

Revision	Date	Drawn	Checked	CPM



Revision	Date	Drawn	Checked	CPM

Client: GERALD EVE LLP

Project Title: STAG BREWERY, MORTLAKE

Scale: A09 1:200

Date: JULY 2015

Drawn: LJC

Checked: CPU

CPM: 915213

Job No: 915213-2

Job Title: LAND SURVEY

Client: GERALD EVE LLP

Project Title: STAG BREWERY, MORTLAKE

Scale: A09 1:200

Date: JULY 2015

Drawn: LJC

Checked: CPU

CPM: 915213

Job No: 915213-3

Job Title: LAND SURVEY

Client: GERALD EVE LLP

Project Title: STAG BREWERY, MORTLAKE

Scale: A09 1:200

Date: JULY 2015

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Client: GERALD EVE LLP

Project Title: STAG BREWERY, MORTLAKE

Scale: A09 1:200

Date: JULY 2015

Drawn: LJC

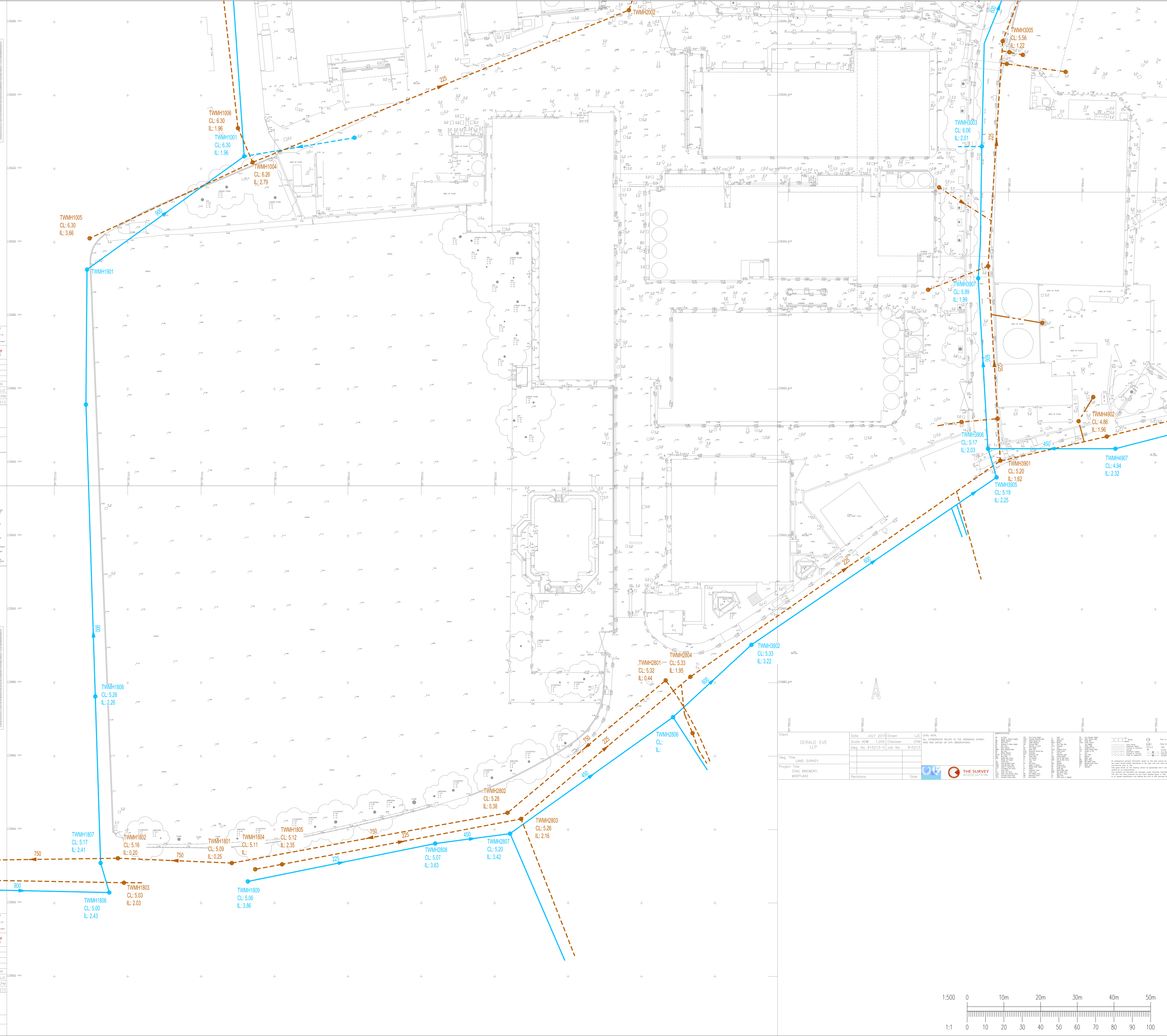
Checked: CPU

CPM: 915213

Job No: 915213-3

Job Title: LAND SURVEY

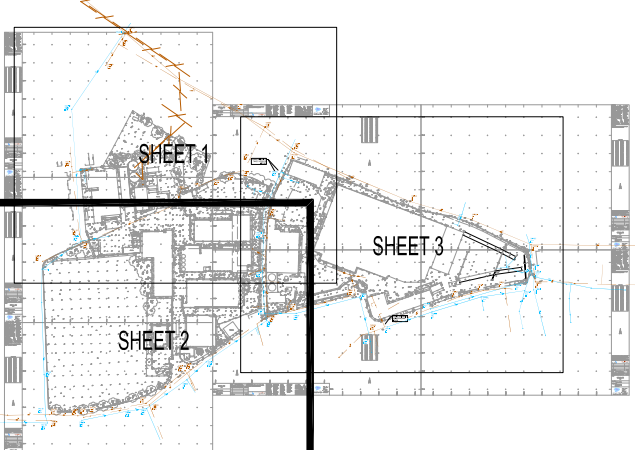
Client: GERALD EVE LLP



LEGEND

- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING PRIVATE FOUL SEWER
- EXISTING PRIVATE COMBINED SEWER
- EXISTING PUBLIC SURFACE WATER SEWER
- EXISTING PUBLIC FOUL SEWER
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PUBLIC RISING MAIN

NOTES
 1) EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF: P97907/31).



Rev	Date	Description	By
A01	20.10.16	PRELIMINARY ISSUE	DO

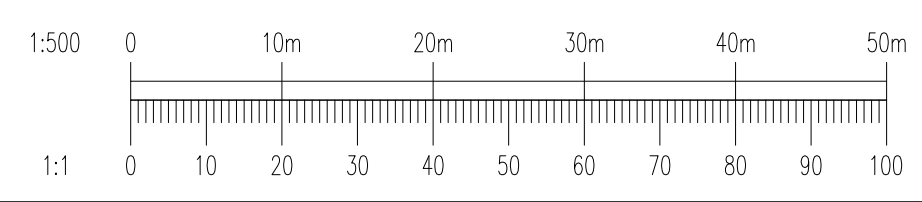
Project: **STAG BREWERY**

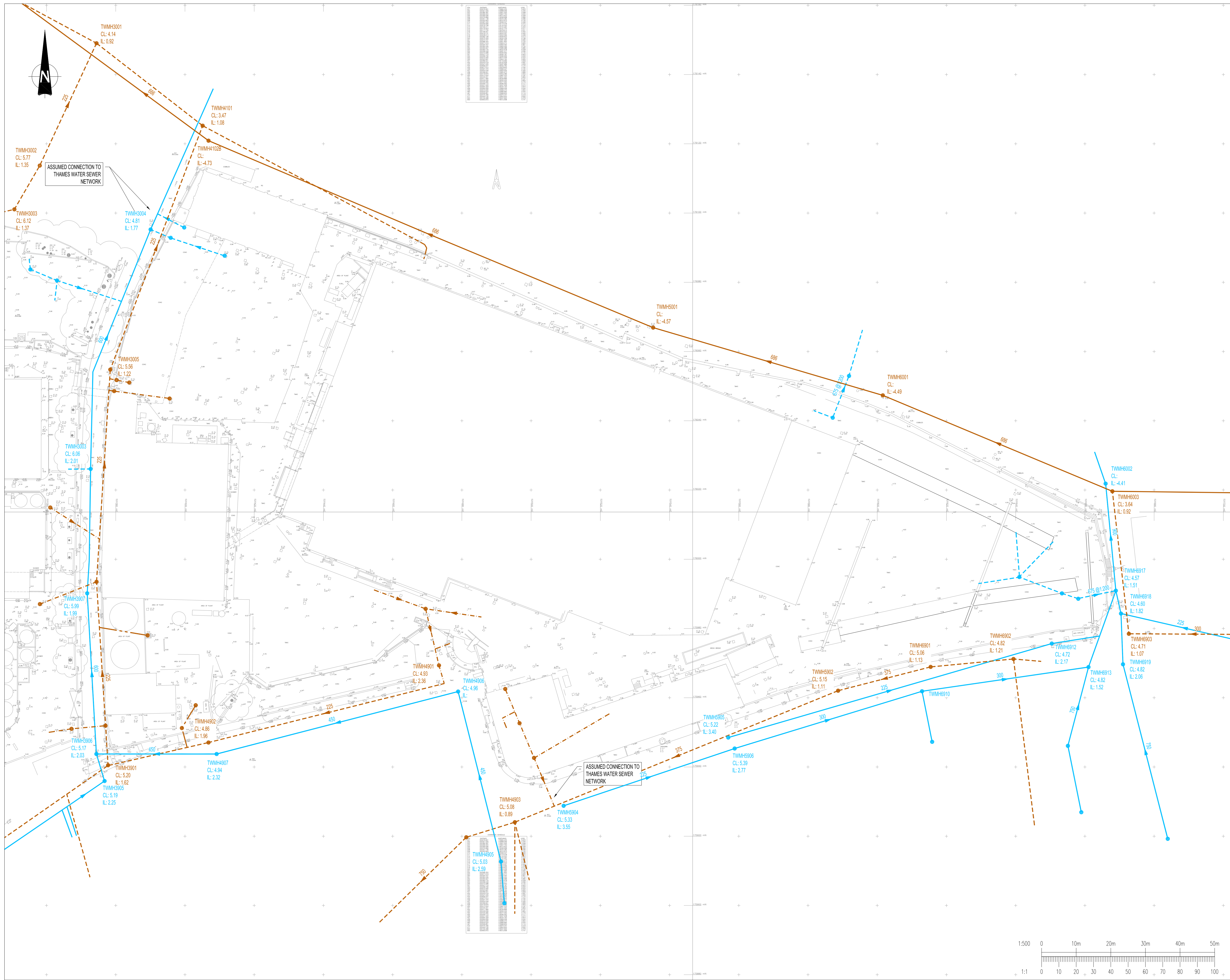
Title: **EXISTING FOUL AND SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 3**

