mayer brown

BARGATE HOMES LTD
LAND WEST OF PAGHAM ROAD,
PAGHAM

DISCHARGE OF CONDITION 11, 12, 13 & 14

OCTOBER 2024

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Project Code:	**SL/BHPAGHAM.10**
Prepared by:	**FA**
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Mayer Brown Limited, Lion House, Oriental Road, Woking, Surrey GU22 8AR

Bargate Homes Ltd

Land west of Pagham Road, Pagham

Discharge of Condition 11, 12, 13 & 14

List of Contents

Sections

Figures

Appendices

1 Introduction

1.1 Mayer Brown Ltd have been commissioned by Bargate Homes Ltd to undertake the surface water and foul water drainage designs to facilitate the discharge of Condition 11, 12, 13 & 14 associated with the residential development at Land west of Pagham Road, Pagham, PO21 3QD.

1.2 The scheme received Planning Permission in December 2022 subject to planning conditions (application ref: APP/ C3810/W/22/3302023), refer to Appendix A for the Decision Notice.

1.3 The purpose of this report is to discharge Condition 11, 12, 13 & 14 (detailed below) associated with the planning application.

Condition 11

Prior to the commencement of construction works, 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) and no dwelling shall be occupied until works for the disposal of sewage have been fully implemented in accordance with the approved details.

Condition 12

No development shall commence, other than works of site survey and investigation, until full details of the proposed surface water drainage scheme have been submitted to and approved in writing by the local planning authority. The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, and the recommendations of the SuDS Manual produced by CIRIA. Design considerations must take full account of the 'Supplementary Requirements for Surface Water Drainage Proposals' produced by Arun District Council and are an overriding factor in terms of requirements. Winter groundwater monitoring to establish highest annual ground water levels and winter percolation testing to BRE 365, or similar approved, will be required to support the design of any infiltration drainage. No dwelling shall be occupied until the complete surface water drainage system serving the property has been implemented in accordance with the agreed details and the details so agreed shall be maintained in good working order in perpetuity.

Condition 13

No development shall commence until details have been submitted to and approved in writing by the local planning authority for any proposals to discharge flows to watercourses, or for the culverting, diversion, infilling or obstruction of any watercourse on or adjacent to the site. Any discharge to a watercourse must be at a rate no greater than the pre-development run-off values and in accordance with current policies. No construction is permitted that will restrict current and future landowners from undertaking their riparian maintenance responsibilities in respect to any watercourse or culvert on or adjacent to the site.

Condition 14

No development shall commence until full details of the maintenance and management of the surface water drainage system is set out in a site- specific maintenance manual and submitted to, and approved in writing, by the local planning authority. The manual is to include details of financial management and arrangements for the replacement of major components at the end of the manufacturer's recommended design life. Upon completed construction of the surface water drainage system, the owner or management company shall strictly adhere to and implement the recommendations contained within the manual.

1.4 This report works through the conditions and provides the evidence required to discharge it. The relevant Appendices are referenced as required throughout the report to discharge them.

2 Existing Site

Site Location

2.1 The application site is located in the north of Pagham, west of Pagham Road and north of Pagham Football Club. The surrounding area is a mixture of urban and rural consisting of mainly residential and some commercial property to the east and south, and greenfield land to the north and west, refer to the site location plan in Appendix B and Figure 2.1 below.

2.2 The site falls under the administrative boundary of Pagham Parish Council. The postcode is PO21 3QD and the approximate co-ordinates to the centre of the site are E489254, N098932.

