 in 100 year storm event plus an allowance of 40% increase for climate change.

6. Summary

- The development is currently a brownfield site.
- Surface water run-off from the proposed development will be via new connections to an existing pubic surface water sewer network subject to Welsh Water consent.
- Storage for the impermeable areas will be provided up to and including the 1 in 100 year + 40% climate change event within the site boundary. The attenuation will be in the form of a pluvial crate system.
- The drainage proposals will be designed in accordance with the techniques set out within the SUDS manual.

7. Conclusion

- The strategy outlined above shows a viable sustainable drainage solution is achievable within the constraints of the site. Detailed design of the system following a successful planning application can be delivered to meet the NPPF, Environment Agency, Local Authority and Anglian Water requirements.

Report Prepared By: A. E. Bristow.

Andrew Bristow

Report Reviewed By: D. C. Sparkes.

Dominic Sparkes

For and on behalf of
ADS Structural Limited.

APPENDIX A
PROPOSED SITE PLAN

1 **05-01_ Site Plan as Proposed**
1 : 500

0m 10m 20m 30m 40m
VISUAL SCALE 1:500 @ A1

N

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PLANNING

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Hazard Identification

ref	hazard	date

SURFACE MATERIALS KEY

- Ownership Boundary
- Soft Landscaping
- Paving
- Concrete Service Yard
- Tarmac Road
- First Floor Office Provision

Site

Name	Area	Site Density %
Site	1.78 acres	33.366405

Note: Boundary Lines shown are indicative, based on information provided - Land Registry title ownership to be confirmed by client.

4 number of parking spaces project outside title ref CYM 246367

Site areas are subject to change to suit confirmed land title plans ,topographic survey data and any site related constraints.

Area Schedule (GIA)

Name	Area	
	Metric	Imperial
GF GIA	2,400.00 m²	25,833 ft²
FF GIA	400.00 m²	4,306 ft²
TOTAL	2,800.00 m²	30,139 ft²

Parking Schedule

Description	Count
Standard Car Parking Bay	31
Accessible Parking Bay	2
TOTAL	33

Rev	Revision Details	Drawn	Date	Checked
P1	Planning Issue	BE	23.08.21	DC

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Client
Village Bakery

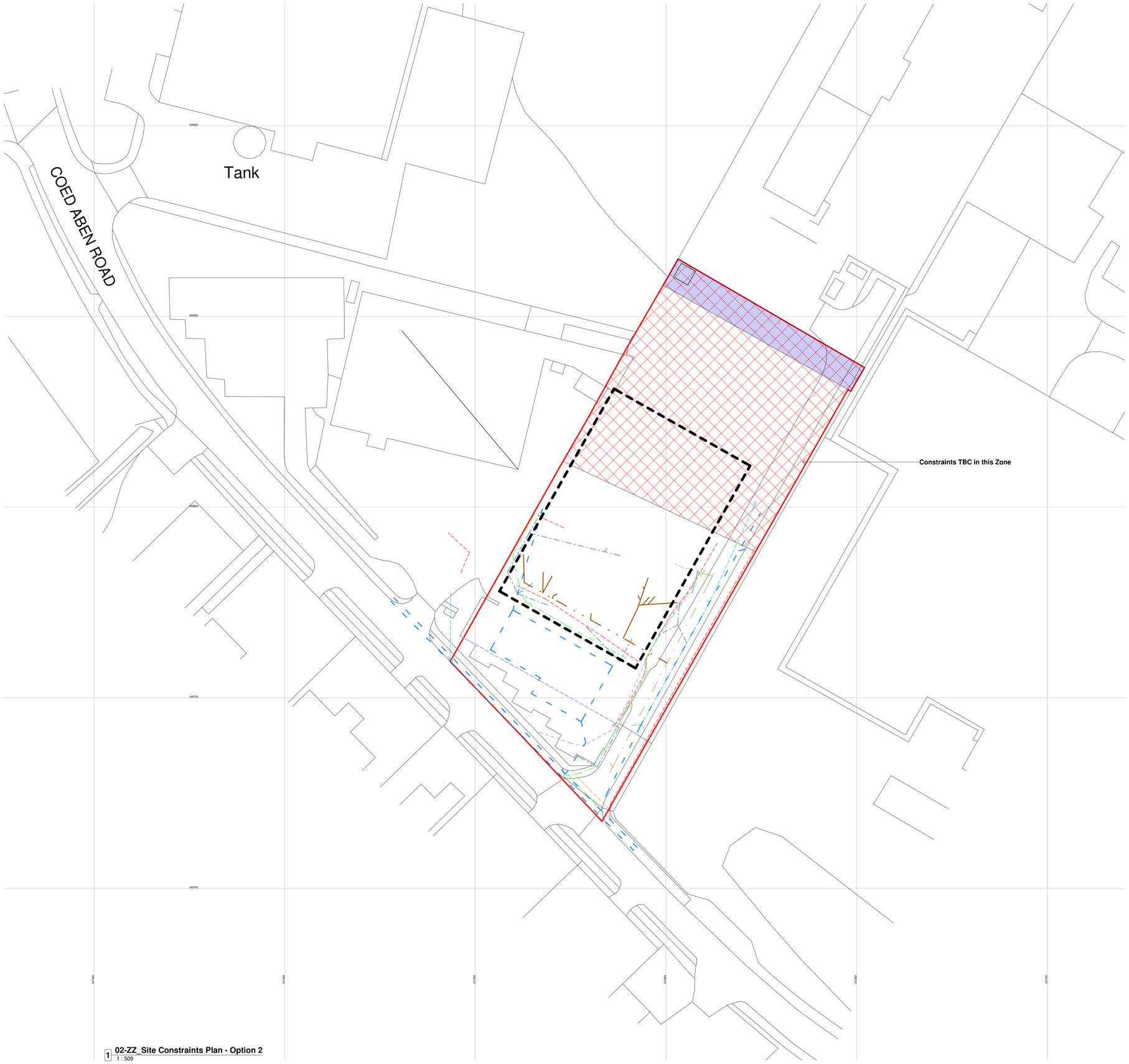
Project
Village Bakery
Wrexham Industrial Estate

