ARDENT
CONSULTING ENGINEERS
AN EMPLOYEE OWNED COMPANY

Our Ref: LE/2202380/LLFA/Rev01

Christopher Brady
Hillingdon Council
Civic Centre
High Street
Uxbridge
UB8 1UW.

29th November 2022

Dear Chris,

RESONSE TO LLFA COMMENTS (REF. 24843/APP/2022/2403 - LLFA Consultation response)

Ardent Consulting Engineers (hereafter referred to as 'Ardent') have been commissioned by Bellway Homes Limited to address comments raised by Hillingdon Borough Council (HBC) as Lead Local Flood Authority (LLFA) on 19th October 2022 with respect to the proposed development at Former Comag Works, West Drayton, UB7 7QE. This follows the submission of a Flood Risk Assessment and drainage strategy in support of the planning application.

This letter aims to address the HBC LLFA comments. For ease of reference, the comments with are replicated below followed with an Ardent response immediately below.

"Please can the applicant submit information which:

- ***Demonstrates that rainwater harvesting techniques have been included or provide a sufficient justification for their non-inclusion***

In line with Policy SI 13 in the London Plan it is proposed that the rainwater downpipes are fitted with rainwater butts to provide rainwater harvesting techniques and betterment to the development site. These should be designed to overflow back into the drainage system, they will be installed on the mezzanine level (Refer to Drainage Strategy included in **Appendix A**). The locations of these rainwater butts are subject to the final drainage and landscape design.

- ***Confirms the method of flow control from the site.***

The proposed flow control method at the site is likely to be a Hydro-Brake vortex flow control device. However, this would be confirmed as part of the detailed design.

- ***Provides the runoff volume for the greenfield, existing and proposed rate for the 1 in 100-year 6 hour storm event.***

The difference in runoff volume has been calculated with the predevelopment site area (0.34ha) being classed as 100% permeable, and the post development site classes as 88% impermeable (0.30ha) accounting for the inclusion of green amenities. This is considered to be a worst case as the existing site is made up of recently demolished made ground and the permeability is in question. The long-term storage volume for the site, included in **Appendix B**, has been calculated to be 94.25m^3. The required storage volume is provided within the proposed attenuation tank.

- ***Provides calculations to demonstrate that the site will not flood as a result of the 1 in 30 year rainfall event, that there will be no flooding of buildings as a result of events up to and including the 1 in 100 year rainfall event, and on-site flow as a result of the 1 in 100 year event with a climate change consideration must be suitably managed (via suitable exceedance flow draining).***

An updated drainage drawing is included in **Appendix A**, including exceedance flow routes. Site levels would be designed to ensure that flows exceeding the capacity of the drainage network would flow away from building entrances and mimic existing flow routes as far as possible.

Calculations to demonstrate the site does not flood as a result of the 1 in 30 year and 1 in 100 year flood are included in **Appendix C**.

- ***Provides the name of the management company who will be in charge of the SuDS maintenance tasks.***

The name of the management company is not yet known, they will be appointed as the design progresses. If required, this could be provided as a planning condition.

- ***Provides evidence that Thames Water has approved the proposed discharge rate into their system."***

A pre-planning enquiry was submitted to Thames Water, a response was received confirming capacity in their network for foul water. Surface water confirmation has been provided subject to

justification for disposal of the surface water sewer over infiltration methods or to the adjacent watercourse. This is included in **Appendix D.**

We trust that the above and attached information is sufficient however, if you have any further queries, please do not hesitate to contact the undersigned.

