



**PERSIMMON HOMES THAMES VALLEY
HAMPTON PARK
LITTLEHAMPTON**

**PHASE 5 AND MAIN AVENUE SURFACE
WATER DRAINAGE (DISCHARGE OF
CONDITION 10)**

JUNE 2021

the journey is the reward

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**Persimmon Homes Thames Valley
Hampton Park
Littlehampton
Phase 5 and Main Avenue Surface Water Drainage (Discharge of Condition 10)**

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1 Introduction

- 1.1 Mayer Brown Ltd (MBL) has been commissioned by Persimmon Homes Thames Valley (PHTV) to compile this report to facilitate the discharge of planning Condition 10 for their outlined approved development (**Arun DC reference LU/47/11/**) for up to 1,200 residential dwellings, B1 employment use, Class A facilities, a 100 bed hotel, 0 bed care home, primary school, plus many other facilities and improvements to the local infrastructure. Refer to Appendix A for the Site Location.

Outline Planning Consent

- 1.2 Outline Planning Consent was granted in 2011, under Arun District Council planning reference LU/47/11, which includes Condition 10 that relates to surface water drainage. This is covered in more detail within the report.

Purpose of this Drainage Report

- 1.3 The reserved matters application area is contained within the overall south and east of central wetlands area covering a total area of approximately **24.3 hectares** with interconnecting drainage networks.
- 1.4 The purpose of this report is to demonstrate the south and east of central wetlands can be safely drained of surface water run-off and will not cause flooding to itself or increase the risk of flooding to adjacent / downstream areas. Phase 5 and the main avenue are contained within this drainage network

Proposed Development

- 1.5 The proposed Phase 5 & Main Avenue application site for **260 new dwellings and approximately one kilometre of Main Avenue** that is identified within the red line boundary in Appendix B.
- » The reserved matters layout and associated surface finishes for the phase 5 residential area is contained in Appendix C.
 - » The reserved matters layout and associated surface finishes for the phase 5 residential area is contained in Appendix D.

2 Surface Water Drainage Condition 10

Condition 10: *No development shall begin until a fully detailed surface water drainage scheme for that phase of the development, based on sustainable drainage principles and designed in accordance with the SUDS strategy for the whole development, has been submitted to and approved in writing by the Local Planning Authority. It should be demonstrated how each detailed scheme will contribute to delivering, and link into, the surface water drainage strategy for the site as a whole.*

- *The SUDS shall be designed to attenuate the 1 in 100 year storm event (plus climate change allowance of 30% in accordance with DEFRA's National Standards for Sustainable Drainage Systems).*
- *No infiltration of surface water drainage shall occur within ground affected by contamination unless suitable remediation is undertaken.*
- *Each detailed scheme should include a timetable for its implementation; and provide a management and maintenance plan in the form of a site specific Maintenance Manual for the SUDS system for the lifetime of the development. This shall include the arrangements for adoption by any public authority or statutory undertaker or details of the financial management of the scheme throughout its lifetime.*

Elements of the scheme serving any particular phase shall subsequently be implemented in accordance with the approved details (unless otherwise agreed with the Local Planning Authority) prior to the occupation of any dwellings in that phase and no building in that phase of the development shall be occupied until the surface water drainage scheme has been fully implemented in accordance with the approved details.

Reason: To ensure that the proposed development is satisfactorily drained to prevent the increased risk of flooding, and improve and protect water quality, habitat and amenity, and ensure future maintenance of these in accordance with national guidance and policies GEN7, GEN9 of the Arun District Local Plan.

3 South & East Central Wetlands Surface Water Strategy

3.1 From a drainage perspective the outline approved masterplan can viewed as two distinct areas that is divided by the central wetlands:

- » **West of Central Wetlands:** The west of central wetlands catchment covers a total area of 19 hectares that is subdivided into 1 land parcels. A large proportion of this catchment has already been constructed and the overall surface water strategy has been reviewed and approved by Arun DC. This approved strategy will continue to be used as the individual reserved matters applications come forward in the future.
- » **South and East of Central Wetlands:** The south and east central wetlands catchment covers a total area of **24.3 hectares** that will also be subdivided into phases / land parcels. None of the phases / land parcels within this catchment have obtained reserved matters planning approval yet and, as such, none of it has been constructed. A breakdown of this catchment is as follows:
 - **Phase 5** Residential for 20 dwellings (**Subject to this RM Application**)
 - Phase Residential, number of dwelling tbc
 - Phase 7 Residential, number of dwelling tbc
 - Community Centre
 - Primary School
 - Youth Centre
 - **Main Avenue** Main infrastructure. Approximately 1.0 kilometre of tree lined main road/main road looping from the west of wetlands through the east of wetlands residential areas, past the new school, community centre and youth centre and linking back onto Toddington Lane (**Subject of this RM Application**)