Drawing Title
Site Plan as Proposed

Status Purpose of Issue
S2 SUITABLE FOR INFORMATION

Drawn by	BE	Created	23.08.21
C4 Job no.	21077	Scale	As indicated @ A1

Drg no. **21077-C4P-AV-XX-DR-A-0501** Rev **P1**



1 02-ZZ_Site Constraints Plan - Option 2
1 : 500

0m 10m 20m 30m 40m
VISUAL SCALE 1:500 @ A1

N

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Hazard Identification

ref	hazard	date

Constraints Legend

- U/G Electic Cables
- U/G Foul Drainage
- U/G Gas Pipe
- U/G Storm Drainage
- U/G Unidentified Services 1
- U/G Unidentified Services 2

Constraints as identified on Barry Lowe Surveys Ltd
Drawing No. 01 (Job No. 9222 - 26/11/13)

- ACO Linear Drainage Channel
- Existing Surface Water Public Sewer
- Foul Drainage
- Surface Water Drainage

Constraints as identified on Tier Consult Ltd
Drawing No. T/13/1359-CL(19)01-C3-Drainage Layout

- Constraints TBC in this zone
- Proposed Building Footprint

Rev	Revision Details	Drawn	Date	Checked
P1	First Issue	BC	06.05.21	DC

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Client
Village Bakery

Project
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Wrexham Industrial Estate

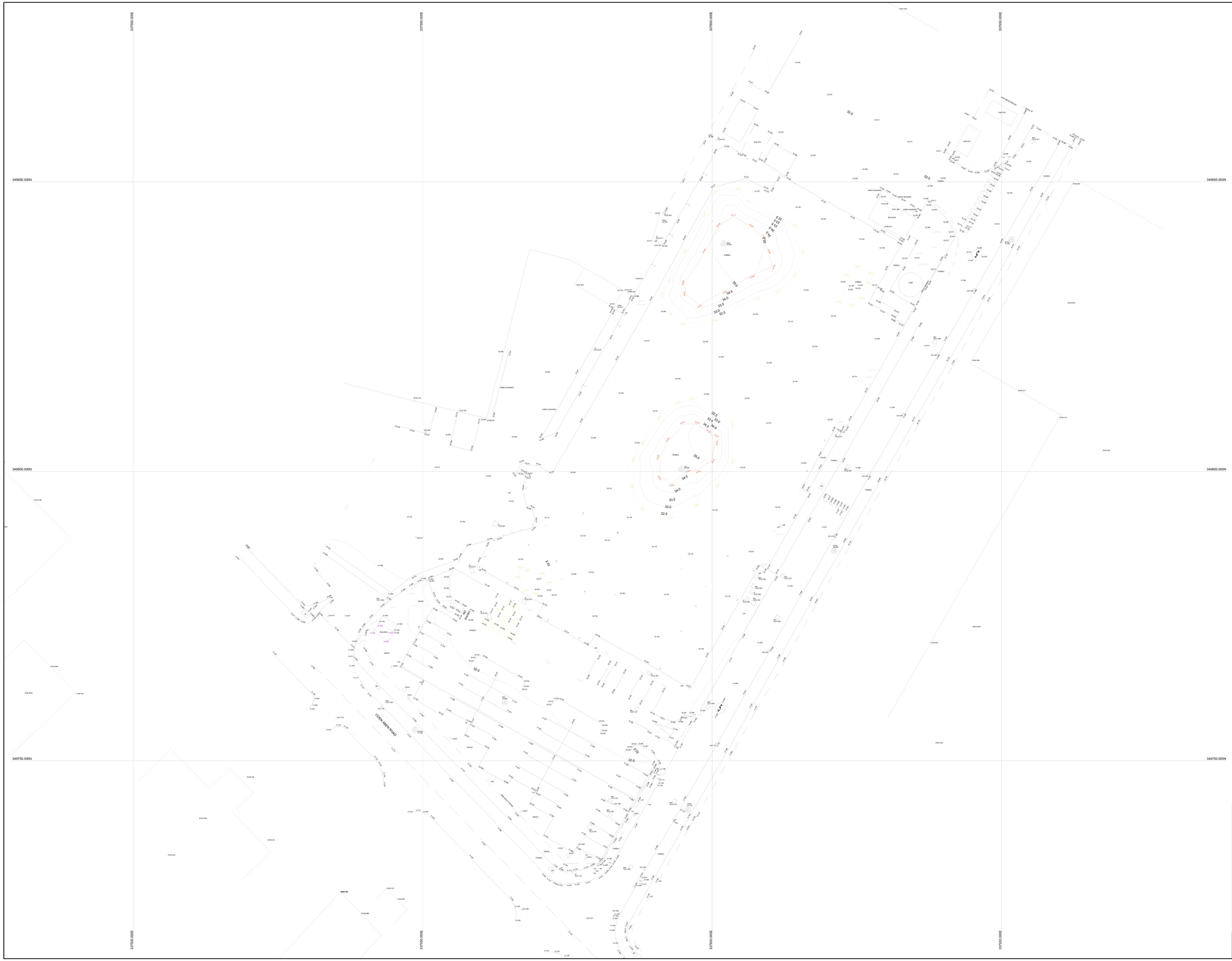
Drawing Title
Site Constraints Plan - Option 2

Status Purpose of Issue
S2 SUITABLE FOR INFORMATION

Drawn by	BC	Created	May 21
C4 Job no.	21077	Scale	As indicated @ A1

Drg no.	Rev
21077-C4P-AV-ZZ-DR-A-0202	P1

APPENDIX B
EXISTING TOPOGRAPHICAL SURVEY AND CONTRAINTS PLAN



Topographical Survey Legend

BIn	Litter bin	TL	Tie line
BM	Benchmark	TP	Telephone pole
Bo	Bollard	TPs	Tactile paving stpts
BS	Bus stop	TS	Traffic signal light
BT	British telecom ic	TV	Television cover
CPS	Concrete paving slabs	VP	Vent pipe
CT	Cattle	WC	Water cooler
Elec	Electrical ic	WO	Wash Out
EP	Elec. pole	U/L	Unable to lift
ER	Earth rod		Fence annotation
FH	Fire Hydrant	B/W	Barbed wire
FL	Floodlight	W/M	Wire mesh fenced
FT	Floodlight	C/S	Corrugated iron
G	Gully	C/L	Chain link
GP	Gate post	C/P	Concrete panel
GV	Gas valve	H/R	Hand rail
IC	Inspection cover	I/R	Iron railings
JB	Junction box	O/B	Open boarded
LB	Letter box	S/B	Solid board
LB	Letter box	P/R	Post & rail
LP	Lamp post	P/W	Post & wire
MM	Utility marker	W/M	Wire mesh
MP	Mile post		Level prefix descriptions
NW	Retaining Wall	Ch	Chimney level
NP	Name plate	EL	Bed level
P	Post	CL	Cover level
PM	Parking meter	EH	Eaves level
RG	Rodding eye	FL	Floor level
RP	Road pin		Ridge level
rwp	Rain water pipe	PL	Parapet level
SP	Sign post	RH	Roofridge level
ST	Stop tap	SL	Soffit level
SB	Service Box	Spr	Arch springing level
SV	Stop valve	Sill	Window cill/sheet
TCB	Telephone call box	HH	Hall height
TH	Trial Hole	WL	Water level

BENCH MARK INFORMATION

All levels relate to O.S (Newlyn) Datum, Established using network RTK. Survey plotted on a plane local grid, orientated to National Grid.