Yours sincerely,

L.Eaborn

Lauren Eaborn
Graduate Consultant

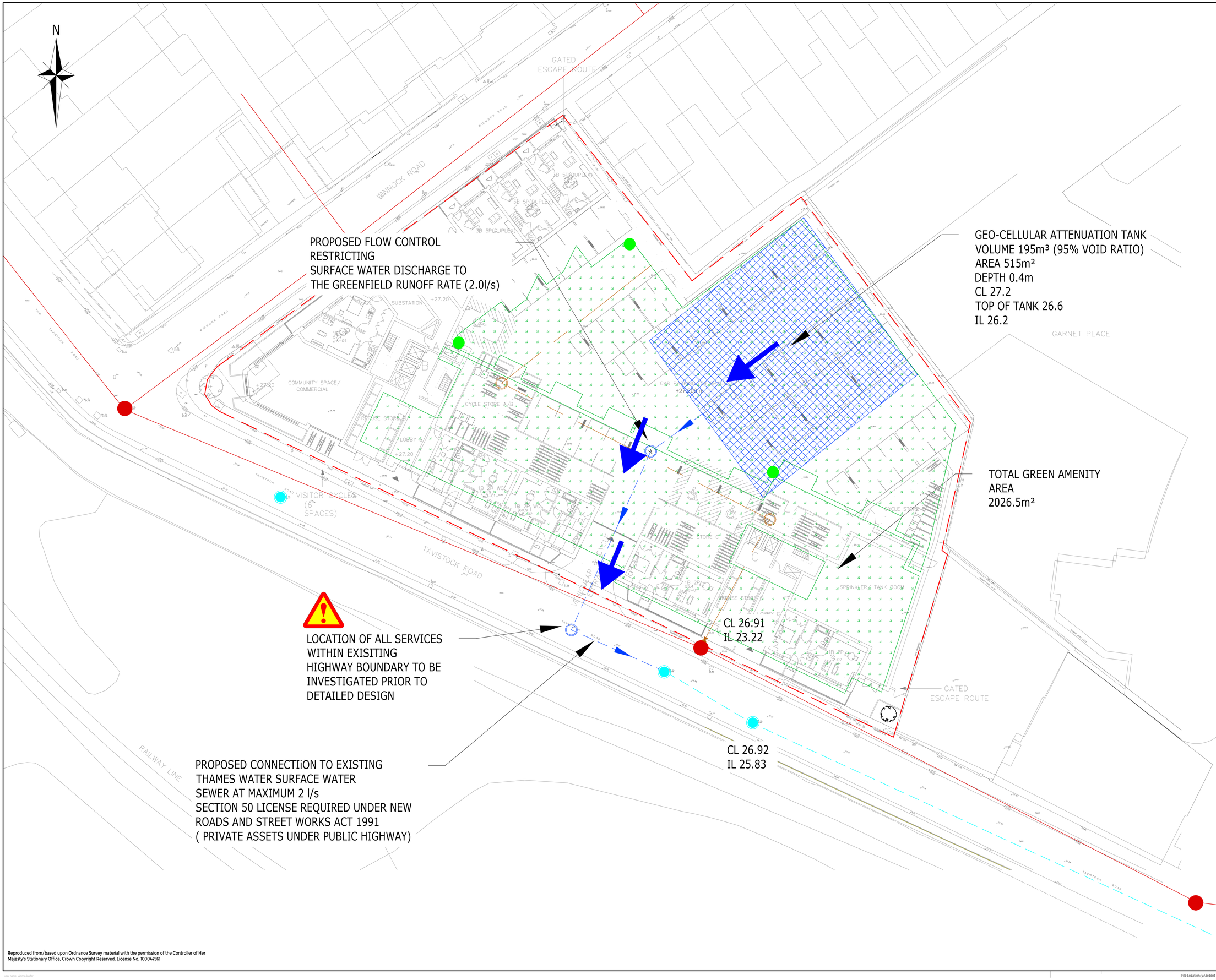
Approved by:

C. Cooper

Charlie Cooper
Associate

Encl: Appendix A - 2200510-002 – Foul and Surface Water Drainage Strategy
Appendix B - Long Term Storage Calculations
Appendix C - 1 in 30 year and 1 in 100 year hydraulic calculation, model build
Appendix D – Thames Water Pre-Planning Enquiry