Outline Approved Surface Water Strategy (2011)

3.2 Greencore obtained outlined planning consent for the scheme in 2011, using White Young Green (WYG) as their drainage consultants, and subsequently sold the site to PHTV.

3.3 The approved drainage strategy from 2011 is contained in Appendix E, which is titled Proposed Surface Water Management Plan. This is a high level drawing identifying a central swale (dark blue dashed line) that forms a distinct break running through the

centre of the overall development. This central swale is fed by secondary swales from within the development parcels. The secondary swales are also shown to discharge into the wetland area to the north using the existing ditch network. There is also an attenuation pond connected to the head of the central swale that is formed by partially filling in an existing lake.

- 3.4 This high level WQG strategy is reflected in the approved masterplan, also in Appendix E, which makes space for these swales and pond.

Updated Surface Water Strategy (2021)

- 3.5 This updated surface water strategy retains the principles set out in the outlined approved drainage strategy by keeping the swales and pond in the same locations. Refer to the updated overall drainage strategy drawing in Appendix G.
- 3.6 This strategy covers a total area of approximately 24.3 hectares that has been progressed/engineered significantly where swale dimensions, bed levels, top of bank levels have all been established. The proposed ground levels in the development parcels have been engineered to ensure their drainage networks feed on a gravity basis into swales.

Pre-Demolition Drainage

- 3.7 The pre-demolition site was heavily developed comprising large glasshouses with associated outbuildings and areas of hardstanding. Refer to the site location plan in Appendix A that shows the extent of the glasshouses covering the site to the east and west of the wetlands.
- 3.8 A plan illustrating the existing surface water regime, produced by Glanville in 2014, is contained in Appendix F.

West of Central Wetlands Drainage

- » Western Area - The former Toddington Nurseries: The western part of the site comprising is understood to have discharged to a combination of soakaways and outfall to the existing ditch system north of the site.
- » Central West Former Holland Nursery: Discharged to an irrigation pond before discharging to Toddington ditch. It is understood that there was no restriction of flows from the system.

South and East of Central Wetlands

- ✦ Central East Area: Outfall to Toddington ditch. It is understood that there was no restriction of flows from the system.
- ✦ Eastern Area: Former Quader Lee nursery. Discharged east towards a lake and irrigation lagoon pond before discharging to Norway Stream. It is understood that there was no restriction of flows from the system. Just the glasshouses and polytunnels alone covered an area of approximately 11.0 hectares within this catchment.

Proposed Overall Discharge Rate

- 3.9 Arun DC SFRA identified the site as brownfield and states that development is unlikely to significantly increase run-off but should seek to reduce rates where possible. Therefore, the proposal is to specify a reduced rate of run-off when compared to the pre-demolition run-off described above.
- 3.10 A proposed peak discharge rate has been calculated using Greenfield runoff methods provided in IoH124 using a Soil Type of 5 to make allowance for the possible effect of the previous extensive impermeable area. The resulting 1 in 1 year brownfield rate has been calculated at approximately 15 litres /second / hectare. A copy of the relevant calculation is contained in Appendix H.
- 3.11 Therefore, the peak rate of surface water discharge for up to the **1 in 100 year return period + 30% climate change** will be restricted to **15 litres / second / hectare**. This is the same as for the approved west of wetlands strategy where the proposed peak rate of surface water discharge will provide betterment when compared to the pre-demolition undeveloped scenario.
- 3.12 The proposed **total combined** discharge from these 4 catchments will not exceed **364 litres/second** (15 litre/sec/hectare x 24.27 hectares) for up all storm events up to the 1in100 year return period plus 30% climate change. (30% climate change is applied in this instance because this was the approved climate change allowance