NOTES

ONLY MANHOLES AND SERVICES VISIBLE AT TIME OF SURVEY SHOWN

DRAINAGE INFORMATION MUST BE CHECKED AND VERIFIED WITH LOCAL AUTHORITY RECORDS PRIOR TO WORK COMMENCING

Levels defining edge of carriageway are observed at channel (bottom of kerb). Unless otherwise stated.

TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE THE AVERAGE SPREAD. THE DRIP LINE LAYER DENOTES THE TREES EXTREMITY

SURVEY STATIONS

STN1	337595.764	349741.620	31.767
STN1A	337548.699	349755.360	31.789
STN2	337621.086	349786.281	32.036
STN3	337651.742	349840.010	32.193
RS1	337564.176	349760.148	31.939

REVISIONS

REV	DESCRIPTION	SURVEYED	DRAWN	DATE
A	STANTIONS SURVEYED WHERE POSSIBLE PLEASE NOTE MOSTLY SURRED ON SITE	MG	PSH	01.06.2021

JLP Surveying

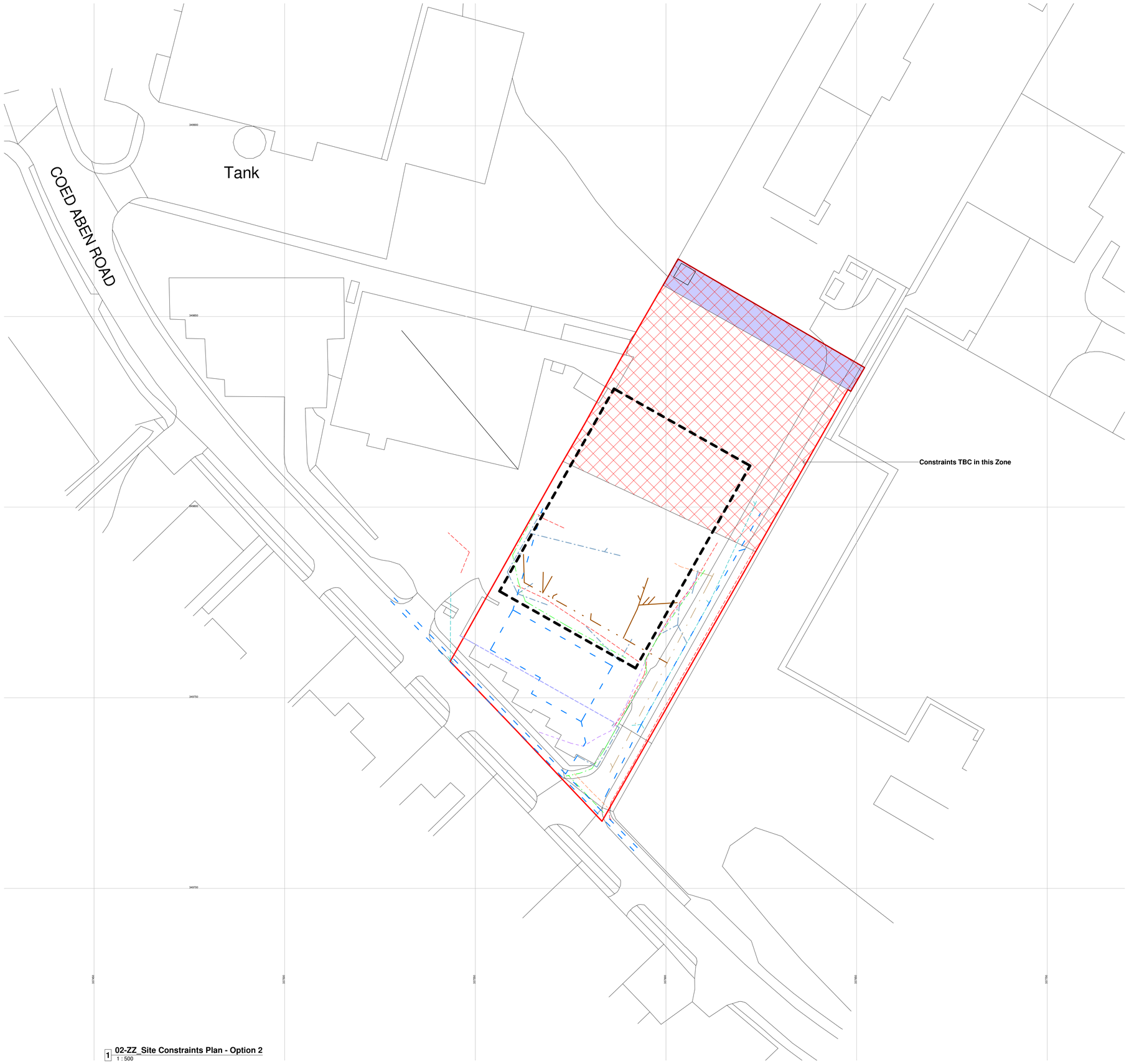
JLP Surveying Consultants Ltd,
Suite 45 Rodney House,
King Street,
Wrexham
LL11 1BT
Tel. - 01942 243313
Fax - 01942 492230
Mobile - 07710 428498
EMAIL - peterhouston@jlpsurveys.com

PROJECT
WREXHAM INDUSTRIAL ESTATE

DRAWING TITLE
Topographical Land Survey

SCALE	SHEET SIZE	No. of SHEETS	DATE	REVISION
1 :200	A0	1	19.05.2021	A

DRAWING NUMBER
S21-468



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Hazard Identification

ref	hazard	date

Constraints Legend

- U/G Electic Cables
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- U/G Gas Pipe
- U/G Storm Drainage
- U/G Unidentified Services 1
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Constraints as identified on Barry Lowe Surveys Ltd
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Drawing Title
Site Constraints Plan - Option 2