Client: **DARTMOUTH CAPITAL ADVISORS LIMITED**



Drawing Status: PRELIMINARY				
Designed by	Checked by	DO	Project No	WIE10667
Drawn by	DO	Date	OCTOBER 2016	Computer File No: WIE10667CSA280002.dwg
Scale: @ A1	work to figured dimensions only	1:500	Number	0002
Zone	SA	Category	92	Revision
Publisher	WIE	Number	0002	Revision
				A01

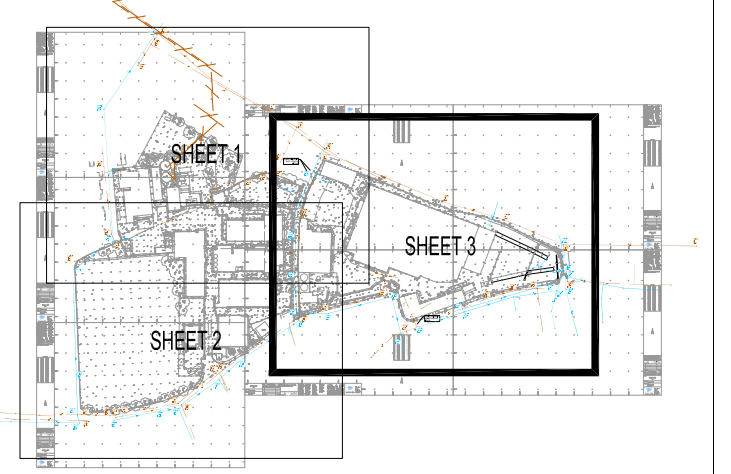




LEGEND

- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING PRIVATE FOUL SEWER
- EXISTING PRIVATE COMBINED SEWER
- EXISTING PUBLIC SURFACE WATER SEWER
- EXISTING PUBLIC FOUL SEWER
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PUBLIC RISING MAIN

NOTES
 1) EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF: P979/07/31).

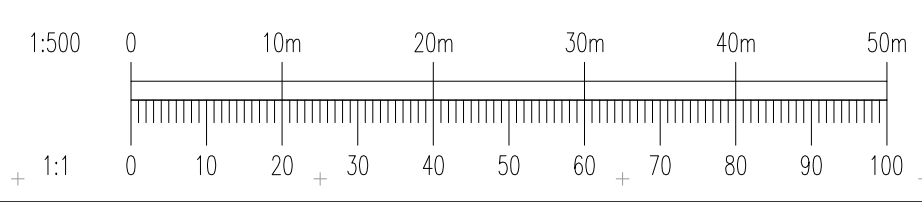


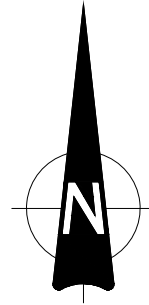
Rev	Date	Description	By
A03	21.11.16	INVERT/COVER LEVELS ADDED	DO
A02	24.10.16	VIEWPORT AMENDED	DO
A01	20.10.16	PRELIMINARY ISSUE	DO

Amendments	
Project	Title
STAG BREWERY	EXISTING FOUL AND SURFACE WATER DRAINAGE LAYOUT SHEET 3 OF 3
Client	DARTMOUTH CAPITAL ADVISORS LIMITED

Pickfords Wharf Clink Street London SE1 9DG
 t 020 7928 7888
 mail@watermangroup.com www.watermangroup.com

Drawing Status		PRELIMINARY	
Designed by	Checked by	DO	Project No
Drawn by	DO	Date	OCTOBER 2016
Scales @ A1		1:500	Computer File No
work to figured dimensions only		1:500	WIE10667CSA280003.dwg
Publisher	Zone	Category	Number
WIE	SA	92	0003
			Revision
			A03



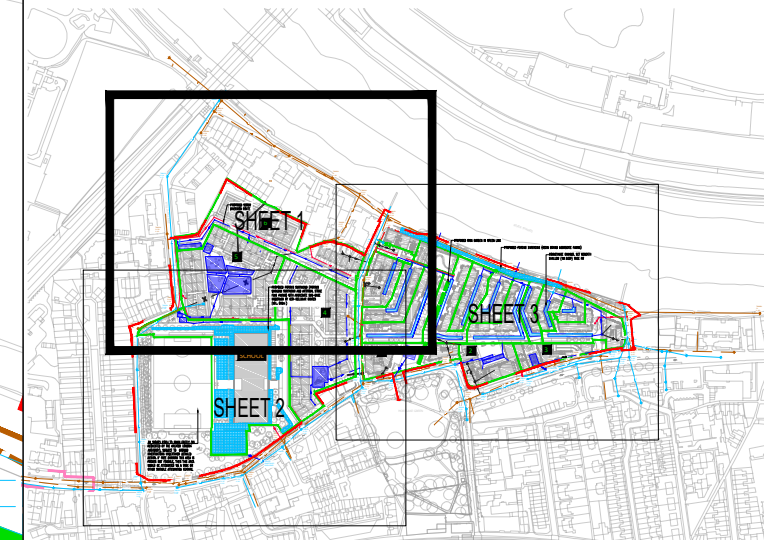


GENERAL NOTES

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- EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF P979/07/31).
- EXISTING FOUL AND SURFACE WATER CONNECTIONS TO BE RE-USED WHERE FEASIBLE, SUBJECT TO DETAILED DESIGN.

LEGEND

- EXISTING SURFACE WATER SEWER
- EXISTING FOUL SEWER
- EXISTING COMBINED SEWER
- PROPOSED FOUL WATER SEWER
- PROPOSED SURFACE WATER SEWER
- SEWERS TO BE ABANDONED
- PROPOSED ATTENUATION TANK
- PROPOSED CONVEYANCE CHANNEL
- PROPOSED POROUS SURFACING
- PROPOSED RAIN GARDEN
- APPLICATION A BOUNDARY
- SURFACE WATER DRAINAGE CATCHMENT
- DRAINAGE CATCHMENT NO.



Rev	Date	Description	By
A10	25.01.22	AMENDED SCHEME PLANS AND DS UPDATE	MS
A09	07.04.20	AMENDED SCHEME PLANS	NB
A08	30.10.19	AMENDED SCHEME PLANS	NB
A07	09.09.19	BASEMENT TANKS REMOVED/REPLACED	NB
A06	20.12.18	PERMEABLE PAVING AND RAIN GARDEN ADDED	NB
A05	13.02.18	UPDATED APPLICATION BOUNDARY	NB
A04	29.01.18	UPDATED ARCHITECT LAYOUT	NB
A03	01.11.17	TEAM ISSUE	NB
A02	23.10.17	SURFACE WATER ATTENUATION AMENDED	NB
A01	29.09.17	PRELIMINARY ISSUE	MAC