Proposed Surface Water Layout

- 3.13 The entire 24.27 hectare is divided into 4 catchments that is clearly identified on overall drainage strategy drawing in **Appendix G**:
- ✦ Catchment 01: Residential area in Phase 5
 - 0.53 Hectares,

- Discharges to new outfall 01 into the central wetland.
 - ✧ Catchment 02: Residential area in Phase 5, plus circa 300 metres of main avenue
 - 1770 Hectares.
 - Discharges into Swales 01 & 02.
 - Swale 02 Discharges to new outfall 02 into the central wetland.
 - ✧ Catchment 03: Partial Phase 5, circa 200 metres main avenue, Phase 6 & 7, School
 - 15.4 Hectares,
 - Discharges into Swales 03, 04, 05, 06, 07 & Pond
 - Swale 07 Discharges to new outfall 03 into the central wetland.
 - ✧ Catchment 04: circa 210 metres main avenue, community centre, Youth Area
 - 1.50 Hectares,
 - Discharges to new outfall 04 into the central wetland.
- 3.14 There will be a traditional network of gullies, pipes and manholes that will convey the surface water run-off to numerous outfalls into the swale network.
- 3.15 The entire interconnected system of pipes and swales has been accurately modelled in microdrainage and the results are contained in Appendix X.

Swales

- 3.16 In total there are seven swales across the network and their typical cross sections are shown on a drawing in Appendix H. The Development parcels and their respective swales are all set higher than the central and northern wetland, which enables them to discharge/empty into the wetland outfalls without being affected by the 1in100yr flood level of 1.03 AOD.
- ✧ Swale 01 & 02: Drains Catchment 02,
 - Combined Attenuation Volume: 2,220m³
 - Bed level: 1.90m AOD
 - Top of bank level 3.7m AOD,
 - Top Water level 3.4m AOD (300mm freeboard)
 - ✧ Swales 03, 04, 05, 06 & 07: Drains Catchment 03,
 - Combined attenuation volume: 7,700m³,
 - Bed Levels: Range from 3.2 to 2.4
 - Top of bank level 4.4m AOD,
 - Top Water level 4.1m AOD (300mm freeboard)

3.17 The swales do not have any longitudinal fall so the bed level is completely flat. The main discharge locations for the swales are into the new central wetland via new outfalls 02 and 03. There are also secondary outfalls to the north that allow the swales to drain down. The rate of discharge out of these secondary outfalls will be quite low at 5 litres/second. The reason for pushing most of the flow towards the central wetland area is to maintain a flow of water this area and also to increase the travel distance before it reaches the Black Ditch.

3.18 The swales have relatively shallow side slopes no steeper than 1in3. It is expected there will be some infiltration through the base and sides (they will not have an impermeable liner) although this has not been modelled in the micro drainage calculations.

Proposed Catchment Discharge Rates

3.19 There are two catchments 02 & 04, with a combined area of approximately 2.0 hectares, where the development configuration and resulting levels do not enable it to drain into the swales.

3.20 There is however a very large volume of attenuation within the swale network and attenuation pond of catchment 03 (total volume of approximately 15,000m³) so the plan is to sub-divide / distribute proposed outfall rates that will enable Catchment 01 & 02 to have a free unrestricted discharge and remove/reduce the volumes of below ground proprietary attenuation tanks. The total combined discharge across the entire network still **will not exceed 364 litres / second**

3.21 With the above in mind the proposed peak discharge rates from the 4 catchments are as follows:

- ✦ Catchment 01 (0.533 hectares): Restricted to 75 litres/sec
- ✦ Catchment 02 (0.77 hectares): Restricted to 100 litres/sec
- ✦ Catchment 03 (15.4 hectares): Restricted to 4 litres/sec
- ✦ Catchment 04 (1.5 hectares): Restricted to 100 litres/sec

Total Combined Peak Discharge: No greater than 364 litres/second

Phase 5 and Main Avenue Surface Water Drainage

3.22 The reserved matters Main Avenue and Phase 5 drainage design drawings are contained in appendices I and J respectively. The entire south and east of central wetlands drainage network had to be designed because this reserved area is spread across all 4 drainage catchments.