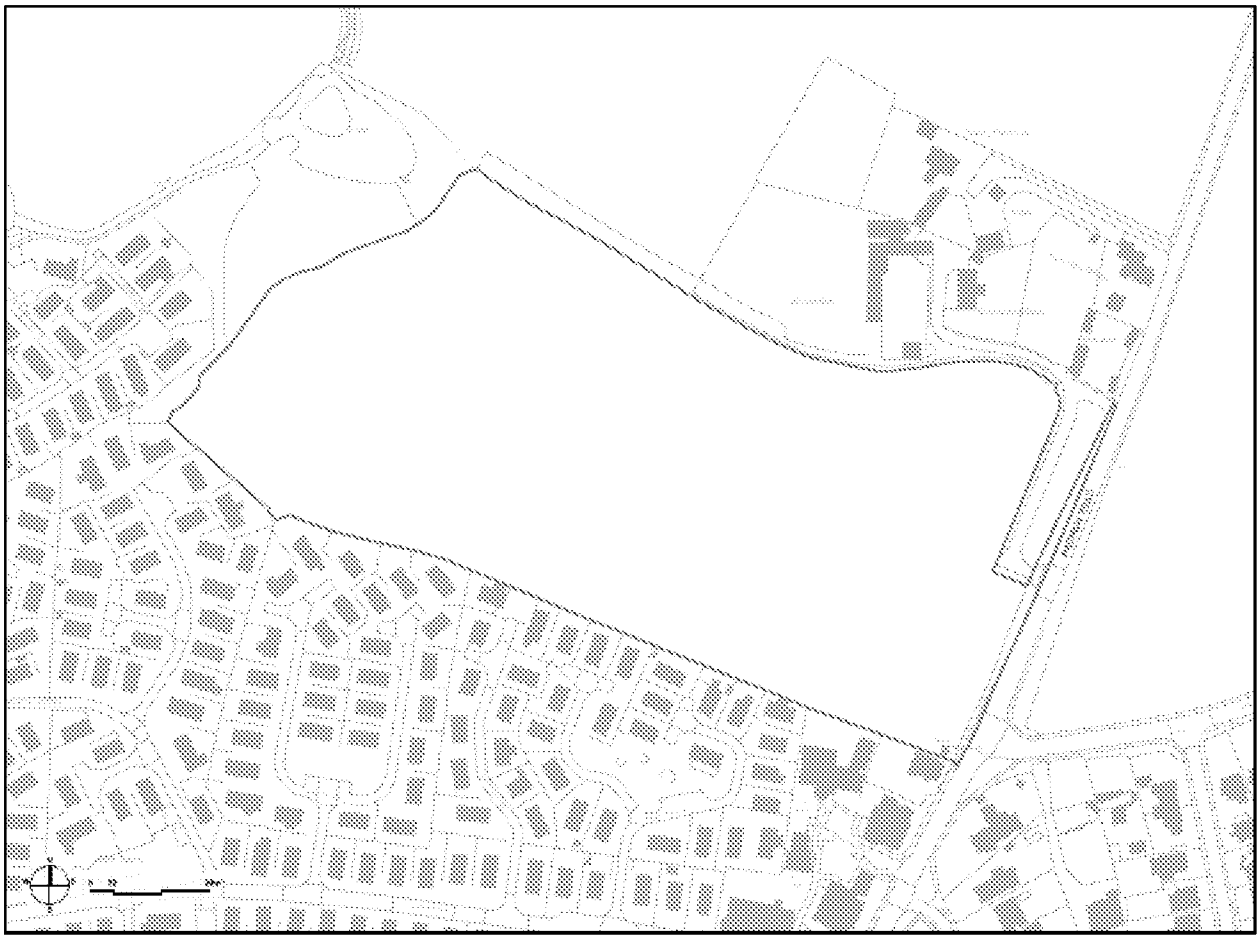


Figure 2.1: Site Location Plan

Topography

2.3 A topographical survey was undertaken in October 2021 by Interlocks Surveys Limited and can be seen in Appendix C. The topography of the site generally falls from east to west with levels ranging from 6.55m AOD to 3.30m AOD.

Infiltration & Geology

2.4 According to the borehole logs undertaken by Ground Condition Consultants (GCC) in October 2023, the site is underlain by gravel, clay, and sand. For further details, please refer to the borehole logs in Appendix D.

2.5 Five rounds of groundwater monitoring were undertaken between October 2023 to March 2024 by GCC. The results show very high levels of groundwater ranging from existing levels down to 0.91m bgl across seven locations (refer to Appendix D for the full results). Due to high groundwater levels, infiltration to the ground is not a suitable means of surface water discharge at this site.

