

PROPOSED DRAINAGE STRATEGY

SEPTEMBER 2023

Date : 15.09.23
Project : Kilnwood Vale – Phase 3 DEFG Planning
Project Ref : 2107121
Report Ref : 2107121-01

DOCUMENT CONTROL

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
-	Issued for planning	MJR	MSL	JEC	15.09.23

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1.0 INTRODUCTION

- 1.1 Ardent Consulting Engineers (hereafter referred to as Ardent) have been appointed by Crest Nicholson South to provide information on the drainage strategy to support a Reserved Matters Planning Application for Phase 3 DEFG of the Kilnwood Vale Masterplan, specifically for land at Kilnwood Vale, Horsham, West Sussex, RH12 0DE, hereby known as 'Site'.
- 1.2 The Reserved Matters Application is pursuant to outline planning permission reference DC/15/2813. This drainage strategy seeks to discharge Condition 7 of the planning permission, the wording of which is set out below:
- 1.3 The Reserved matters application is pursuant to outline planning permission ref. DC/15/2813. Conditions 25 and 27, which this drainage strategy seeks to discharge are set out below:

Condition 25

At the Reserved Matters stage for any phase or part phase (excluding Phase 1) a drainage strategy detailing any on and/or off-site foul drainage works for that phase or part phase, shall be submitted to and approved in writing by the Local Planning Authority in consultation with the sewerage undertaker. No discharge of foul water from the site shall be accepted into the public system until the drainage works referred to in the strategy have been completed. The development shall be carried out in accordance with the approved details.

Condition 27

"At the Reserved Matters stage for any phase or part phase excluding Phase 1, a surface water drainage strategy for that phase or part phase based on sustainable drainage principles and an assessment of the hydrological and hydro geological context of the whole development, should be submitted to and approved in writing by the Local Planning Authority.

The strategy shall also include:

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- *Details of how the sustainable drainage management train will be incorporated including several water treatment stages*
- *Details of how the drainage from the phase or part phase will discharge into the watercourse as proposed in section 15.3 of the approved Flood Risk Assessment (FRA) dated July 2010 (SLR Ref: 403-00404-00027).*
- *Consideration of pollution prevention measures to protect watercourses and groundwater*
- *Confirmation that there will be no discharge to ground in areas affected by contamination*
- *Demonstration that the scheme complies with Advice Note 6 'Potential Bird Hazards from Sustainable Urban Drainage Schemes (SUDS)'.*
- *Demonstration that flows through railway culverts will be restricted to pre-development rates or less.*

The development shall be carried out in accordance with the details and any timings of the approved scheme. Any subsequent amendments shall be agreed in writing with the Local Planning Authority.

Reason: To prevent the increased risk of flooding and ensure a management train is incorporated as agreed to improve and protect water quality, improve habitat and amenity, and ensure future maintenance of the drainage system. This planning condition is necessary to ensure the development complies with the principles of the NPPF and Policy 38 of the Horsham District Planning Framework (2015).

- 1.4 This briefing note constitutes an addendum to the Flood Risk Assessment produced by Global Environmental Solutions (report ref: 403.00404.00027 dated July 2010). The following sections outline the existing site characteristics, flood risk environment, proposed surface water drainage strategy and the intended Sustainable Drainage System (SuDS) management and maintenance regime.
- 1.5 This briefing note is to be read in conjunction with Ardent Consulting Engineers' drawing 2107121-0400 entitled *Main Drainage General Arrangement* which can be found in **Appendix A**.

2.0 EXISTING SITE

- 2.1 This development is within Phase 3 of land on the north-western edge of the wider Kilnwood Vale Masterplan. The reserved land parcels were originally kept free of residential development in order to be utilised for Site access to the prior phases of construction towards the South. The Site is now ready for construction due to impending completion of prior phases.
- 2.2 The site of the wider development incorporates multiple land usages; greenfield, former inert landfill and an active construction waste recycling facility.
- 2.3 In terms of the Site's topography, existing levels fall from approximately 91.45mAOD in the south-western boundary, to 73.22mAOD to the north-east of the site.
- 2.4 The Site is shown on British Geological mapping to be underlain by bedrock of the Weald Clay Formation – mudstone. A Land Contamination Assessment was undertaken by ST Environmental in November 2017 (ref: J13115) for the entire site which confirmed that the soil has poor drainage characteristics and therefore infiltration would not be viable due to the clay geology.
- 2.5 Prior to the Kilnwood Vale masterplan, there were no existing drainage networks at the Site. However, surface water runoff from the entirety of Site will now be conveyed to one of several attenuation basins, before being discharged from the basins at greenfield run-off rates. **Figure 2-1** shows the Overall Drainage Constraints plan for the specific Phase 3 DEFG.