Surface Water Treatment

3.23 Table 2.2 of the SuDS Manual identifies the pollution hazard level associated with the land uses within the Proposed Development as being **Low**. On a scale from 0-1 a **Low** pollution hazard level relates to the following pollution hazard indices (See table 2.2 of the SuDS Manual) This is applicable to runoff from residential roofs, driveways, paths, residential parking areas and low traffic roads:

- ✦ Total Suspended Solids ≤ 0.5
- ✦ Metals ≤ 0.4
- ✦ Hydrocarbons ≤ 0.4

3.24 Table 2.3 of the SuDS Manual sets out the indicative mitigation indices provided by different SuDS features for discharges to surface water.

Swale Networks (& Ditch in Central Wetland Area)

3.25 The new swales within the Development platforms will not have any longitudinal fall and eventually outfall into the central wetland area will flow through a swale before it connects into the new ditch passing through the central wetland area and eventually into the Black Ditch.

3.26 This new ditch will also be entirely flat (similar to the local existing ditch network) so the water will be extremely slow moving allowing pollutants to drop out before it reaches the Black Ditch. Swales can remove coarse to medium sediments and associated pollutants by filtration through surface vegetation and groundcover, providing mitigation indices of 0.5, 0.4 and 0.3, which exceed the requirement set out in paragraph 3.22.

Traditional Gullies

3.27 Full size precast concrete gully pots draining the asphalt roads that will act as the first line of defence to trap silt and sediments in the drainage network.

Exceedence Flows

3.28 The entire drainage network drainage network is designed to cope with all rainfall events up to the **1in100yr return period+30%CC** and this water will be contained on site within the developed area (not the wetlands).

3.29 The ground and road levels have also been engineered so it falls either towards a swale or outwards towards the wetland from the new dwelling. The proposed overall drainage

plan in Appendix G show the proposed levels and the route of overland flow in the event of system failure, blockage or overload.

Surcharged Outfall

- 3.30 It is important to ascertain what would happen if the central wetland area flooded and the new outfalls become surcharged. The EA supplied 1in100yr 20th CC modelled flood level within the floodplain ranges from 1.72m AOD to 1.3m AOD. A flood level in the wetlands of 1.0m AOD will have a negligible effect on the ability of the new outfalls to empty because all the attenuation tanks, swales and attenuation pond are above the flood level and, as such will be empty into the wetland even in an extreme flood scenario

Adoption and Maintenance

- 3.31 The proposed surface water drainage systems will be offered for adoption to ICOSA Water under a S104 agreement, which will ensure they are maintained in perpetuity.

Drainage Network Design Criteria

- 3.32 The positive drainage will be designed in accordance with Sewers for Adoption, and BS EN 752 – Drain and sewer systems outside buildings and the Building Regulations - part H (2002).
- 3.33 The surface water network design and rate of surface water runoff would be based on the Modified Rational method and designed in accordance with the Wallingford Procedure. In order to carry out the design of the networks, a number of Global Variables are used. These Global Variables / parameters are related to the location of the site in the UK and have been obtained from the **Flood Estimation Handbook (FEH)**.
- 3.34 The exact total impermeable area has not been measured because a large proportion of the development has not been fully designed yet. Therefore, the proposed simulations have been run with a **Cv** value of **0.84**
- 3.35 The positive surface water system would be designed such that:
- ✧ The pipes remain unsurcharged during the 1 in 2 year design storm
 - ✧ The system should not flood during the worst case 1 in 30 year storm with a free outfall
 - ✧ The surface water run-off from the proposed development would be safely contained on site for up to and including the worst case 1 in 100 year storm event, plus an additional 30% for climate change

- » The pipe velocities are such that self-cleansing is achieved at lesser more moderate storm intensities:
 - Pipe roughness (ks) □ 0.□
 - Minimum pipe velocity at full flow □ 1.0 m/s
 - Cv Value of 1.0
 - Percentage Impermeable areas
 - Buildings □ 100□
 - Carriageways and footpaths □ 100□
 - Private and Communal Parking □ 100□

Micro Drainage Software

- 3.3□ The proposed network has been designed and analysed using the Micro drainage software package that is recognised as one of the industry standard design suites. There are two separate programmes used within the package to firstly generate and then analyse the completed model. These are □System 1□ and □Simulation□
- » Network: The surface water computer model has been generated in □System 1□ in using proposed data, such as the cover levels, invert levels and catchment areas. This is used to si□□ the pipes in the proposed network based on the global variable outlined above.
 - » Simulation: Once the proposed drainage system has been generated it was analysed using □Simulation□ This is a full hydrograph method for the determination of flood risk and system failure under extreme conditions. It can be used to analyse system overloads, storage, reverse flow characteristics, surcharging and backwater effects. It can also analyse against a wide variety of critical variables.

