E.V. Waddington Ltd.

The Oval Plot, Rockingham

Proposed Drainage Strategy

The proposed development comprises the construction of a single, industrial use building and associated vehicle access/parking areas. The developer owns land adjacent to this application site on which a Drive Thru' Starbucks has recently been completed (planning approval 2018/1334). A site location plan Drg. No. 39724/201A and a proposed site layout Drg. No. 39724/202A are appended.

Proposed Surface Water Drainage Strategy

A Drainage Strategy accompanied the application for the Drive Thru' and this outlined the design parameters for the proposed surface water drainage system for the wider site and described off-site works to connect the development to a suitable point of disposal. These off-site works have now been completed and so works for the current application are restricted to within the site boundary.

It was agreed as part of the Drive Thru' application that the surface water discharge rate from the whole of the development site (the Drive Thru' and the current application site) would be restricted to the existing "green-field" run-off rates, which were established as being 3.4 litres/second/hectare for the 1 in 1 year rainfall event, and 8.6 litres/second/hectare for the 1 in 30 year rainfall event. A staged discharge would then be provided, so that run-off from events up to and including the 1 in 30 return period be restricted to the 1 in 1 year discharge rate, with more onerous events up to the 1 in 100 year return period plus an allowance of 30% for climate change restricted to the 1 in 30 year rate. However, as the Drive Thru' had a relatively small impermeable area (approx. 2,000 m^2), it was agreed that the permitted discharge rate from this area would be set to ensure that the vortex flow control device had an orifice of 50mm diameter, in order to reduce the risk of frequent blockages. The actual rate would be confirmed at detail design stage to suit the head of water within the system being attenuated. This discharge rate was later established as 1.7 litres/second, as shown on the appended as-built external drainage layout for the Drive Thru', Drg. No. 39724/041F.

As can be seen from the as-built drawing, a 150 dia. pipe has been provided into the current application site to receive surface water. This pipe connects downstream of the flow control device for the Drive Thru' site, meaning that the total flow from the overall site is a sum of the design rates of the existing and proposed flow control devices.

The total permitted discharge rate is obtained by taking the "green-field" run-off rates given earlier and applying these to the impermeable area of the overall site. The impermeable areas of the Drive Thru' and current application site are 2,000 m^2 and 10,200 m^2 respectively, a total of 12,200 m^2 (1.22 Ha). The permitted discharge rates for events up to 1 in 30 year and for the 1 in 100 year plus 30% years are therefore 4.1 litres/second (1.22 x 3.4) and 10.5 litres/second (1.22 x 8.6) respectively.

To obtain the permitted discharge rates for the current application site, the existing flow rate from the Drive Thru' site system must be deducted. Therefore, the two discharge rates obtained above must each be reduced by 1.7 litres/second, giving figures of 2.4 litres/second and 8.8 litres/second.

As previously discussed, as a staged discharge is proposed, it is necessary to provide two vortex flow control devices within the new surface water drainage system serving the current application site. These two flow controls, Device 1 & Device 2, are to have design flow rates of 2.4 litres/second and 6.4 litres/second (8.8 – 2.4) respectively.

Appended are sheets SW1, SW2 & SW3 which determine the required storage for the design rainfall events using the rates obtained for the flow control devices.

Sheet SW1 shows that the volume of storage required for the critical duration 1 in 30 year event (1080 minutes) is 415 m^3. This storage is to be fed by an overflow from the chamber containing Device 1.

Sheet SW2 shows that the during 1 in 100 year + 30% events the 415m^3 of storage is calculated to be fully utilised after a 57 minute duration storm. At this point, exceedance volumes will overflow into the chamber containing Device 2, and will then overflow again into the second block of storage.

Sheet SW3 shows that the volume of storage required for the critical duration 1 in 100 year event plus 30% for climate change (360 minutes) is 550 m^3. Therefore, the storage associated with Device 2 will require a volume of 135m^3 (550-415).