Hydrology & Hydrogeology

2.6 The tidal Pagham Rife

2.7 is located approximately 30m to the west of the site which flows from north to south. The majority of the site is located in a low-risk Flood Zone 1; however, there is a relatively small area of high-risk Flood Zone 3 (1in200 year for Tidal) associated with the Pagham Rife confined to the west of the site.

2.8 Brookbanks Consulting Ltd was commissioned to carry out flood modelling to assess the flood risk at the site, as detailed in Appendix N. The flood modelling results indicate that all flooding, including the 200-year tidal storm event + climate change (1.6m) for the 2115 defended scenario, is restricted to the site's soft landscaping areas to the west. All areas of the site including the road and houses are positioned above the maximum defended flood level of 3.88m AOD.

2.9 There are existing ditches along the northern and western boundaries that to discharge to the Pagham Rife.

2.10 According to the Magic Map provided by the Department of Environment, the site is not located within a Source Protection Zone.

Existing Surface Water Drainage

2.11 The Southern Water sewer records show a 225mm to 450mm diameter surface water sewer travelling along Pagham Road to the east of the site which flows in a northernly direction (see Appendix E). The Southern Water sewer records also show an abandoned

sewer which intersects the northeastern area but does not travel the entire length of the site.

2.12 As the site is greenfield, it is expected that the surface water originating from the site flows overland and into the ditch to the west and ultimately the Pagham Rife at an unrestricted rate.

Existing Foul Water Drainage

2.13 The Southern Water sewer records (Appendix E) show a 150mm diameter public foul water sewer located along Pagham road which continues onto Hook Lane. The nearest public foul sewer manhole 2801 is located to the east of the site in Pagham Road.

2.14 The sewer records (Appendix E) also show a rising main coming from Honeysuckle Drive, crossing the central area of the site which continues into Hook Lane to the east.

2.15 As the site is greenfield, there is currently no discharge of foul effluent.

3 Proposed Development

3.1 The proposal is for the construction of 95 new residential dwellings, provision of access onto Pagham Road, new pedestrian and cycle links, private parking, and landscaping. Refer to Figure 3.1 below and Appendix F for the Proposed Layout.