Return Periods & Critical Duration Storms

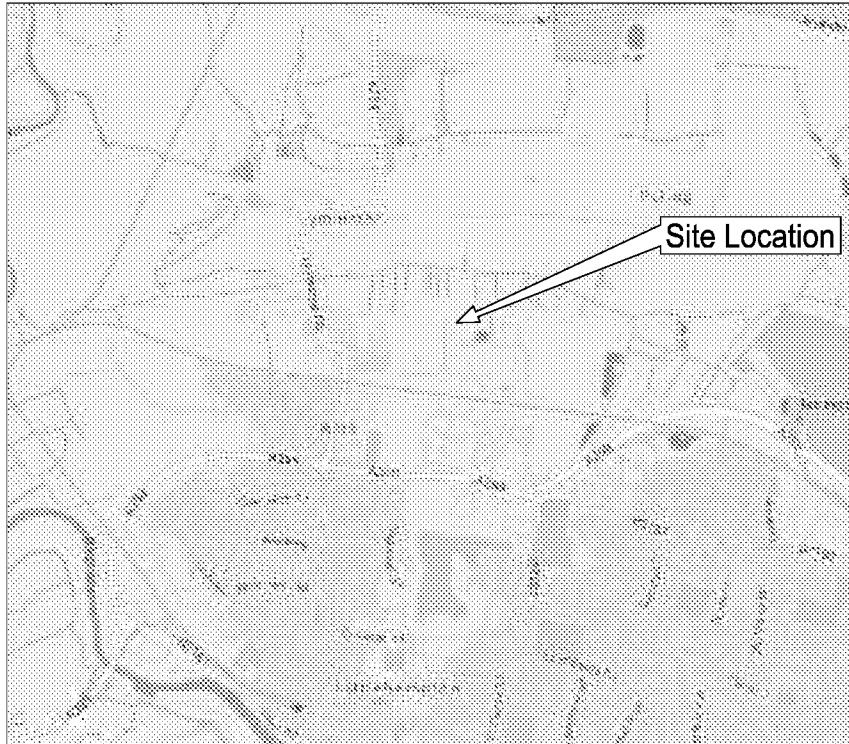
- 3.37 To determine the hydraulic re□uirements for an element of a drainage system, one must first consider the conse□uences of that capacity being exceeded, and then identify an acceptable fre□uency for this to occur. This acceptable fre□uency is termed the return period, the period of time during which the stated rainfall can be expected to be exceeded on average once. That particular element is then designed to accommodate a storm / flood with this return period.
- 3.3□ Once the design return period is established, the most critical storm duration for each of the elements is determined. These range in duration from 15 to 1440 minutes. For example□

- » A 1 in 30 year, 30 minute duration storm has an average intensity of 12mm/hr (figure taken from simulated result). This intensity storm would be used to size the pipes and other drainage elements for conveyance purposes.
- » A 400 minute duration storm has an average intensity of only 1mm/hr. However, the 400 minute storm lasts 10 times longer, therefore generating a much greater volume of water, and would be used to size the attenuation devices.

4 Condition 10 Conclusion

- 4.1 This surface water drainage strategy report, with accompanying drawings and calculations, demonstrate that the reserved matters planning application for Phase 5 and the main avenue of the greater outline approved Hampton Park development can be drained satisfactorily without increasing flood risk elsewhere.
- 4.2 The Surface water runoff will be discharged to the Black Ditch at a peak allowable discharge of 15 litres / second / hectares for up to the 1 in 100 year return period, plus 30% allowance.
- 4.3 It has already been agreed that this proposed rate of discharge will provide considerable betterment when compared to the pre-demolition brownfield arrangement (as established in the west of wetland report). The provision of SuDS and attenuation features will store the balance of surface water runoff.
- 4.4 The ground and road levels have been engineered so it falls either towards the swales or outwards towards the wetlands from the new dwellings. The proposed overall drainage plan in Appendix G show the proposed levels and the route of overland flow in the event of system failure, blockage or overload.
- 4.5 Therefore, it is considered that this evidence base, when read in conjunction with the approved West of Wetlands drainage strategy, provides sufficient information to discharge the outline planning Condition 10 for the Phase 4 reserved matters application.