Project **STAG BREWERY**

Title **PROPOSED FOUL AND SURFACE WATER DRAINAGE LAYOUT SHEET 1 OF 3**

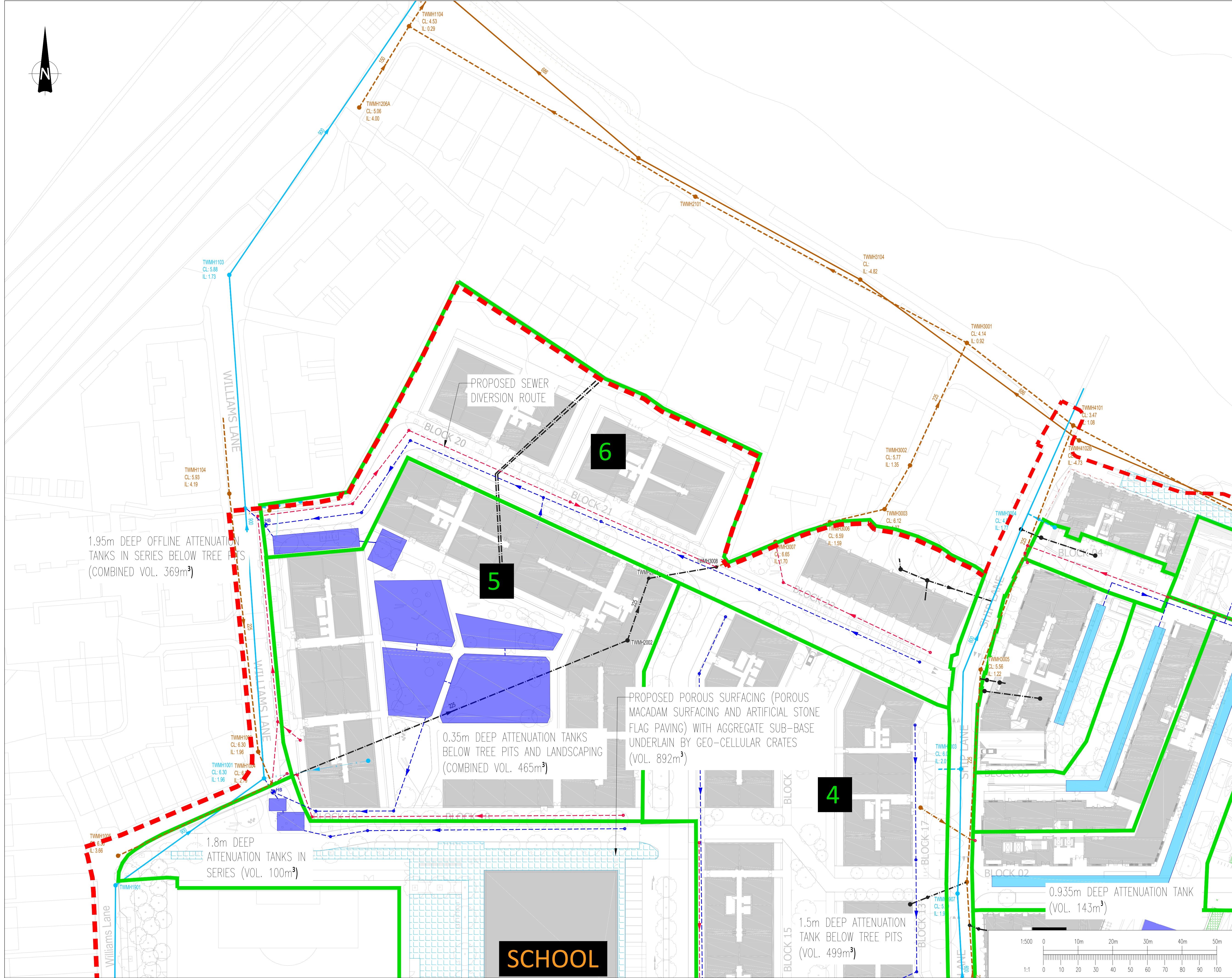
Client **RESELTON PROPERTIES LIMITED**



Drawing Status **PRELIMINARY**

Designed by NB Checked by DO Project No **WIE15582**
 Drawn by NB Date **SEPTEMBER 2017**
 Scales @ A1 work to figured dimensions only **1:500** Computer File No **15582-WIE-ZZ-XX-DR-92004.dwg**

Publisher	Zone	Category	Number	Revision
WIE	ZZ	92	0004	A10



1.95m DEEP OFFLINE ATTENUATION TANKS IN SERIES BELOW TREE PITS (COMBINED VOL. 369m³)

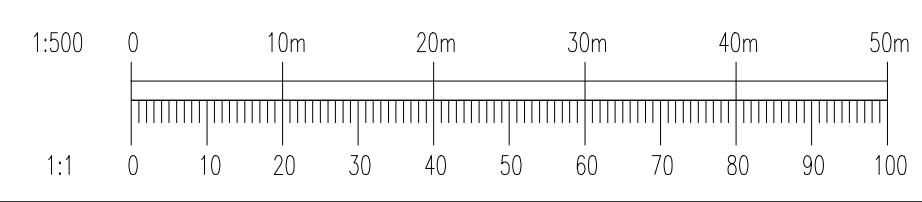
0.35m DEEP ATTENUATION TANKS BELOW TREE PITS AND LANDSCAPING (COMBINED VOL. 465m³)

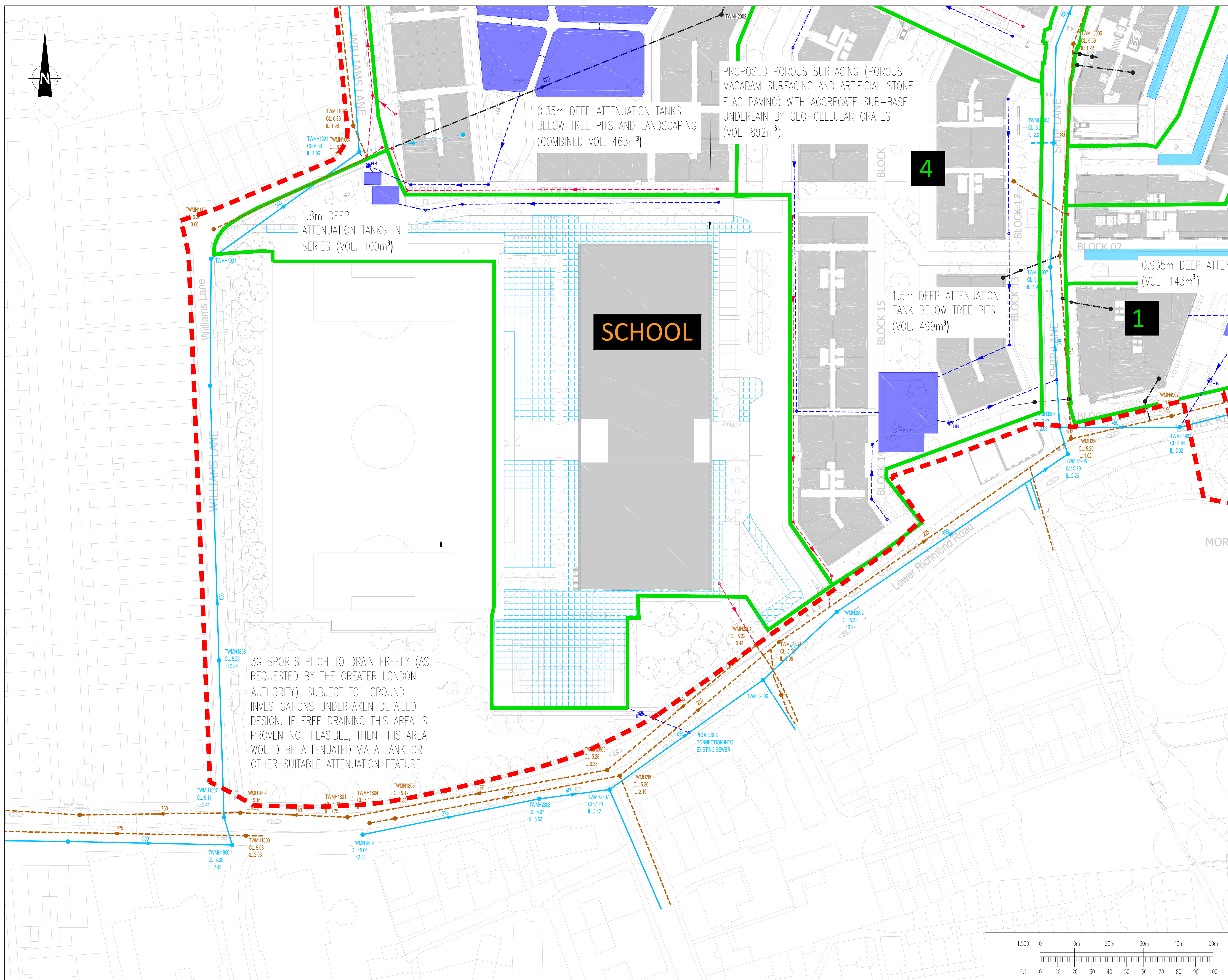
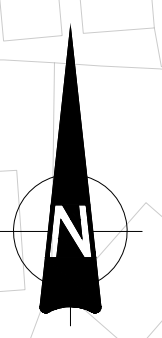
1.8m DEEP ATTENUATION TANKS IN SERIES (VOL. 100m³)

PROPOSED POROUS SURFACING (POROUS MACADAM SURFACING AND ARTIFICIAL STONE FLAG PAVING) WITH AGGREGATE SUB-BASE UNDERLAIN BY GEO-CELLULAR CRATES (VOL. 892m³)

1.5m DEEP ATTENUATION TANK BELOW TREE PITS (VOL. 499m³)

0.935m DEEP ATTENUATION TANK (VOL. 143m³)

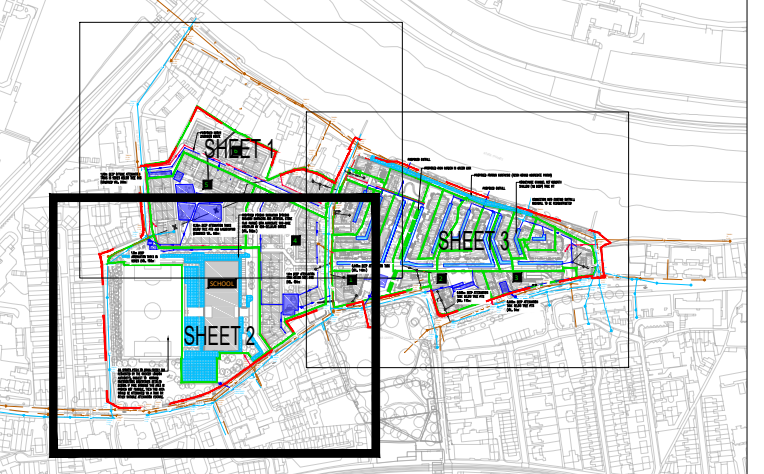




GENERAL NOTES

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6. EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF P979/07/31).
7. EXISTING FOUL AND SURFACE WATER CONNECTIONS TO BE RE-USED WHERE FEASIBLE, SUBJECT TO DETAILED DESIGN.