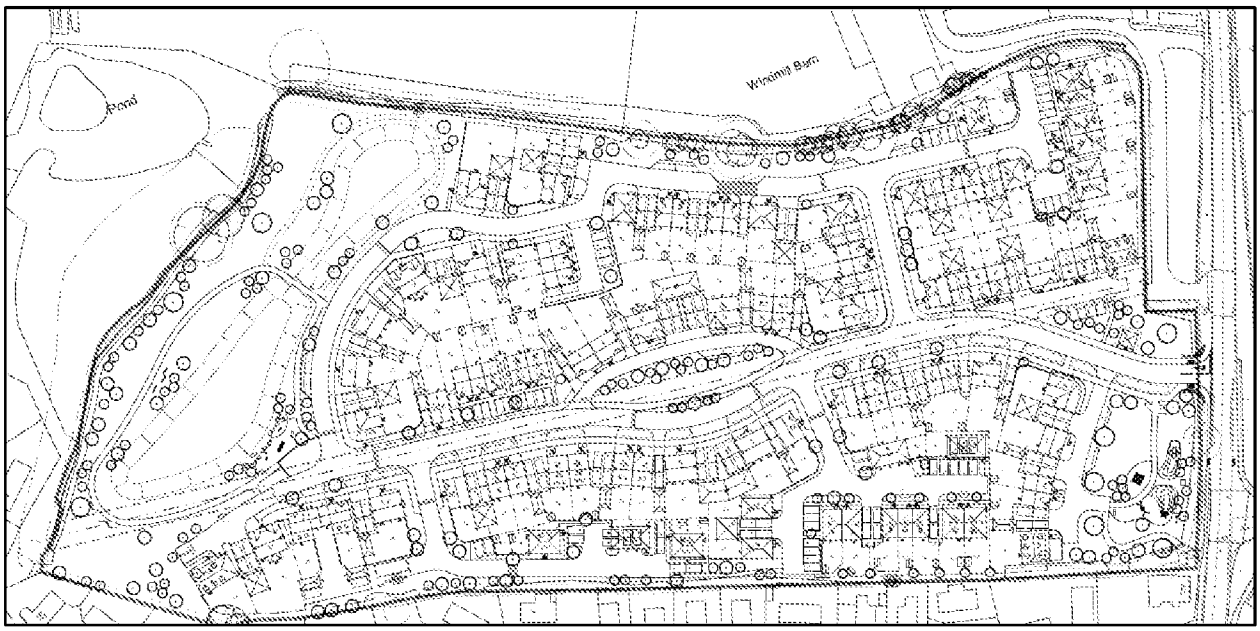


Figure 3.1: Proposed Layout

3.2 In terms of hard landscaping, below is an approximate breakdown of how the 4.81ha site will be divided:

Buildings (included 10% allowance for Urban Creep):	0.633ha
Roads:	0.721ha
Parking Areas:	0.072ha
Footpaths:	0.303ha
Driveways:	0.351ha
Garages:	0.100ha
Total Hardstanding:	2.180ha
Total Soft Landscaping:	2.630ha
Site Boundary:	4.810ha

3.3 A contribution of run-off from the SuDS basins into the drainage system has been allowed for bringing the overall hardstanding area to 2.478ha, please refer to Appendix G for the contributing areas plan for more information.

4 Condition 12 – Surface Water Drainage Detail

Existing Surface Water Drainage

4.1 The Southern Water sewer records show a 225mm to 450mm diameter surface water sewer travelling along Pagham Road to the east of the site which flows in a northernly direction (Appendix E). The Southern Water sewer records also show an abandoned sewer which intersects the northeastern area but does not travel the entire length of the site.

4.2 As the site is greenfield, it is expected that the surface water originating from the site flows overland and into the ditch to the west and ultimately the Pagham Rife at an unrestricted rate.

Infiltration & Geology

4.3 According to the borehole logs undertaken by Ground Condition Consultants (GCC) in October 2023, the site is underlain by gravel, clay, and sand. For further details, please refer to the borehole logs in Appendix D.

4.4 Five rounds of groundwater monitoring were undertaken between October 2023 to March 2024 by Ground Condition Consultants. The results show very high levels of groundwater ranging from existing levels down to 0.91m bgl across seven locations (refer to Appendix D for the full results). Due to high groundwater levels, infiltration to the ground is not a suitable means of surface water discharge at this site.

Sustainable Drainage (SuDS) and Drainage Hierarchy

4.5 West Sussex County Council, as the Lead Local Flood Authority (LLFA), will be concerned about the quantity, rate and quality of surface water run-off leaving development sites.

4.6 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.

4.7 To determine the most sustainable method of surface water disposal, the hierarchy from the approved document part H has been used, see below:

- **An adequate soakaway or some other adequate infiltration system** – Due to the high groundwater levels (Appendix D) across the site, infiltration drainage is not a suitable means of surface water discharge from this site.
- **A watercourse** – There is an existing ditch located along the western boundary that discharges into the Pagham Rife, approximately 30m to the west of the site. The ditch provides a suitable outfall for surface water discharge from this site.

4.8 The proposed drainage strategy builds on the principles agreed during the Outline Stage Flood Risk Assessment, undertaken by Brookbanks Consulting Ltd in December 2021, as shown in the illustrative Surface Water Drainage Strategy (drawing number: 10821-DR-01, refer to Appendix N). The agreed strategy included discharging surface water to an existing ditch along the western boundary which ultimately discharges to the Pagham Rife watercourse via a SuDS attenuation basin, with outflow restricted to greenfield run-off rates through a Hydrobrake Flow control system. The proposed design enhances this by incorporating swales and permeable paving, providing additional benefits for amenity, biodiversity, and water quality.

4.9 Ordinary watercourse consent and any other appropriate permissions to discharge surface water from the outfall into the watercourse will be obtained at the detailed design stage.

Proposed Surface Water Disposal

4.10 A proposed drainage strategy has been undertaken and is contained in Appendix H.

4.11 The proposed SuDS features will reduce the rate of discharge by providing storage during heavy rainfall events, reducing the risk of flooding.