APPENDIX A: Hampton Park Site Location & Pre-Demolition Layout



NOTES

1. This drawing is to be read in conjunction with all relevant documents and specifications.
2. Dimensions not to be scaled.

LOCATION

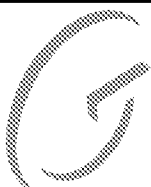
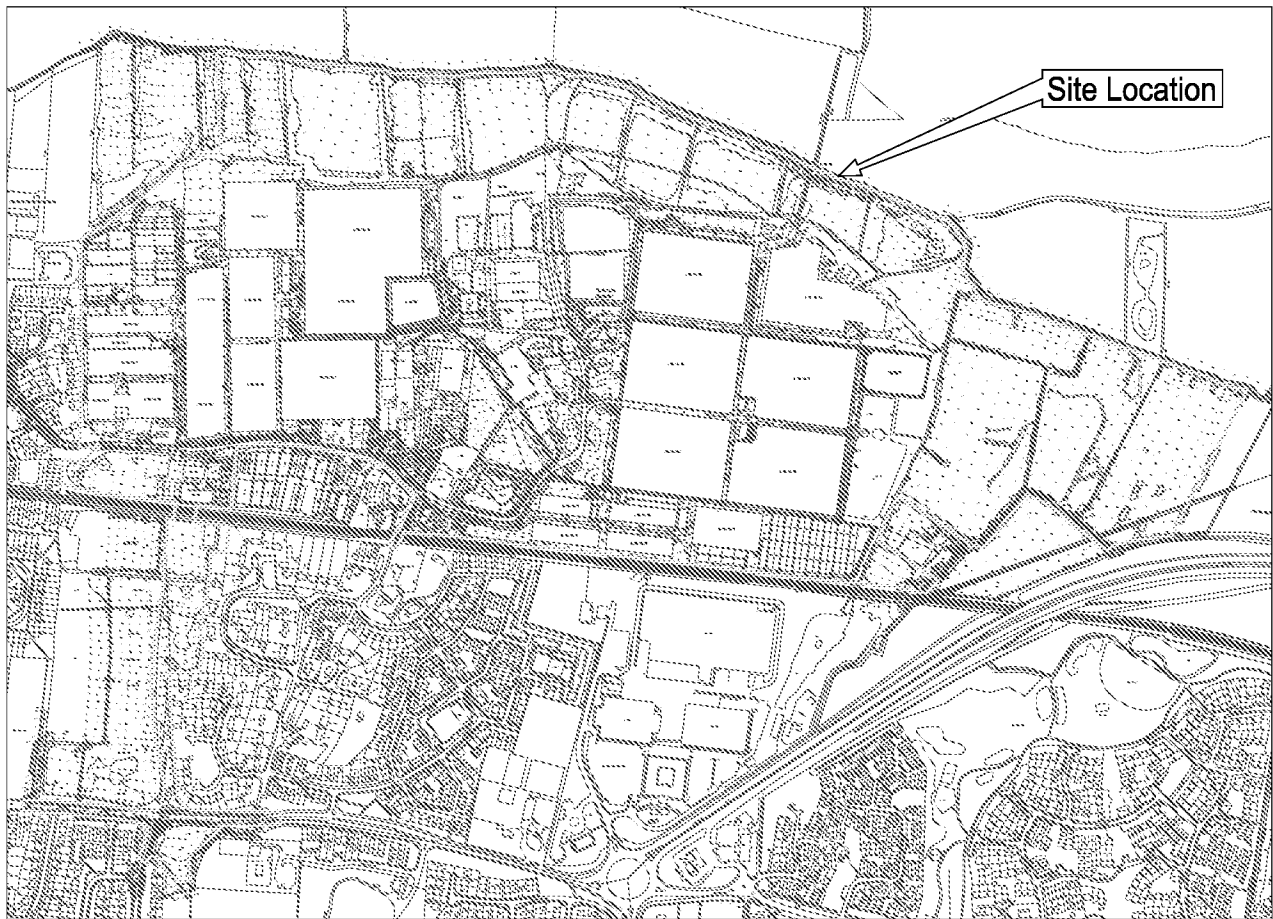
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Wick
Littlehampton
West Sussex
BN17 7PP