- LEGEND**
- EXISTING SURFACE WATER SEWER
 - EXISTING FOUL SEWER
 - EXISTING COMBINED SEWER
 - PROPOSED FOUL WATER SEWER
 - PROPOSED SURFACE WATER SEWER
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 - PROPOSED CONVEYANCE CHANNEL
 - PROPOSED POROUS SURFACING
 - PROPOSED RAIN GARDEN
 - APPLICATION A BOUNDARY
 - SURFACE WATER DRAINAGE CATCHMENT
 - DRAINAGE CATCHMENT NO.



Rev	Date	Description	By
A11	25.01.22	AMENDED SCHEME PLANS AND DS UPDATE	MS
A10	07.04.20	AMENDED SCHEME PLANS	NB
A09	30.10.19	AMENDED SCHEME PLANS	NB
A08	09.09.19	BASEMENT TANKS REMOVED/REPLACED	NB
A07	06.01.19	MINOR AMENDMENT TO TEXT	NB
A06	20.12.18	PERMEABLE PAVING AND RAIN GARDEN ADDED	NB
A05	13.02.18	UPDATED APPLICATION BOUNDARY	NB
A04	29.01.18	UPDATED ARCHITECT LAYOUT	NB
A03	01.11.17	TEAM ISSUE	NB
A02	23.10.17	SURFACE WATER ATTENUATION AMENDED	NB
A01	29.09.17	PRELIMINARY ISSUE	MAC

Project: **STAG BREWERY**

Title: **PROPOSED FOUL AND SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 3**

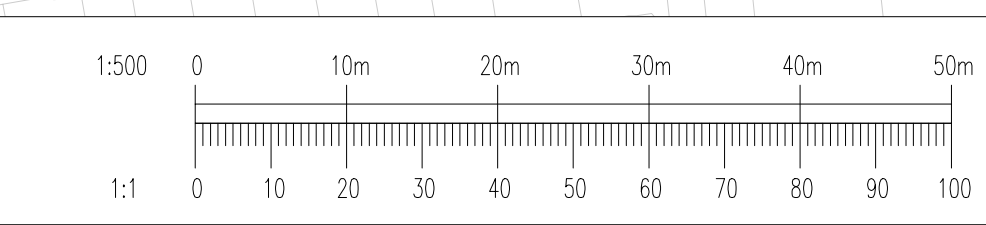
Client: **RESELTON PROPERTIES LIMITED**

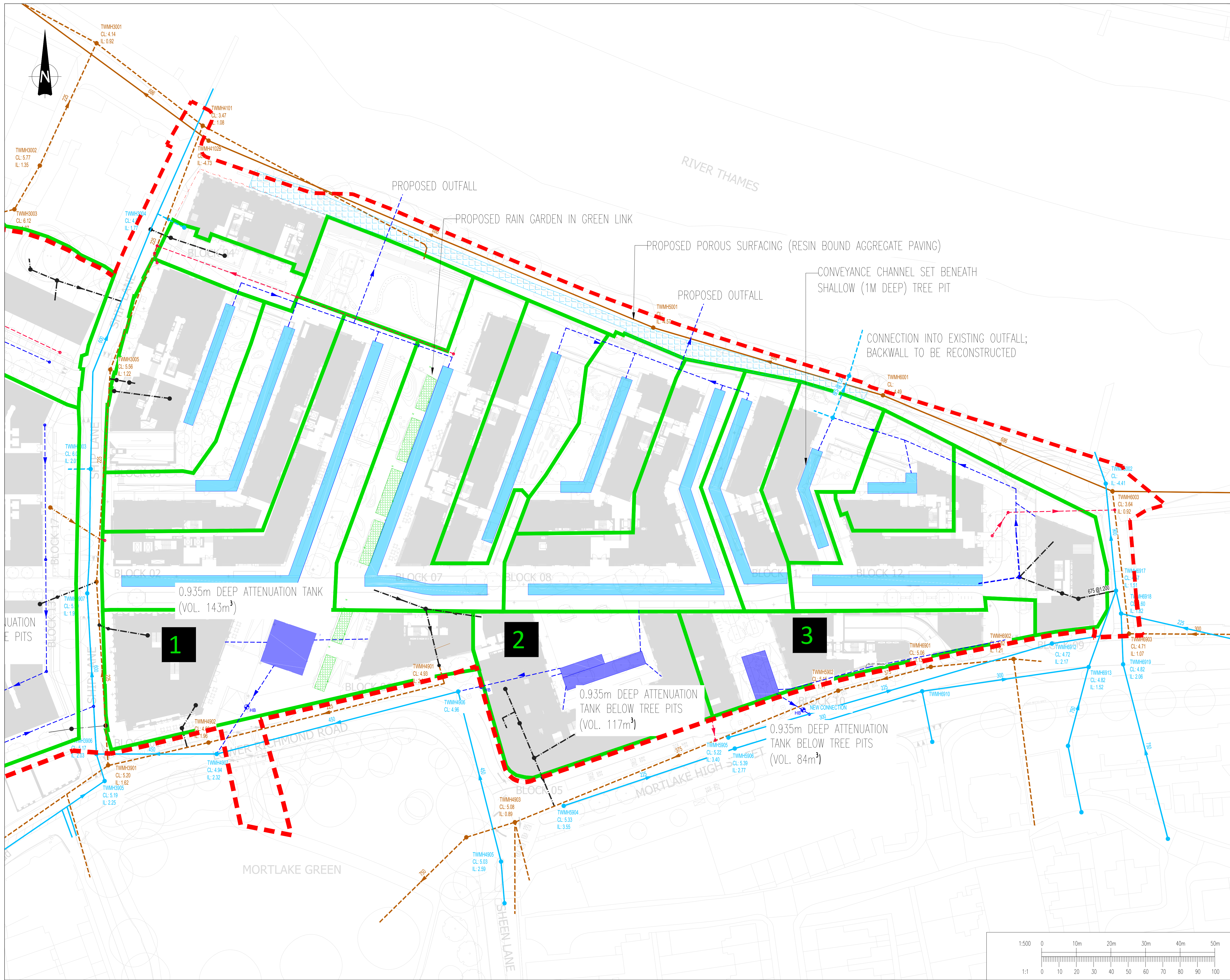


Drawing Status: **PRELIMINARY**

Designed by: NB Checked by: DO Project No: WIE15582
 Drawn by: NB Date: SEPTEMBER 2017
 Scales @ A1: work to figured dimensions only 1:500 Computer File No: 15582-WIE-ZZ-XX-DR-0005.dwg

Publisher	Zone	Category	Number	Revision
WIE	SA	92	0005	A11

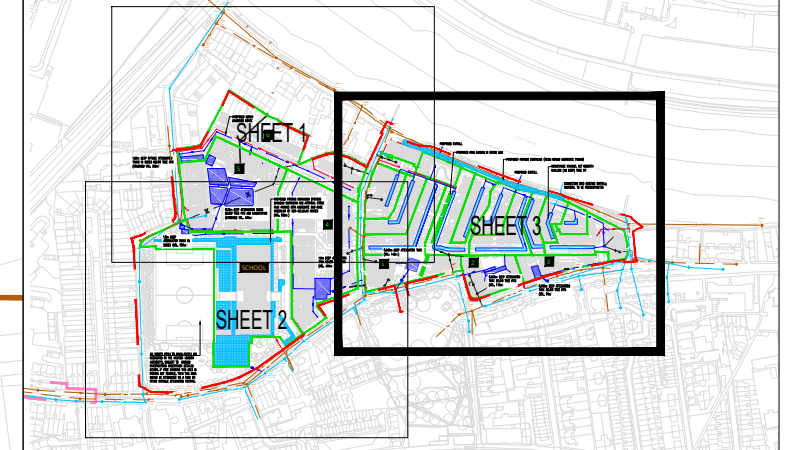




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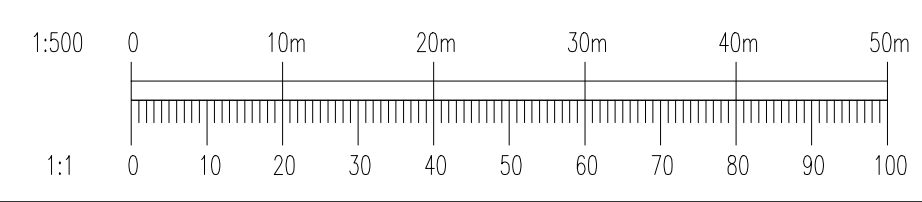
Rev	Date	Description	By
A10	25.01.22	AMENDED SCHEME PLANS AND DS UPDATE	MS
A09	07.04.20	AMENDED SCHEME PLANS	NB
A08	30.10.19	AMENDED SCHEME PLANS	NB
A07	09.09.19	MINOR UPDATES IN TEXT	NB
A06	20.12.18	PERMEABLE PAVING AND RAIN GARDEN ADDED	NB
A05	13.02.18	UPDATED APPLICATION BOUNDARY	NB
A04	29.01.18	UPDATED ARCHITECT LAYOUT	NB
A03	01.11.17	TEAM ISSUE	NB
A02	23.10.17	SURFACE WATER ATTENUATION AMENDED	NB
A01	29.09.17	PRELIMINARY ISSUE	MAC