4.12 Run-off from plots 43–52 and 67–89 will be collected via rainwater downpipes and conveyed through fin drains into the permeable paving sub-base within the road. The sub-base provides granular storage and treatment before the water is discharged into Attenuation Basin 1.

4.13 Run-off from plots 1-42 and 53 – 66 will be collected via rainwater downpipes and flow into the permeable paving sub-base beneath the road before discharging to conveyance swales located between the footway and spine road with an underdrain to collect the water from the swales, which then discharges to the traditional piped network and into Attenuation Basin 2.

4.14 Run-off from the spine road will crossfall into the conveyance swales, into the underdrain and discharge to Attenuation Basin 2.

4.15 Run-off from footways and footpaths located adjacent the spine road will crossfall into the conveyance swales. All other footways and footpaths will discharge into the permeable sub-base within the roads via the fin drains.

4.16 A Hydrobrake Flow control system will restrict the peak discharge into the ditch on the western boundary to the agreed greenfield run-off rate of 5.08l/s with any excess water backing up into the attenuation basins provided.

Calculations & Results

4.17 The greenfield rate for the site has been agreed and accepted at the Outline Planning stage and can be found in the FRA undertaken by Brookbanks Consulting Ltd in December 2021. An extract from the FRA has been included in Figure 4.1 for convenience.

Catchment	Land Use	Impermeable Area (ha)	Impermeable Area (ha)	Existing QBAR Value (Run-off (l/s)	Proposed QBAR Value (Run-off (l/s)
A	Residential	2.95	1.78	16.19	5.08

Table 4.1: Greenfield Run-off Rate

4.18 The proposed discharge rates match the agreed discharge rate shown in Figure 4.1.

4.19 The proposed surface water drainage network calculations have been undertaken using the Storm Network function within Causeway Flow. The calculations demonstrate that the Attenuation Basin and Permeable Paving provides sufficient storage to attenuate flows on-site, ensuring no flooding for up to and including the 1in100 year storm event + 45% climate change allowance, refer to Appendix I for the full calculations. A suitable freeboard allowance of approximately 10% of the overall volume of the basin's has been included.

4.20 In addition to the above, sensitivity testing has been caried out considering the effect of a surcharged outfall. The purpose of this to demonstrate that in the event the maximum design flood level in the ditch is reached, the system can still function effectively (refer to Appendix J). A water level of 3.88m AOD has been modelled in the watercourse which is included for up to the 1in100 year + 45% climate change event.

4.21 In line with the Environment Agency guidance on climate change allowances, a 40% climate change allowance has been applied to the 1-in-10-year and 1-in-30-year storm event, using the upper end allowances for the 2070s epoch.

Surface Water Treatment

4.22 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

4.23 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

4.24 Roads and Driveways, except from the spine road, will be constructed using permeable paving allowing the rainwater falling onto permeable paved areas to be treated by the microorganisms as it passes through the drainage medium (see Figure 4.1 below), before discharging into the traditional piped network.

4.25 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 requirements set out in paragraph 4.22.

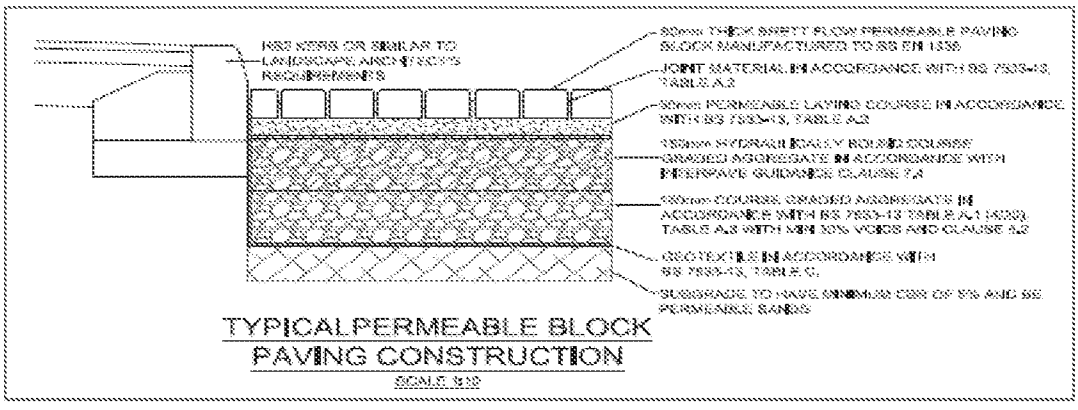


Figure 4.1: Typical Permeable Block Paving Construction

Swales

4.26 Swales will be provided as part of the proposed surface water drainage strategy and will be used to treat surface water run-off from the site by reducing the contaminant load.