As outlined above, the volumes of attenuated surface water run-off will be retained on site within two separate off-line blocks of proprietary below ground voided storage units, each being fed by separate overflow pipes from the two flow control device chambers. The below ground pipework is to be arranged in such a way that only when the storage block associated with Device 1 is full, will flows reach Device 2. This ensures that the staged discharge functions within the previously discussed design principles, whereby flows are restricted to the 1 in 1 year rate during events up to 1 in 30 year return period and to the 1 in 30 year rate for more onerous events.
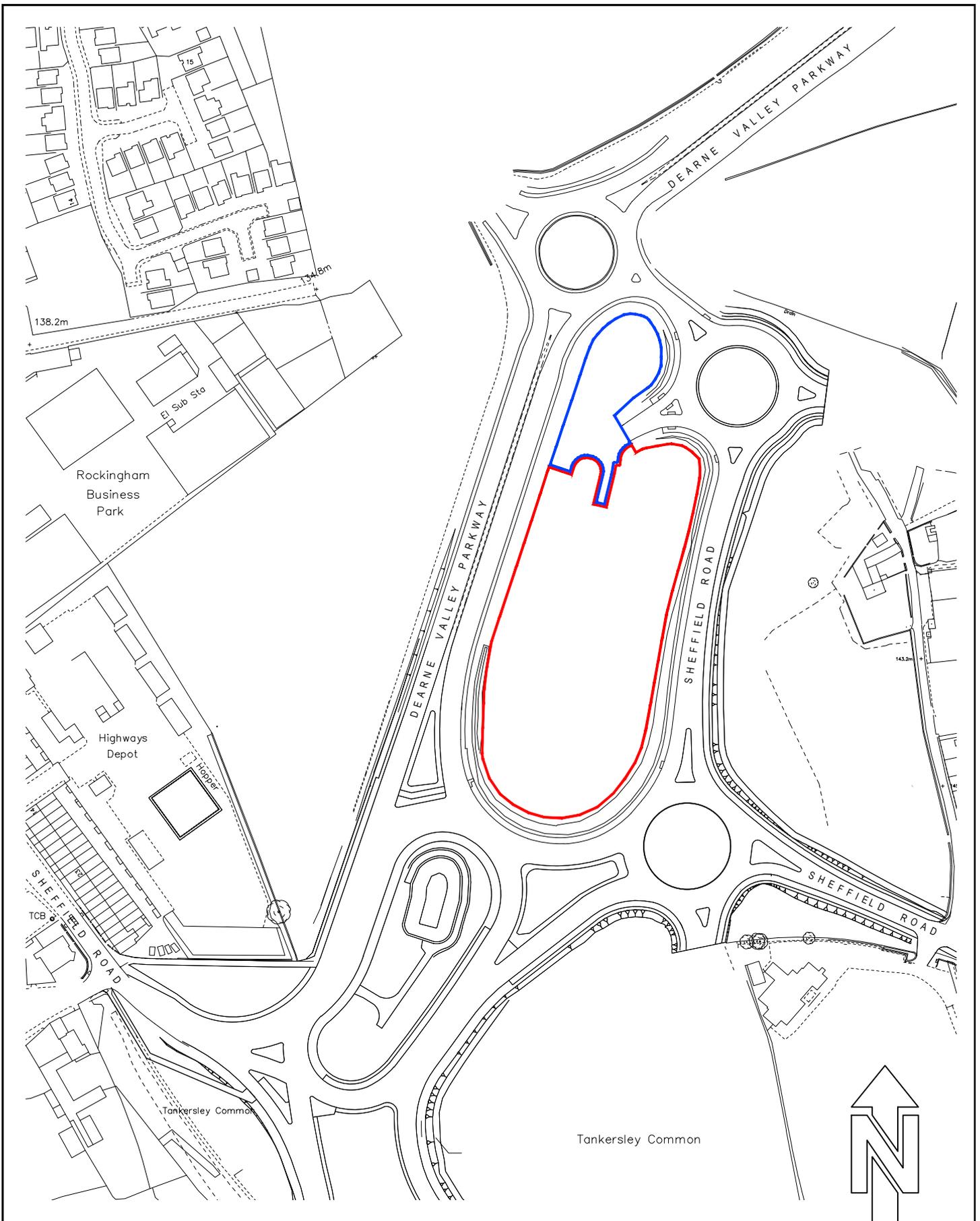
The layout of the surface water drainage system will be determined at detail design stage, but will follow the principles discussed above.