Figure 2-1: Drainage Constraints Plan for Site

3.0 PROPOSED DEVELOPMENT

- 3.1 The proposed Phase 3 (land parcels DEFG) development consists of 278 residential units, with associated access roads, car parking and open space. The site is 12.05ha.

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4.0 SURFACE WATER DRAINAGE STRATEGY

- 4.1 Based on the principles set out in the approved Flood Risk Assessment (FRA) aforementioned, Ardent have prepared an on-site surface water drainage strategy which follows the SuDS Management Train philosophy. The Indicative Drainage Strategy incorporates 3355m² of permeable pavement.
- 4.2 The positive system will be offered to Thames Water for adoption.
- 4.3 The flow from Phase 3 will be conveyed to strategic 'Pond S1' via manholes S205 and S215 to then be discharged into the adjacent ditch, as detailed in Campbell Reith's Overall Drainage Constraints Plan '11950-3DEFG-CD100' Rev. P1.
- 4.4 The system will be unrestricted in line with the approved FRA and there will be no requirement for offline storage to deal with the 1 in 100-year plus 40% climate change event to suit Sewers for Adoption requirements; the network will be conveying a flow from all designed storm events to Pond S1. The surface water drainage calculations can be found within **Appendix B**. The Proposed Overall Drainage Constraints Plan is included in **Appendix C**.
- 4.5 Phase 3 (Parcels DEFG) is the sole parcel of reserved land within this catchment. In line with the approved FRA, the greenfield runoff rates for the various return periods of the reserve land are replicated in **Table**.

Return Period (Yrs)	Greenfield Runoff Rate (l/s/ha)	Proposed Discharge Rates (l/s)
2	4.50	30.15
30	11.50	77.05
100	16.20	-
100+CC	16.20	108.54

Table 1: Proposed Discharge Rates of Basin A1

Urbanisation

- 4.6 The proposed impermeable areas within each catchment have incorporated a 10% uplift to account for 'urban creep' over the lifetime of the development.

Water Quality

- 4.7 Permeable pavement has been incorporated within the Phase 3 Drainage Strategy. As identified in "SuDS for Roads" - Scotland, permeable paving provides two stages of treatment, firstly within the grit layer and geotextile which the blocks are bedded on, and secondly, the underlying gravel media comprising washed, no-fines material of adequate depth, i.e. 0.5m from the surface to base of the system.
- 4.8 Shown below are three tables which form part of the CIRIA C753 Simple Index Treatment Method and highlight the improvement in water quality the designed SuDS methods deliver. The benchmark classification data for the development is shown in **Table 2** which is then compared to the SuDS mitigation indices displayed in **Table 3**.
- 4.9 As seen within the comparison in **Table 4**, the quality of water discharging from the site has been improved by the use of the proposed SuDS methods.

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

Table 2: Pollution hazard indices for different land use classifications (land use in bold applicable for the development).

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Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bio retention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

**Table 3: Indicative SuDS mitigation indices for discharges to surface waters
(bold text is applicable to this development)**

For surface water discharge from Residential Parking Areas and Low Traffic Roads <300 traffic movements/day			
	Required mitigation indices		
Source	TSS	Metals	Hydrocarbons
Medium	0.5	0.4	0.4
Type of SuDS component provided			
Permeable Pavement	0.7	0.6	0.7
Check	+0.2	+0.2	+0.3

Table 4: SuDS mitigation indices provided

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- 4.10 Tanked/lined permeable pavement is to be used to protect watercourses and groundwater receptors from pollution. In addition, no infiltration SuDS techniques will be used in areas affected by contamination to reduce the risk of mobilising contaminants.