Appendix A



NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED. ALL LEVELS SHOWN ARE IN METRES ABOVE ORDNANCE DATUM.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
6. THIS DRAWING HAS BEEN BASED ON DRAWING No. "CWD-RMA-ZZ-00-DR-A-0100_P1 Site Plan Ground Floor Level"
7. EXISTING DRAINAGE AND UTILITIES TO BE CONFIRMED IN-SITU BY THE CONTRACTOR, PRIOR TO STARTING WORKS.
8. THE DRAINAGE STRATEGY IS INDICATIVE ONLY, TO DEMONSTRATE DESIGN INTENT AND ATTENUATION STORAGE REQUIREMENTS.
9. INDICATIVE DRAINAGE STRATEGY SUBJECT TO LONDON BOROUGH OF HILLINGDON (LEAD LOCAL FLOOD AUTHORITY) APPROVAL.
10. STRATEGY SUBJECT TO CCTV SURVEY REQUIRED OF EXISTING DRAINAGE NETWORK TO CONFIRM LEVELS AND CONDITION.

KEY

- INDICATIVE SITE BOUNDARY
- PROPOSED SURFACE WATER SEWER
- PROPOSED SURFACE WATER MANHOLE
- PROPOSED FOUL WATER SEWER
- PROPOSED FOUL MANHOLE
- NON-RETURN VALVE
- EXISTING THAMES WATER FOUL SEWER
- EXISTING THAMES WATER SURFACE WATER SEWER
- EXISTING THAMES WATER SURFACE WATER MANHOLE
- PROPOSED GEOCELLULAR STORAGE (95% VOID RATIO)
- PROPOSED GREEN AMENITY AREAS
- INDICATIVE RAINWATER BUTT (SUBJECT TO FINAL LANDSCAPE DESIGN)
- EXCEEDANCE FLOW ARROW

Rev	Description	Drn	Chk	App	Date

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Client: BELLWAY HOMES LIMITED

Project Title: COMAG WORKS, WEST DRAYTON

Drawing Title: FOUL AND SURFACE WATER DRAINAGE STRATEGY

A1 Scale	Date	Designed by
1:200	22/07/22	LE
Drawn by	**Checked by**	**Approved by**
LE	CC	BC

Drawing Number: 2202380-007 Rev -

Appendix B

Difference in Runoff Volume Following Development (i.e. Long Term Storage Volume)

This methodology is taken from *The SuDS Manual* (Ciria C753) and is also in accordance with the methods in *SC030219 Rainfall Runoff for Developments* and *BS 8582 Code of Practice for Surface Water Management for Development Sites* .

The SuDS Manual Equation for greenfield development sites

$$Vol_{xs} = RD \times A \times 10\ (0.8 - SPR)\frac{PIMP}{100}$$

Calculation Inputs

RD	63	Rainfall depth during 1 in 100 year, 6hour storm event (taken from Figure A3.1 in '*Rainfall runoff management for developments* ') (mm)
A	0.34	Total area of site (ha)
SPR	0.3	Standard Percentage Runoff from greenfield site
PIMP	88	Percentage imperable area following development (%)

Calculation Outputs

Pre-development runoff volume	**64.26**	m^3	(assuming greenfield site)
Post development runoff volume	**158.51**	m^3	
Difference in Runoff Volume, Vol_{xs} (i.e. Long Term Storage Volume)	**94.25**	m^3	

Where a development is found to increase the volume of runoff then the additional volume should be prevented from leaving the site (i.e. infiltration or rainwater harvesting). If this is not possible then the additional volume should be released at a very low rate (2 l/s/ha or less).