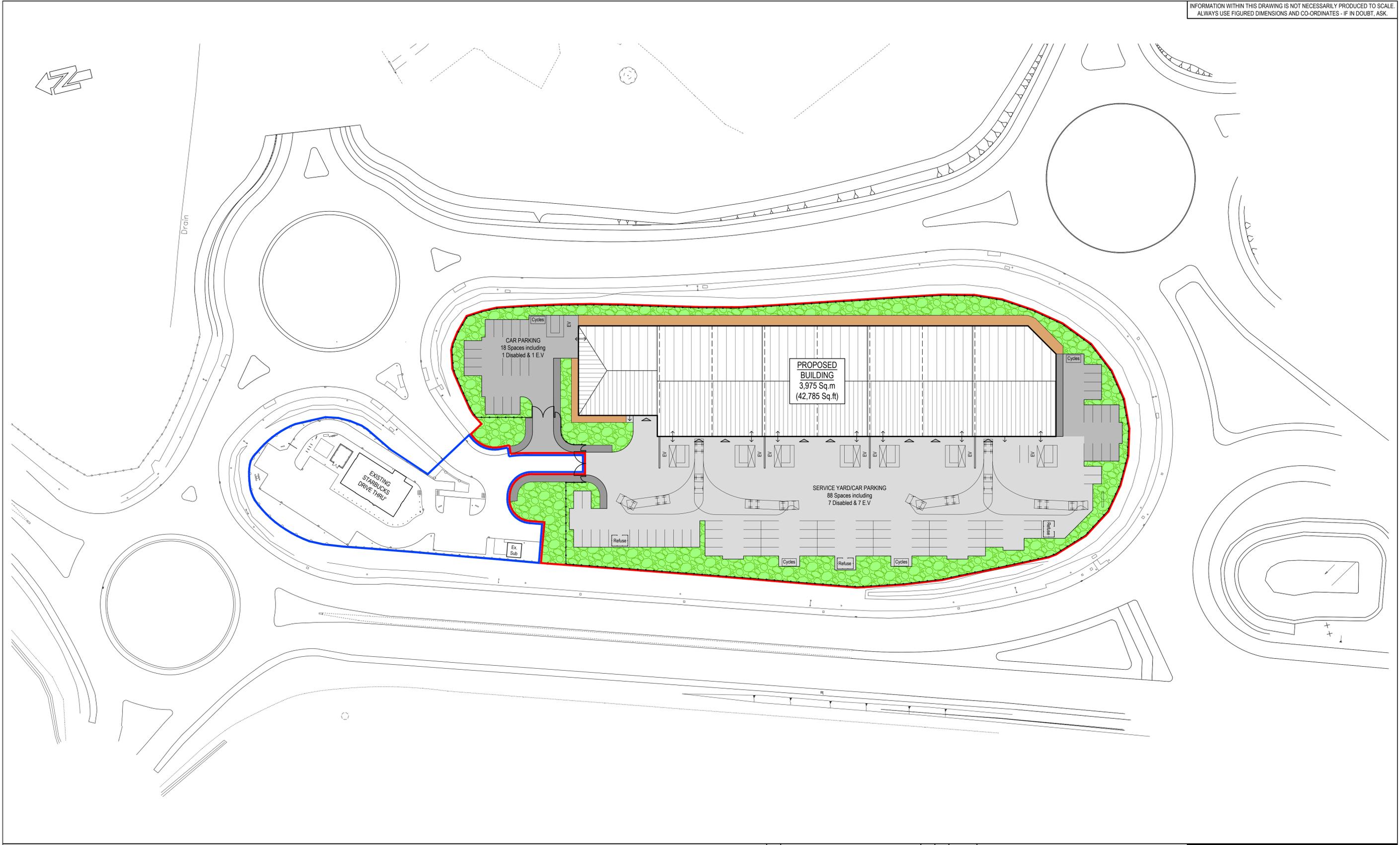All parking area run-off will pass through a suitably sized Class 1 interceptor with high level alarm.

Proposed Foul Drainage Strategy

As with the surface water, the previously approved Drive Thru' Drainage Strategy discussed the necessary off-site works required to connect the development plot to the public sewer network. These works have now been completed and so works for the current application are restricted to within the site boundary.

Again, the appended as-built external drainage layout for the Drive Thru', Drg. No. 39724/041F, shows a 150 dia. pipe has been provided into the current application site to receive foul discharge. Therefore, it is proposed that all new foul effluent is drained by gravity and discharged into this existing private foul drainage system, providing conveyance to the public sewer network.