Project	Amendments
STAG BREWERY	
PROPOSED FOUL AND SURFACE WATER DRAINAGE LAYOUT	
SHEET 3 OF 3	

Client: RESELTON PROPERTIES LIMITED

Pickfords Wharf Clink Street London SE1 9DG
 1 020 7928 7888
 mail@watermangroup.com www.watermangroup.com

Drawing Status				
PRELIMINARY				
Designed by	NB	Checked by	DO	Project No
Drawn by	NB	Date	SEPTEMBER 2017	WIE15582
Scales @ A1	work to figured dimensions only	1:500	Computer File No	15582-WIE-ZZ-XX-DR-0006.dwg
Publisher	Zone	Category	Number	Revision
WIE	ZZ	92	0006	A10



F. London Borough Richmond upon Thames (LBRuT) Correspondence

Appendices

The Former Stag Brewery, Mortlake

Project Number: WIE18671

Document Reference: WIE18671-104-R-11-2-2-DS

O'Donovan, Donal

From: Brian Humphris <brian.humphris@richmond.gov.uk>
Sent: 03 March 2016 15:32
To: O'Donovan, Donal
Subject: RE: WIE10667 160122 DOBH Stag Brewery Flood Risk Enquiry
Attachments: Gully reports.xlsx

Donal

In response to your questions below:-

- 1 Not sure who would be the best contact but they have area teams, so any enquiry relating to Stag site would be referred to them.
- 2 I can find no record of a name either. OS plan indicates that the culvert is fed by open ditches along both sides of Sheen Common, but nothing is indicated south of the common, within Richmond Park.
- 3 Please see attached – reports as logged on our system.

Regards Brian

Brian Humphris
Highway Asset Co-ordinator

020 8891 7738

From: O'Donovan, Donal [mailto:donal.odonovan@watermangroup.com]
Sent: 03 March 2016 12:03
To: Brian Humphris
Subject: RE: WIE10667 160122 DOBH Stag Brewery Flood Risk Enquiry

Hi Brian,

Many thanks for the response, I have a few follow up queries that I hope you will be able to answer.

1. You mentioned that we would need to confirmed if the Site had passed the Sequential Test with the Planners. Do you have the contact details for the best person/team to contact in relation to this.
2. You provided plan showing a culverted watercourse that has an outlet adjacent to the Site. Do you know what this watercourse is called? I have had a look online but not had any luck.
3. You mentioned that there have been some records of flooding due to blocked gullies. Can you provide any further information in relation to these (ie. extent, date, location etc.).

If you have any queries please feel free to give me a call.

Cheers,

Donal

From: Brian Humphris [mailto:brian.humphris@richmond.gov.uk]
Sent: 24 February 2016 16:23
To: O'Donovan, Donal <donal.odonovan@watermangroup.com>
Subject: RE: WIE10667 160122 DOBH Stag Brewery Flood Risk Enquiry

Hi Donal

Please accept my apologies for the delay in responding to your enquiry. Unfortunately some of the information that you requested has taken some time to obtain. Please see comments below.

Regards Brian

Brian Humphris
Highway Asset Co-ordinator

020 8891 7738

From: O'Donovan, Donal [<mailto:donal.odonovan@watermangroup.com>]

Sent: 22 January 2016 14:34

To: Brian Humphris

Subject: WIE10667 160122 DOBH Stag Brewery Flood Risk Enquiry

Hi Brian,

Thanks for speaking to me earlier.

Stag Brewery – Flood Risk Enquiry

I'm writing regarding the proposed redevelopment of Stag Brewery, located within the London Borough of Richmond upon Thames. The Site is approximately 9ha in size, and is located at approximate postcode SW14 7ET, please find attached a location plan for your information. The proposals comprise construction of a residential led mixed use development.

We have been commissioned to investigate the risk of flooding to the proposed development. I would be grateful if you could provide information relating to the following:

1. The Environment Agency mapping shows that the Site lies within Flood Zones 2 and 3, and is generally shown as being defended. The River Thames defences are identified as being continuous in this location, please could you confirm that the Site is fully defended from tidal and fluvial flooding.
We do not have detailed records of River Defences. However photographs on pages 24 & 25 of the SPD show that there are no defences at Ship Lane. Street View images from the river appear to show river levels approx. 1m below the towpath level, although there is no way of knowing what the Tide Status was at that time. There are defences at Bulls Alley, as indicated on Page 13 of the SPD.
2. The Stag Brewery SPD sets out the planning brief for potential development at the Site. Please could you confirm that the Sequential Test has been passed.
This would need to be confirmed by our Planners.
3. As it is very early in the decision process it is currently unknown where development would be located. However, the design would ensure that appropriate mitigation steps would be incorporated. In line with other Sites within London we currently assume that commercial and retail ('less vulnerable') uses would be acceptable on the ground floor. We also assume that duplex residential uses would be acceptable on the ground and first floor (bedrooms location on the first floor), as a means of egress would be available to ensure safety. Please could you confirm this. We will further consult once the scheme plans have evolved.
This approach is reasonable but Planners would make final approval. At other developments within Flood Zones floor levels are usually raised to at least 300mm above ground level to reduce flood risk.
4. Could you please provide a map showing the location of any Ordinary Watercourses near the Site, and note any development restrictions that would therefore apply.

Please note plans attached. Watercourses plan shows a watercourse under the site, although the alignment is probably only indicative. OS plan is marked with the known extents of relevant section – ‘outlet’ is marked on the plan.

5. Please could you confirm whether or not there are any ‘lost rivers’ in the vicinity of the Site. Please could you provide any information you have relating to this, to include a map.
See above
6. Please could you provide your Risk of Flooding from Surface Water map in the vicinity of the Site, as the EA’s online version is difficult to interpret due to the scale.
Richmond does not have its own Flood risk maps, we use the EA plans.
7. Please provide us with details of any historic tidal, fluvial, groundwater, surface water or sewer flooding affecting or in the vicinity of the Site. Alternatively, please confirm that you have no records of flooding in the vicinity.
Our Highways Enquiry System has no record of any flooding reports at Mortlake High Street, Lower Richmond Road, Ship Lane or Williams Lane, other than blocked gully reports.
8. Please could you confirm the likely groundwater levels in the vicinity of the Site.
Unfortunately we do not have records of likely Groundwater Levels.
9. It is still very early in the design process and at this stage the drainage strategy is still being developed. We are currently looking at all options available to drain surface water runoff from the Site. Our approach will follow the drainage hierarchy where possible, with the preference of draining the site to the River Thames (unrestricted due to the tidal nature of the River). Should it not be possible to drain to the River Thames due to Site constraints, we would connect to the public sewer network. Following the requirements of the London Plan, we would limit surface water runoff from the Site to 50% of the existing rate, for the 1 in 100 year event, including for the predicted increase in rainfall intensity over the lifetime of the development due to climate change. Please could you confirm that this approach is acceptable.
This approach is acceptable.

We are also writing to the Environment Agency and Thames Water requesting details of recorded flooding incidents and relevant information. If you are aware of any other parties that may have useful information please let me know.

This information is required as soon as possible and we would be grateful if you could provide your written response by 5th February 2016. If this is unlikely to be achievable or you require any further information please feel free to get in contact.


Please feel free to give me a call if you wish to discuss the above.

