



**PERSIMMON HOMES THAMES VALLEY
LAND NORTH OF TODDINGTON LANE,
LITTLEHAMPTON**

**DRAINAGE STRATEGY, WEST OF
WETLANDS
(DISCHARGE OF CONDITIONS REPORT.
CONDITIONS 10, 11, 12 & 13)**

MARCH 2018

the journey is the reward

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**Persimmon Homes Thames Valley
Land North of Toddington Lane, Littlehampton
Drainage Strategy, West of Wetlands
(Discharge of Conditions Report. Conditions 10, 11, 12 & 13)**

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1 Introduction

- 1.1 Mayer Brown Ltd has been commissioned by Persimmon Homes Thames Valley (PHTV) to compile this Surface and Foul Water Drainage Strategy to assist with the discharge 4 of planning conditions for their outlined approved development (**Arun DC reference LU/47/11/**) for up to 1,260 residential dwellings, B1 employment use, Class A facilities, a 100 bed hotel, 60 bed care home, primary school, plus many other facilities and improvements to the local infrastructure.

Outline Planning Consent

- 1.2 Outline Planning Consent was granted in 2011, under Arun District Council planning reference LU/47/11, which includes four conditions that relate to drainage. These are covered in more detailed within the report but a high level description is as follows:

- ✦ Condition 10 – Surface Water Drainage Strategy
- ✦ Condition 11 – Existing Watercourses and Culverts
- ✦ Condition 12 – Discharge Consents
- ✦ Condition 13 – Foul Water Drainage

Purpose of this Drainage Report

- 1.3 This drainage report does not cover the entire area that received outline planning approval. It includes the development area of approximately 19.0 hectares to the west of the wetlands as identified Appendix B, titled “Land Uses and Drainage Areas Covered”.
- 1.4 There are a total of 18 land parcels and associated road infrastructure identified within this catchment at varying states of progress. The report describes the design philosophy behind the main surface and foul water sewers within the road network that will eventually drain the development parcels within this area. It also specifies the proposed connection points and peak allowable surface water discharge from each of the land parcels.
- 1.5 A parcel specific surface and foul water drainage strategy will still be required to accompany the reserved matters (RM) applications from the individual land parcels.

- 1.6 This report is to be used to accompany the RM planning applications for each of the individual parcels in order to demonstrate that the receiving drainage network has been adequately designed and considered.
- 1.7 This report should discharge outline planning Conditions 11 & 12 without the reliance of an accompanying RM strategy because these are remote from the individual land parcels and are considered to be strategic conditions.

Previous Consultancy Work

- 1.8 Greencore obtained outlined planning consent for the scheme in 2011, using White Young Green as their drainage consultants, and subsequently sold the site to PHTV.
- 1.9 Glanville Consulting Engineers were employed by PHTV to develop the surface and foul water strategy further. Glanville are no longer working on the project but produced useful information to depict the pre-development scenario, which is contained in a number of Appendices within this report.
- 1.10 Mayer Brown were employed by PHTV as their drainage consultants for the project in September 2017 and where possible will utilise the information produced by previous Consultants.

2 Condition 10 - Surface Water Drainage

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.

Pre-Demolition Site

- 2.1 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.
- 2.2 A plan illustrating the existing surface water regime, produced by Glanville in 2014, is contained in Appendix K.
- » 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.

Infiltration

- 2.3 Intrusive ground investigations and soakage testing undertaken by Merebrook have confirmed that infiltration methods for the disposal of surface water runoff are unlikely to be practical across the majority of the site as the underlying material is generally found to comprise of Clay.
- 2.4 Review of these investigative reports appears to indicate only two areas where infiltration drainage were feasible (subject to further testing):
- » Towards the western part of the site at depths of around 1.0m into the localised sand deposits; Parcels B3, B5, B1, Care Home, Enterprise Zone
 - » Towards the western part of the site at depths of around 2.0m into localised Sand deposits; notably Parcels A1, A2, Youth Facility, B6, Waste Recycling Centre, and Commercial Areas.
- 2.5 Other than the locations noted above infiltration methods for the disposal of surface water runoff are unlikely to be feasible due to either the presence of Clay material or high groundwater levels.
- 2.6 Modelled Flood Levels in the Black Ditch are within a metre of ground level in many locations which could restrict depths available to effectively locate SuDS features.

Sustainable Drainage (SuDS) and Drainage Hierarchy

- 2.7 Sustainable Urban Drainage Systems (SuDS) are a range of techniques that aim to mimic the way rainfall drains in natural systems and so reduces the hydraulic and hydrological impact on the local area and downstream catchments. There are a number of options available to impose surface water restrictions on proposed development plots such as oversized sewers, below ground storage tanks, attenuation ponds and basins, swales, permeable paving, or infiltration systems.
- 2.8 To determine the most sustainable method of surface water disposal the hierarchy from approved document part H was used, see below:
- » **An adequate soakaway or some other adequate infiltration system** apart from a few locations across the site infiltration methods for the disposal of surface water runoff are not feasible due to either the presence of Clay material or high groundwater.
 - » **A Watercourse** – The Black Ditch is located to the north of the site within the boundary of the consented scheme. There are ordinary watercourse tributaries that run across the wetlands and connect to the Black Ditch
 - » **A Sewer** – There are no public surface water sewers in the immediate vicinity. The only drains available were those that drained the pre-demolition glasshouses and discharged into the black ditch.

Proposed Surface Water Strategy

- 2.9 Based upon the above hierarchy a high level description of the surface water strategy is that the entire 19 hectare catchment as identified in Appendix B will drain at a restricted rate of run-off into the Black Ditch via a single outfall located at the northern boundary of development parcel C2.
- 2.10 As explained in the introduction this report describes the drainage strategy for the development parcels and associated road network for the consented scheme to the west of the wetlands. (The remaining area to the east of the wetlands is currently under development).

Proposed Discharge Rates

- 2.11 The pre-demolition impermeable area for the overall consented scheme was approximately 38 hectares, whereas the proposed impermeable area will be approximately 27 hectares. The rates and volumes of discharge will naturally significantly reduce following completion of the consented scheme.

- 2.12 The Arun DC SFRA identifies the site as brownfield and states that development is unlikely to significantly increase run-off but should seek to reduce rates where possible.
- 2.13 For the western portion of the site, given the large impermeable area and expected overland flows, a conservative 'brownfield rate' has been calculated using Greenfield runoff methods provided in IoH124 utilising a Soil Type of 5 to make allowance for the possible effect of the extensive impermeable area. The resulting 1 in 1 year brownfield rate for this area has been calculated at approximately 15 litres /second / hectare. A copy of the relevant calculation is contained in Appendix K.

Peak Discharge Rate

- 2.14 The proposed peak rate of surface water discharge, as agreed at the outline planning stage, will provide significant betterment when compared to the pre-demolition undeveloped scenario. 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**.

Calculations and Results

- 2.15 A Micro Drainage model has been created of the drainage network covering the overall catchment area of 19.0 hectares. The pipes have been sized to convey the surface water run-off from each area, and the proposed peak allowable discharge has been specified from each future development plot. The overall network schematic and details are contained in Appendix H.
- 2.16 The final peak allowable discharge of **285 litres / second** (19 hectares x 15 litres / second / hectares) has been modelled for the worst case 1 in 100 year storm event + 30% climate change. The simulation results are contained in Appendix I & J.
- 2.17 The discharge rates will be considerably lower for lower intensity storm events as shown below:
- ✦ Critical 1 in 100 year storm (+30% CC): 282 litres / second
 - ✦ Critical 1 in 30 year Storm: 222 litres / second
 - ✦ Critical 1 in 1 year Storm: 144 litres / second
- 2.18 Most of the surface water attenuation will be located within the future car park area in a 1500 cubic metre proprietary storage tank and permeable paving

sub-base. There will also be attenuation in the 900mm diameter pipe running from the car park to the outfall.

- 2.19 A maximum allowable discharge will be imposed on the majority of development parcels and, as such, each parcel will need to contain surface water storage within its respective reserved matters (RM) application boundary. These have been modelled indicatively within the micro drainage network but their design will need to be undertaken to accompany each RM Application.

Existing & Future Development Parcels

- 2.20 The discharge from each parcel into the main drainage network will be restricted to the following peak rate of run-off:

⌘ Non-Resi Land (0.91Ha)	5 litres / second
⌘ Non-Resi Land (0.81Ha)	5 litres / second
⌘ Non-Resi Land (0.32Ha)	5 litres / second
⌘ Non-Resi Land (Hotel)	5 litres / second
⌘ Care Home:	5 litres / second
⌘ Parking Square:	5 litres / second
⌘ A1 Parcel (Existing):	34.5 litres / Second
⌘ A2 Parcel:	5 litres / second
⌘ B1 Parcel:	5 litres / second
⌘ B2 Parcel:	Free Discharge into Network
⌘ B3 & B5 Parcel (Existing):	120 litres / second
⌘ B6 Parcel:	5 litres / second
⌘ Block B Parcel:	5 litres / second
⌘ Block A Parcel:	5 litres / second
⌘ B4 Parcel (Phase2):	Free Discharge into Network
⌘ C1 Parcel:	Free Discharge into Network
⌘ C2 Parcel:	Free Discharge into Network
⌘ C4 Parcel:	Free Discharge into Network
⌘ Roads Serving Above	Free Discharge into Network

Modelled Overflow into Future Parcel B4

- 2.21 There is a requirement to add an overflow in the drainage network at the south west corner of the catchment (by SW01). The drainage is exceptionally

shallow in this location so there is no scope to add surface water attenuation under the road or adjacent parking areas.

- 2.22 Approximately 226m³ of surface water run-off will overflow into the proposed surface water drainage network that will eventually serve the future development parcel B4. This will only occur for the critical duration storm (120mins) for the 1in100yr return period + climate change.
- 2.23 Therefore, the plan is to increase the size of the future attenuation tank in the adjacent B4 parcel so it will store the 226m³ and release it into the wetlands via a future outfall at the agreed rate of 15 liters / second / hectare.

Surface Water Treatment

- 2.24 Table 26.2 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 26.2 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
- 2.25 Table 26.3 of the SuDS Manual sets out the indicative mitigation indices provided by different SuDS features for discharges to surface water.

Permeable Paving

- 2.26 Communal parking and private driveways will be constructed using permeable paving allowing the rainwater falling onto permeable paved areas to be treated by the microorganisms as it passes through drainage medium, see Figure 4.1 below.
- 2.27 Permeable paving provides sufficient pollution mitigation for runoff from low hazard land uses and provides mitigation indices of 0.7, 0.6 and 0.7, which are in excess of the requirement set out in paragraph 2.25.

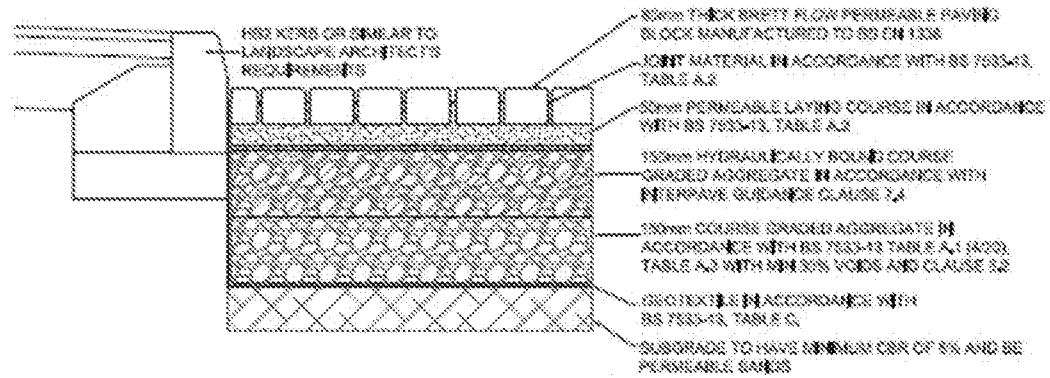


Figure 2.1: Typical Permeable Block Paving Construction

Permeable Sub-base Road

- 2.28 A number of the private roads within C2 Parcel, B2 Parcel and B4 Parcel draining into the drainage network will drain via permeable sub-base located under the road surface. The specific construction is contained in Appendix M.
- 2.29 It is considered that the permeable sub-base provides sufficient pollution mitigation for runoff from low hazard land uses and provides mitigation indices of 0.7, 0.6 and 0.7, which are in excess of the requirement set out in paragraph 2.25

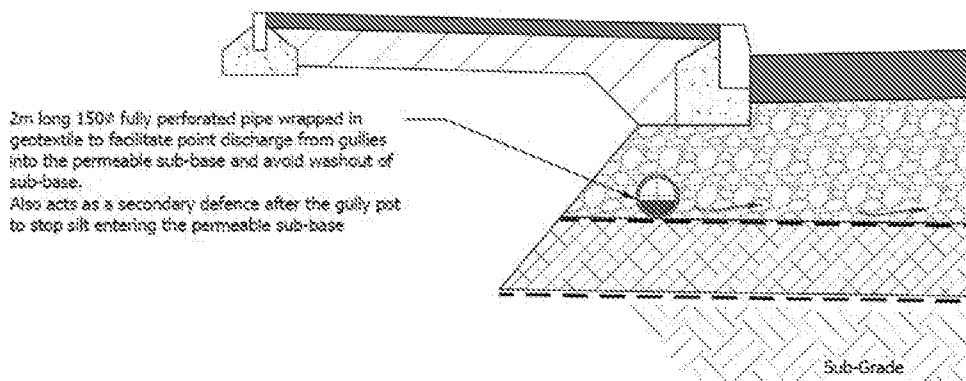


Figure 2.2: Permeable Sub-base Road (refer to Appendix M)

- 2.30 The private roads within C1 Parcel will drain via a filter trench running adjacent the carriageways. The specific construction is contained in Appendix M.
- 2.31 It is considered that the granular material sub-base will provides sufficient pollution mitigation for runoff from low hazard land uses and provides mitigation indices of 0.7, 0.6 and 0.7, which are in excess of the requirement set out in paragraph 2.25

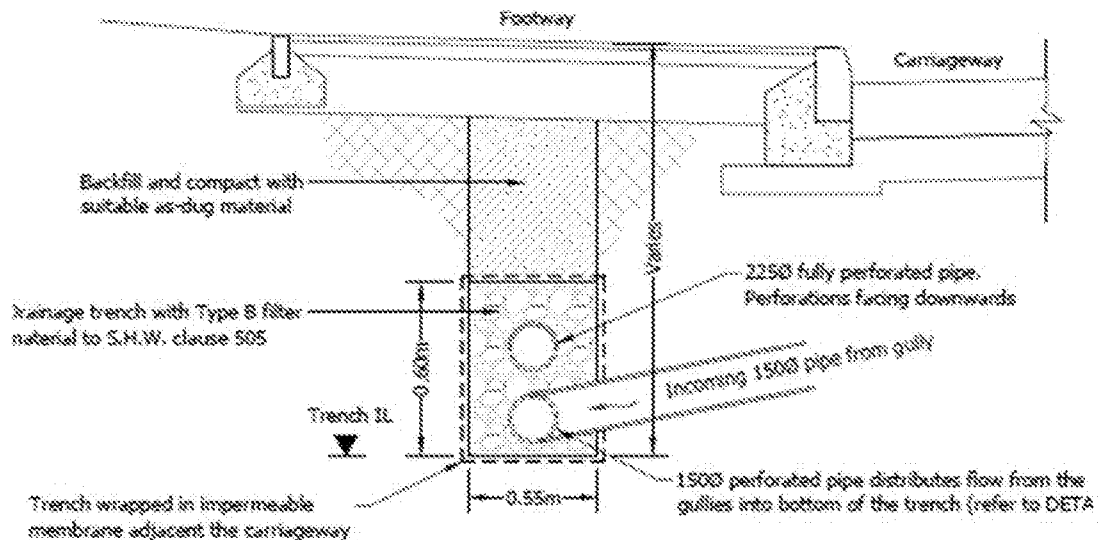


Figure 2.3: Permeable Sub-base Road (refer to Appendix M)

Traditional Gullies

- 2.32 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.