DEARNE VALLEY PARKWAY

Rockingham
Business
Park

El Sub Sta

Highways
Depot

Hopper

SHEFFIELD ROAD

DEARNE VALLEY PARKWAY

SHEFFIELD ROAD

SHEFFIELD ROAD

TCB

Tankersley Common

Tankersley Common

138.2m

134.8m

143.2m

N

INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.

Drain

Cycles

EV

CAR PARKING
18 Spaces including
1 Disabled & 1 E.V

Cycles

PROPOSED
BUILDING
3,975 Sq.m
(42,785 Sq.ft)

EXISTING
STARBUCKS
DRIVE THRU'

Ex
Sub

SERVICE YARD/CAR PARKING
88 Spaces including
7 Disabled & 7 E.V

EV

Refuse

Refuse

Cycles   Refuse   Cycles

NOTES

Concrete Service Yard/Car Parking.

Tarmac Access Road.

Tarmac footway.

Gravel.

Landscaping.

New 2.4m high black weld mesh fencing with matching gates.

REV	DESCRIPTION	SIG	CHK	DATE
A	First Issue.			

E.V WADDINGTON LTD.

ROCKINGHAM

PROPOSED SITE LAYOUT

SCALE WHEN PLOTTED AT A1	DRAWING STATUS
1:500	PRELIMINARY

DRAWN	CHECKED	DATE	DRAWING NUMBER	REV
MW	AP	04-08-20	39724/202	A

INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.

NOTES

1. This drawing to be read in conjunction with Eastwood & Partner's drawing number 39724/042.

2. All pipes shall be either :-

    A - Vitrified clay to BS EN 295 with a minimum crushing strength as follows :-
    150 dia. - 40 kN/m
    225 dia. - 45 kN/m
    300 dia. - 72 kN/m   OR

    B - Class H concrete to BS 5911.   OR

    C - PVC to have BSI kitemark status (certified to WIS 4-35-01) Wavin or similar approved. Maximum pipe length to be 3m.

3. All pipes are to be laid soffit to soffit at manholes unless noted otherwise.

4. Pipes entering manholes and road gullies shall have a flexible joint within 600 of the inside of the manhole or gully joining with a short Rocker pipe.

5. All pipes to be 100 dia. unless noted otherwise.

6. All works and materials to be in accordance with "Sewers for Adoption" (6th edition), bedded with a Class S granular bed and surround as a minimum requirement.
Pipes within highways with cover less than 1200 to have a Class Z concrete bed and surround.
Pipes within paved areas with cover less than 600 to have a Class Z concrete bed and surround.
Pipes within landscaped areas with cover less than 300 to have a Class Z concrete bed and surround.

7. All trenches in roads and paved areas shall be backfilled with Type 1 DOT granular sub-base material.

8. All cover levels are indicative only. Covers to be set to suit camber/gradient of proposed surfacings.

9. The invert levels at the proposed points of connection to existing drains shall be checked before any new drains are constructed. Any variation to the levels shown on the drawing shall be notified to Eastwood & Partners.

150 Ø stub pipe at 1 in 150 for future foul connection.

150 Ø stub pipe at 1 in 150 for future surface water connection.

MH S1 CL 137.85 IL 135.60
MH F1 CL 137.67 IL 135.65
MH S11 CL 137.65 IL 135.60
MH S2 CL 137.30 IL 135.50
RE S6 CL 137.32 IL 136.75
IC S7 CL 137.35 IL 136.15
IC S3 CL 137.40 IL 136.60
IC F2 CL 137.38 IL 136.75
IC F4 CL 137.40 IL 136.75
RAIC S7a CL 137.40 IL 136.05
RAIC S8 CL 137.33 IL 136.00
MH F5 CL 137.20 BD 136.20 IL 135.05
MH F3 CL 137.32 BD 136.30 IL 135.30
Ex. FMH CL 136.35 Approx. IL 134.95
MH S13 CL 137.08 IL 135.00
MH S9 CL 137.05 IL 135.20
MH S5 CL 137.17 IL 135.25 BL 134.75
MH S12 CL 137.25 IL 135.30
MH S4 CL 137.18 IL 135.50
Ex. SWMH CL 136.30 Approx. IL 134.95
MH S10 CL 136.97 IL 135.05 BL 134.55

F.F.L 137.45 (S.S.L 137.435)
F.F.L 137.45

Silt Trap
300 Ø feed to storage

Foul to discharge to existing manhole with inverts levels.
Ex. 300 dia. foul drain
Ex. 300 surface water drain
Surface water to discharge to existing manhole with inverts levels.