Appendix C

Summary of Results for 30 year Return Period

Half Drain Time : 400 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	26.285	0.085	0.0	1.8	1.8	41.5	O K
30 min Summer	26.309	0.109	0.0	2.0	2.0	53.2	O K
60 min Summer	26.332	0.132	0.0	2.0	2.0	64.8	O K
120 min Summer	26.353	0.153	0.0	2.0	2.0	75.0	O K
180 min Summer	26.363	0.163	0.0	2.0	2.0	79.5	O K
240 min Summer	26.367	0.167	0.0	2.0	2.0	81.6	O K
360 min Summer	26.369	0.169	0.0	2.0	2.0	82.7	O K
480 min Summer	26.370	0.170	0.0	2.0	2.0	83.0	O K
600 min Summer	26.369	0.169	0.0	2.0	2.0	82.7	O K
720 min Summer	26.368	0.168	0.0	2.0	2.0	82.1	O K
960 min Summer	26.364	0.164	0.0	2.0	2.0	80.0	O K
1440 min Summer	26.352	0.152	0.0	2.0	2.0	74.4	O K
2160 min Summer	26.333	0.133	0.0	2.0	2.0	65.3	O K
2880 min Summer	26.317	0.117	0.0	2.0	2.0	57.1	O K
4320 min Summer	26.293	0.093	0.0	2.0	2.0	45.4	O K
5760 min Summer	26.280	0.080	0.0	1.7	1.7	39.3	O K
7200 min Summer	26.272	0.072	0.0	1.5	1.5	35.1	O K
8640 min Summer	26.266	0.066	0.0	1.4	1.4	32.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	76.035	0.0	37.2	26
30 min Summer	49.499	0.0	49.6	40
60 min Summer	30.811	0.0	66.3	68
120 min Summer	18.615	0.0	80.5	126
180 min Summer	13.715	0.0	89.2	184
240 min Summer	10.995	0.0	95.5	242
360 min Summer	8.034	0.0	104.8	316
480 min Summer	6.428	0.0	111.8	380
600 min Summer	5.404	0.0	117.5	442
720 min Summer	4.687	0.0	122.3	508
960 min Summer	3.743	0.0	130.2	644
1440 min Summer	2.723	0.0	141.6	914
2160 min Summer	1.979	0.0	158.2	1300
2880 min Summer	1.577	0.0	167.8	1672
4320 min Summer	1.143	0.0	181.3	2344
5760 min Summer	0.910	0.0	195.3	3064
7200 min Summer	0.762	0.0	204.1	3816
8640 min Summer	0.659	0.0	211.3	4504

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	26.261	0.061	0.0	1.3	1.3	29.8	O K
15 min Winter	26.295	0.095	0.0	2.0	2.0	46.4	O K
30 min Winter	26.322	0.122	0.0	2.0	2.0	59.8	O K
60 min Winter	26.349	0.149	0.0	2.0	2.0	73.0	O K
120 min Winter	26.373	0.173	0.0	2.0	2.0	84.9	O K
180 min Winter	26.385	0.185	0.0	2.0	2.0	90.3	O K
240 min Winter	26.390	0.190	0.0	2.0	2.0	93.0	O K
360 min Winter	26.394	0.194	0.0	2.0	2.0	94.8	O K
480 min Winter	26.392	0.192	0.0	2.0	2.0	94.1	O K
600 min Winter	26.391	0.191	0.0	2.0	2.0	93.3	O K
720 min Winter	26.388	0.188	0.0	2.0	2.0	92.0	O K
960 min Winter	26.380	0.180	0.0	2.0	2.0	88.3	O K
1440 min Winter	26.361	0.161	0.0	2.0	2.0	78.9	O K
2160 min Winter	26.332	0.132	0.0	2.0	2.0	64.6	O K
2880 min Winter	26.308	0.108	0.0	2.0	2.0	52.8	O K
4320 min Winter	26.282	0.082	0.0	1.8	1.8	40.1	O K
5760 min Winter	26.269	0.069	0.0	1.5	1.5	33.9	O K
7200 min Winter	26.261	0.061	0.0	1.3	1.3	29.9	O K
8640 min Winter	26.256	0.056	0.0	1.1	1.1	27.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.583	0.0	216.9	5248
15 min Winter	76.035	0.0	42.1	26
30 min Winter	49.499	0.0	56.1	39
60 min Winter	30.811	0.0	74.5	68
120 min Winter	18.615	0.0	90.5	124
180 min Winter	13.715	0.0	100.2	182
240 min Winter	10.995	0.0	107.2	238
360 min Winter	8.034	0.0	117.6	348
480 min Winter	6.428	0.0	125.5	444
600 min Winter	5.404	0.0	131.9	476
720 min Winter	4.687	0.0	137.3	552
960 min Winter	3.743	0.0	146.1	702
1440 min Winter	2.723	0.0	158.9	990
2160 min Winter	1.979	0.0	177.4	1388
2880 min Winter	1.577	0.0	188.3	1736
4320 min Winter	1.143	0.0	203.6	2424
5760 min Winter	0.910	0.0	218.9	3120
7200 min Winter	0.762	0.0	228.8	3824
8640 min Winter	0.659	0.0	237.0	4576