Status Purpose of Issue
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Drawn by	BC	Created	May 21
C4 Job no.	21077	Scale	As indicated @ A1

Drg no.	Rev
21077-C4P-AV-ZZ-DR-A-0202	P1

APPENDIX C
MICRODRAINAGE REPORT

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes ADS-STN Manhole Sizes ADS-STD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.000	Add Flow / Climate Change (%)	0
Ratio R	0.331	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.900
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.316	4-8	0.143

Total Area Contributing (ha) = 0.459

Total Pipe Volume (m³) = 12.218

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	10.625	0.070	152.0	0.112	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	17.807	0.119	149.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.002	62.505	0.417	150.0	0.062	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	27.206	0.180	151.3	0.068	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	60.501	0.403	150.0	0.064	4.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	21.720	0.146	149.2	0.070	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	48.18	4.16	31.388	0.112	0.0	0.0	0.0	1.06	42.3	14.7
S1.001	47.01	4.44	31.318	0.112	0.0	0.0	0.0	1.07	42.4	14.7
S1.002	43.95	5.25	31.199	0.175	0.0	0.0	0.0	1.28	90.6	20.8
S1.003	42.77	5.61	30.782	0.243	0.0	0.0	0.0	1.28	90.6	28.1
S2.000	44.03	5.23	31.442	0.064	0.0	0.0	0.0	0.82	14.5	7.6
S2.001	42.87	5.57	31.039	0.134	0.0	0.0	0.0	1.07	42.4	15.6

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	6.784	0.045	150.0	0.000	4.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	20.272	0.134	151.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.000	19.124	0.129	148.4	0.036	4.00	0.0	0.600	o	150	Pipe/Conduit	
S5.000	21.304	0.141	151.4	0.046	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.004	8.873	0.058	152.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	14.065	0.094	150.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S3.000	48.29	4.14	31.227	0.000	0.0	0.0	0.0	0.82	14.5	0.0
S3.001	46.59	4.55	31.182	0.000	0.0	0.0	0.0	0.82	14.5	0.0
S4.000	47.21	4.39	31.133	0.036	0.0	0.0	0.0	0.82	14.5	4.6
S5.000	47.06	4.43	31.157	0.046	0.0	0.0	0.0	0.82	14.5	5.9
S1.004	42.40	5.72	30.602	0.459	0.0	0.0	0.0	1.27	90.0	52.7
S1.005	41.82	5.90	30.544	0.459	0.0	0.0	0.0	1.28	90.6	52.7

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.005	S	31.879	30.450	30.450	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

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Simulation Criteria for Storm

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Storm Duration (mins)	30
Ratio R	0.331		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S5, DS/PN: S1.004, Volume (m³): 5.1

Unit Reference	MD-SHE-0167-1250-0550-1250
Design Head (m)	0.550
Design Flow (l/s)	12.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	167
Invert Level (m)	30.602
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.550	12.5
Flush-Flo™	0.249	12.5
Kick-Flo®	0.436	11.2
Mean Flow over Head Range	-	9.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.9	1.200	18.1	3.000	28.1	7.000	42.2
0.200	12.4	1.400	19.5	3.500	30.2	7.500	43.7
0.300	12.4	1.600	20.8	4.000	32.2	8.000	45.1
0.400	11.7	1.800	22.0	4.500	34.1	8.500	46.5
0.500	11.9	2.000	23.1	5.000	35.9	9.000	47.9
0.600	13.0	2.200	24.2	5.500	37.6	9.500	49.2
0.800	14.9	2.400	25.2	6.000	39.0		
1.000	16.6	2.600	26.2	6.500	40.6		

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Storage Structures for Storm

Cellular Storage Manhole: S5, DS/PN: S1.004

Invert Level (m) 30.602 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	300.0	50.0	0.551	0.0	68.0
0.550	300.0	68.0			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff 0.750 Foul Sewage per hectare (l/s) 0.000
Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Summer	1	+0%	100/15 Summer			
S1.001	S2	15 Winter	1	+0%	100/15 Summer			
S1.002	S3	15 Winter	1	+0%	100/15 Summer			
S1.003	S4	15 Winter	1	+0%	100/15 Summer			
S2.000	S5	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
S2.001	S6	15 Winter	1	+0%	100/15 Summer			
S3.000	S7	15 Summer	1	+0%	100/120 Winter			
S3.001	S8	15 Summer	1	+0%	100/120 Winter			
S4.000	S9	15 Winter	1	+0%	100/15 Summer			
S5.000	S10	15 Winter	1	+0%	30/15 Summer			
S1.004	S5	180 Winter	1	+0%	100/15 Summer	100/120 Winter		
S1.005	S10	180 Winter	1	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	31.486	-0.126	0.000	0.40			14.1	OK	
S1.001	S2	31.412	-0.131	0.000	0.37			14.0	OK	
S1.002	S3	31.297	-0.202	0.000	0.23			19.4	OK	
S1.003	S4	30.898	-0.184	0.000	0.32			25.6	OK	
S2.000	S5	31.523	-0.069	0.000	0.52			7.4	OK	1
S2.001	S6	31.133	-0.130	0.000	0.37			14.3	OK	
S3.000	S7	31.227	-0.150	0.000	0.00			0.0	OK	
S3.001	S8	31.182	-0.150	0.000	0.00			0.0	OK	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S4.000	S9	31.192	-0.091	0.000	0.33			4.5	OK	
S5.000	S10	31.225	-0.082	0.000	0.43			5.8	OK	
S1.004	S5	30.727	-0.175	0.000	0.12		99	7.1	OK	3
S1.005	S10	30.606	-0.238	0.000	0.09			7.1	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep Fine Inertia Status OFF
DTS Status OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Summer	30	+0%	100/15 Summer			
S1.001	S2	15 Winter	30	+0%	100/15 Summer			
S1.002	S3	15 Winter	30	+0%	100/15 Summer			
S1.003	S4	15 Winter	30	+0%	100/15 Summer			
S2.000	S5	15 Winter	30	+0%	30/15 Summer	100/15 Winter		
S2.001	S6	15 Winter	30	+0%	100/15 Summer			
S3.000	S7	15 Summer	30	+0%	100/120 Winter			
S3.001	S8	15 Summer	30	+0%	100/120 Winter			
S4.000	S9	15 Winter	30	+0%	100/15 Summer			
S5.000	S10	15 Winter	30	+0%	30/15 Summer			
S1.004	S5	120 Winter	30	+0%	100/15 Summer	100/120 Winter		
S1.005	S10	120 Winter	30	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	31.565	-0.048	0.000	0.97			34.4	OK
S1.001	S2	31.485	-0.058	0.000	0.89			34.0	OK
S1.002	S3	31.369	-0.129	0.000	0.59			50.7	OK
S1.003	S4	30.994	-0.088	0.000	0.83			67.8	OK
S2.000	S5	31.807	0.215	0.000	1.17			16.6	SURCHARGED
S2.001	S6	31.211	-0.052	0.000	0.92			35.6	OK
S3.000	S7	31.227	-0.150	0.000	0.00			0.0	OK
S3.001	S8	31.182	-0.150	0.000	0.00			0.0	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S4.000	S9	31.235	-0.048	0.000	0.80			11.0	OK
S5.000	S10	31.310	0.003	0.000	1.02			13.8	SURCHARGED
S1.004	S5	30.901	-0.001	0.000	0.20		88	12.4	OK
S1.005	S10	30.625	-0.219	0.000	0.16			12.4	OK