MH S10 to have a Hydrobrake Optimum flow control device ref. MD-SCL-0051-1700-1900-1700 to restrict discharge to 1.7 litres/second at 1.9m design head.

Klargester NSBP004 Class 1 by-pass separator with vent pipe and alarm.

105 cubic metres of surface water storage provided using Triton S22 proprietary units with voided stone surround installed as shown on Triton Drg. No. 920/01. Underside of storage at 135.20.

Legend

- Ex. surface water drainage
- Ex. foul drainage
- Surface water drainage
- Foul drainage
- Road gully with 150 dia. roddable outlet.
- IC 450 min. dia. Polypropylene inspection chamber.

F	As Built Issue.	GB	JEST	18.12.19
E	S5 repositioned & levels amended and underside of storage level amended, all to suit tank supplier's detail proposals.	MW	AP	03.06.19
D	Construction Issue	MW	AP	22.03.19
C	Foul drainage revised to suit required "pop-up" locations. S10 base levels lowered.	MW	AP	18.03.19
B	Waiting Bay and Staff Parking Bay repositioned.	MW	AP	17.02.19
A	First Issue.			
REV	DESCRIPTION	SIG	CHK	DATE

E.V WADDINGTON LTD.

ROCKINGHAM

STARBUCKS
EXTERNAL DRAINAGE LAYOUT

Eastwood & Partners
CONSULTING ENGINEERS
St. Andrew's House
23 Kingfield Road
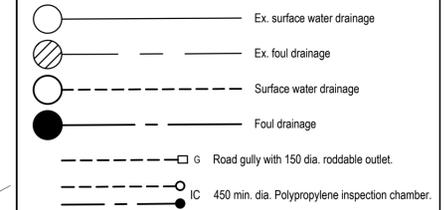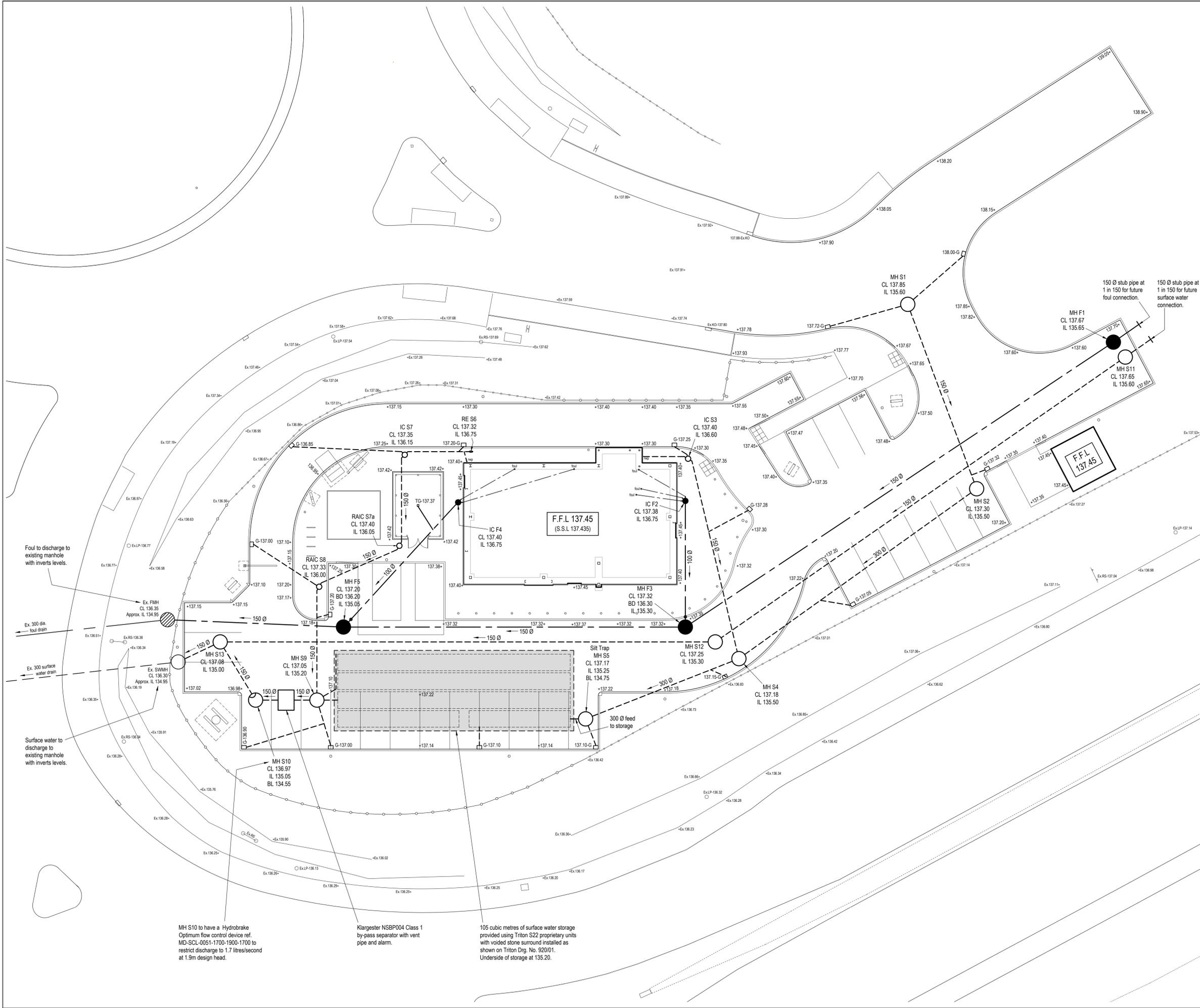Sheffield
S11 9AS
Tel 0114 255 4554
Fax 0114 255 4330
mail@eastwoodandpartners.com
www.eastwoodandpartners.com