Exceedance Flows & Surcharged Outfall

- 2.33 The drainage network is designed to cope with flooding up to the **1in100yr+30%CC** flood event and this water will be contained on site within the developed areas (not the wetlands)
- 2.34 Appendix H contains drawings that show the route of overland flow in the event of system failure, blockage or overload. This demonstrates that dwellings will be suitably protected in the event of a drainage system failure and resulting overland flow can find its way safely through the road network and into the wetlands.
- 2.35 Discussions have been had with WSCC to ascertain what would happen if the wetland are flooded and the outfall becomes surcharged. The 1in100yr+CC flood level in the wetlands is 3.23m AOD by the outfall that would result in the outfall (@ 1.0m AOD) being surcharged by approximately 2.23m.
- 2.36 The chances of the critical 1in100yr+CC flood level in the wetlands (which is tidal) coinciding with the peak 1in100yr+CC storm event on the site are infinitesimally small. However, a fully surcharged outfall was simulated and results in a flood volume of 1750m³ escaping from the drainage network.

- 2.37 It was agreed with WSCC that it is not reasonable keep this flood water on site and the resulting flood water will flow safely through the road network and eventually into the wetlands, as shown in Appendix H.

Adoption and Maintenance

- 2.38 The proposed surface water drainage system will be constructed in accordance with Sewers for Adoption 7th edition (SFA7); however it will remain in private ownership and will be maintained by a Management Company organised by the Developer.
- 2.39 Some of the main roads, footpaths and shared areas will be adopted by Mid Sussex District Council under a Section 38 agreement. The remaining private roads and communal parking areas will be maintained by a Management Company, organised by the Developer.
- 2.40 Taking this approach will ensure shared drainage and infrastructure items are properly maintained. This should enable tight control over the operation and maintenance of the drainage / SuDS systems on site.

Attenuation Tank Maintenance

- 2.41 The primary purpose of the attenuation tanks is to attenuate surface water run-off during extreme rainfall events.
- 2.42 Regular inspection and maintenance is required to ensure the effective long-term operation of the below ground storage tanks, see table 2.1 below for details:

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Debris removal from catchment surface (where may cause risk to performance).	Monthly.
	Remove sediment from pre-treatment structures.	Annually, or as required.
Remedial Actions	Repair/rehabilitation of inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually and after large storms.
	Survey inside of tank for sediment build-up and remove if necessary.	Annually until evidence this is too regular, every 5 years thereafter.

Table 2.1: Attenuation Tank Maintenance Requirements

Pervious Pavement Maintenance

- 2.43 Pervious pavements are pavements that allow for pedestrian and/or vehicular traffic while allowing rainwater to infiltrate through the surface and into underlying structural foundation layers.
- 2.44 Regular inspection and maintenance is important for the effective operation of pervious pavements as designed, these are described below in table 2.2:

Maintenance Schedule	Required Action	Recommended Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required.
	Removal of weeds or management using glyphosphate applied directly into weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost joining material.	As required.
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging).
Monitoring	Initial inspection.	Monthly for three months after installation.
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48h after large storms in first six months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually.
	Monitor inspections chambers.	Annually.

Table 2.2: Pervious Pavement Maintenance Requirements

Drainage Network Design Criteria

- 2.45 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).
- 2.46 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).
- 2.47 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) = 0.6
 - Minimum pipe velocity at full flow = 0.75m/s
 - Cv Value of 0.84 (as agreed with WCSS, see Appendix F)
 - Percentage Impermeable areas
 - Buildings = 100%
 - Carriageways and footpaths = 100%
 - Private and Communal Parking = 100%

Micro Drainage Software

- 2.48 The proposed and existing networks have 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'.
- ✧ System 1: 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 size 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

- 2.49 To determine the hydraulic requirements for an element of a drainage system, one must first consider the consequences of that capacity being exceeded and then identify an acceptable frequency for this to occur. This acceptable frequency is termed the return period, the period of time during which the stated rainfall can be expected to be exceeded on average only once, that particular element is then designed to accommodate a storm / flood with this return period.
- 2.50 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 for the northern catchment has an average intensity of 56.762mm/hr. This intensity of storm would be used to size the pipes and other drainage elements for conveyance purposes.
 - ✦ A 480 minute duration storm has an average intensity of only 8mm/hr (figures obtained from simulated results). However, the 480 minute storm lasts 16 times longer, therefore generating a much greater volume of water and would be used to size the attenuation tanks.

Condition 10 Conclusion

- 2.51 This surface water drainage strategy demonstrates that the west of wetlands catchment site can be drained satisfactorily without increasing flood risk elsewhere.
- 2.52 Intrusive ground investigations and ground water monitoring have determined that infiltration drainage is unlikely to be practical across much of the site. Discharge of surface water runoff directly into the chalk, which is designated a principal aquifer, has been discounted due to high recorded groundwater levels within this material and the inability to provide a minimum standoff distance from the saturated zone.
- 2.53 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.
- 2.54 This proposed rate of discharge will provide considerable betterment when compared to the pre-demolition brownfield arrangement. The provision of SuDS and attenuation features will store the balance of surface water runoff.
- 2.55 The information contained within this report demonstrates that adequate surface water infrastructure will be provided to enable the consented scheme to be satisfactorily drained, and will enable the future Parcels within the west of the wetlands catchment to make a positive connection into the proposed surface water network.
- 2.56 The reserved matters planning applications for the future parcels will need to be accompanied by an individual surface water drainage strategy and technical note. Each technical note will also include this overall strategy that demonstrates the downstream receiving network has been satisfactorily designed in accordance with the relevant standards.
- 2.57 Therefore, it is considered that this evidence base, when read in conjunction with the RM application for the individual parcels, will provide sufficient information to discharge the outline planning Condition 10.

3 Condition 11: Existing Watercourses & Culverts

Condition 11: *The development shall not commence until such time that arrangements for the future access to and maintenance of any watercourse or culvert (piped watercourse) crossing or abutting the site has been submitted and approved in writing by the Local Planning Authority. No construction is permitted, which will restrict current and future land owners from undertaking their riparian maintenance responsibilities of any watercourse on or adjacent to the site.*

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 national guidance and policies GEN7, GEN9 of the Arun District Local Plan.

- 3.1 There are no existing watercourses or culverts that are adversely effected by the development for most of the parcels within the 19 hectare catchment. Most of the individual parcels and the supporting road network will be constructed on the raised areas that previously contained the glasshouses and its supporting infrastructure.

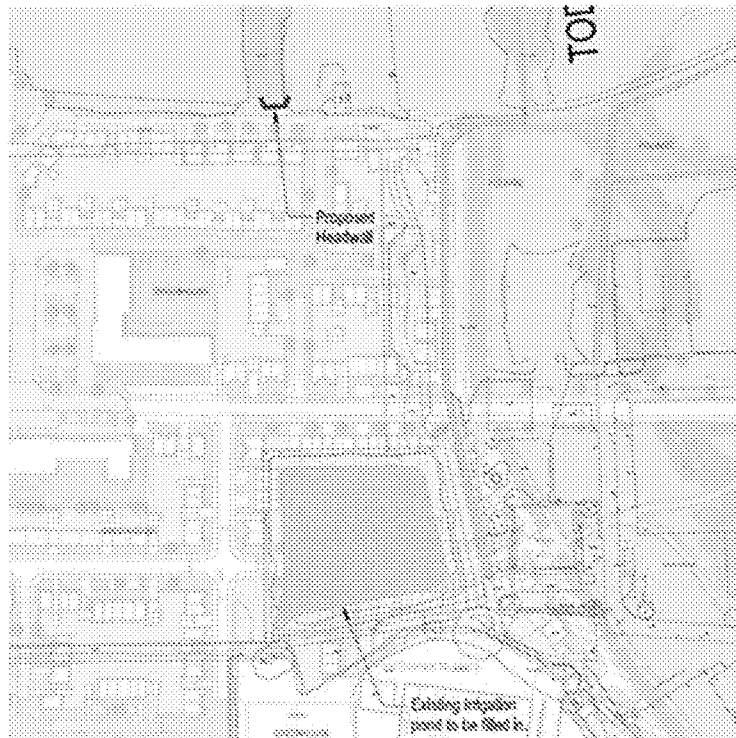


Figure 3.1 Existing Lagoon and Ditch (in green) to be filled in

- 3.2 The only exception to this are the northern and western perimeters of the parcels adjacent to the wetlands (C1, C2, B2 & B4) where the development

platform is to be extended into the wetlands. Refer to figure 3.1) This work will require the existing irrigation pond to be filled in and its associated drainage ditch that eventually ends up connecting the Black Ditch via Toddington Ditch. Refer to figure 3.1 above that shows their location.

- 3.3 This extension of the development platform into the wetlands will require flood compensation. The agreement of this are outside the scope of this document. This will be addressed under a separate outline planning Condition 9 and PHTV have appointed the Consultants White Young Green produce the relevant information that will discharge this condition.

Condition 11 Conclusion

- 3.4 The only watercourses and ditch affected by the proposed development will be the irrigation lagoon and its overflow, which are no longer required to serve the consented scheme. Therefore, it is considered that this evidence base alone provides sufficient information to discharge outline planning Condition 11.

4 Condition 12: Discharge Consents

- 4.1 **Condition 12:** *The development shall not commence until formal consent has been approved in writing from the Local Planning Authority for the discharge of any flows to watercourses, or the culverting, diversion, infilling or obstruction of any watercourse on the site.*

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.

- 4.2 As described in section 2.0 (Condition 10 – surface water drainage) the 19 hectare catchment will drain via a single outfall into the Black Ditch.

- 4.3 As required by Condition 12, a discharge consent for this new outfall has been obtained from the Environment Agency (EA) under Consent Number SE_WS_2015_311_2 dated 30 July 2015. The Consent is included within Appendix C of this report.

- 4.4 The description of the works within the consent is as follows:

“Construction of 1 no. precast concrete surface water outfall (with railings and flap valve) to take discharge from new development through 525mm diameter pipe”

Condition 12 Conclusion

- 4.5 A discharge consent for the proposed outfall has been obtained from the Environment Agency and is contained in Appendix C of this report. Therefore, it is considered that this evidence base alone provides sufficient information to discharge the outline planning Condition 12.

5 Condition 13: Foul Water Drainage

- 5.1 **Condition 13:** *Before each phase or sub phase of the development hereby permitted is commenced details of a proposed foul drainage system shall be submitted to and approved in writing by the Local Planning Authority (including details of its siting, design and subsequent management/maintenance, if appropriate) and no dwelling in that phase of development shall be occupied until works for the disposal of sewage have been fully implemented in accordance with the approved details.*
- 5.2 *Reason: To ensure adequate infrastructure is provided to enable the scheme to be satisfactorily drained. The site lies on the Upper Chalk, a Principal Aquifer and requires protection against contamination from any proposed development in accordance with national guidance and Policy GEN26 of the Arun District Local Plan.*

Offsite Foul Drainage & Connections

- 5.3 Foul drainage from the entire outline approved scheme of will drain a new foul pump station (PS) located in the south east corner of Block A Parcel, which is positioned within the 19 hectare catchment to the west of the wetlands. This foul PS will pump the effluent via a new 2.0km rising main to an existing Southern Water gravity sewer located by Fitzalan Road to the south. The location of the pump station and route of the rising main are contained in Appendix D of this report.
- 5.4 The design of the pump station compound, the optimum route of the rising main and its connection / discharge point have been decided by Southern Water under a Section 98 Agreement.
- 5.5 These works are currently being constructed by Southern Water and the pump station is scheduled to be fully operational are no later than July 2018.

On Site Foul Drainage

- 5.6 All foul sewers within this catchment, to the west of the wetlands, will flow on a gravity basis (no pumps required) into the new foul PS being delivered by Southern Water.
- 5.7 The proposed routes of the foul sewers within the road network are shown on the drainage strategy drawing in Appendix L of this report. These foul sewers

have been designed with foul connection points / spurs into the individual land parcels.

Design Criteria

- 5.8 The proposed foul sewers have been designed in accordance with Sewers for Adoption, BS EN 12056 – Gravity Drainage Systems Inside buildings, and Building Regulations - part H (2015).
- 5.9 A schematic of the proposed foul sewer network, dwelling numbers and corresponding peak foul flows are shown in Appendix E of this report.