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S1.003	S4	
S2.000	S5	1
S2.001	S6	
S3.000	S7	
S3.001	S8	
S4.000	S9	
S5.000	S10	
S1.004	S5	3
S1.005	S10	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Volumetric Runoff Coeff	0.750	Foul Sewage per hectare (l/s)	0.000
Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Margin for Flood Risk Warning (mm)	300.0	DVD Status	ON
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	OFF		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S1	15 Winter	100	+40%	100/15 Summer			
S1.001	S2	180 Winter	100	+40%	100/15 Summer			
S1.002	S3	180 Winter	100	+40%	100/15 Summer			
S1.003	S4	240 Winter	100	+40%	100/15 Summer			
S2.000	S5	15 Winter	100	+40%	30/15 Summer	100/15 Winter		
S2.001	S6	180 Winter	100	+40%	100/15 Summer			
S3.000	S7	180 Winter	100	+40%	100/120 Winter			
S3.001	S8	180 Winter	100	+40%	100/120 Winter			
S4.000	S9	180 Winter	100	+40%	100/15 Summer			
S5.000	S10	180 Winter	100	+40%	30/15 Summer			
S1.004	S5	180 Winter	100	+40%	100/15 Summer	100/120 Winter		
S1.005	S10	180 Winter	100	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S1	31.965	0.352	0.000	1.53			54.1	FLOOD RISK
S1.001	S2	31.873	0.330	0.000	0.42			15.8	SURCHARGED
S1.002	S3	31.862	0.363	0.000	0.28			24.5	SURCHARGED
S1.003	S4	31.849	0.767	0.000	0.32			25.9	SURCHARGED
S2.000	S5	32.215	0.623	0.428	1.56			22.0	FLOOD
S2.001	S6	31.848	0.584	0.000	0.49			18.9	SURCHARGED
S3.000	S7	31.834	0.457	0.000	0.04			0.5	FLOOD RISK
S3.001	S8	31.834	0.502	0.000	0.06			0.8	FLOOD RISK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S4.000	S9	31.842	0.559	0.000	0.37			5.1	FLOOD RISK
S5.000	S10	31.846	0.539	0.000	0.48			6.5	FLOOD RISK
S1.004	S5	31.834	0.932	1.842	0.29		168	18.0	FLOOD
S1.005	S10	30.643	-0.201	0.000	0.24			18.0	OK

PN	US/MH Name	Level Exceeded
S1.000	S1	
S1.001	S2	
S1.002	S3	
S1.003	S4	
S2.000	S5	1
S2.001	S6	
S3.000	S7	
S3.001	S8	
S4.000	S9	
S5.000	S10	
S1.004	S5	3
S1.005	S10	

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Client						
Project village bakery						Job Ref
Section Drainage Brownfield Flow Rates						Sheet No 1
Calc by	Date 30/09/2021	Checked by	Date	Approved by	Date	Rev 1

WALLINGFORD PROCEDURE - MODIFIED RATIONAL METHOD

Fill in this column

Location		England		(England, Ireland, Scotland, Wales)
M5 - 60	=	19	mm	(Fig 6.1)
r	=	0.45		(Fig 6.2)
Area	=	0.0054	km2	
Growth		40	%	

Fill in this column

Fill in this column

mins		Z1 (Fig 6.3b)	ARF Factor (Fig 6.4)
5	=	0.38	0.900
10	=	0.52	0.930
15	=	0.65	0.940
30	=	0.79	0.950
60	=	1.00	0.960
120	=	1.20	0.965
240	=	1.50	0.975
360	=	1.60	0.980
600	=	1.85	0.985
1440	=	2.10	0.990
2880	=	2.50	1.000

AVERAGE AREAL INTENSITY

INTERPOLATED

	M1 (mm/hr)	M2 (mm/hr)	M3 (mm/hr)	M4 (mm/hr)	M5 (mm/hr)	M10 (mm/hr)	M20 (mm/hr)	M30 (mm/hr)	M50 (mm/hr)	M100 (mm/hr)
5	66.6	86.2	98.2	105.9	112.4	133.2	153.9	163.7	180.1	208.5
10	47.9	61.7	69.5	74.9	79.5	95.7	111.1	118.1	131.2	153.6
15	40.3	52.0	58.5	63.1	67.0	80.6	93.6	99.5	110.5	129.4
30	25.6	32.3	35.9	38.7	41.1	49.5	57.9	61.9	69.1	81.1
60	16.9	20.9	23.2	24.8	26.3	31.7	36.8	39.3	43.9	51.3
2hr	10.5	12.8	14.0	14.9	15.9	19.1	21.9	23.4	26.2	30.3
4hr	6.8	8.2	8.9	9.4	9.9	11.9	13.4	14.3	16.0	18.4
6hr	4.9	5.8	6.4	6.7	7.1	8.5	9.6	10.2	11.4	13.1
10hr	3.5	4.1	4.5	4.8	4.9	5.8	6.5	6.9	7.7	8.8
24hr	1.7	2.0	2.1	2.3	2.4	2.7	3.1	3.3	3.6	4.2
48hr	1.1	1.2	1.3	1.4	1.4	1.6	1.8	1.9	2.0	2.3