| SCALE WHEN PLOTTED AT A1 | DRAWING STATUS |
| 1:150 | AS BUILT |

| DRAWN | CHECKED | DATE | DRAWING NUMBER | REV |
| MW | AP | 14-02-19 | 39724/041 | F |

EASTWOOD & PARTNERS (Consulting Engineers) Ltd.

Project:		Sheet	SW1
E.V Waddington - Rockingham Site		Job No.	39724
		Date	12/08/2020
Subject:		Designed	MW
Surface Water Storage - 1 in 30 year		Checked	
		Revision	

Site Details :   **Information From Wallingford Maps :**

Location :	**Barnsley**			M5-60	**19.0**	mm
Grid Ref :				r	**0.36**	
				SAAR	**750**	mm
Total Site Area	**1.317**	ha		UCWI	80	(Fig. 9.7)
				Soil Type	**4**	
Roof		ha		SOIL	0.45	(Section 7.4)
Paved		ha				
Other		ha				
Total Impermeable	**1.020**	ha				

PIMP	77.4%		
PR	61.0	Equation 7.3	
Cv	**0.79**	Equation 7.21	
Default Cv	**0.84**	Designer to insert to override calculated Cv	

Design Return Period   **30**   **Years**   Max. Branch Length   **100**

Approx. Time of Flow   **1.7** mins

Percentage Increase For Climate Change: **0%**

Details of Restricted Discharge :

Maximum Permitted Rate of Flow from the System

2.4 Litres/sec

Assumed Average Flow as a Proportion (Estimate)   **80** %

Average Rate of Flow   **1.9** Litres/sec

Calculation of Critical Duration and Storage Volume Required :

Trial Durations (mins)	600	720	840	960	1080	1200	1440
Average Point Intensity (mm/hr)	5.5	4.8	4.2	3.8	3.5	3.2	2.8
Volume of Run-off for the period = Area x Cv x i x D (m3)	467.5	488.8	507.5	524.1	539.2	553.0	577.5
With climate change	467.5	488.8	507.5	524.1	539.2	553.0	577.5
Volume of Out-flow for the period = Ave. flow x (D+Tf)(m3)	69.3	83.1	97.0	110.8	124.6	138.4	166.1
Storage Volume for this Duration (m3)	**398.2**	**405.7**	**410.5**	**413.4**	**414.6**	**414.5**	**411.5**

Storage Volume Reqired for

30 Year Return Period   =   414.6   m3

EASTWOOD & PARTNERS (Consulting Engineers) Ltd.