Adoption & Maintenance

- 5.10 The proposed foul sewers within the road network will be adopted by Southern Water under a Section 104 agreement, which will ensure they are maintained in perpetuity.

Condition 13 Conclusion

- 5.1 The information contained within this report demonstrates that adequate foul infrastructure will be provided to enable the consented scheme to be satisfactorily drained, and will enable the future Parcels within the west of the wetlands catchment to make a positive connection into the proposed foul sewer network.
- 5.2 The reserved matters planning applications for the future parcels will need to be accompanied by an individual foul water drainage strategy and technical note. Each technical note will also include this overall strategy that demonstrates the downstream receiving network has been satisfactory designed in accordance with the relevant standards.
- 5.3 Therefore, it is considered that this evidence base, when read in conjunction with the RM application for the individual parcels, will provide sufficient information to discharge the outline planning Condition 13

,

APPENDIX A: 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

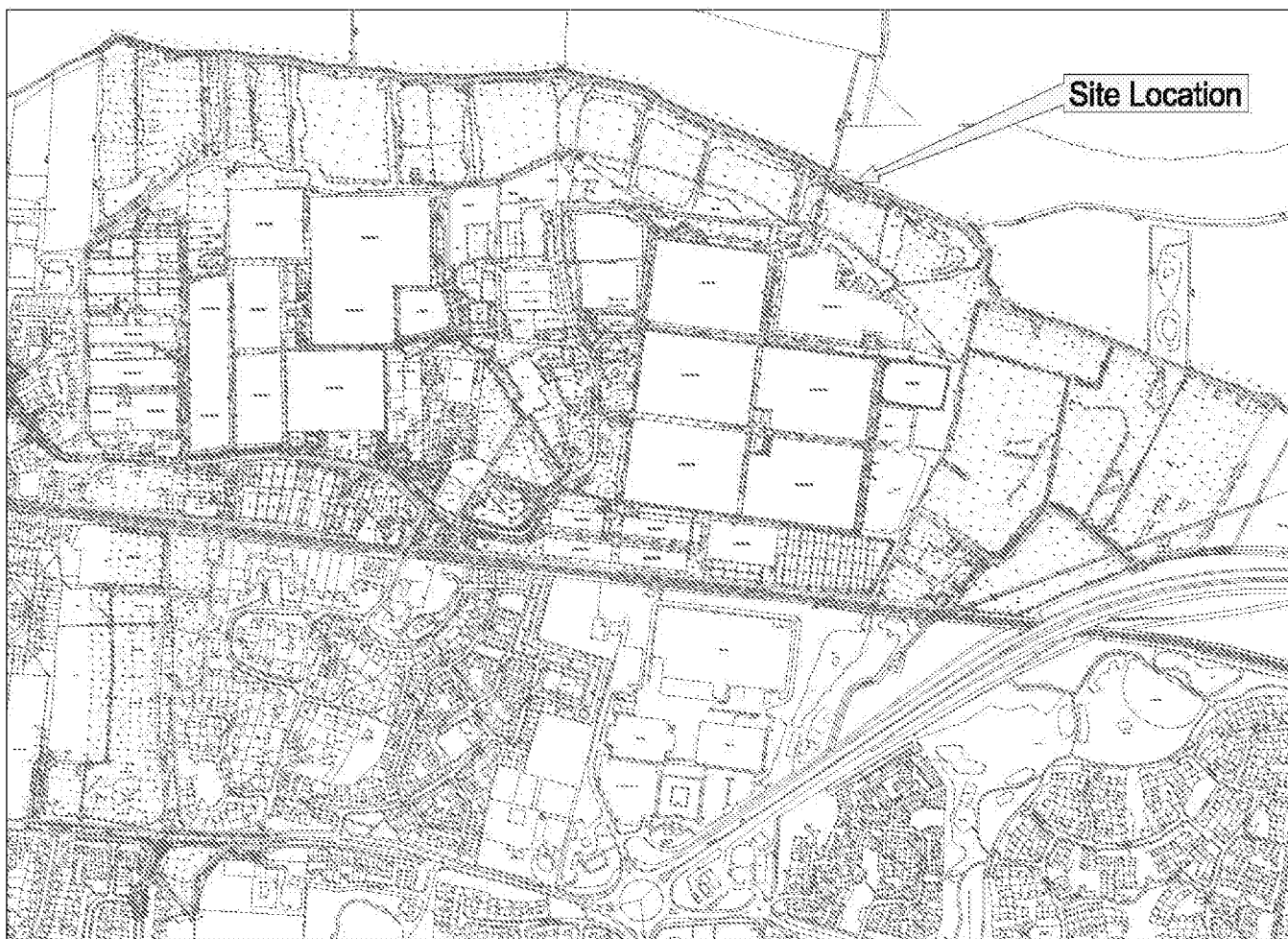
Address: Toddington Lane
Wick
Littlehampton
West Sussex
BN17 7PP

National Grid reference: TQ 03414 03979



Plan NTS

Plan 1:10000



Glanville

Cornerstone House
62 Foxhall Road, Didcot
Oxon, OX11 7AD

Tel: (01235) 515550 Fax: (01235) 517799
post@glanvillegroup.com www.glanvillegroup.com

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

Drawing No.

N/A

Rev:

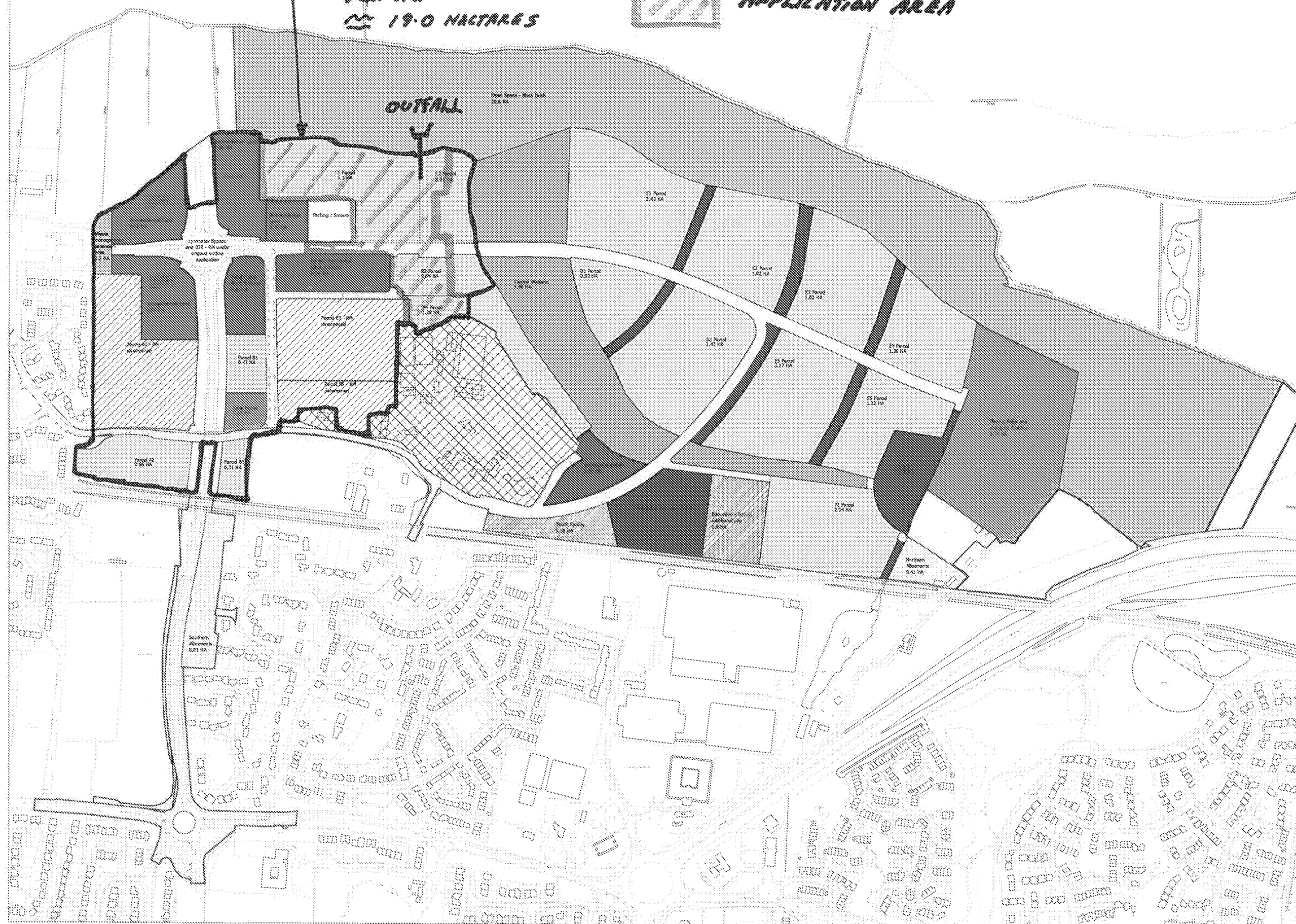
-

APPENDIX B: Land Uses & Drainage Areas Covered

RESERVED MATTERS
APPLICATION AREA



OUTFALL



Key	
	Public Town Square - Street - Bench
	Public Town Square - General Weekend
	Playing Adults and Children Football (18106 - 1.79164)
	Afternoon (18106 - 2.41104 & 0.31164)
	Student
	Residential
	Education - School Week (18106 - 2.2818)
	Continuing Center and Youth Facility (18106 - 1.62184 & 0.30184)
	Nonresidential Land (18106 - 2.82184, Contin. & 2.84184)
	Recreation Center (18106 - 0.3118)
	Hazel 2 (moderated) up to 3995104 of Class 4x
	Infrastructure
	STL education - Periods (moderated) under previous 800
	Cura Home

B	Veränderung der Verbindlichkeiten	13.04.17
A	Veränderung der Vermögensgegenstände	12.09.16



PERSIMMON
Together, we make a home

Penniston James Thamez Valley
Penniston House, Knoll Road,
Camden, Surrey GU10 3JQ
Tel 01276 800000

Toddington Lane
Littlehampton

27 06 16

1:2500 @ A1

519-GR.1.006

Parameter Plan - Land use

Submitted



2

APPENDIX C: Condition 12, Flood Defence Consent



Flood Defence Consent

Section 23 of the Land Drainage Act 1991

Persimmons Homes Ltd
(Thames Valley)
Persimmon House
Knoll road
Camberley
Surrey
GU15 3TQ

**Consent applying to the
construction of 1 no.
surface water outfall to
take discharge from new
development into
Ordinary Watercourse
(within the River Arun
Internal Drainage
District)**

Land south of Black Ditch,
North Littlehampton, West
Sussex

NGR: 503413, 104302

Consent number
SE_WS_2015_311_2

Effective from
30th July 2015

Disclaimer

The Environment Agency does not accept any responsibility for the design and construction of the works referred hereto and any liability for any loss or damage which may arise out of their design, construction, maintenance or use.

Our approval is given solely on river morphology, flow, ecology, and other land drainage criteria. It should not be regarded by the applicant as in any way approving the design and soundness of the proposed structure, other than in relation to its impact on flows in the watercourse and its flood plain

This Consent does not free you from the need to obtain other licences, consents, approvals (including bye-law consents) or permissions (including planning permission) which may be required in law or in order to comply with any duties or responsibilities for conservation or protection of the environment. You should ensure that the works are carried out in a proper manner so as not to adversely affect the watercourse. A copy of the Special Requirements issued by the Environment Agency is available upon request. Work should be completed as quickly as possible once started.

The works shall be carried out at your own risk and responsibility. We accept no responsibility for any loss or damage howsoever caused arising from the carrying out or construction of the works. We may occasionally make observations on health and safety aspects of the work, however this should not be taken in any way whatsoever to imply that we have a role in ensuring site safety, nor that we have approved any contractors plans.

Land ownership is not a material consideration in determining this consent. Where you are not the owner of the land (including riverbeds and other water bodies) referred to in this consent, you must obtain suitable permission from the landowner prior to the commencement of works. This Consent does not confer any rights of entry or rights over property.

If you undertake works in contravention of Section 109 of the Water Resources Act, 1991 (Restriction on erection of structures in, over or under main river), or of the terms of this consent, we may remove, alter or pull down the works and recover from you the expenses incurred in doing so.

The responsibility to ascertain the location of any services, which may be affected by the proposed works, lies solely with the Applicant/Agent.

The contents of this consent must be brought to the attention of your contractor.

If you believe that conditions have been unreasonably imposed then you have a right of appeal.

Environment Agency Consent

Consent

Section 23 of the Land Drainage Act 1991



Flood Defence Consent

Control of works affecting watercourses and/or flood defences

Consent number **SE_WS_2015_311_2**

To Persimmon Homes Ltd (Thames Valley)
of Persimmon House, Knoll Road, Camberley, Surrey GU15 3TQ

The Environment Agency, in exercise of its powers under Section 23 of the Land Drainage Act 1991 and subject to the conditions overleaf, hereby grants its consent in relation to the works or operations described in this Consent.

Watercourse: Ordinary Watercourse within the River Arun Internal Drainage District

Location: Land south of Black Ditch, North Littlehampton, West Sussex

NGR: 503413, 104302

Description of works: Construction of 1 no. precast concrete surface water outfall (with railings and flapvalve) to take discharge from new development through 525mm diameter pipe.

For the following activities:

Construction of 1 no. surface water outfall

(1) Construction of 1 no. permanent precast concrete surface water outfall (with railings and flapvalve) to take discharge from new development through 525mm diameter pipe

As detailed on Drawings: 8140927/SK12, CV8140927/SK09 and SFA 10C Headwall Plan

The Agency does not accept any responsibility for the design and construction of the works referred hereto and any liability for any loss or damage which may arise out of their design, construction, maintenance or use.

This Consent shall come into effect on **30th July 2015**

Signed on behalf of the Environment Agency

A rectangular box containing a handwritten signature in black ink.