Cheers,

Donal

C. Donal O’Donovan
Engineer
Waterman Infrastructure & Environment Ltd

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t +44 207 928 7888 | d +44 3300 602 316
www.watermangroup.com | [LinkedIn](#) | [Twitter](#)

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G. Tide Locking Calculations




CALCULATIONS

Company: WIE Office: London
 Sheet No: 1 of 1 Project No: WIE10667
 By: N Balboni Date: 27.09.2017
 Checked: D O'Donovan Date: 27.09.2017

Project Title: **Former Stag Brewery, Mortlake**
 Calculations Title: **Tide Locking Calculation**

CALCULATIONS						
The 'rule of twelfths' is a rule of thumb that allows the tide level to be estimated based on the high and low water levels. The rule is an approximation assuming six hours between high and low water, and does not take account of geographical location.						
Source: Port of London Authority, 2017. <i>Tide Tables and Port Information</i>						
Closest tidal stations: Barnes and Chiswick.						
Barnes MHWS (m AOD)	4.13					
Chiswick MHWS (m AOD)	4.08					
Inputs			Rule of Twelfths			
Mean High Water Spring	=	5.23 m AOD	Hour	Change	Water Level	
Mean Low Water Spring	=	-1.02 m AOD	0	-	-1.02	
			1	1/12	-0.50	
Invert Level of Outfall	=	2.60 m AOD	2	1/6	0.54	
			3	1/4	2.11	
			4	1/4	3.67	
			5	1/6	4.71	
			6	1/12	5.23	
			7	1/12	4.71	
			8	1/6	3.67	
			9	1/4	2.11	
			10	1/4	0.54	
			11	1/6	-0.50	
			12	1/12	-1.02	
Output						
Time that outfall becomes submerged (hrs)	=		3.3			
Time that outfall becomes unsubmerged (hrs)	=		8.6			
Total time that outfall is submerged (hrs)	=		5.3			

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Pickfords Wharf Clink Street London SE1 9DG		
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Micro Drainage	Network 2017.1.2	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm





Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	1999
Site Location GB 520450 176000 TQ 20450 76000	
C (1km)	-0.024
D1 (1km)	0.322
D2 (1km)	0.262
D3 (1km)	0.219
E (1km)	0.306
F (1km)	2.539
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	5
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	40
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

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
1.000	124.000	0.012	10333.3	0.300	5.00	0.0	0.600	[]	-1	Pipe/Conduit	
1.001	2.949	0.590	5.0	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
1.002	7.594	0.051	150.0	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
1.003	25.890	1.295	20.0	0.000	0.00	0.0	0.600	o	675	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)
1.000	0.00	5.00	5.480	0.300	0.0	0.0	0.0	0.14	67.5	0.0
1.001	0.00	5.00	4.945	0.300	0.0	0.0	0.0	11.77	4211.0	0.0
1.002	0.00	5.00	4.355	0.300	0.0	0.0	0.0	2.14	765.0	0.0
1.003	0.00	5.00	4.305	0.300	0.0	0.0	0.0	5.88	2103.1	0.0

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	[]	-1	1	6.030	5.480	0.400	Open Manhole	3000
1.001	o	675	2	6.030	4.945	0.410	Open Manhole	3000
1.002	o	675	3	6.030	4.355	1.000	Open Manhole	1500
1.003	o	675	3	6.030	4.305	1.050	Open Manhole	2100

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	124.000	10333.3	2	6.030	5.468	0.412	Open Manhole	3000
1.001	2.949	5.0	3	6.030	4.355	1.000	Open Manhole	1500
1.002	7.594	150.0	3	6.030	4.305	1.050	Open Manhole	2100
1.003	25.890	20.0		4.500	3.010	0.815	Open Manhole	675

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003		4.500	3.010	2.625	675	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
30	5.230	90	5.230	150	5.230	210	5.230	270	5.230	330	5.230
60	5.230	120	5.230	180	5.230	240	5.230	300	5.230	360	5.230

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 Coefficient 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 0
 Number of Online Controls 0 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Pickfords Wharf
 Clink Street
 London SE1 9DG



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Micro Drainage Network 2017.1.2

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 520450 176000 TQ 20450 76000
C (1km)	-0.024
D1 (1km)	0.322
D2 (1km)	0.262
D3 (1km)	0.219
E (1km)	0.306
F (1km)	2.539
Summer Storms	Yes
Winter Storms	No
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		
Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0


Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 520450 176000 TQ 20450 76000
C (1km)	-0.024
D1 (1km)	0.322
D2 (1km)	0.262
D3 (1km)	0.219
E (1km)	0.306
F (1km)	2.539
Cv (Summer)	0.750
Cv (Winter)	0.840
Margin for Flood Risk Warning (mm)	300.0
DVD Status	OFF
Analysis Timestep	Fine Inertia Status OFF
DTS Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%	100/15	Summer			5.824
1.001	2	60 Summer	100	+40%					5.274
1.002	3	60 Summer	100	+40%	100/30	Summer			5.267
1.003	3	60 Summer	100	+40%	100/30	Summer			5.254

PN	US/MH Name	Surcharged		Flooded		Pipe		Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap. (l/s)	Overflow (l/s)	Flow (l/s)	Status	
1.000	1	0.194	0.000	1.29	285.9	FLOOD RISK		
1.001	2	-0.346	0.000	0.15	147.8	OK		
1.002	3	0.237	0.000	0.35	148.7	SURCHARGED		

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

PN	US/MH Name	Surcharged Flooded		Flow / Overflow		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Cap.	(l/s)	Flow (l/s)		
1.003	3	0.274	0.000	0.10		149.6	SURCHARGED	

CHART DATUMS & STANDARD LEVELS IN THE PORT OF LONDON

1. **Chart Datum** is set to approximately the level of Lowest Astronomical Tide (L.A.T.)
2. **Low Water levels** in the upper reaches of the tidal Thames are greatly affected by the land water flow at Teddington Weir. **They frequently fall below chart datum** when this flow is significantly reduced, typically during the summer months.
3. **Maintained level** and chart datum above Richmond half tide weir are both 1.72 metres above Ordnance Datum (Newlyn).
4. **Trinity High Water (T.H.W.)** is deemed, by the Port of London Act, 1968, to be a level having a value of 11.4 feet (i.e. **3.475 metres**) above Ordnance Datum (Newlyn).

Tidal Station	Level of Chart Datum below Ordnance Datum (Newlyn) m	Standard levels above local C.D.				
		Mean Low Water Springs MLWS	Mean Low Water Neaps MLWN	Mean High Water Neaps MHWN	Mean High Water Springs MHWS	Highest Astronomical Tide (HAT)
WALTON	2.16	0.5	1.1	3.5	4.3	4.7
MARGATE	2.50	0.6	1.3	4.0	4.8	5.1
SHIVERING SAND	-	0.6	1.4	4.4	5.4	5.7
SOUTHEND	2.90	0.6	1.4	4.8	5.9	6.3
CANVEY	2.97	0.6	1.4	5.0	6.1	6.6
CORYTON	3.05	0.6	1.5	5.1	6.2	6.7
TILBURY	3.12	0.6	1.5	5.4	6.6	7.0
GREENHITHE	3.20	0.6	1.6	5.6	6.7	7.2
DAGENHAM	3.28	0.6	1.6	5.8	7.0	7.5
NORTH WOOLWICH	3.35	0.6	1.6	5.9	7.2	7.7
TOWER	3.20	0.5	1.5	5.9	7.1	7.6
BLACKFRIARS	3.05	0.5	1.4	5.8	7.0	7.5
WESTMINSTER	2.90	0.5	1.3	5.7	6.9	7.4
VAUXHALL	2.59	0.3	1.0	5.4	6.6	7.1
VICTORIA RAIL	2.44	0.3	0.9	5.3	6.5	6.9
ALBERT BRIDGE	2.29	0.3	0.9	5.1	6.3	6.8
WANDSWORTH	2.13	0.3	0.9	5.0	6.2	6.7
PUTNEY	1.98	0.3	0.8	4.9	6.1	6.6
HAMMERSMITH	1.68	0.3	0.7	4.7	5.8	6.4
BARNES	1.37	0.2	0.6	4.4	5.5	6.1
CHISWICK	1.22	0.2	0.5	4.3	5.3	6.0
KEW	1.07	0.2	0.5	4.2	5.2	5.9
BRENTFORD	0.91	0.1	0.4	4.0	5.0	5.7
RICHMOND	0.61	0.1	0.2	3.8	4.8	5.5
TWICKENHAM	Note 3	-	-	1.5	2.5	3.2

H. Surface Water Calculations

CALCULATIONS

Company: WIE Office: London
 Sheet No: 1 of 11 Project No: WIE15582
 By: N Balboni Date: 10/09/2019
 Checked: D O'Donovan Date: 10/09/2019

Project Title Former Stag Brewery, Mortlake
 Calculations Title Surface Water Management - Summary Sheet

LOCATION	CALCULATIONS						OPTIONS					
	Surface water at the Site will be managed in accordance with the Local Authority requirements, i.e. surface water discharge restricted to the existing existing rate, including for the impacts of climate change.											
	Existing Surface Water Discharge Regime (M100_60)											
		Area (ha)	Calculation method			Discharge Rate						
	Site Area*	4.82	Wallingford (Page 2)			688 l/s						
	(calculated with PIMP of 100 %)					143 l/s/ha						
	Site Area**	5.89	Wallingford (Page 3)			841 l/s						
	(calculated with PIMP of 100 %)					143 l/s/ha						
	*excludes area of the site which is proposed to discharge unrestricted into the River Thames											
	**area that discharges into the Thames Water network in the existing case											
	Proposed Surface Water Discharge Regime											
	Minimum requirement = 50% of existing rate					420.4 l/s						
	Attenuation is maximised within each catchment, providing the following reduction in flows:											
	Catchment	Area (ha)	Ex. Rate (l/s)	Pr. Rate (l/s)	Att. (m3)	Betterment (%)						
	East - 1	0.30	42.8	20.0	143	53						
	East - 2	0.25	35.7	17.8	117	50						
	East - 3	0.18	25.7	12.8	84	50						
	West - school	1.31	187.0	16.0	992	91						
	West - 4	1.07	152.7	76.2	499	50						
	West - 5	0.92	131.3	49.5	465	62						
	West - 6	0.79	112.8	56.3	369	50						
	Sub-Total	4.82	688	249	2667	64						
	The proposed drainage strategy maximises the area of the site that is drained into the River Thames, directing surface water into the River Thames that in the existing situation drains into the Thames Water sewer network, thus providing a further betterment in surface water discharge rates, as below.											
	Total	5.89*	841	249	2667	70						
	*includes area of the Site which is proposed to discharge unrestricted into the River Thames											