SuDS Management and Maintenance

- 4.11** The maintenance of all SuDS components will be in accordance with best practice and the CIRIA C753 publication "The SuDS Manual". The recommended operation and maintenance requirements for the proposed permeable paving are provided in
- 4.12** Table **5** below.
- 4.13 A private management company will be appointed to maintain the unadopted elements of the surface water drainage network, including the permeable paving, tank and flow control.

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Maintenance Issues	Failure of components, blockage from debris	
Maintenance Period	Maintenance Task	Frequency
Regular	Inspect and identify any elements that are not operating correctly.	Monthly for three months, then six monthly
	Brush surface and remove sweepings from all hard surfaces	Monthly or as required
	Remove weeds from surface of permeable paving	As necessary, inspect regularly
	Remove sediment/debris from catchpits/gullies and control structures.	Annually, after severe storms or as required
Occasional Tasks	Sweep and suction brush surface in autumn after leaf fall	Annually or as required
	Brush and vacuum surface to prevent silt blockage and enhance design life	Annually
	Remove sediment/debris from catchpits/gullies and control structures.	Annually, after severe storms or as required
	Remove covers of inspection chambers and control chamber and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt	Annually
Remedial Work	Repair inlets, outlets, vents, overflows and control structures.	As required
	Repair physical damage if necessary	As required
Monitoring	Inspect all inlets, outlets, vents, overflows and control structures to ensure they are in good condition and operating as designed.	Annually or after severe Storms

Table 5: SuDS Operation and Maintenance requirements

5.0 FOUL WATER DRAINAGE

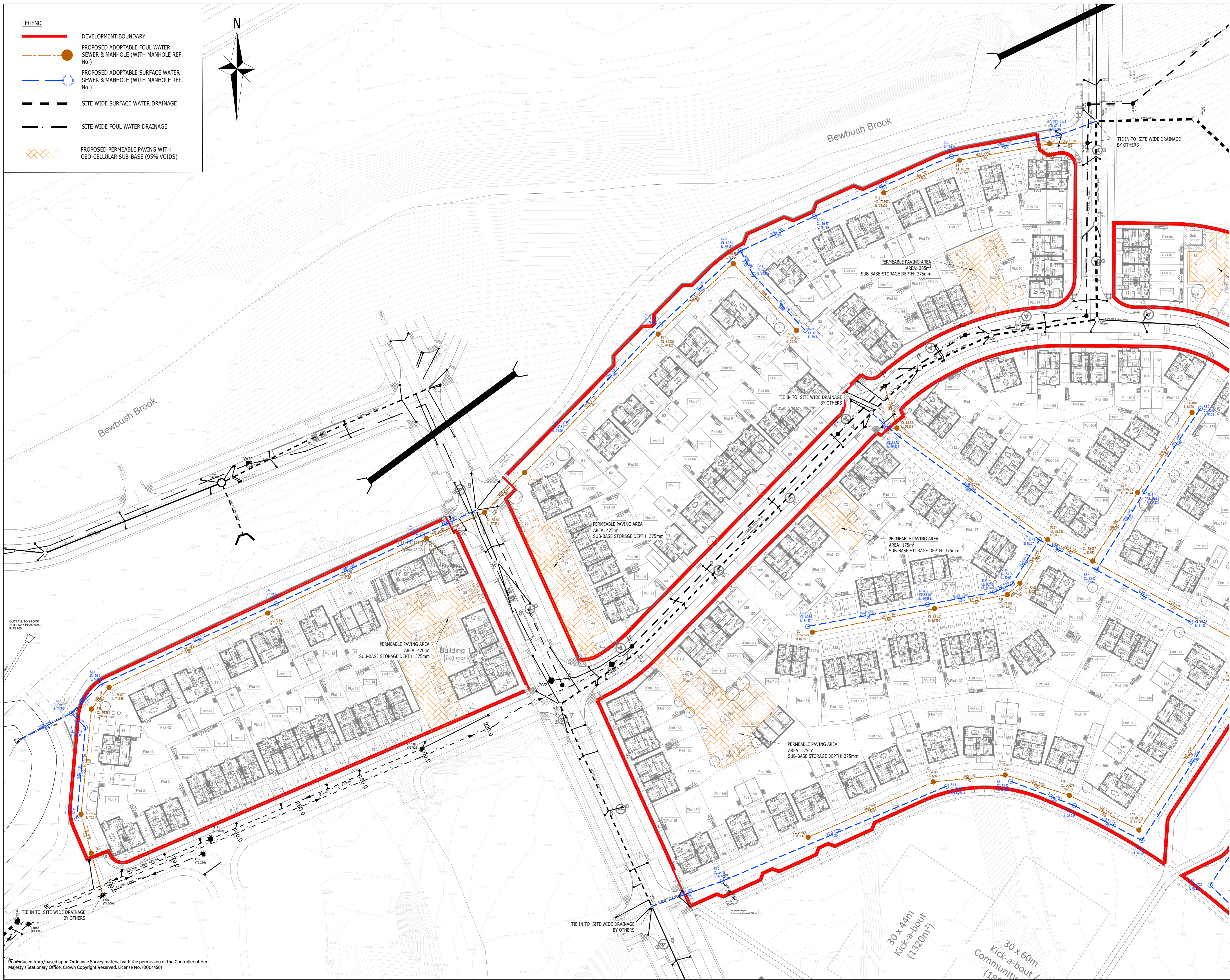
- 5.1 Foul flows from the 278no. residential units in Phase 3 (DEFG) utilises the pre-constructed foul network to convey foul sewerage across the Site to outlet points at manholes F60.002 and F104, in line with Campbell Reith's Phase 3DEFG Overall Drainage Constraints Plan 11950-3DEFG-CD100, Rev. P1. Besides a portion of 3D1, every land parcel will discharge to Manhole 60.002.
- 5.2 The proposed foul water design can be found on ACE's *Main Drainage General Arrangement* (2107121-0400) which can be found in **Appendix A**.