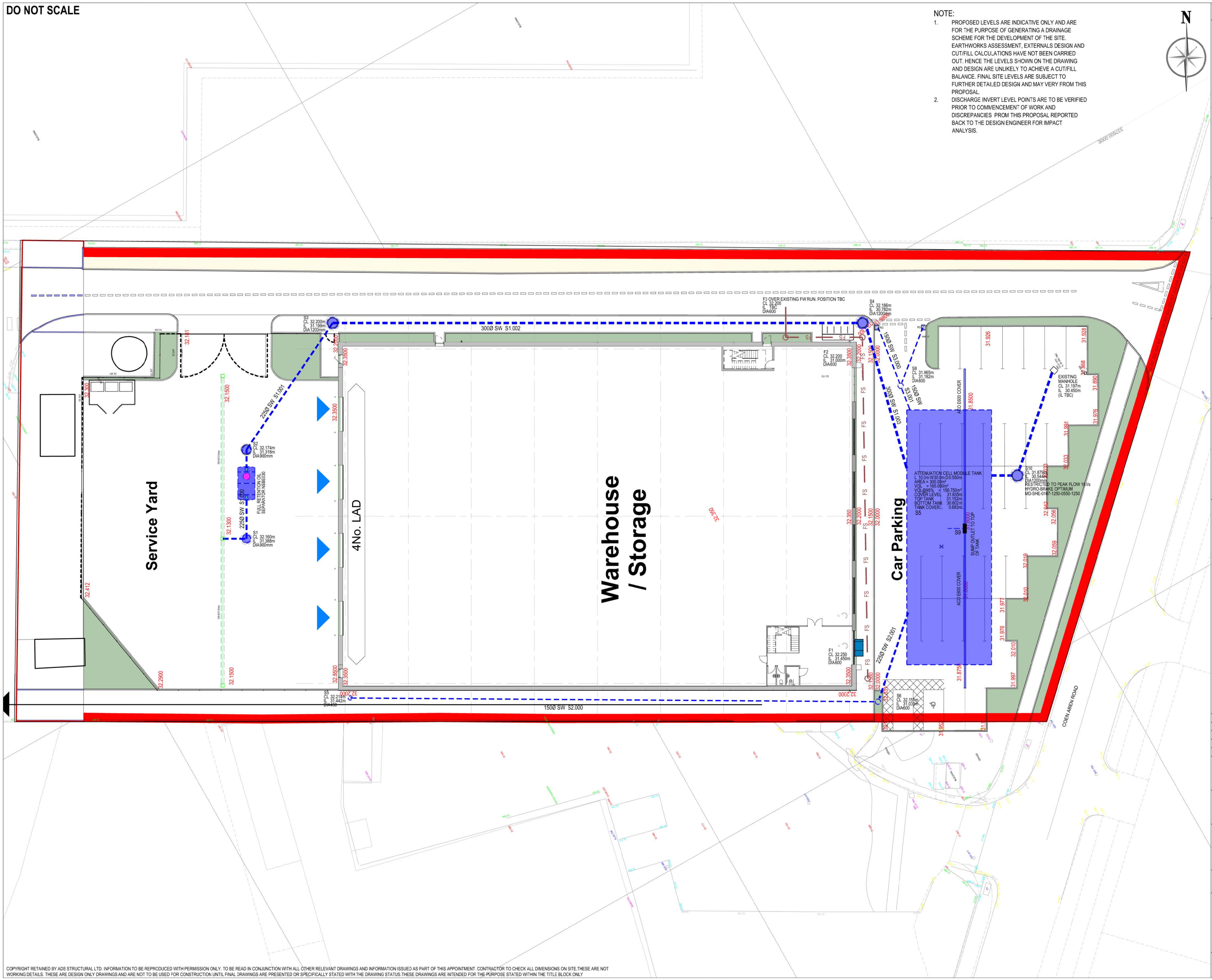
QBAR		32.5	Betterment	40%				19.48 l/s
		AAI		AREA (Ha)				
M1	=	16.9	x	0.54	x	2.78	=	25.3 l/s
M2	=	20.9	x	0.54	x	2.78	=	31.4 l/s
M3	=	23.2	x	0.54	x	2.78	=	34.9 l/s
QBAR	=	21.6	x	0.54	x	2.78	=	32.5 l/s
M30	=	39.3	x	0.54	x	2.78	=	59.0 l/s
M100	=	51.3	x	0.54	x	2.78	=	77.1 l/s

APPENDIX D
PROPOSED DRAINAGE LAYOUTS

DO NOT SCALE

NOTE:

1. PROPOSED LEVELS ARE INDICATIVE ONLY AND ARE FOR THE PURPOSE OF GENERATING A DRAINAGE SCHEME FOR THE DEVELOPMENT OF THE SITE. EARTHWORKS ASSESSMENT, EXTERNALS DESIGN AND CUT/FILL CALCULATIONS HAVE NOT BEEN CARRIED OUT. HENCE THE LEVELS SHOWN ON THE DRAWING AND DESIGN ARE UNLIKELY TO ACHIEVE A CUT/FILL BALANCE. FINAL SITE LEVELS ARE SUBJECT TO FURTHER DETAILED DESIGN AND MAY VERY FROM THIS PROPOSAL.
2. DISCHARGE INVERT LEVEL POINTS ARE TO BE VERIFIED PRIOR TO COMMENCEMENT OF WORK AND DISCREPANCIES FROM THIS PROPOSAL REPORTED BACK TO THE DESIGN ENGINEER FOR IMPACT ANALYSIS.



NOTES

CDM REGULATIONS 2015

IN LINE WITH THE ABOVE REGULATIONS WE ARE OBLIGED TO INFORM THE CONTRACTORS OF THE RISKS THAT MAY BE ENCOUNTERED IN THE CONSTRUCTION OF THESE WORKS. ALL DESIGN WORK HAS BEEN CARRIED OUT WITH HEALTH & SAFETY ASPECTS GIVEN FULL CONSIDERATION. WHEREVER POSSIBLE RISKS HAVE BEEN ELIMINATED FROM THE DESIGN. HOWEVER DUE TO THE VERY NATURE OF THIS TYPE OF WORK IT IS NOT POSSIBLE TO REMOVE ALL RISKS FROM THE DESIGN. WE WOULD ALSO RESPECTFULLY REMIND THE CONTRACTOR OF HIS OBLIGATIONS TO TAKE ALL REASONABLE STEPS ENSURING THAT ONLY COMPETENT WORKERS WHO HAVE A VALID SAFETY POLICY ARE EMPLOYED.
THEY SHOULD ALSO PROVIDE SATISFACTORY RESPONSES AT TENDER STAGE AS TO THE MANNER IN WHICH THEY DEAL WITH THE ELEMENTS OF RISK INVOLVED IN THIS TYPE OF WORK AND IN PARTICULAR THOSE HIGHLIGHTED BY ADS STRUCTURAL LIMITED BELOW:-