Summary of Results for 30 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	26.252	0.052	0.0	1.0	1.0	25.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.583	0.0	243.4	5248

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.300

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.100	4	8	0.100	8	12	0.100

Model Details

Storage is Online Cover Level (m) 27.200

Cellular Storage Structure

Invert Level (m) 26.200 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	515.0	0.0	0.401	0.0	0.0
0.400	515.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0076-2000-0400-2000
Design Head (m)	0.400
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	26.200
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	2.0	Kick-Flo®	0.286	1.7
Flush-Flo™	0.124	2.0	Mean Flow over Head Range	-	1.7

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	2.0	1.200	3.3	3.000	5.1	7.000	7.6
0.200	1.9	1.400	3.5	3.500	5.4	7.500	7.9
0.300	1.8	1.600	3.8	4.000	5.8	8.000	8.2
0.400	2.0	1.800	4.0	4.500	6.1	8.500	8.4
0.500	2.2	2.000	4.2	5.000	6.5	9.000	8.7
0.600	2.4	2.200	4.4	5.500	6.8	9.500	8.9
0.800	2.7	2.400	4.6	6.000	7.1		
1.000	3.0	2.600	4.7	6.500	7.4		

Summary of Results for 100 year Return Period

Half Drain Time : 546 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	26.310	0.110	0.0	2.0	2.0	53.9	O K
30 min Summer	26.343	0.143	0.0	2.0	2.0	70.1	O K
60 min Summer	26.376	0.176	0.0	2.0	2.0	86.2	O K
120 min Summer	26.406	0.206	0.0	2.0	2.0	100.8	O K
180 min Summer	26.420	0.220	0.0	2.0	2.0	107.5	O K
240 min Summer	26.426	0.226	0.0	2.0	2.0	110.8	O K
360 min Summer	26.431	0.231	0.0	2.0	2.0	113.2	O K
480 min Summer	26.431	0.231	0.0	2.0	2.0	113.0	O K
600 min Summer	26.429	0.229	0.0	2.0	2.0	112.3	O K
720 min Summer	26.427	0.227	0.0	2.0	2.0	111.2	O K
960 min Summer	26.422	0.222	0.0	2.0	2.0	108.5	O K
1440 min Summer	26.408	0.208	0.0	2.0	2.0	101.5	O K
2160 min Summer	26.384	0.184	0.0	2.0	2.0	90.0	O K
2880 min Summer	26.361	0.161	0.0	2.0	2.0	79.0	O K
4320 min Summer	26.325	0.125	0.0	2.0	2.0	60.9	O K
5760 min Summer	26.300	0.100	0.0	2.0	2.0	48.9	O K
7200 min Summer	26.286	0.086	0.0	1.9	1.9	42.3	O K
8640 min Summer	26.278	0.078	0.0	1.7	1.7	38.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	98.681	0.0	49.5	26
30 min Summer	64.789	0.0	66.1	40
60 min Summer	40.510	0.0	87.8	70
120 min Summer	24.461	0.0	106.5	128
180 min Summer	17.964	0.0	117.5	186
240 min Summer	14.342	0.0	125.2	244
360 min Summer	10.418	0.0	136.4	362
480 min Summer	8.302	0.0	145.0	442
600 min Summer	6.956	0.0	151.8	496
720 min Summer	6.017	0.0	157.5	558
960 min Summer	4.784	0.0	166.7	684
1440 min Summer	3.456	0.0	179.9	954
2160 min Summer	2.493	0.0	199.8	1348
2880 min Summer	1.975	0.0	210.8	1736
4320 min Summer	1.421	0.0	226.1	2464
5760 min Summer	1.124	0.0	241.5	3120
7200 min Summer	0.936	0.0	251.2	3824
8640 min Summer	0.806	0.0	259.0	4504