Partnerships and Strategic Overview Team Leader

Date of signing

30th July 2015

Environment Agency Consent SE_WS_2015_311_2
Effective date 30th July 2015

Conditions

This consent is granted subject to the following conditions:

- 1. That the headwalls are adequately keyed into the banks and bed of the watercourse to prevent erosion.**
- 2. No excavated material or debris arising from the construction of the works shall be disposed of on the site or in the floodplain without our prior agreement. Any materials, debris etc that fall into the river channel, or onto the banks of the watercourse shall be removed immediately.**
- 3. There should be no storage of materials (or chemicals/fuels) within (EIGHT) metres of the watercourse.**
- 4. No refuelling of any machinery shall take place within (EIGHT) metres of any watercourse**
- 5. No dredging of the riverbed shall take place during the construction period.**
- 6. The banks and/or bed of the watercourse where disturbed shall be restored to our reasonable satisfaction.**
- 7. We shall be afforded access to the works at all reasonable times for the purpose of inspection during construction of the works and after completion of the works.**
- 8. The construction of the works described in this consent must be completed within three years from the date of issue of this consent. Works not completed within this time, additional works and/or amendments will require a new consent.**

Informatives

- Although the ditches involved were dry when the water vole survey/report was carried out, there are water vole populations in close proximity to this site.
- It is recommended that an ecologist looks over the works footprint prior to starting the work, to ensure no burrows are disturbed.
- Water vole burrows can normally extend up to 5 metres into the river banks.
- It is a legal offence to disturb water vole and their burrows so you should be aware of the legal implications when undertaking your work.

Other information

This Note does not form part of the Certificate of Authorisation.

Pollution Prevention

You are reminded that it is an offence under Regulation 38 of The Environmental Permitting (England and Wales) Regulations 2010 to cause or knowingly permit a water discharge activity or ground water activity. Care must be taken to ensure that neither the watercourse nor groundwater becomes polluted, particularly by, for example diesel fuel, petrol and oil from machinery. All fuels, oils and chemicals must be stored securely and any large containers left on site must be bunded. Care should also be taken when filling machinery to ensure that diesel/petrol/oil is not spilt on the ground. Spillages must not be washed away, but absorbed by some medium and then removed from site to a suitable licensed waste facility. Any such incidents must be reported to the Environment Agency immediately (Emergency Tel No 0800 807060). Copies of the Environment Agency's Pollution Prevention Guidelines (PPG5) and (PPG6) are either attached for your information or if not available upon request.

Disturbance of bed and bank material in watercourses should be minimised, including when carrying out excavations. An appropriate silt control system should also be considered if material is likely to be disturbed. In-river vehicle tracking should be kept to an absolute minimum.

Any waste generated in the course of the works must be disposed of in accordance with the provision of the Environmental Protection Act 1990. Persons carrying waste are required by law to register with the Environment Agency as a Waste Carrier (subject to certain exceptions). The deposit, keeping, treating or disposal of waste should only take place at premises licensed by the Environment Agency to receive the waste (subject to certain exceptions and exemptions). When you give waste to someone else, details of the transfer of waste should be described on a document called a Duty of Care Transfer Note.

If the waste contains any properties that are hazardous to health or the environment, the waste will be classed as 'Hazardous Waste' as defined in the Hazardous Waste Regulations 2005. These Regulations place specific requirements on the producer and carrier of such waste. Further information can be found on the Agency's website (www.environment-agency.gov.uk) or by contacting the National Customer Contact Centre on 03708 506506.

The activity of importing waste into the site for use as part of the construction process, for example hardcore, must be registered by Environment Agency as an exempt activity under the Waste Management Licensing Regulations 1994.

Flood Risk Management

The structure(s) must be removed immediately, for any reason, at the request of the Area Flood Risk Manager.

Environment Agency Consent SE_WS_2015_311_2
Effective date 30th July 2015

You must ensure that any structure is clear and free of rubbish, silt and debris at all times. Regular inspections of the structure should also be carried out and the appropriate maintenance work undertaken.

Fisheries

You are strongly advised to inform the appropriate Angling Association/Interests of your proposals (where applicable), before commencing work, since the issue of a Flood Defence Consent by this Agency will not protect you from any claim for nuisance or damage which may be attributed to your works.

The free passage of fish must be maintained at all times, unless otherwise agreed in advance with the Agency.

Under the terms of the Salmon and Freshwater Fisheries Act 1975, it is an offence to cause or knowingly permit to flow, or put, into any waters containing fish, any liquid or solid matter to such an extent as to cause the water to be poisonous or injurious to fish or the spawning grounds, spawn or food of fish.

Biodiversity

Natural environments such as watercourses are important as habitats in their own right and for the plants and animals they support. There are several Acts and Regulations that ensure these special features are protected and you should be aware of and comply with this legislation. A list of relevant legislation can be found in our working method guidance.

The list of species and actions below are not exhaustive and the applicant should consult the relevant legislation regarding other concerns.

A licence for works affecting protected species may be required from Natural England. You should consult their standing advice for more information on this.

Otters and their places of rest are protected. Otters are widespread and significant tree works or works to the banks have the risk of disturbing otters and damaging their Holts. You should make an assessment of the risk to otters and where required a survey should be undertaken by a suitably qualified ecologist. Note otters sometimes lie up in drains/small watercourses so wherever possible drain entrances should be kept clear.

Bats and their habitats are protected. Bats are often found in structures and trees on or adjacent to watercourses. If your works are likely to affect structures such as bridges, walls, culverts or buildings you must consider impacts on bats. An appropriate assessment of risk and, where required a survey should be undertaken by a suitably qualified ecologist.

Water voles and their habitat are protected. If water voles are present on your site you need to consider the impacts of your work on them and an appropriate assessment of risk and where required survey should be undertaken by a suitably qualified ecologist.

Native Crayfish are protected. When undertaking works where native crayfish are present you need to consider the impacts of your works and an appropriate assessment of risk and where required survey should be undertaken by a suitably qualified ecologist.

Vegetation

No bankside vegetation within 7m of the watercourse is to be removed unless strictly necessary. In such cases, trees/shrubs should be limbed or coppiced, and the root base to be left intact. Scrub vegetation as possible should be retained, as this provides valuable wildlife habitat.

Trees should be protected from the works in accordance with British Standard 5837, "Trees in relation to construction", and contractors' working areas shall be clearly marked out and boundaries adhered to.

Any bankside trees or vegetation damaged or removed during the works should be replaced with native species of local provenance appropriate to the local habitat.

Birds

Breeding birds and their nests are protected under the Wildlife and Countryside Act 1981. If your work is taking place within or close to the main bird breeding season (1st March to 31st July) you should consider the impacts of your works and an appropriate assessment of risk should be undertaken.

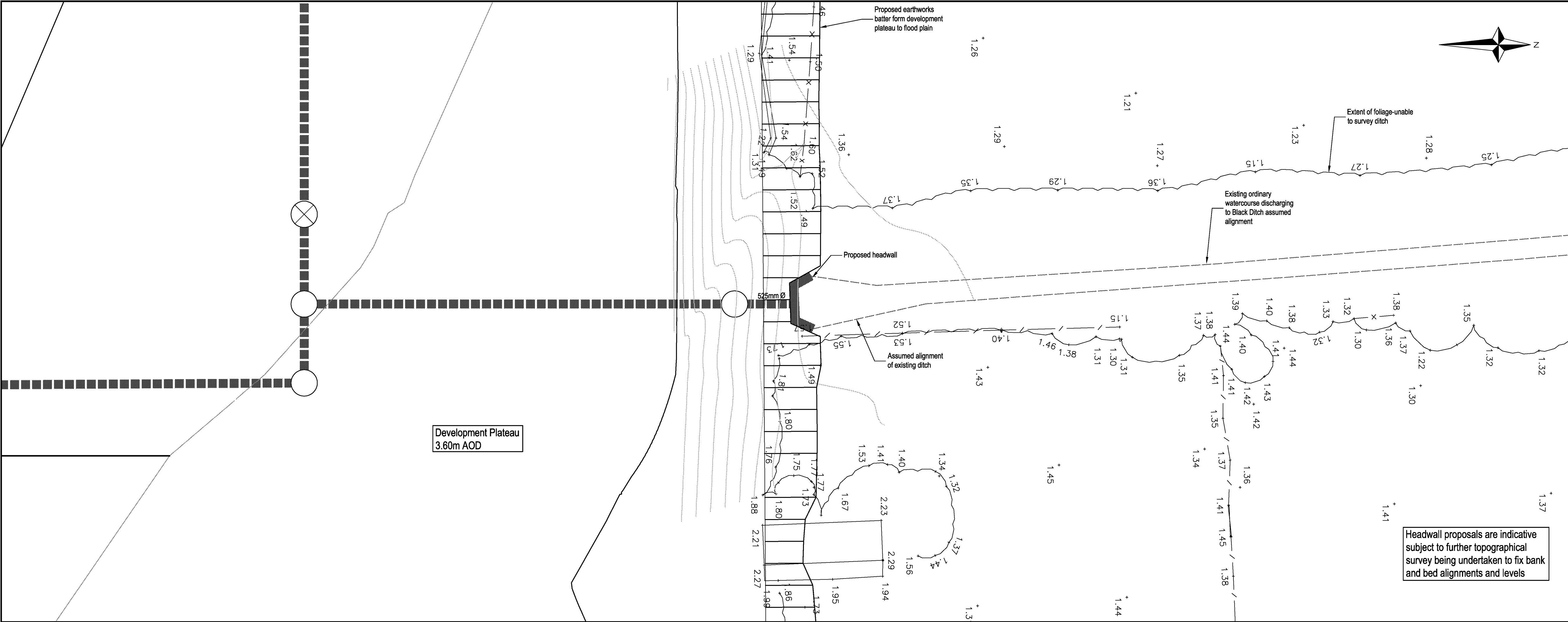
Invasive Non-native species

The Wildlife and Countryside Act makes it an offence to cause certain species to spread in the wild. If these species are present on your site you need to have a plan for how you will manage them and any waste containing them during your work.

Bio security

When travelling or working between watercourses there is a high risk of transferring problem species or diseases between watercourses.

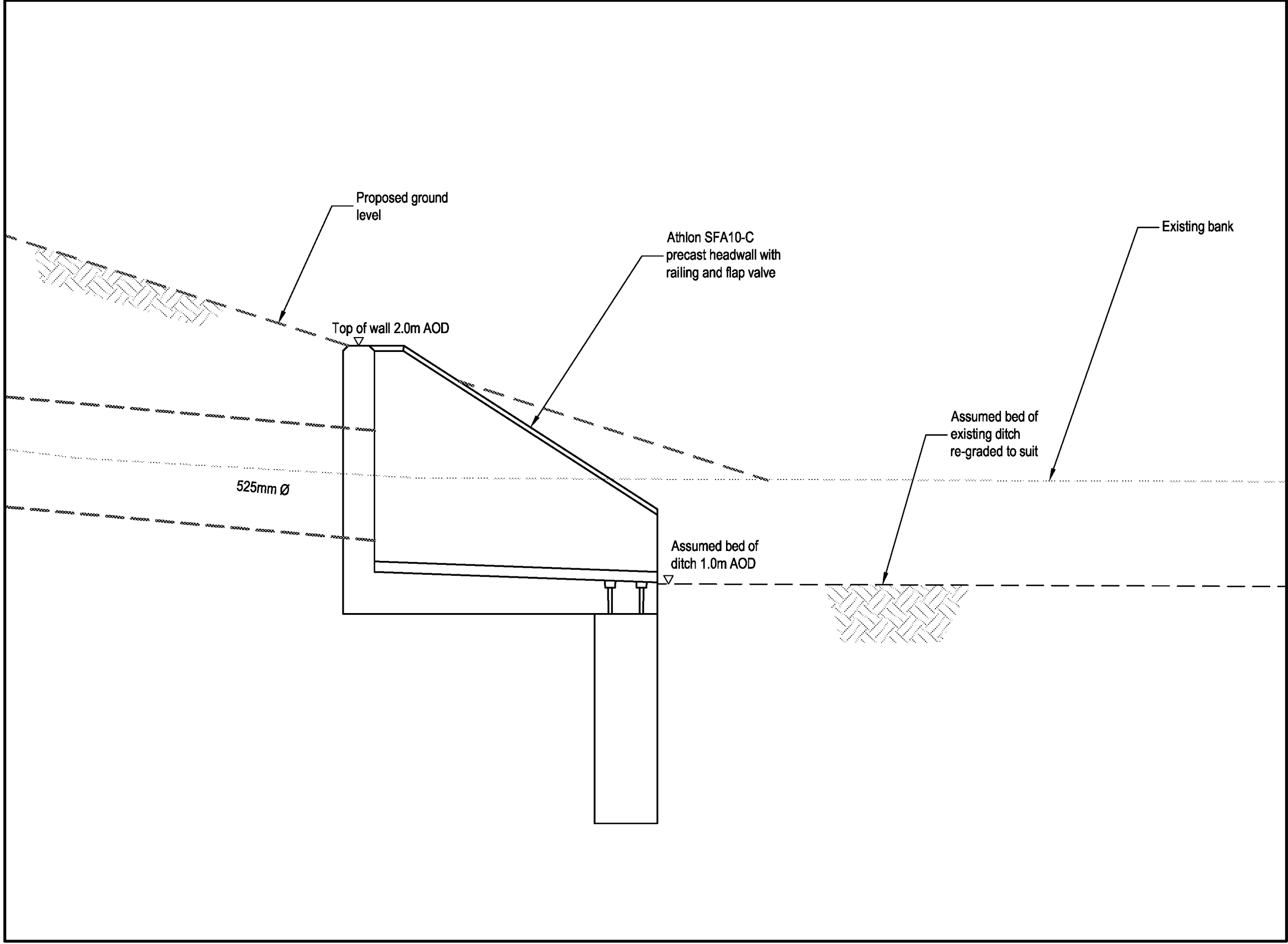
This can be avoided by following the advice of the "check, clean, dry" campaign. Simple measures such as checking for and cleaning mud and bits of vegetation from boots, equipment and machines and allowing them to dry (ideally in sunlight) can prevent the spread of problem species.