1. SUPPORT/ TREATMENT FOR ALL EXCAVATION WORK.
2. GUARDING TO EDGES OF EXCAVATIONS TO PREVENT PEOPLE, MATERIALS AND VEHICLES FALLING INTO EXCAVATIONS.
3. GUARDING OF EXCAVATIONS OUTSIDE WORKING HOURS TO PREVENT UNAUTHORISED ACCESS.
4. UNDERMINING TO ADJACENT ROADS OR STRUCTURES.
5. CONFINED SPACE OPERATIONS.
6. DEALING WITH EXISTING SERVICES.
7. TRAFFIC MANAGEMENT ON EXISTING HIGHWAYS.
8. PROCEDURE TO BE FOLLOWED IN EVENT OF AN ACCIDENT OR EMERGENCY.
9. METHOD OF WORKING WHERE CONTAMINATED GROUND IS PRESENT ON SITE.
10. CONFIRMATION WILL BE REQUIRED THAT ALL OPERATIVES ARE ADEQUATELY TRAINED, AND COPIES OF RELEVANT CERTIFICATES TO BE SUPPLIED.
11. THE CONTRACTOR IS RESPONSIBLE FOR THE OVERALL STABILITY OF THE STRUCTURE FROM THE COMMENCEMENT OF WORKS INCLUDING THE DESIGN AND PROVISION OF ALL NECESSARY TEMPORARY WORKS.

THE ABOVE LIST IS BY NO MEANS EXHAUSTIVE BUT IT DOES HIGHLIGHT OPERATIONS THAT PRESENT A RISK TO CONTRACTORS AND THE GENERAL PUBLIC.

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONNECTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
2. DO NOT SCALE FROM THIS DRAWING. ALL SETTING OUT DIMENSIONS ARE TO BE CHECKED AND VERIFIED ON SITE PRIOR TO COMMENCEMENT OF ANY BUILDING WORKS & FABRICATION OF MATERIALS. ANY DISCREPANCIES ARE TO BE REPORTED TO THE ENGINEER.
3. ALL WORKMANSHIP AND MATERIALS ARE TO COMPLY WITH THE CURRENT BUILDING REGULATIONS, BRITISH STANDARDS AND CODES OF PRACTICE, ALL MATERIALS SHALL BE FIXED OR APPLIED IN ACCORDANCE WITH THE MANUFACTURES RECOMMENDATIONS. THE CONTRACTOR IS TO TAKE INTO ACCOUNT EVERYTHING DEEMED NECESSARY FOR THE PROPER EXECUTION OF THE WORKS WHETHER INDICATED ON THE DRAWINGS OR NOT TO THE COMPLETE SATISFACTION OF THE LOCAL AUTHORITY.
4. FOR FINAL SETTING OUT INFORMATION RELATING TO WALL POSITIONS REFER TO ARCHITECTS DRAWINGS.

DRAINAGE NOTES

1. ALL DRAINAGE WORKS ARE TO BE CARRIED OUT IN ACCORDANCE WITH ADS STRUCTURAL LTD DESIGN SPECIFICATIONS. ANY DEVIATIONS WILL NEED TO BE APPROVED BY THE DESIGN ENGINEER PRIOR TO WORKS.
2. THE CONTRACTORS ARE TO CONFIRM FIRST ALL DIMENSIONS AND LEVELS PRIOR TO THE COMMENCEMENT OF ANY WORK. DISCREPANCIES MUST BE HIGHLIGHTED WITH THE DESIGN ENGINEER WHO IS TO ASSESS THE POTENTIAL IMPACT PRIOR TO FURTHER WORKS.
3. ALL DRAINAGE IS TO CONFORM TO THE ASSOCIATED STANDARDS OF BOTH BS EN 7524 CODE OF PRACTICE FOR BUILDING DRAINAGE AND TO SEWERS FOR ADOPTION WHERE APPROPRIATE.
4. THE CONTRACTOR IS TO PROVIDE PROTECTION TO ALL NEW AND EXISTING SERVICE PIPEWORK DURING THE CONSTRUCTION PHASE. A STATEMENT OF PROPOSED MEASURES TO BE PROVIDED TO THE DESIGN ENGINEER PRIOR TO THE COMMENCEMENT OF WORKS
5. ALL PIPES WITHIN TRAFFICKED AREAS TO HAVE A MINIMUM OF 900mm COVER UNLESS OTHERWISE STATED. WHERE THESE DO NOT CONFORM TO THIS STANDARD A MINIMUM OF 150mm SURROUND CONCRETE USING C20/20 AS PROTECTION. FLEXIBILITY OF PIPES EITHER SIDE OF THE PROTECTION MUST BE UTILISED.
6. PIPE TRENCHES ARE TO HAVE ALL SOFT SPOTS FILLED WITH APPROVED GRANULAR FILL. HARD SPOTS ARE TO BE BROKEN DOWN. THE CONTRACTOR TO ENSURE ALL TRENCHES OFFER ADEQUATE PROTECTION FOR SAFE WORKING.
7. TRENCHES ARE TO BE BACKFILLED WITH EITHER GRANULAR FILL OR TYPE 'B' SELECTED MATERIAL FROM EXISTING SITE. ANY TRENCH WITHIN 1M OF A LOAD BEARING STRUCTURE TO BE BACKFILLED WITH CONCRETE UP TO THE UNDERSIDE OF THE STRUCTURE.
8. ALL ACCESS COVERS MUST CONFORM TO BS EN 124 PART 1.
9. RWP'S DISCHARGING TO A COMBINED SEWER MUST BE INSTALLED WITH TRAPPED BACK INLET GULLY.
10. ALL COVER LEVELS ARE APPROXIMATE AND ARE TO BE SET IN ACCORDANCE TO FINISHED LEVELS.