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	26.271	0.071	0.0	1.5	1.5	34.8	O K
15 min Winter	26.324	0.124	0.0	2.0	2.0	60.5	O K
30 min Winter	26.361	0.161	0.0	2.0	2.0	78.8	O K
60 min Winter	26.398	0.198	0.0	2.0	2.0	97.1	O K
120 min Winter	26.433	0.233	0.0	2.0	2.0	113.8	O K
180 min Winter	26.449	0.249	0.0	2.0	2.0	121.7	O K
240 min Winter	26.457	0.257	0.0	2.0	2.0	125.9	O K
360 min Winter	26.465	0.265	0.0	2.0	2.0	129.7	O K
480 min Winter	26.466	0.266	0.0	2.0	2.0	130.3	O K
600 min Winter	26.464	0.264	0.0	2.0	2.0	129.1	O K
720 min Winter	26.459	0.259	0.0	2.0	2.0	126.8	O K
960 min Winter	26.450	0.250	0.0	2.0	2.0	122.5	O K
1440 min Winter	26.429	0.229	0.0	2.0	2.0	111.9	O K
2160 min Winter	26.392	0.192	0.0	2.0	2.0	94.0	O K
2880 min Winter	26.358	0.158	0.0	2.0	2.0	77.2	O K
4320 min Winter	26.307	0.107	0.0	2.0	2.0	52.2	O K
5760 min Winter	26.284	0.084	0.0	1.8	1.8	41.0	O K
7200 min Winter	26.272	0.072	0.0	1.6	1.6	35.3	O K
8640 min Winter	26.265	0.065	0.0	1.4	1.4	31.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.710	0.0	264.9	5248
15 min Winter	98.681	0.0	55.9	26
30 min Winter	64.789	0.0	74.5	40
60 min Winter	40.510	0.0	98.7	68
120 min Winter	24.461	0.0	119.5	126
180 min Winter	17.964	0.0	131.8	182
240 min Winter	14.342	0.0	140.4	240
360 min Winter	10.418	0.0	153.0	354
480 min Winter	8.302	0.0	162.5	466
600 min Winter	6.956	0.0	170.1	570
720 min Winter	6.017	0.0	176.5	658
960 min Winter	4.784	0.0	186.8	744
1440 min Winter	3.456	0.0	201.4	1042
2160 min Winter	2.493	0.0	223.9	1468
2880 min Winter	1.975	0.0	236.4	1848
4320 min Winter	1.421	0.0	253.8	2516
5760 min Winter	1.124	0.0	270.6	3168
7200 min Winter	0.936	0.0	281.5	3888
8640 min Winter	0.806	0.0	290.4	4584

Summary of Results for 100 year Return Period

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	26.259	0.059	0.0	1.2	1.2	28.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.710	0.0	297.3	5248

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram

Total Area (ha) 0.300

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.100	4	8	0.100	8	12	0.100

Model Details

Storage is Online Cover Level (m) 27.200

Cellular Storage Structure

Invert Level (m) 26.200 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	515.0	0.0	0.401	0.0	0.0
0.400	515.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0076-2000-0400-2000
Design Head (m)	0.400
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	26.200
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	2.0	Kick-Flo®	0.286	1.7
Flush-Flo™	0.124	2.0	Mean Flow over Head Range	-	1.7

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	2.0	1.200	3.3	3.000	5.1	7.000	7.6
0.200	1.9	1.400	3.5	3.500	5.4	7.500	7.9
0.300	1.8	1.600	3.8	4.000	5.8	8.000	8.2
0.400	2.0	1.800	4.0	4.500	6.1	8.500	8.4
0.500	2.2	2.000	4.2	5.000	6.5	9.000	8.7
0.600	2.4	2.200	4.4	5.500	6.8	9.500	8.9
0.800	2.7	2.400	4.6	6.000	7.1		
1.000	3.0	2.600	4.7	6.500	7.4		