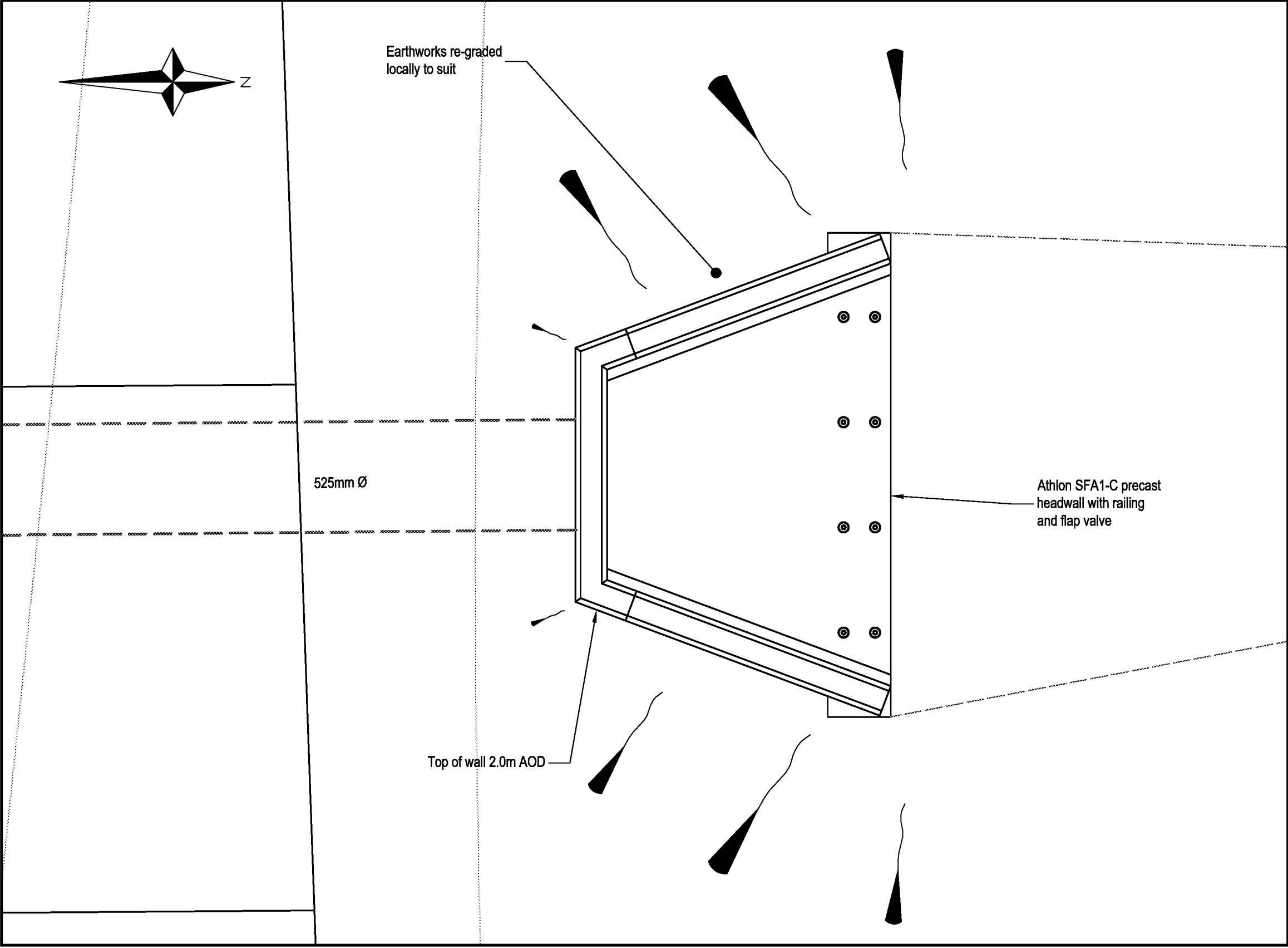
- NOTES**
1. This drawing to be read in conjunction with all relevant documents and specifications
 2. Dimensions not to be scaled

Headwall proposals are indicative subject to further topographical survey being undertaken to fix bank and bed alignments and levels

Location Plan
Scale 1:250



Outfall B Section
Scale 1:20



Outfall B Plan
Scale 1:20

Rev.	Description	Date	Chkd
 Glanville Cornerstone House 62 Foxhall Road, Didcot Oxon, OX11 7AD Tel: (01235) 515550 Fax: (01235) 817799 postbox@glanvillegroup.com www.glanvillegroup.com			
Client : PERSIMMON			
Project : Toddington Lane North Littlehampton			
Title : Outfall B Headwall			
Project Engineer : S. Hudson		Scale : As Shown @ A1	
Project Director : K. Rayner		Date : May 2015	
Status : PRELIMINARY			
Drawing No. CV8140927/SK09			Rev -

APPENDIX D: Condition 13, S98 Foul Pump Station & Rising Main

6.5m DIAMETER X 8m DEEP WETWELL

S98 Foul PUMP STATION & 2KM
RISING MAIN. DELIVERED BY
SOUTHERN WATER UNDER A
S98 REQUISITION

S98 Foul PUMP STATION & RISING MAIN

THE ENTIRE DEVELOPMENT (OUTLINE APPROVED
CONSENTED SCHEME) WILL DRAIN INTO
THE S98 Foul PUMP STATION



APPROX
ROUTE OF
2KM RISING
MAIN

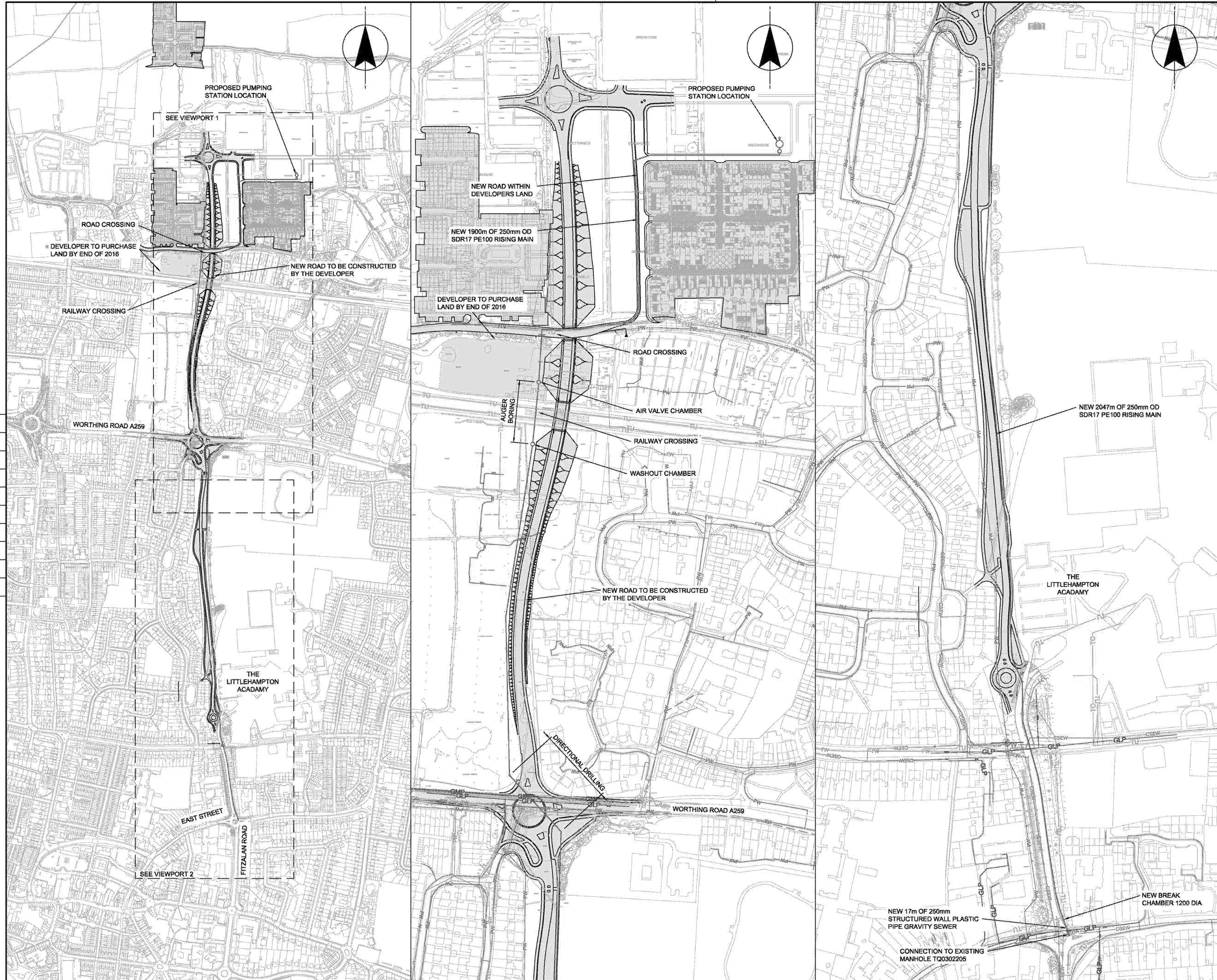
CONTINUES TO CONNECTION
BY FIDALAN ROAD => REFER TO SOUTHERN WATER PLAN

- Public Open Space - Street Scen
- Public Open Space - General
- Playing Fields and Open Space (1000 - 1.5000)
- Recreation (1000 - 1.5000)
- Recreation (1000 - 1.5000)
- Education - School Site (1000 - 1.5000)
- Community Center and Public Building (1000 - 1.5000)
- Non-residential Land (1000 - 1.5000)
- Residential (1000 - 1.5000)
- Industrial (1000 - 1.5000)
- Other (1000 - 1.5000)

PERSIMMON
Together, we make a home

Persimmon Homes Thames Valley
Persimmon House, 10th Floor
Canterbury, Surrey GU1 3YU
Tel: 01223 500000

Toddington Lane Littlehampton	
27.05.16	1:2500 @ A1
519-GR.L.006	
Parameter Plan - Land use	
Submitted	10
8	



S.W. DRAWING NO.
JN.670038-27.1C0002

REVISION
B

NOTES

- ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE.
- THIS DRAWING IS BASED ON HISTORICAL AND O.S. DATA. INCONSISTENCY IN DATA SHOULD BE CHECKED AND VERIFIED BEFORE EXCAVATION.
- EXISTING AND INDICATIVE PIPE ROUTES BASED ON GIS DATA. SOUTHERN WATER SERVICES LTD. ACCEPT NO RESPONSIBILITY IN THE EVENT OF INACCURACY. THE ROUTES ARE TO BE CHECKED AND VERIFIED BEFORE CONSTRUCTION WORKS.

REFERENCES

JN.670038-27.1C0002 - SITE LAYOUT OVERVIEW
JN.670038-27.1C0005 - HAZARD PLAN AND LONGSECTION, SITE OVERVIEWS
JN.670038-27.1C0006 - PLAN AND LONGITUDINAL SECTION, SHEET 1 OF 8
JN.670038-27.1C0007 - PLAN AND LONGITUDINAL SECTION, SHEET 2 OF 8
JN.670038-27.1C0008 - PLAN AND LONGITUDINAL SECTION, SHEET 3 OF 8
JN.670038-27.1C0009 - PLAN AND LONGITUDINAL SECTION, SHEET 4 OF 8
JN.670038-27.1C0010 - PLAN AND LONGITUDINAL SECTION, SHEET 5 OF 8
JN.670038-27.1C0011 - PLAN AND LONGITUDINAL SECTION, SHEET 6 OF 8
JN.670038-27.1C0012 - PLAN AND LONGITUDINAL SECTION, SHEET 7 OF 8
JN.670038-27.1C0013 - PLAN AND LONGITUDINAL SECTION, SHEET 8 OF 8
JN.670038-27.1C0021 - SIGNIFICANT HAZARDS AND HIGH RISK SERVICES, SHEET 1
JN.670038-27.1C0022 - SIGNIFICANT HAZARDS AND HIGH RISK SERVICES, SHEET 2
JN.670038-27.1C0023 - SIGNIFICANT HAZARDS AND HIGH RISK SERVICES, SHEET 3
JN.670038-27.1C0024 - SIGNIFICANT HAZARDS AND HIGH RISK SERVICES, SHEET 4
JN.670038-27.1C0025 - SIGNIFICANT HAZARDS AND HIGH RISK SERVICES, SHEET 5
JN.670038-27.1C0026 - SIGNIFICANT HAZARDS AND HIGH RISK SERVICES, SHEET 6
JN.670038-27.1C0027 - SIGNIFICANT HAZARDS AND HIGH RISK SERVICES, SHEET 7
JN.670038-27.1C0028 - SIGNIFICANT HAZARDS AND HIGH RISK SERVICES, SHEET 8
JN.670038-27.1C0031 - PUMPING STATION GENERAL ARRANGEMENT
JN.670038-27.1C0032 - PUMPING STATION COMPOUND LAYOUT

LEGEND

PROPOSED WORKS

— FUTURE ROAD CONSTRUCTION BY OTHERS

▲ FOUL RISING MAIN (UNADOPTED)

▲ FOUL PUMPING STATION (UNADOPTED)

SEWERS

— SW — EXISTING SURFACE WATER SEWER

— FW — EXISTING FOUL WATER SEWER

— CSEW — EXISTING COMBINED MAIN

— PS — EXISTING PRIVATE SEWER

UTILITIES

— PW — POTABLE WATER MAIN

— TO — OVERHEAD TELECOMS

— TU — UNDERGROUND TELECOMS

— HV — HIGH VOLTAGE ELECTRIC

— CABTV — CABLE TV

— TU — TELECOMS U/G OTHER

— GLP — LOW PRESSURE GAS MAIN

— GMP — MEDIUM PRESSURE GAS MAIN

SCALE 1 : 2000

SCALE 1 : 5000

CURRENT VERSION INFORMATION

B. TWO NOTES ALTERED.

DATE	DRWN	CHKD	REVD	REV	REASON FOR ISSUE
2016/10/07	BN	AR	JC	A	FOR INFORMATION
2017/03/26	BN	AR	GA	B	FOR INFORMATION

THIS DRAWING IS ISSUED BY SOUTHERN WATER SUBJECT TO THE CONDITIONS THAT IT IS NOT COPIED EITHER IN WHOLE OR IN PART OR DISCLOSED TO THIRD PARTIES UNLESS PRIOR WRITTEN AUTHORIZATION IS GIVEN BY SOUTHERN WATER. PREVIOUS VERSIONS OF THIS DRAWING SHOULD BE STAMPED SUPERSEDED OR DESTROYED. DO NOT SCALE THIS DRAWING - IF IN DOUBT ASK.