CALCULATIONS

Company: WIE Office: London
 Sheet No: 2 of 11 Project No: WIE15582
 By N Balboni Date 10/09/2019
 Checked: D O'Donovan Date 10/09/2019

Project Title Former Stag Brewery, Mortlake

Calculations Title Existing Discharge Rate (excluding area proposed to discharge into River Thames) - Modified Rational Method

LOCATION	CALCULATIONS	OPTIONS
	Calculations based on: Design and Analysis of urban storm drainage. The Wallingford Procedure, Volume 1 Principles methods and practice.	
	User Input Data	
	Total site area	4.82 ha
	SAAR (From FEH)	605
	Rainfall Intensity (From FEH)	51.80
	PIMP (% impervious)	100 %
	Soil Type	0.40
	Very Low Runoff (well drained sandy, loamy or earthy peat soils)	0.15
	Low Runoff (Very permeable soils (e.g. gravel, sand)	0.30
	Moderate (Very fine sands, silts and sedimentary clays)	0.40
	High Runoff (Clayey or loamy soils)	0.45
	Very High Runoff (Soils of the wet uplands)	0.50
Fig. 9.7	UCWI (From Figure 9.7 of Wallingford Method)	52
Eqn. 13	$Q_p \text{ (peak discharge)} = 2.78 C_v CR i A$	
	Where: Q_p (Peak Discharge) i = rainfall intensity A = Total Area	
From FEH	Average rainfall Intensity (i)	
	M100_60 is: 51.80 mm	
Eqn 7.20	$C_v = PR/100$	
Eqn 7.3	$PR = (0.829 PIMP) + (25.0 SOIL) + (0.078 UCWI) - 20.7$	
	PIMP (Percentage of catchment which is impervious)	100 %
Page 52	Note: PIMP can not be less than 40%	40 %
	Thus value of PIMP to be used	100 %
	Soil: 0.40 UCWI: 52	
	PR =	76.26
	Thus C_v =	0.76
Sec 7.10	CR (Recommended for simulation and design)	1.3
	Q_p for 1 in 100 year 60 minute duration =	688.1 l/s 142.8 l/s/ha

CALCULATIONS

Company: WIE Office: London
 Sheet No: 3 of 11 Project No: WIE15582
 By N Balboni Date 10/09/2019
 Checked: D O'Donovan Date 10/09/2019

Project Title Former Stag Brewery, Mortlake




Calculations Title Existing Discharge Rate (whole site currently draining to Thames Water network) - Modified Rational Method

LOCATION	CALCULATIONS	OPTIONS
	Calculations based on: Design and Analysis of urban storm drainage. The Wallingford Procedure, Volume 1 Principles methods and practice.	
	User Input Data	
	Total site area	5.89 ha
	SAAR (From FEH)	605
	Rainfall Intensity (From FEH)	51.80
	PIMP (% impervious)	100 %
	Soil Type	0.40
	Very Low Runoff (well drained sandy, loamy or earthy peat soils)	0.15
	Low Runoff (Very permeable soils (e.g. gravel, sand)	0.30
	Moderate (Very fine sands, silts and sedimentary clays)	0.40
	High Runoff (Clayey or loamy soils)	0.45
	Very High Runoff (Soils of the wet uplands)	0.50
Fig. 9.7	UCWI (From Figure 9.7 of Wallingford Method)	52
Eqn. 13	Q_p (peak discharge) = 2.78 C_v CR i A	
	Where: Q_p (Peak Discharge) i = rainfall intensity A = Total Area	
From FEH	Average rainfall Intensity (i)	
	M100_60 is: 51.80 mm	
Eqn 7.20	$C_v = PR/100$	
Eqn 7.3	$PR = (0.829 PIMP) + (25.0 SOIL) + (0.078 UCWI) - 20.7$	
	PIMP (Percentage of catchment which is impervious)	100 %
Page 52	Note: PIMP can not be less than 40%	40 %
	Thus value of PIMP to be used	100 %
	Soil: 0.40 UCWI: 52	
	PR =	76.26
	Thus C_v =	0.76
Sec 7.10	CR (Recommended for simulation and design)	1.3
	Q_p for 1 in 100 year 60 minute duration =	840.8 l/s 142.8 l/s/ha
	50% of the existing runoff rate=	420.4 l/s 71.4 l/s/ha

CALCULATIONS

Company: WIE Office: London
 Sheet No: 4 of 11 Project No: WIE15582
 By: N Balboni Date: 10/09/2019
 Checked: D O'Donovan Date: 10/09/2019

Project Title Former Stag Brewery, Mortlake
 Calculations Title Greenfield Runoff Rate (IoH 124)

LOCATION	CALCULATIONS	OPTIONS																													
	<p>In order to calculate the rate of surface water discharge from the permeable portion of the Site, the Windes Microdrainage version 2017.1.2 Source Control module has been utilised. Rural runoff has been calculated using the IoH 124 Methodology. The input and output data for which are shown below;</p> <p>An area of 50ha has been used in the calculations as this is the lowest catchment area which the IoH 124 method can calculate. The 50ha output is then prorated as set out in IoH 124</p>																														
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">Waterman Group</td> <td>Page 1</td> </tr> <tr> <td colspan="2">Pickfords Wharf</td> <td rowspan="2" style="text-align: center;"></td> </tr> <tr> <td colspan="2">Clink Street London, SE1 9DG</td> </tr> <tr> <td>Date 10/09/2019 09:37</td> <td colspan="2">Designed by csnb2</td> </tr> <tr> <td>File</td> <td colspan="2">Checked by</td> </tr> <tr> <td>Innovyze</td> <td colspan="2">Source Control 2019.1</td> </tr> </table> <p style="text-align: center;"><u>IH 124 Mean Annual Flood</u></p> <p style="text-align: center;">Input</p> <table style="margin-left: auto; margin-right: auto;"> <tr> <td>Return Period (years)</td> <td>100</td> <td>Soil</td> <td>0.400</td> </tr> <tr> <td>Area (ha)</td> <td>50.000</td> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SAAR (mm)</td> <td>605</td> <td>Region Number</td> <td>Region 6</td> </tr> </table> <p style="text-align: center;">Results l/s</p> <p>QBAR Rural 143.4 QBAR Urban 143.4</p> <p>Q100 years 457.5</p> <p>Q1 year 121.9 Q2 years 126.4 Q5 years 183.6 Q10 years 232.4 Q20 years 287.3 Q25 years 308.1 Q30 years 325.1 Q50 years 375.8 Q100 years 457.5 Q200 years 537.9 Q250 years 563.7 Q1000 years 740.1</p>	Waterman Group		Page 1	Pickfords Wharf			Clink Street London, SE1 9DG		Date 10/09/2019 09:37	Designed by csnb2		File	Checked by		Innovyze	Source Control 2019.1		Return Period (years)	100	Soil	0.400	Area (ha)	50.000	Urban	0.000	SAAR (mm)	605	Region Number	Region 6	
Waterman Group		Page 1																													
Pickfords Wharf																															
Clink Street London, SE1 9DG																															
Date 10/09/2019 09:37	Designed by csnb2																														
File	Checked by																														
Innovyze	Source Control 2019.1																														
Return Period (years)	100	Soil	0.400																												
Area (ha)	50.000	Urban	0.000																												
SAAR (mm)	605	Region Number	Region 6																												
	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">1 in 1</td> <td style="width: 35%;">121.9 l/s/50ha</td> <td style="width: 35%;">2.4 l/s/ha</td> <td style="width: 15%;">11.8 l/s</td> </tr> <tr> <td>Qbar (1 in 2.333)</td> <td>143.4 l/s/50ha</td> <td>2.9 l/s/ha</td> <td>13.8 l/s</td> </tr> <tr> <td>1 in 100</td> <td>457.5 l/s/50ha</td> <td>9.2 l/s/ha</td> <td>44.1 l/s</td> </tr> </table>	1 in 1	121.9 l/s/50ha	2.4 l/s/ha	11.8 l/s	Qbar (1 in 2.333)	143.4 l/s/50ha	2.9 l/s/ha	13.8 l/s	1 in 100	457.5 l/s/50ha	9.2 l/s/ha	44.1 l/s																		
1 in 1	121.9 l/s/50ha	2.4 l/s/ha	11.8 l/s																												
Qbar (1 in 2.333)	143.4 l/s/50ha	2.9 l/s/ha	13.8 l/s																												
1 in 100	457.5 l/s/50ha	9.2 l/s/ha	44.1 l/s																												