LEGEND

- MAHOLE
- INSPECTION CHAMBER
- ROAD GULLY
- RAIN WATER PIPE
- SLOT DRAIN
- BACKDROP PIPE
- SURFACE WATER PIPE
- FOUL WATER PIPE (150Ø uno)
- COMBINED SEWER
- EXISTING SURFACE WATER
- EXISTING FOUL WATER
- FLOW DIRECTION
- CONCRETE SURROUND PIPES
- 00.00 PROPOSED LEVEL

5m 0m 5m 10m
Scale 1:200

REV	DATE	REVISION DETAILS	DRN	CHK	APP
P1	29.10.21	PLANNING APPLICATION	GR	AEB	ADS

CLIENT
VILLAGE BAKERY

PROJECT:
VILLAGE BAKERY

DRAWING TITLE:
DRAINAGE LAYOUT

DRAWING STATUS:
PLANNING ONLY

A1

ads structural
Alexandra Business Park
2nd Floor
The Court
Prescot Road
St Helens
WA10 3TP
Tel: 0151 541 4000
info@adsstructural.co.uk

SCALE	PROJECT - ORIGINATOR - ZONE - LEVEL - TYPE - ROLE - NUMBER	REV
1:200	6595-ADS-XX-00-DR-S-500	P1

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APPENDIX E
SUDS MANAGEMENT AND MAINTENANCE

ADS Structural Ltd

Sustainable Drainage System (SuDS) Management Strategy

for

Village Bakery

Document No.:	6595-ADS-XX-XX-RP-S-500
Title:	Sustainable Drainage System (SuDS) Management Strategy
Client:	Village Bakery
Date:	October 2021

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1.0 INTRODUCTION

This management strategy has been prepared by ADS Structural Limited on behalf of Village Bakery, for the development at Wrexham Industrial Estate.

The SUDS considered for the purposes of this statement, include drainage features that will be employed to reduce and manage surface water runoff from the development to a design return period of one hundred years plus climate change of 40%. This is required so that the development will not increase the risk of flooding to the site and its environs. All drainage on site is taken to the underlying strata via the following features:

- Storage Tank.
- Flow Control
- Pipes
- Manholes

This document outlines the long-term maintenance of the proposed surface water system and will make reference to the following documents, some of which provide further detail on the maintenance operations required:

- CIRIA Report C753, 'The SUDS Manual', 2015
- CIRIA Report C625, 'Model Agreements for Sustainable Water Management Systems', 2004.
- CIRIA Report C768, 'Guidance on the Construction of SuDS', 2017; and

2.0 MAINTENANCE RESPONSIBILITIES

Responsibility for drainage within England and Wales rests with various bodies. For the Development, the drainage responsibilities will be as following:

- Client - Village Bakery will maintain the drainage features, all permeable paving, stormwater attenuation tanks, outfalls and any associated flow controls within communal areas. However, it should be noted that if, the Flood and Water Management Act 2010 is ever fully implemented this allows a surface water drainage system to be vested to the SUDS approving body (SAB) in this case Buckinghamshire Council. This would be reviewed at the time of any implementation of the act.

3.0 MAINTENANCE REGIME

The following section describes the required maintenance for each feature in turn. The SUDS maintenance requirements listed below should be reviewed after the first 5 years, with a view to agreeing a new regime for the ongoing maintenance.

Notwithstanding the routine inspections and maintenance requirements, after severe storm events all features shall be inspected to clear debris and repair damaged structures or features. Records of the maintenance carried out shall be prepared by the Operator.

3.1 Storage Tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

3.2 Flow Controls

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Inspect inlets, outlets, and overflows for blockages, and clear if required.	Monthly
	Inspect inlets, outlets, and overflows for evidence of physical damage.	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), the annually or as required
	Check any penstocks and other mechanical devices	Annually
	Maintenance of pump plant	As per the supplier maintenance agreement schedule
Occasional Maintenance	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair/rehabilitation of inlets, outlets, and overflows	As required

3.3 Manholes

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Inspect inlets, outlets, and overflows for blockages, andclear if required.	Monthly
	Inspect inlets, outlets, and overflows for evidence of physical damage.	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), the annually or as required
	Check any penstocks and other mechanical devices	Annually
Occasional Maintenance	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair/rehabilitation of inlets, outlets, and overflows	As required

3.4 Pipes

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect inlets, outlets, and overflows for evidence of poor operation.	Monthly
	Inspect inlets and facility surface for silt accumulation.	Monthly (for first year), the annually or as required
Occasional Maintenance	Rod through poorly performing pipes	As required
	If continued poor performance jet and CCTV survey poorly performing runs.	As required
Remedial actions	Repair / rehabilitation	As required

APPENDIX A

INSPECTION CHECKLIST

General information			
Site ID			
Site location and co-ordinates (GIS if appropriate)			
Elements forming the SuDS scheme		Approved drawing reference	
Inspection frequency		Approved specification reference	
Type of development		Specific purpose of any parts of the scheme (e.g., biodiversity, wildlife, and visual aspects)	

Inspection Date	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date completed
General inspection items								
Is there any evidence of erosion, channeling, ponding (where not desirable) or other poor hydraulic performance?								
Is there any evidence of accidental spillages, oils, poor water quality, odours, or nuisance insects?								
Have any health and safety risks been identified to either the publicor maintenance operatives?								
Silt/Sediment accumulation								
Is there any sediment accumulationat inlets (or other defined accumulation zones such as the surface of filter drains or infiltration basins and within proprietary devices)? If yes, state depth (mm) and extent.Is removal required? If yes, state waste disposal requirements and confirm that all waste management requirements have been complied with (consult environmental regulator)								
Is surface clogging visible potentially problematic where waterhas to soak into the underlying construction or ground (e.g., under drained swale or infiltration basin)?								

Inspection Date	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date completed
Does permeable or porous surfacing require sweeping to remove silt?								
Is there evidence of litter accumulation in the system? If yes,is this a blockage risk?								
Is there any evidence of any other clogging or blockage of outlets or drainage paths?								
Is the vegetation condition satisfactory (density, weed growth, coverage etc.)? (check against approved planting regime)								
Does any part of the system require weeding, pruning, or mowing? (check against maintenance frequency state in approved design).								
Is there any evidence of invasive species becoming established? If yes, state action required								
Are any check dams or weirs in good condition?								
Is there any evidence of any accidental damage to the system (e.g., wheel ruts?)								
Is there any evidence of cross connections or other unauthorised inflows?								
Is there any evidence of tampering with the flow control?								
Are there any other matters that could affect the performance of thesystem in relation to the design objectives for hydraulic, water quality, biodiversity, and visual aspects?								

Inspection Date	Details	Y/N	Action required	Date completed	Details	Y/N	Action required	Date completed
Other observations								
Information appended (e.g., photos)								
Continue as current Increase maintenance. Decrease maintenance								
Proposed date for next inspection								