6.0 CONCLUSIONS

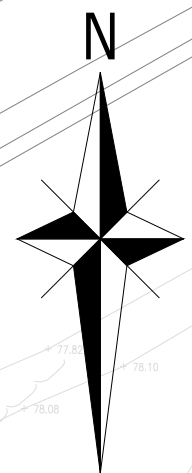
- 6.1 Surface water runoff from Phase 3 (DEFG) will be conveyed unrestricted to Pond S1 via a piped sewer network. The network will discharge freely into Pond S1 during all return events up to and including the 1 in 100 year plus 40% climate change event in line with the approved FRA aforementioned.
- 6.2 Tanked/lined permeable pavement is included within the Phase 3 (DEFG) surface water strategy, providing two levels of treatment to protect watercourses and groundwater receptors from pollution.
- 6.3 Foul flows from the 278no. units in Phase 3 (DEFG) will be conveyed unrestricted to Manholes F60.002 and F104; a majority of the Site discharging to the former.

Appendix A

Preliminary Surface & Foul Water Drainage Strategy

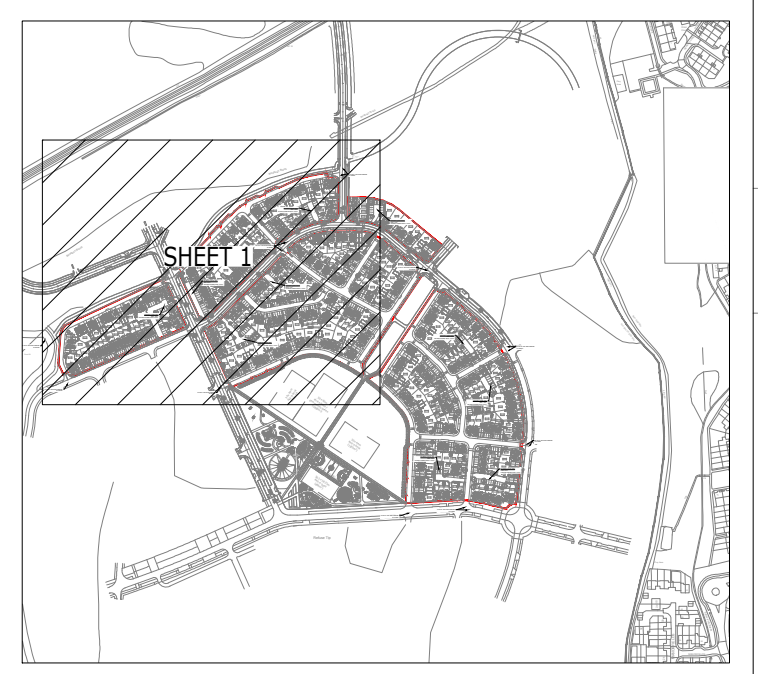


- LEGEND**
- DEVELOPMENT BOUNDARY
 - PROPOSED ADOPTABLE FOUL WATER SEWER & MANHOLE (WITH MANHOLE REF. No.)
 - PROPOSED ADOPTABLE SURFACE WATER SEWER & MANHOLE (WITH MANHOLE REF. No.)
 - - - SITE WIDE SURFACE WATER DRAINAGE
 - - - SITE WIDE FOUL WATER DRAINAGE
 - PROPOSED PERMEABLE PAVING WITH GEO-CELLULAR SUB-BASE (95% VOIDS)



- NOTES**
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
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 7. DRAWING BASED ON SITE PLAN BY OSP ARCHITECTS DATED OCTOBER 2021

- CDM NOTES**
- THE ATTENTION OF THE CLIENT, PRINCIPAL DESIGNER, PRINCIPAL CONTRACTOR, DESIGNERS AND CONTRACTORS IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:
1. WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND BT WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
 2. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
 3. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
 4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
 5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