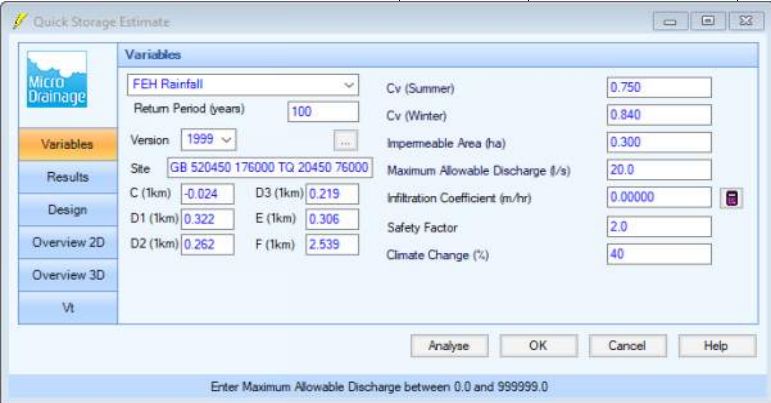
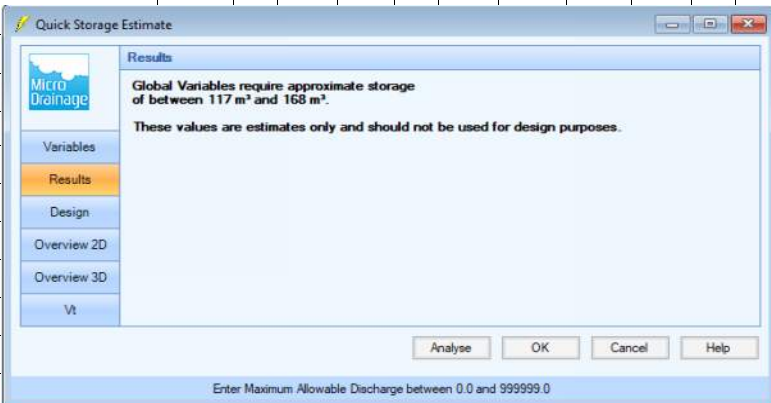


CALCULATIONS

Company: WIE Office: London
 Sheet No: 5 of 11 Project No: WIE15582
 By: N Balboni Date: 10/09/2019
 Checked: O O'Donovan Date: 10/09/2019

Project Title Former Stag Brewery, Mortlake

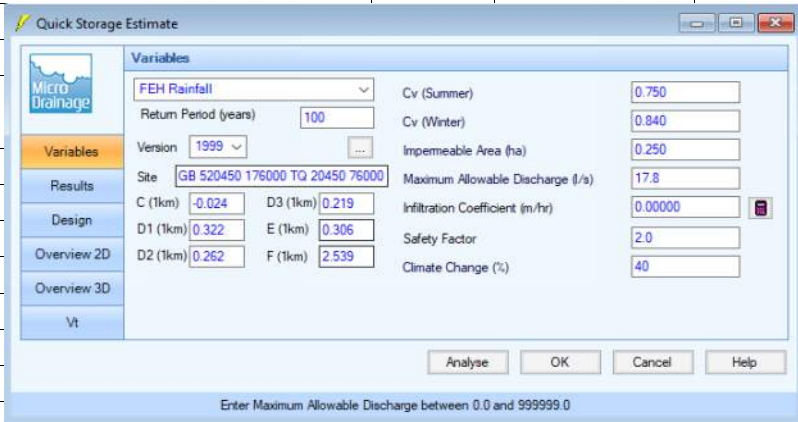
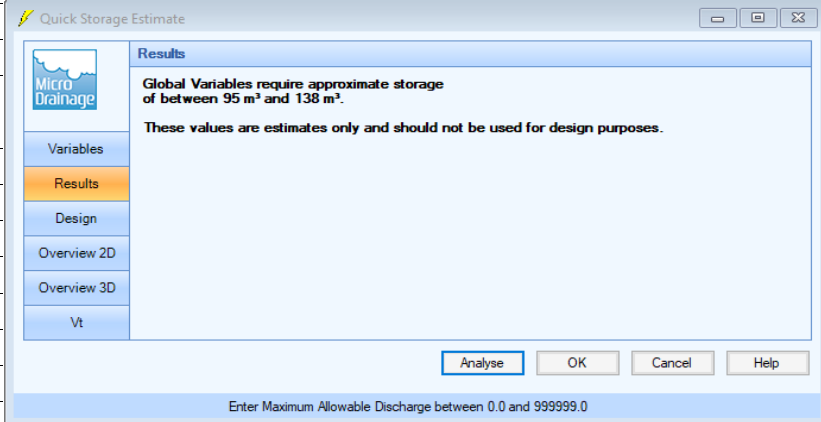
Calculations Title Surface water attenuation volume - catchment East 1

LOCATION	CALCULATIONS										OPTIONS		
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2018.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;												
	Drainage Catchment - East 1												
	Area	0.30 ha											
	Attenuation available	143 m3											
	Discharge rate	20.0 l/s											
													
													
	<u>Required volume to achieve 20.0 l/s</u>												
	Attenuation volume (m3)	143											

CALCULATIONS

Company: WIE Office: London
 Sheet No: 6 of 11 Project No: WIE15582
 By: N Balboni Date: 10/09/2019
 Checked: O O'Donovan Date: 10/09/2019

Project Title **Former Stag Brewery, Mortlake**
 Calculations Title **Surface water attenuation volume - catchment East 2**

LOCATION	CALCULATIONS	OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;	
	Drainage Catchment - East 2	
	Area 0.25 ha	
	Attenuation available 117 m ³	
	Discharge rate 17.8 l/s	
		
		
	<u>Required volume to achieve 17.8 l/s</u>	
	Attenuation volume (m ³) 117	



CALCULATIONS

Company: WIE Office: London
 Sheet No: 7 of 11 Project No: WIE15582
 By: N Balboni Date: 10/09/2019
 Checked: O'Donovan Date: 10/09/2019

Project Title Former Stag Brewery, Mortlake

Calculations Title Surface water attenuation volume - catchment East 3

LOCATION	CALCULATIONS												OPTIONS			
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;															
	Drainage Catchment - East 3															
	Area	0.18 ha														
	Attenuation available	84 m3														
	Discharge rate	12.8 l/s														
	<div style="display: flex; justify-content: space-around;"> <div data-bbox="264 863 1081 1294"> </div> <div data-bbox="1099 863 1917 1294"> </div> </div>															
	Required volume to achieve 12.8 l/s															
	Attenuation volume (m3)	84														

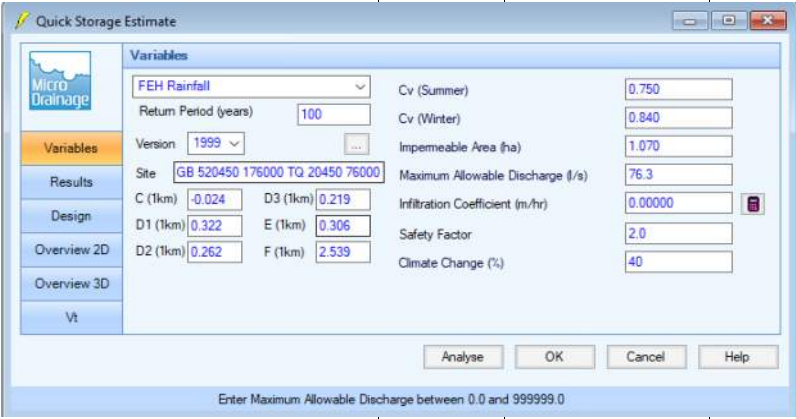
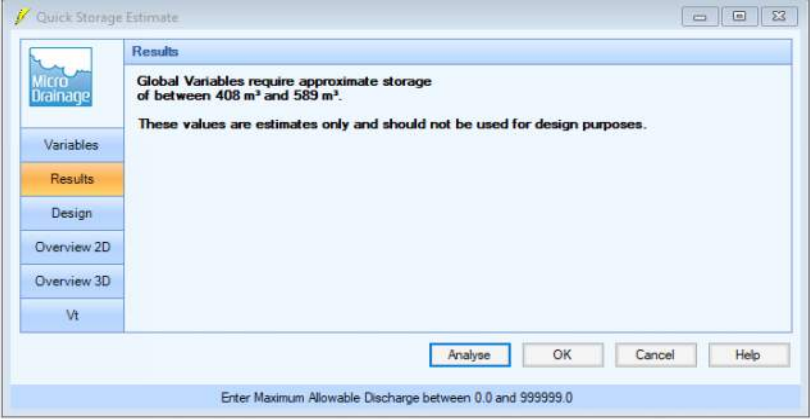


CALCULATIONS

Company: WIE Office: London
 Sheet No: 9 of 11 Project No: WIE15582
 By: N Balboni Date: 10/09/2019
 Checked: O O'Donovan Date: 10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume - catchment West 4**

LOCATION	CALCULATIONS	OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;	
	Drainage Catchment - West 4	
	Area 1.07 ha	
	Attenuation available 499 m3	
	Discharge rate 76.3 l/s	
		
		
	Required volume to achieve 76.3 l/s	
	Attenuation volume (m3) 499	