National Grid reference: TQ 03414 03979



Plan NTS

Plan 1:10000



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Project :

Land North of Toddington Lane, Littlehampton

Title :

Site Location Plan

Project Engineer :

J O'Kelly

Scale : As Shown@A4

Project Director :

k Rayner

Date : December 14

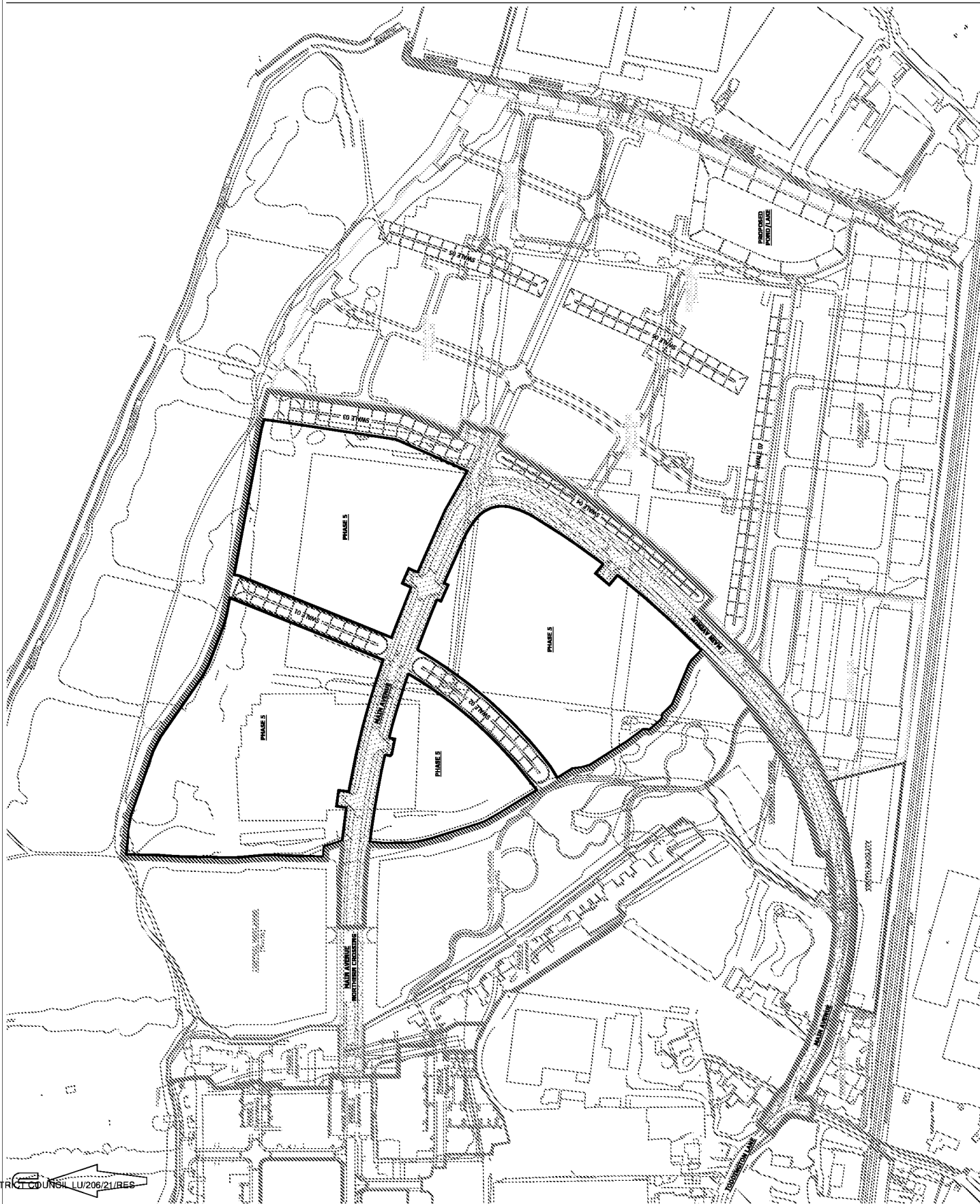
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APPENDIX B: Phase 5 & Main Avenue Location within Masterplan



APPENDIX C: RM Application – Main Avenue Surface Finishes Plans