Southern Water

In Partnership with

MWH

Southern House
Yeoman Road
Worthing
West Sussex
BN13 3NX
telephone (01903) 284444
fax (01903) 891435

PROJECT TITLE

S98 DEV. NORTH OF TODDINGTON LANE
LITTLEHAMPTON

DRAWING TITLE

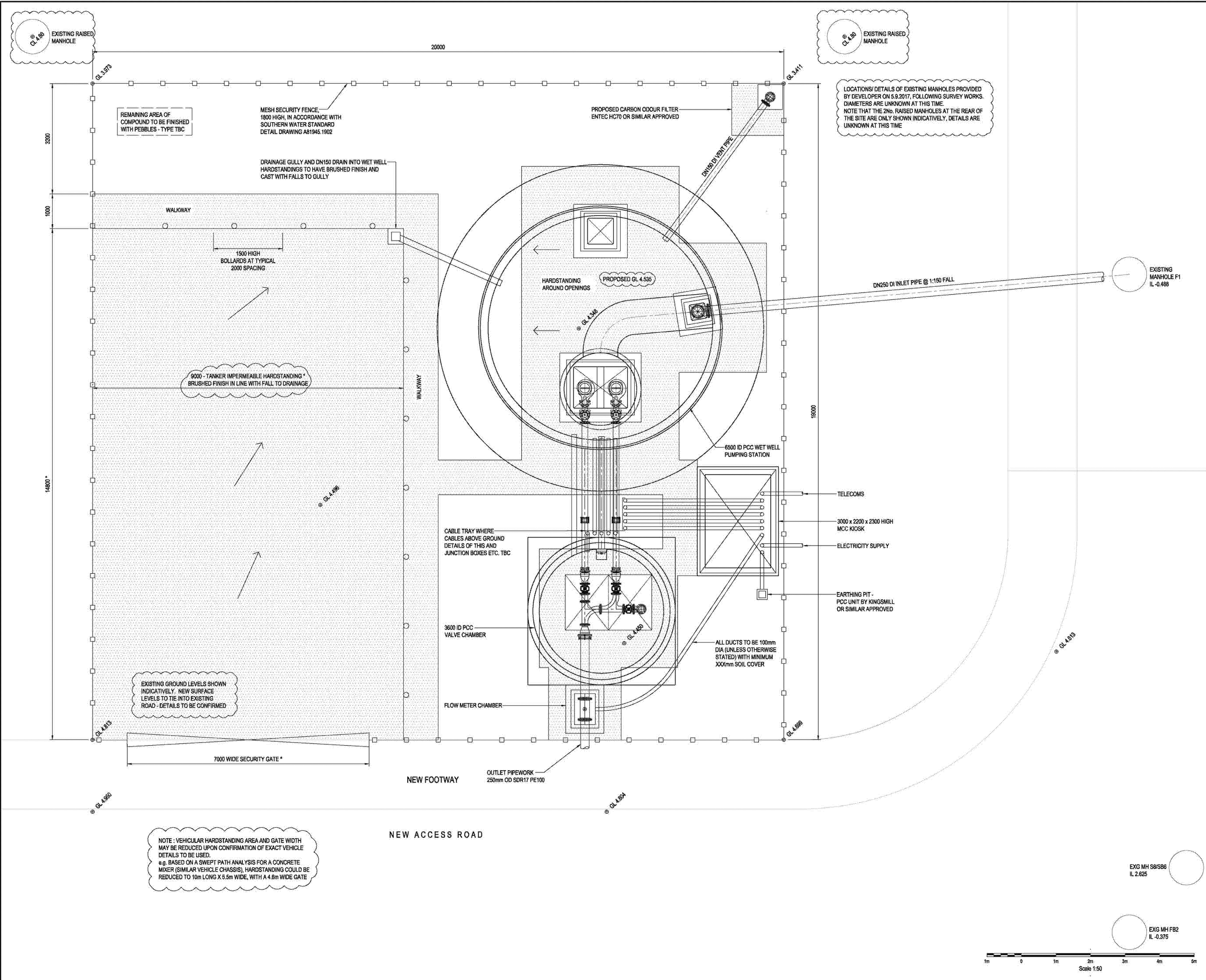
SITE LAYOUT OVERVIEW

SITE UNIT MEMORIC	SITE UNIT NO.
670038-27	AS SHOWN

PRN	SCALE	MASTER SIZE
670038-27	AS SHOWN	A1

S.W. DRAWING NO.
JN.670038-27.1C0002

REVISION
B



NOTES

- ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES UNLESS SHOWN OTHERWISE
- ALL LEVELS ARE IN METRES AND RELATE TO ORDNANCE DATUM UNLESS STATED OTHERWISE
- DO NOT SCALE FROM THIS DRAWING
DO NOT TAKE DIGITAL DIMENSIONS OFF THIS DRAWING
WORK TO FIGURED DIMENSIONS ONLY - IF IN DOUBT ASK
- ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH THE FOLLOWING DOCUMENTS, UNLESS SPECIFIED OTHERWISE:-
 - THE SPECIFICATION FOR TUNNELLING BTS & ICE 2015
 - SOUTHERN WATER TECHNICAL SPECIFICATION MANUAL CIVIL ENGINEERING REQUIREMENTS:
 - CED 4002
 - CED 4015
 - CED 4023
 - CED 4024
 - SEWERS FOR ADOPTION CESW1 7th EDITION
- FOR CONSTRUCTION METHODOLOGY, REFER TO THE CONTRACTOR'S SPECIFIC METHOD STATEMENT FOR THE WORK
- THE CONTRACTOR IS TO CONFIRM ALL LEVELS AND SETTING OUT PRIOR TO COMMENCEMENT OF THE WORKS
- CONSTRUCTION TOLERANCES IN ACCORDANCE WITH THE 'SPECIFICATION FOR TUNNELLING' BTS & ICE 2010, TABLE 15, SECTION 326, TOLERANCES FOR TUNNELS, SHAFTS AND UNDERGROUND WORKS
- ALL PROPRIETARY PRODUCTS ARE TO BE USED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS
- ACCESS ARRANGEMENTS, PROTECTIVE BARRIERS AND TEMPORARY PLATFORMS ARE TO BE DESIGNED BY OTHERS
- SERVICE DIVERSIONS ARE THE RESPONSIBILITY OF OTHERS

KEY

PERSONNEL FOOTWAY / HARDSTANDING AREA

VEHICULAR HARDSTANDING

HARDSTANDING DETAILS IN ACCORDANCE WITH SOUTHERN WATER STANDARD DETAILS

SIGNIFICANT DESIGNER'S IDENTIFIED HAZARDS

HAZ001	UNKNOWN GROUND CONDITIONS
HAZ002	STRIKING OF BURIED SERVICES
HAZ010	INJURY/FATALITY DUE TO WORKING IN CONFINED SPACES
HAZ011	EMERGENCY ACCESS AND EGRESS OF SHAFT

- FOR MORE DETAILED INFORMATION ON THE HIGHLIGHTED HAZARDS, REFER TO COWI UK LIMITED DESIGNER'S RISK ASSESSMENT FOR THIS PROJECT.

- 'EVERYDAY' LOW RISK HAZARDS AND THOSE HAZARDS WHICH SHOULD BE OBVIOUS TO A COMPETENT CONTRACTOR HAVE NOT BEEN INDICATED ON THIS DRAWING.

- SHOULD ANY ADDITIONAL HAZARDS BE IDENTIFIED DURING THE COURSE OF THE WORKS, THE CONTRACTOR SHALL NOTIFY ALL RELEVANT MEMBERS OF THE PROJECT TEAM.

CURRENT VERSION INFORMATION

B. KIOSK AND CHAMBERS RELOCATED, PIPEWORK LAYOUT UPDATED, HARDSTANDING AREAS REVISED

B	ISSUED FOR APPROVAL	NM	LJP	AJK	AJK 24.11.17
A	FOR DISCUSSION	NM	LJP	-	- 08.11.17
Rev	Revision Description	Drawn	Drawn's	CHK'd	Appl'd Date

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Kevin House, RTG Business Park,
London Road, Derby, DE24 8UP
Tel: 01332 343800 E-Mail: info_@cowi.com

Client:

Project:

TODDINGTON LANE RISING MAIN

Title:

SITE LAYOUT

Drawn by:	Designed by:	Checked:
NM	LJP	AJK
Date:	Orig. Sheet Size:	Approved:
NOV 2017	A1	AJK
Scales:	Status:	
1:50	FOR DISCUSSION	

Drawing No:

J1534-DRG-C01-004

Revision

B

ARUN DISTRICT COUNCIL L158516.DOC

APPENDIX E: Condition 13, Foul Layout Schematic & Peak Flows

Retail

Trade Flow = 0.5 l/sec/Ha of developable area

Block A & Block B Parcel
(Retail & Resi) 95 Units
1dwf= 0.66 l/s
6dwf= 3.96 l/s

114 Units
1dwf= 0.79 l/s
6dwf= 4.74 l/s

PARCEL A2

37 Units
1dwf= 0.26 l/s
6dwf= 1.56 l/s

Non-Resi Land

100 Bed Hotel

dwf = 550 litres/room/day

dwf = 0.64 l/s

6dwf = 3.84 l/s

Non-Resi Land
0.81 Hectares
0.91 l/s

Non-Resi Land
0.90 Hectares
1.0 l/s

PARCEL B1

X Units
1dwf= x l/s
6dwf= x l/s

60 Bed Care Home
375 litres/bed/day
dwf = 0.26 l/s
6dwf = 1.56 l/s

PARCEL B6

21 Units
1dwf= 0.15 l/s
6dwf= 0.90 l/s

246 dwellings: dwf
6dwf= 10.26 l/s + Non resi 1.9 l/s)
x 10% infil = 13.40 l/s

PARCEL C1

Phase 2 - 56 Units
1dwf= 0.39 l/s
6dwf= 2.34 l/s

C1 Resiblock

42 Units

1dwf= 0.29 l/s

6dwf= 1.75 l/s

Block A
(Retail & Resi)
65 Units
1dwf= 0.45 l/s
6dwf= 2.70 l/s

PARCEL B3 & B5

121 Units
1dwf= 0.84 l/s
6dwf= 5.0 l/s

Part PARCEL C2

Phase 2 - 19 units
Next Phase - 9 units

28 Units
1dwf= 0.19 l/s
6dwf= 1.14 l/s

Part PARCEL C2
16 Units
1dwf= 0.11 l/s
6dwf= 0.66 l/s

Part PARCEL B2
23 Units
1dwf= 0.16 l/s
6dwf= 0.96 l/s

Part PARCEL 1
19 Units

PARCEL B4
31 Units

- | 50 Units
- | 1dwf= 0.35 l/s
- | 6dwf= 2.1 l/s

598 Foul Pump Station
Incoming pipe 250ø on MGJV drawings
Will be increased to 300ø with capacity of 80 l/s

Primary School
(Assumed 420 Pupils)

80 litres/pupil/day
dwf = 0.39 l/s
6dwf = 2.34 l/s

**Rising Main discharges pumped flow of 16.5 l/s to Proposed 225 ϕ Gravity Sewer + 39 dwellings with 6dwf of 1.62 l/s
Total = 18.1 l/s**

411 dwellings + 100 bed Hotel
 {dwf = 2.85 l/s + 6.64 l/s = 3.52 l/s}
 * 6dwf = 17.10 l/s + 3.84 l/s = 20.94 l/s
 * + Pumped 3dwf flow from East of Wetlands = 16.5 l/s
 * + Flow from non-resi land = 1.9 l/s

Sub-total = (39.34 litres / second) x 100 infiltration
 TOTAL = 43.30 litres / second
 (Prop 225@ @ 1in/100 full bore capacity = 45.6 l/s)

192 dwellings + Primary School + Carehome
 • 1dwf = 1.33 l/s + 0.39 l/s + 0.26 l/s = 2.34 l/s
 • 6dwf = 8.0 l/s + 2.34 l/s + 1.56 l/s

Sub-total = (11.9 litres / second) x 10% infiltration
 TOTAL = 13.10 litres / second
 (Ex 150ø full bore capacity = 12 l/s)

Future Pump Station
6 x dwf (in) = 33 l/s
3 x dwf (out) = 16.5 l/s

800 DWELLINGS

APPENDIX F: Condition 10, WSCC Surface Drainage Correspondence

Sean Foley

From: Sean Foley
Sent: 05 March 2018 09:11
To: 'Mark Akmenkalns'
Cc: Tim Townsend; 'Graham, Laura'; [REDACTED]
[REDACTED] Adrian Barnley; Oliver Nevett;
[REDACTED] David Lambert'; 'Sara McKnight'; 'Edgley, Martin';
'Edgley, Antony'; 'Adam Winstone'; Paul Stewart
Subject: RE: D1013/00: RES application LU/278/17/RES - SURFACE WATER DRAINAGE - WSCC Response 18-03-05

Mark,

This is very good news and WSCC's acceptance of a Cv value of 0.84 in this instance is most appreciated.

Many thanks

Sean Foley
Principal Engineer
Mayer Brown Ltd
[REDACTED]

From: Mark Akmenkalns [REDACTED]
Sent: 05 March 2018 08: [REDACTED]
To: Sean Foley [REDACTED]
Cc: Tim Townsend [REDACTED]
Subject: D1013/00: RES application LU/278/17/RES - SURFACE WATER DRAINAGE - WSCC Response 18-03-05

Sean,

Thank you for reviewing the surface water simulation against the alternative FSR data with a Cv value of 1 (100%). I have reviewed your situation with the WSCC Drainage Team and would confirm the following:

- WSCC have preference to utilise the FEH data (more current day compared to FSR).
- With regards to the Cv we accept your summation and design value of 0.84, in this instance.

In conclusion your initial surface water hydraulic calculations are acceptable.