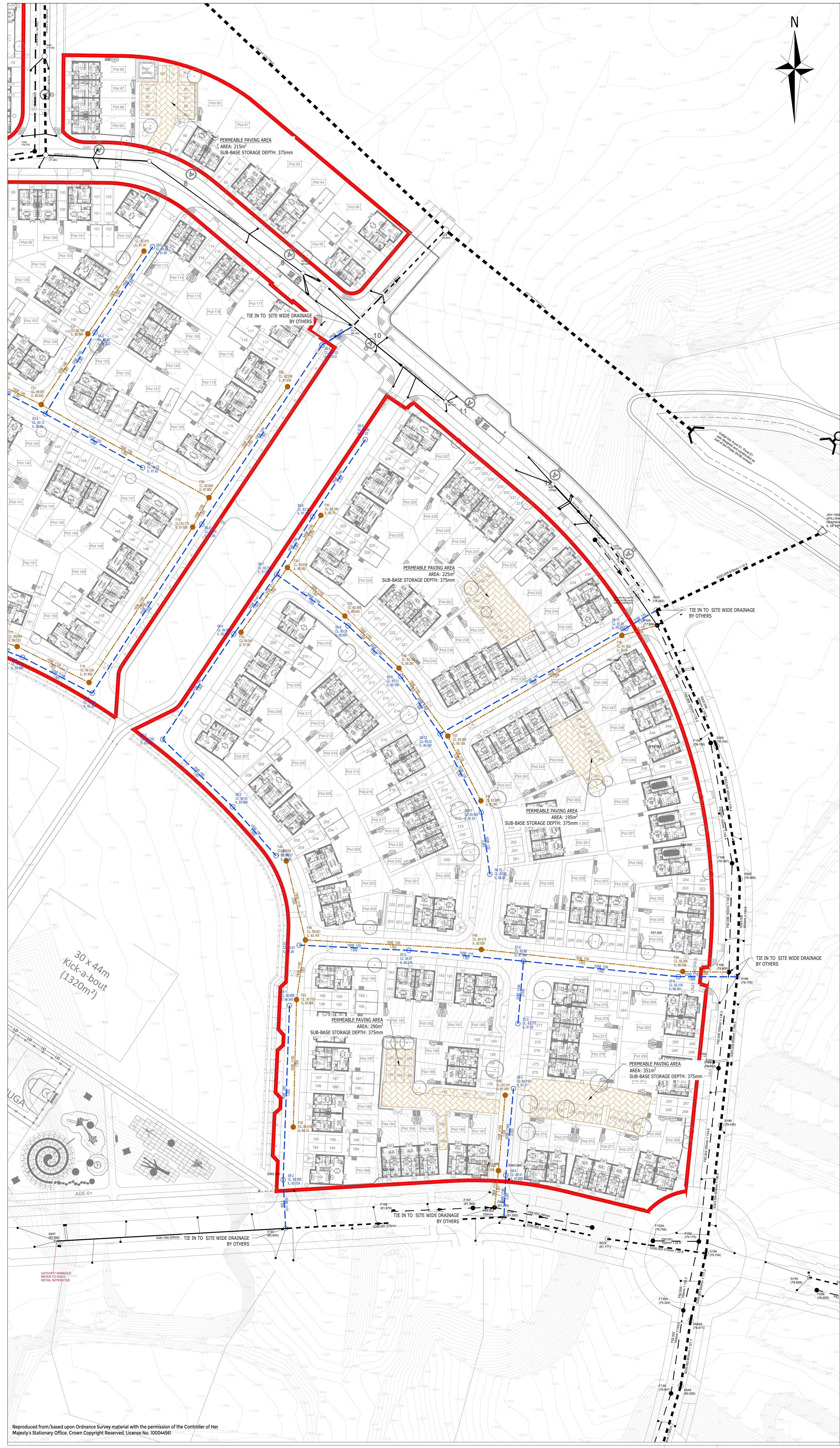


KEY PLAN - SCALE 1:8000

WORK IN PROGRESS

Rev	Description	Dn	Chk	App	Date
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Client CREST NICHOLSON SOUTH					
Project Title: KILNWOOD VALE PHASE 3 DEFG - PLANNING					
Drawing Title: PRELIMINARY SURFACE AND FOUL WATER DRAINAGE STRATEGY (SHEET 1 OF 2)					
A1 Scale	1:500	Date	SEP 23	Designed by	JL
Drawn by	JL	Checked by	MSL	Approved by	JEC
Drawing Number	2107121-002				Rev -

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CDM NOTES

THE ATTENTION OF THE CLIENT, PRINCIPAL DESIGNER, PRINCIPAL CONTRACTOR, DESIGNERS AND CONTRACTORS IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:

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WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.

3.

HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.

4.

THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.

5.

THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

LEGEND

DEVELOPMENT BOUNDARY

PROPOSED ADOPTABLE FOUL WATER SEWER & MANHOLE (WITH MANHOLE REF. No.)

PROPOSED ADOPTABLE SURFACE WATER SEWER & MANHOLE (WITH MANHOLE REF. No.)

SITE WIDE SURFACE WATER DRAINAGE

SITE WIDE FOUL WATER DRAINAGE

PROPOSED PERMEABLE PAVING WITH GEO-CELLULAR SUB-BASE (95% VOIDS)

SHEET 2

KEY PLAN - SCALE 1:8000

WORK IN PROGRESS

Rev

Description

Drn

Chk

App

Date

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CREST NICHOLSON SOUTH