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

Half Drain Time : 835 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	26.355	0.155	0.0	2.0	2.0	75.9	O K
30 min Summer	26.403	0.203	0.0	2.0	2.0	99.1	O K
60 min Summer	26.450	0.250	0.0	2.0	2.0	122.4	O K
120 min Summer	26.495	0.295	0.0	2.0	2.0	144.5	O K
180 min Summer	26.518	0.318	0.0	2.0	2.0	155.5	O K
240 min Summer	26.530	0.330	0.0	2.0	2.0	161.6	O K
360 min Summer	26.543	0.343	0.0	2.0	2.0	167.9	O K
480 min Summer	26.548	0.348	0.0	2.0	2.0	170.3	O K
600 min Summer	26.548	0.348	0.0	2.0	2.0	170.3	O K
720 min Summer	26.545	0.345	0.0	2.0	2.0	169.0	O K
960 min Summer	26.539	0.339	0.0	2.0	2.0	166.0	O K
1440 min Summer	26.525	0.325	0.0	2.0	2.0	158.9	O K
2160 min Summer	26.499	0.299	0.0	2.0	2.0	146.5	O K
2880 min Summer	26.471	0.271	0.0	2.0	2.0	132.4	O K
4320 min Summer	26.419	0.219	0.0	2.0	2.0	107.0	O K
5760 min Summer	26.376	0.176	0.0	2.0	2.0	85.9	O K
7200 min Summer	26.342	0.142	0.0	2.0	2.0	69.3	O K
8640 min Summer	26.317	0.117	0.0	2.0	2.0	57.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	70.8	26
30 min Summer	90.705	0.0	93.6	41
60 min Summer	56.713	0.0	123.8	70
120 min Summer	34.246	0.0	149.8	130
180 min Summer	25.149	0.0	165.0	188
240 min Summer	20.078	0.0	175.7	246
360 min Summer	14.585	0.0	191.2	364
480 min Summer	11.622	0.0	203.0	482
600 min Summer	9.738	0.0	212.3	600
720 min Summer	8.424	0.0	220.0	676
960 min Summer	6.697	0.0	232.1	786
1440 min Summer	4.839	0.0	247.8	1040
2160 min Summer	3.490	0.0	280.0	1456
2880 min Summer	2.766	0.0	295.7	1848
4320 min Summer	1.989	0.0	317.8	2604
5760 min Summer	1.573	0.0	338.5	3344
7200 min Summer	1.311	0.0	352.2	4032
8640 min Summer	1.129	0.0	363.4	4672