Project:		Sheet	SW2
E.V Waddington - Rockingham Site		Job No.	39724
		Date	12/08/2020
Subject:		Designed	MW
Duration at which flow control device 2 is first used		Checked	
		Revision	

Site Details :   **Information From Wallingford Maps :**

Location :	**Barnsley**		M5-60	**19.0**	mm
Grid Ref :			r	**0.36**	
			SAAR	**750**	mm
Total Site Area	**1.317**	ha	UCWI	80	(Fig. 9.7)
			Soil Type	**4**	
Roof		ha	SOIL	0.45	(Section 7.4)
Paved		ha			
Other		ha			
Total Impermeable	**1.020**	ha			

PIMP	77.4%	
PR	61.0	Equation 7.3
Cv	**0.79**	Equation 7.21

Default	Cv	**0.84**	Designer to insert to override calculated Cv

Design Return Period	**100**	**Years**	Max. Branch Length	**100**	
			Approx. Time of Flow	**1.7**	mins

Percentage Increase For Climate Change: **30%**

Details of Restricted Discharge :
Maximum Permitted Rate of Flow from the System

	2.4	Litres/sec
Assumed Average Flow as a Proportion (Estimate)	**80**	%
Average Rate of Flow	**1.9**	Litres/sec

Calculation of Critical Duration and Storage Volume Required :

Trial Durations (mins)	15	30	55	56	57	58	59
Average Point Intensity (mm/hr)	89.9	60.2	40.7	40.2	39.8	39.3	38.9
Volume of Run-off for the period = Area x Cv x i x D (m3)	192.6	257.7	319.8	321.7	323.6	325.5	327.3
With climate change	250.4	335.0	415.8	418.3	420.7	423.1	425.5
Volume of Out-flow for the period = Ave. flow x (D+Tf)(m3)	1.9	3.6	6.5	6.6	6.8	6.9	7.0
Storage Volume for this Duration (m3)	248.4	331.4	409.2	411.6	414.0	416.3	418.5

415 m3 required in storage fed from flow control Device 1 - See sheet SW1

EASTWOOD & PARTNERS (Consulting Engineers) Ltd.

Project: **E.V Waddington - Rockingham Site**		Sheet	SW3
		Job No.	39724
		Date	12/08/2020
Subject: **Surface Water Storage - I in 100 year + 30%**		Designed	MW
		Checked	
		Revision	

Site Details :

Information From Wallingford Maps :

Location :	**Barnsley**	M5-60	**19.0**	mm
Grid Ref :		r	**0.36**	
		SAAR	**750**	mm
Total Site Area	**1.317** ha	UCWI	80	(Fig. 9.7)
		Soil Type	**4**	
Roof	ha	SOIL	0.45	(Section 7.4)
Paved	ha			
Other	ha			
Total Impermeable	**1.020** ha			

PIMP	77.4%	
PR	61.0	Equation 7.3
Cv	**0.79**	Equation 7.21
Default Cv	**0.84**	Designer to insert to override calculated Cv

Design Return Period	**100**	**Years**	Max. Branch Length **100**
			Approx. Time of Flow **1.7** mins

Percentage Increase For Climate Change: **30%**

Details of Restricted Discharge :

Device 2 design flow	**6.4**	Litres/sec
Assumed Average Flow as a Proportion (Estimate)	**80**	%
Device 2 Average Rate of Flow	**5.1**	Litres/sec

Calculation of Critical Duration and Storage Volume Required :

Trial Durations (mins)	57	60	120	240	360	480	600
Average Point Intensity (mm/hr)	39.8	38.4	23.7	14.2	10.4	8.3	7.0
Volume of Run-off for the period = Area x Cv x i x D (m3)	323.6	329.1	406.1	485.7	534.1	571.3	601.4
With climate change	420.7	427.9	528.0	631.4	694.3	742.7	781.9
Volume of Out-flow for from Device 2 = Ave. flow x (D+Tf)(m3)	0.0	1.4	19.9	56.7	93.6	130.5	167.3
Out-flow from Device 1 at a constant 2.4l/sec after 57 minutes	6.8	8.9	17.5	34.8	52.1	69.4	86.6
Total Out-Flow =	0.0	10.3	37.4	91.5	145.7	199.8	254.0
Storage Volume for this Duration (m3)	**413.9**	**417.5**	**490.6**	**539.9**	**548.6**	**542.9**	**527.9**

Storage Volume Reqired for
         100 Year Return Period   =   548.6   m3