Please note for future applications the WSCC Drainage Team will always require evidence in support of the selected Cv design value.

Tim – With regards to the uncertainty with the 'future parcels' and the corresponding estimated impermeable area/storage we recommend this is controlled by a bespoke condition.

Any queries please call.

Regards,

Mark Akmenkalns | Infrastructure Engineer (Consultant), Implementation Team, Strategic Planning, Communities and Infrastructure, West Sussex County Council
Location: Ground Northleigh, County Hall, Chichester PO19 1RG
Internal: 25753 | External: 03302 225753 | E-mail: mark.akmenkalns@westsussex.gov.uk

From: Sean Foley [REDACTED]
Sent: 01 March 2018 15:30
To: Mark Akmenkalns
Subject: RE: D1013/00: RES application LU/278/17/RES - SURFACE WATER DRAINAGE - WSCC Response 18-02-26

Mark,

I just ran the simulation and it works well when using the FSR rainfall profile. Please see attached results

Some minor flooding that is easily and safely contained within the road network.

It would be fantastic if we could go with this scenario please because there is no uplift in attenuation volume required

Regards,

Sean Foley
01483 750 508

From: Mark Akmenkalns [REDACTED]
Sent: 01 March 2018 15:10
To: Sean Foley [REDACTED]
Subject: RE: D1013/00: RES application LU/278/17/RES - SURFACE WATER DRAINAGE - WSCC Response 18-02-26

Sean,

Have you run the Microdrainage simulation to lesser FSR rainfall with a Cv of 1?

Regards,

From: Sean Foley [REDACTED]
Sent: 01 March 2018 14:59
To: Mark Akmenkalns
Cc: Tim Townsend; Graham, Laura ([REDACTED]); [REDACTED]; David Lambert; Sara McKnight; Logley, Martin; Logley, Antony; Adam Winstone; Paul Stewart
Subject: RE: D1013/00: RES application LU/278/17/RES - SURFACE WATER DRAINAGE - WSCC Response 18-02-26

Mark,

Thanks for your response and it is good news overland flow information is sufficient.

We'd like to take the opportunity to let WSCC know the development as a whole will provide a significant reduction in the rate and volume of surface water run-off when compared to the pre-demolition undeveloped site that had a hardstanding area of approximately 22 hectares that previously discharged into the black ditch.

Regarding the use of Cv, thanks for sending over what WCSS consider to be supporting evidence. As pointed out in our previous E-mail the suggested WSCC change results in an uplift of approximately £100,000 to the below ground attenuation cost. We expect our Client's finances are not at the top of WSCC's agenda but it is important to emphasise the importance of changing the design parameter of Cv to 1, especially when we consider it unnecessary to do so. I'm sure there are instances when it might be appropriate but we don't believe this is it. We believe the explanation below provides reasonable justification why it is not required for this particular development.

SFA 7th Edition

The reference to SFA 7th Edition (SFA7) is that “an impermeability of 100% run-off should generally be assumed”. This is not a reference to the design parameter of Cv within the modified rational method. We have actually used 100% impermeability from the roads, parking areas and roofs that we know about – see image below. In the other future development plots we can only apply a % of the development boundary because the layout has not yet been decided.

McCloy Susdrain Fact sheet

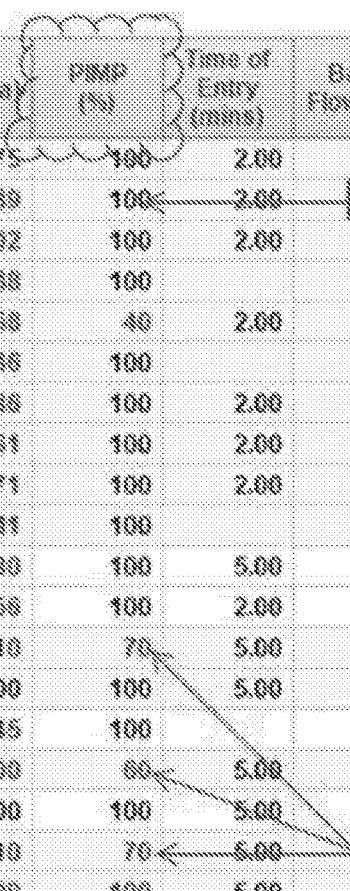
This is a guidance document produced by an independent firm of Consulting Engineers and our Client feels it is not appropriate to use this document as a justification for Cv on this development.

We believe the document, as the title suggests, is an assessment tool for determining storage volumes. At the early stages of most planning applications we produce “Quick Storage Estimates” (QSE) using Windes and we’re 100% confident WSCC have received many of these QSE estimates when reviewing drainage designs. QSE could be viewed as an “assessment tool” to determine high level volumes to ensure sufficient storage space is available within planning applications.

If, for example, we work out the QSE estimate for our 19 hectare catchment (FEH Rainfall, 19 hectares, 50% impermeability, discharge rate of 15 l/sec/hect, 30% CC) the attenuation volume is up to 5,520m³. If we use the less onerous FSR Rainfall the volume is up to 4,750m³. 770m³ difference between FEH & FSR.

We, however, have produced a detailed drainage model that accurately analyses the main sewer within the entire 19 hectare catchment. This has been used to analyse system overloads, storage, reverse flow characteristics, surcharging and backwater effects within the piped network and to accurately determine the attenuation volume. We’ve also used the more onerous **FEH rainfall profile**. Using this detailed model the total volume of attenuation has actually worked out at 5,340m³ (1,600m³ for main infrastructure and the remaining 3,830m³ spread across 12 development parcels.

Our model also does not simply discharge 100% of run-off into the black ditch. It is only the detailed areas that 100% is applied, but a large number of future parcels have not yet been designed yet so we can only apply an estimation of the % impermeability. Below are some images from our model where we’ve applied the total application boundary a future parcels and then applied and percentage impermeability. The total modelled impermeability works out at approximately 58% of total catchment (11.14 Ha within 19 Ha catchment)



Pipe Number	US/MH Name	Pipe Length (m)	Area (ha)	PMP (%)	Time of Entry (mins)	Base Flow (l/s)	Pipe Rough. (mm)	US/IL (m)	D/S (m)
13.000	SW-FUT-01	63.816	0.275	100	2.00		0.600	2.560	2.
14.000	Plots 80-86	12.624	0.089	100	2.00		0.600	2.550	2.
15.000	Plots 87-94	7.200	0.102	100	2.00		0.600	2.550	2.
1.013	SW05	37.575	0.038	100			0.600	2.150	1.
16.000	C2 Resiblock A	8.659	0.358	40	2.00		0.600	2.275	2.
1.014	SW06	32.449	0.036	100			0.600	1.990	1.
17.000	SW-FUT-02	54.502	0.186	100	2.00		0.600	2.320	2.
18.000	Plots 60-73	7.800	0.061	100	2.00		0.600	2.600	2.
19.000	Plots 74-78	9.600	0.071	100	2.00		0.600	2.600	2.
17.001	SW07	21.498	0.011	100			0.600	2.100	2.
20.000	Plots 39-46	6.005	0.080	100	5.00		0.600	3.690	2.
21.000	SW-LYM 01	24.867	0.056	100	2.00		0.600	3.740	3.
22.000	Non resi	39.317	0.810	70	5.00		0.600	4.800	3.
22.001	Non resi	13.808	0.000	100	5.00		0.600	3.720	3.
21.001	SW-LYM 02	44.896	0.045	100			0.600	3.640	3.
23.000	Parcel A1	39.613	1.000	60	5.00		0.600	4.000	3.
23.001	As-built SAs	28.513	0.000	100	5.00		0.600	3.783	3.
24.000	Non Resi	34.498	0.910	70	5.00		0.600	3.800	3.
24.001	SW Stub 02	5.111	0.000	100	5.00		0.600	3.840	3.
23.002	SW-LYM 03/1	16.877	0.000	100	5.00		0.600	3.570	3.
21.002	SW-LYM 03	25.768	0.045	100			0.600	3.350	3.

Pipe Number	DS/MH Name	DS/CL (m)	Fall (m)	US C.Depth (m)	DS C.Depth (m)	Σ Imp. Area (ha)	Control in USMH	Rain No.
30.001	SW09	5.000	0.200	2.475	2.375	0.630	ro-Brake®	1
31.000	SW09	5.000	1.150	1.325	2.375	0.096		1
32.000	Stub SW9/2	5.100	0.200	1.950	2.150	0.224		1
32.001	SW09	5.000	0.100	2.375	2.375	0.224	ro-Brake®	1
30.002	SW16	4.640	0.300	2.375	2.315	1.034		1
33.000	SW13	4.020	0.110	1.305	1.115	0.071		1
33.001	SW14	4.020	0.160	1.115	1.275	0.142		1
33.002	SW15	4.600	0.290	1.275	2.145	0.213		1
33.003	SW16	4.640	0.130	2.070	2.240	0.264		1
30.003	SW17	5.000	0.300	2.240	2.900	1.386		1
30.004	SW21	5.000	0.140	2.750	2.890	1.386		1
21.010	SW22	4.300	0.030	2.440	1.770	4.814		1
20.001	SW23	3.900	0.135	1.770	1.505	4.958		1
34.000	SW23	3.900	0.100	1.275	1.175	0.080		1
20.002	SW24	3.710	0.085	1.505	1.400	5.058		1
1.015	SW25	3.600	0.130	1.400	1.420	10.910		1
35.000	Stub SW25/1	3.700	0.230	1.105	1.335	0.055		1
35.001	SW25	3.600	0.180	1.335	1.415	0.110		1
36.000	SW25	3.600	0.200	1.215	1.415	0.094		1
1.016	Outfall B	1.750	0.200	1.875	0.225	11.144	ro-Brake®	Total m equals 55% of

Within the Mcloy document the Author states the following: “it is a usable approximation that can provide acceptable solutions for design. Most of the inputs are based on statistics and calibration factors; therefore we can only ever achieve an approximation of how the system will behave in reality. The results of calculations and modelling need to be used alongside professional judgement to provide the design”

We firmly believe that we have applied sound professional judgement when generating this hybrid model that contains a combination of very detailed development parcels alongside future parcels that have very little design information and, as such, a Cv of 0.84 can continue to be applied.

Our Client wishes to fulfil his planning obligations and conduct his business in a responsible and sustainable manner but feels the unwarranted amendment to the design parameter Cv, on this development, is wasteful of both finance and resource.

With the above in mind we'd be grateful if you could reconsider the use of Cv in this particular scenario.

Regards,

Sean Foley
Principal Engineer
Mayer Brown Ltd

From: Mark Akmenkalns
Sent: 26 February 2018 15:55
To: Sean Foley <

Cc: Tim Townsend <[REDACTED]> Graham, Laura ([REDACTED])
[REDACTED] Adrian Barnley
[REDACTED] Oliver Nevett [REDACTED]
David Lambert <[REDACTED]> Sara McKnight [REDACTED] Edgley,
Martin [REDACTED] Edgley, Antony [REDACTED] >; Adam
Winstone [REDACTED] Stewart [REDACTED]
Subject: D1013/00: RES application LU/278/17/RES - SURFACE WATER DRAINAGE - WSCC Response 18-02-26

Sean,

Thanks for your response. On review of your response to 4 & 5 I confirm the overland flow evidence is sufficient.

With regards to the Cv criteria I have consulted with the WSCC Drainage Team who have provide two pieces of supporting evidence as follows (see attached):

- SFA7 Extract
- Susdrain/CIRIA fact sheet

In conclusion, as previously advised, the WSCC Drainage Team require a Cv of 1.0 (100% run-off).

Regards,

From: Sean Foley [REDACTED]
Sent: 23 February 2018 17:49
To: Mark Akmenkalns [REDACTED]
Cc: Tim Townsend; Graham, Laura [REDACTED]
Adrian Barnley; Oliver Nevett; [REDACTED] David Lambert; Sara McKnight; Edgley, Martin; Edgley,
Antony; Adam Winstone; Paul Stewart
Subject: RE: D1013/00: RES application LU/278/17/RES - SURFACE WATER DRAINAGE - WSCC Response 18-02-23

Mark,

Thanks for responding so quickly.

In response to Items 4 & 5 below please find attached a pdf (3 drawings) that shows the route of overland flow in the event of system failure, blockage or overload. I trust this demonstrates that dwellings should be suitably protected in the event of a drainage system failure and resulting overland flow can find its way safely through the road network and into the wetlands.

In response to value to use for Cv. I have been working with Micro Drainage to design and analyse drainage networks for almost 20 years and I have never been asked to apply an a Cv value 1.0 within network simulation. I've also consulted my Colleagues in other offices and they are also in agreement

Regarding the design parameters:

- We've used the more onerous FEH rainfall profiles instead FSR profiles, which is location specific and generates higher rainfall volumes for the long duration storm events when compared to FSR
- We've used the higher default Cv setting of 0.84 instead of 0.75.

If we apply a Cv value of 1.0 the flooding within network increases by approximately 500m3 and the attenuation will need to be increased accordingly, which represents an increase of approximately £100,000 based upon an installation cost of £200/m3. This represents a significant expenditure for our Client, especially when we still feel it is unnecessary. With this in mind we would be grateful if a Cv value of 0.84 can be retained whilst being safe in the knowledge that the system overload can safely overflow into the wetlands

I look forward to your response

Regards,

Sean Foley
01483 750 508

From: Mark Akmenkalns [mailto:mark.akmenkalns@wcc.gov.uk]

Sent: 23 February 2018 10:14

To: Sean Foley

Cc: Tim Townsend; Graham, Laura

David Lambert; Sara McKnight; Edgley, Martin; Edgley, Antony

Subject: D1013/00: RES application LU/278/17/RES - SURFACE WATER DRAINAGE - WSCC Response 18-02-23

Sean,

Thank you for your comprehensive email response. My comments as below.