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Summer	26.299	0.099	0.0	2.0	2.0	48.6	O K
15 min Winter	26.374	0.174	0.0	2.0	2.0	85.2	O K
30 min Winter	26.427	0.227	0.0	2.0	2.0	111.3	O K
60 min Winter	26.481	0.281	0.0	2.0	2.0	137.7	O K
120 min Winter	26.533	0.333	0.0	2.0	2.0	162.7	O K
180 min Winter	26.558	0.358	0.0	2.0	2.0	175.2	O K
240 min Winter	26.573	0.373	0.0	2.0	2.0	182.4	O K
360 min Winter	26.589	0.389	0.0	2.0	2.0	190.2	O K
480 min Winter	26.596	0.396	0.0	2.0	2.0	193.6	O K
600 min Winter	26.597	0.397	0.0	2.0	2.0	194.4	O K
720 min Winter	26.596	0.396	0.0	2.0	2.0	193.6	O K
960 min Winter	26.587	0.387	0.0	2.0	2.0	189.3	O K
1440 min Winter	26.567	0.367	0.0	2.0	2.0	179.7	O K
2160 min Winter	26.532	0.332	0.0	2.0	2.0	162.6	O K
2880 min Winter	26.494	0.294	0.0	2.0	2.0	143.7	O K
4320 min Winter	26.412	0.212	0.0	2.0	2.0	103.7	O K
5760 min Winter	26.349	0.149	0.0	2.0	2.0	72.8	O K
7200 min Winter	26.307	0.107	0.0	2.0	2.0	52.4	O K
8640 min Winter	26.288	0.088	0.0	1.9	1.9	42.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Summer	0.994	0.0	372.1	5344
15 min Winter	138.153	0.0	79.6	26
30 min Winter	90.705	0.0	104.9	40
60 min Winter	56.713	0.0	138.9	70
120 min Winter	34.246	0.0	167.9	126
180 min Winter	25.149	0.0	184.9	184
240 min Winter	20.078	0.0	196.7	242
360 min Winter	14.585	0.0	214.1	358
480 min Winter	11.622	0.0	227.0	472
600 min Winter	9.738	0.0	237.3	582
720 min Winter	8.424	0.0	245.6	692
960 min Winter	6.697	0.0	258.6	890
1440 min Winter	4.839	0.0	273.4	1106
2160 min Winter	3.490	0.0	313.8	1576
2880 min Winter	2.766	0.0	331.2	2024
4320 min Winter	1.989	0.0	356.4	2808
5760 min Winter	1.573	0.0	379.3	3464
7200 min Winter	1.311	0.0	394.7	4048
8640 min Winter	1.129	0.0	407.3	4664

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
10080 min Winter	26.278	0.078	0.0	1.7	1.7	38.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
10080 min Winter	0.994	0.0	417.4	5344

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
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)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.100	4	8	0.100	8	12	0.100

Model Details

Storage is Online Cover Level (m) 27.200

Cellular Storage Structure

Invert Level (m) 26.200 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	515.0	0.0	0.401	0.0	0.0
0.400	515.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0076-2000-0400-2000
Design Head (m)	0.400
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	26.200
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	2.0	Kick-Flo®	0.286	1.7
Flush-Flo™	0.124	2.0	Mean Flow over Head Range	-	1.7

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	2.0	1.200	3.3	3.000	5.1	7.000	7.6
0.200	1.9	1.400	3.5	3.500	5.4	7.500	7.9
0.300	1.8	1.600	3.8	4.000	5.8	8.000	8.2
0.400	2.0	1.800	4.0	4.500	6.1	8.500	8.4
0.500	2.2	2.000	4.2	5.000	6.5	9.000	8.7
0.600	2.4	2.200	4.4	5.500	6.8	9.500	8.9
0.800	2.7	2.400	4.6	6.000	7.1		
1.000	3.0	2.600	4.7	6.500	7.4		

Appendix D

Miss. Lauren Eaborn
Ardent Consulting Engineers
The Hallmark Building
London
EC3M 5JE

Wastewater pre-planning
Our ref DS6096077

19 July 2022

Pre-planning enquiry: Confirmation of sufficient capacity

Site address: Comag Tavistock Road West, Drayton, UB7 7QE

Dear Mr. Ramos,

Thank you for providing information on your development. We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Development details:

Existing development: 1,655sqm of offices, and 1,020sqm of warehouse, foul discharge via gravity into existing manhole ref TQ05808101, existing surface water flows not confirmed.

Development proposal for 105 residential flats, proposed foul via gravity into existing manhole TQ05808101, proposed storm discharge attenuated to 2l/s for all storm events into existing surface water manhole ref TQ05808103.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to not be viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers.

Only when it can be proven that soakage into the ground or a connection into an adjacent watercourse is not possible would we consider a restricted discharge into the public surface water sewer network.

Thames Water Planning team would ask to see why it is not practicable on the site to restrict to Greenfield run-off rates if they are consulted as part of any planning application.
In considering your surface water needs, we support the use of sustainable drainage on development sites. You'll need to show the local authority and/or lead local flood authority how you've taken into account the surface water hierarchy that we've included.

What happens next?

If you've any further questions, please contact me on 07747 640 273.

Yours sincerely

David Stamateris

Project Engineer

Thames Water