Project Title:

KILNWOOD VALE PHASE 3 DEFG - PLANNING

Drawing Title:

PRELIMINARY SURFACE AND FOUL WATER DRAINAGE STRATEGY (SHEET 2 OF 2)

A1 Scale

1:500

Date

SEP 23

Designed by

JL

Drawn by

JL

Checked by

MSL

Approved by

JEC

Drawing Number

2107121-003

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Appendix B

MicroDrainage Surface Water Calculations

Ardent		Page 1
3rd Floor, The Hallmark Building 52-56 LeadenHall Street London, EC3M 5JE		
Date 28/01/2022 12:47 File A.MDX	Designed by mrickleton Checked by	
Innovyze Network 2020.1		

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
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 Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.309	4-8	0.067

Total Area Contributing (ha) = 0.376

Total Pipe Volume (m³) = 7.106

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	17.383	0.103	168.8	0.054	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	47.528	1.347	35.3	0.110	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	56.986	2.710	21.0	0.081	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	11.906	0.310	38.4	0.086	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.29	79.145	0.054	0.0	0.0	0.0	1.00	39.9	7.3
1.001	50.00	5.65	79.042	0.164	0.0	0.0	0.0	2.21	87.9	22.2
1.002	50.00	5.98	77.695	0.245	0.0	0.0	0.0	2.87	114.0	33.2
1.003	50.00	6.07	74.985	0.331	0.0	0.0	0.0	2.12	84.2	44.8

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