Regards,

From: Sean Foley

Sent: 22 February 2018 19:24

To: Tim Townsend

Cc: Graham, Laura; Adrian Barnley; Oliver Nevett; David Lambert; Mark Akmenkalns; Sara McKnight; Edgley, Martin; Edgley, Antony

Subject: RE: RES application LU/278/17/RES - SURFACE WATER DRAINAGE

Tim,

Many thanks for your response, which looks quite positive

Below are our responses in red. Happy to discuss

Regards,

Sean Foley

Sean Foley,
Principal Engineer
Mayer Brown Limited
Lion House
Oriental Road
Woking
Surrey
GU22 8AR



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From: Tim Townsend

Sent: 19 February 2018 15:12

To: Sean Foley

Cc: Graham, Laura

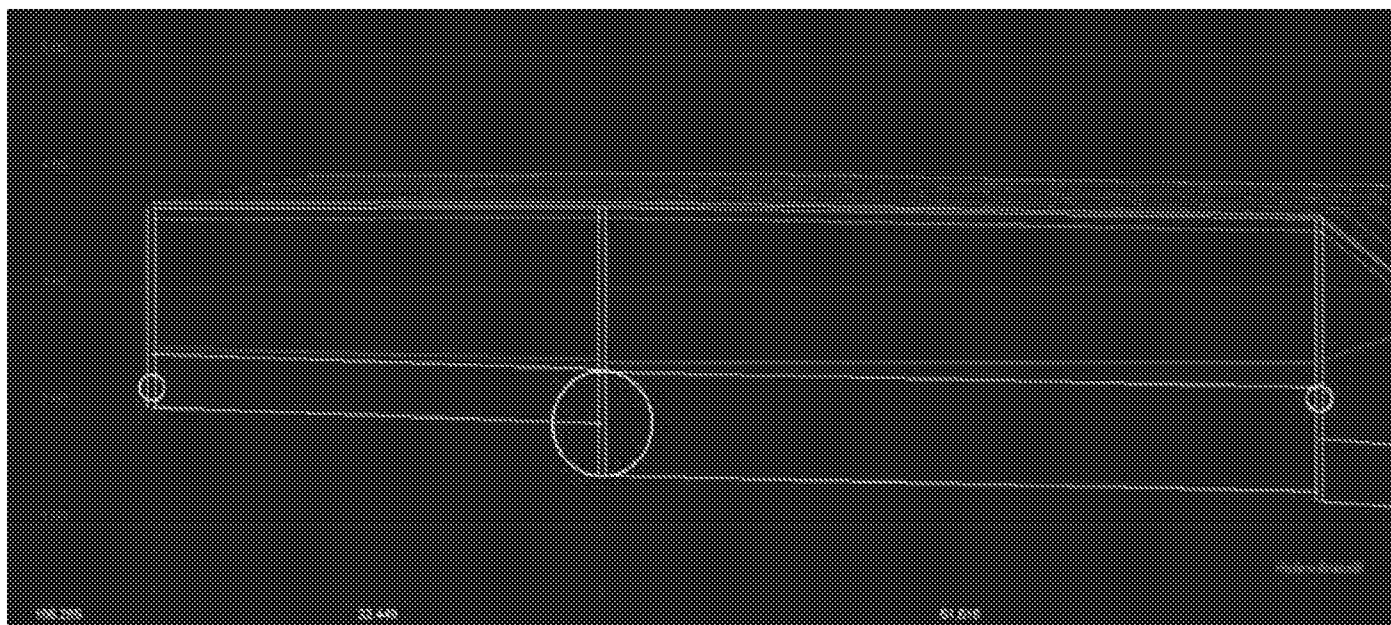
Subject: RES application LU/278/17/RES - SURFACE WATER DRAINAGE

Dear Sean,

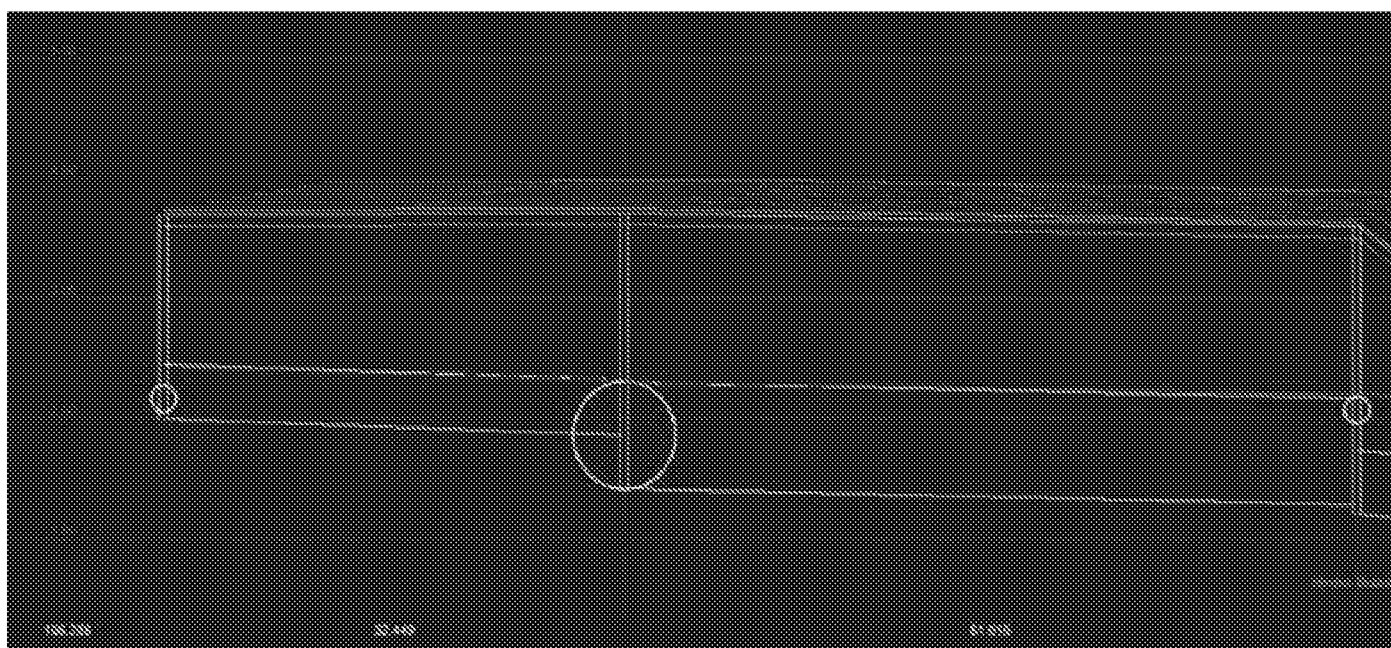
Thank you for your recent submission dated 30th January 2018 containing your surface water drainage assessment for the Southern By-Pass scheme. This has been reviewed and WSCC comments as follows:

- Item 1 Response - Noted, no further comments.
- Item 2 Response - Noted, no further comments.
- Item 3 Response - Agreed, no further comments.
- Item 4 Response - WSCC has reviewed the Micro-drainage simulation and accept this is a comprehensive model. However, noting the ultimate outfall is to the Black Ditch, it is not clear if this outfall will ever discharge under surcharged conditions. **If so, what bearing will this have on the upstream network and anticipated road extents (public and private)?**

The 1in100yr+CC flood level in the wetlands is 3.23m AOD by the outfall, but this will result in the outfall (@ 1.0m AOD) being surcharged by approximately 2.23m. There will be a flap valve on the final headwall to ensure this floodwater will not back up into the drainage network but in this scenario the drainage network can't push open the flap valve until the water level within the site goes above the flood level in the wetlands. In our opinion the chance of the critical 1in100yr+CC flood level in the wetlands (which is tidal) coinciding with the peak 1in100yr+CC storm event on the site are infinitesimally small.



We have however run the simulation with a fully surcharged outfall (@ 3.23m — see image above) and it results in a combined flood volume of 1750m³ escaping from the drainage network. We do not believe it is reasonable keep this flood water on site for this unlikely occurrence and the resulting flood water will flow safely through the road network and eventually into the wetlands.



We've also run the simulations with a 1m surcharged outfall (see image) and it results in a combined flood volume of approximately 500m³ escaping from the network.

It's important to note that these are for the long duration 4 hours (average rainfall intensity of 20.5mm/hr) relatively low intensity rainfall events so the flood water will flow benignly in the road channel.

For the short duration high intensity event 30mins (average rainfall intensity of 75mm/hr) the system won't event flood because the storm will barely create enough water to fill the drainage network.

We agree the likelihood of a coincidence occurrence is low. We also appreciate that the standing time may only be for a few hours until the River water level reduces. Our only main concern here is to consider where flooding will occur within the site and what the impacts will be:

1. Will any flood water continue to flow 'overland' towards an outfall? (It may be prudent to show a basic sketch of the routing through roads/wetlands as you state)

2. Will flooding impact on access/egress (inc emergency access)
3. Will flooding impact on any buildings i.e. flood damage

- Item 5 Response - I note that you say you are obliged to follow the guidance agreed at the time planning was consented. Please note however that the WSCC look to observe the 100yr plus 40% climate change impacts to Section 38 roads as noted above in accordance with NPPF requirements. This is to understand overland flow routing and flooding vs standing time and accessibility. **Please confirm that the 100yr + 40% climate change has been modelled in accordance with NPPF requirements.**

We'd like to clarify that none of the S38 Roads are simulated to flood for the 30% allowance CC. There will be approx. 15m³ at the low point in the private road immediately to the east but none of this will reach the S38 Road.

However, we believe it is reasonable to undertake some sensitivity testing of the model to ascertain the impact the 40%CC allowance will have on the network when compared to the 30%CC allowance. We have re-run the model using 40%CC and the combined flood volume at this low point increases from 15m³ to 60m³. (see pipe numbers 14.00 & 15.00 below which represent the low point). This additional flood water will spill over the S38 table and flow safely in the estate roads a northerly direction and into the wetlands.

Noted. Whilst the overall impacts at 40% are negligible on the scale of the development, the same issues would apply as noted above.

1.012	SW04	240 minute 100 year Winter I+40%	240	4.400	3.972	1.232
13.000	SW-FUT-01	120 minute 100 year Winter I+40%	120	4.000	3.951	1.091
14.000	Plots 80-86	240 minute 100 year Winter I+40%	240	3.800	3.828	1.053
15.000	Plots 87-94	240 minute 100 year Winter I+40%	240	3.800	3.831	1.056
1.013	SW05	240 minute 100 year Winter I+40%	240	4.100	3.843	1.243
16.000	C2 Resiblock A	120 minute 100 year Winter I+40%	120	4.300	3.843	1.343
1.014	SW06	240 minute 100 year Winter I+40%	240	3.700	3.730	1.290
17.000	SW-FUT-02	240 minute 100 year Winter I+40%	240	4.280	3.723	1.103
18.000	Plots 60-73	240 minute 100 year Winter I+40%	240	3.700	3.701	0.876

- Item 6 Response - Noted, no further comments.
- Item 7 Response - Noted, drawings 312 & 412 are now subject to the S278/38 design check.
- Item 7 Response - Agreed, no further comments.
- Item 8 Response - Agreed, no further comments.
- Item 9 Response - Agreed, no further comments.
- Item 10 Response - Agreed, no further comments.
- Microdrainage - WSCC note that there numerous hydrobrake flow controls proposed. WSCC recommendation (and S38 policy) is to ensure the solid handling opening is a minimum of 75mm to mitigate future block risks; we note a few are specified just below this size. **Please confirm that all will have opening of minimum of 75mm.**

All of the controls on the network apart from the final outfall are on the private / future development plots and we anticipate that all of the flow control devices will be specified with an opening no less than 75mm. There will be designed / specified as there plots are development in the near future.

The only flood control on the main drainage runs are on the final outfall where the opening is 286mm.

Noted. No further comments.

- Microdrainage - Please note the WSCC requirement for selecting an appropriate coefficient of volumetric run-off (Cv); where your calculations consider the impermeable areas only as contributing to the drainage system we recommend a Cv of 1.0 (This is also advised in Sewers For Adoption 7th Edition and so may already apply elsewhere). **Please confirm that a Cv of 1.0 has been used.**

We have conformed to the requirements of SFA7 and 100% of the hardstanding from roads, footpath, parking, driveways and houses have been plugged into the micro drainage model. However we have not used a Cv of 1.0 because it will be an incorrect usage of this parameter within micro drainage

When selecting a suitable Cv value the Wallingford Procedure Volume 4 states:

"An extensive study of the runoff data from sewered urban catchments showed that the volume of runoff was related to the impervious area, the soil type and the catchment wetness. An approximate result may be obtained by assuming that the runoff derives from a proportion of the impervious area (paved and roof), the proportion varying according to soil type. On this basis the overall average value of Cv is about 0.75, ranging from 0.6 on catchments with rapidly-draining soils to about 0.9 on catchments with heavy soils"

These values reflect the loss of some rainfall from impervious areas through cracks and into depressions and by drainage onto pervious (unpaved) areas. Similarly, any runoff from the pervious areas onto the impervious areas is also incorporated. The above range of values for Cv should therefore be used in conjunction with the total impervious area (paved and roof) intended to drain to the storm system. This is a large drainage catchment extending over 19 hectares.

Microdrainage has two default settings for Cv, which are 0.75 (the summer setting) or 0.84 (the winter setting). All of our simulations has used the higher winter setting of 0.84

If you take the typical value of Cv as 0.75 and multiply it by 1.3 (which is the routing co-efficient in the modified rational method) you get 0.975 which is very nearly 1 and therefore makes no difference compared to the Rational Method of design if using a Cv of 1. By choosing the higher setting of 0.84 in micro drainage the figure increases to 1.09.

I trust the above explanation explains why we have chosen the higher default setting of 0.84 within micro drainage as the Cv value

CIRIA advises that the Microdrainage (and other design software) 'defaults' may not be appropriate. Microdrainage points to Wallingford Vol 1 to determine the calculation criteria, however your reference to Wallingford is not relevant as the catchment is 100% impervious (with no soil factors). Indeed the Wallingford website questions/answers also covers this topic. Whilst I appreciate your summary of your parameters, however it is a **WSCC policy (as LLFA) to use a Cv of 1.0** (100% run-off).

I look forward to your early responses to the highlighted points in the text above.

Thank you,

Tim

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APPENDIX G: Condition 10, Exceedance Flows

SYSTEM FAILURE
- 02

Abstract

PHASE 2:
Application

System
Share
0/

Lymington Bypass