4.27 Swales provide adequate pollution mitigation for runoff from low hazard land uses and provides mitigation indices of 0.5, 0.6, and 0.6, which meet or in excess of the requirement set out in paragraph 4.22.

Attenuation Basins

4.28 Attenuation basins provide surface water treatment primarily via the gravitational settling of particles.

4.29 Basins provide adequate pollution mitigation for runoff from low hazard land uses and provides mitigation indices of 0.5, 0.5, and 0.6 which meet or are in excess of the requirement set out in paragraph 4.22.

Groundwater and Buoyancy

4.30 High groundwater levels at the site pose a buoyancy risk to the basins due to the upward pressure exerted by water. To mitigate this risk, both basins are proposed to have filter drains beneath the basin liners to collect and discharge groundwater prior to it building up beneath the liner (refer to Appendix K for the Basin details). The proposed network of filter drains will manage groundwater levels by collecting excess groundwater beneath the liner and discharging it via a single piped connection downstream of the Hydrobrake.

Exceedance Flows

4.31 In the event the capacity of the proposed surface water drainage network is exceeded, the excess water will follow the topography of the ground and flow overland into the existing ditch network and ultimately the Pagham Rife. An Exceedance Flow Plan has been provided in Appendix O.

Adoption and Maintenance

4.32 The proposed surface water network will remain in private ownership and be maintained by a Management Company organised by the developer. This should enable tight control over the operation and maintenance of the drainage/SuDS systems on site.

4.33 A Management and Maintenance Plan has been provided, outlining the strategies and procedures to effectively manage and maintain the various SuDS systems proposed, please refer to Appendix L.

Design Criteria

4.34 The positive drainage will be designed in accordance with Design and Construction Guidance, BS EN 752 – Drain and Sewer Systems Outside Buildings and the Building Regulations – Part H (2015), CIRIA C753 (The SuDS Manual), and the Non-statutory Technical Standards for SuDS.

4.35 The surface water network design and the rate of surface water run-off are based on the Flood Estimation Handbook (FEH) data downloaded from the FEH Web Services, utilising the most up-to-date rainfall methodology, FEH 2022.

4.36 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, and a 40% climate change allowance has been included in the design to account for potential increases in rainfall intensity.
- The surface water run-off from the proposed development would be contained on site for up to and including the worst case 1 in 100 year storm event, plus an additional 45% 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
    - Percentage Impermeable areas:
        - Buildings = 100%
        - Carriageways, footpaths and parking = 100%
        - Private and Communal Parking = 100%
        - Soft Landscaping = 0%

Protection during construction

4.37 In order to protect the drainage system and manage run-off during construction a number of measures will be employed:

- Cut-off ditches and/or silt fences will prevent unrestricted release of sediments from the site or into the SuDS features.
- Surface water drains will be fitted with sediment traps.
- Earth movement will be controlled which will reduce the risk of surface water run-off combining with silt.
- Contained wheel washing facilities will be used where required.

Arun District Council Surface Water Drainage Design Checklist

4.38 A review of Arun District Councils Supplementary Requirements for Surface Water Drainage Proposals and Surface Water Drainage Design Checklist has been undertaken to ensure that the drainage design aligns with the requirements set out in the checklist, please refer to Appendix M for more information.

Condition 12

4.39 Condition 12 states that a Surface Water Drainage Strategy should be submitted to the Local Planning Authority. A Surface Water Drainage Strategy has been prepared which is discussed in Section 4 and can be found in Appendix H.

4.40 This report and drainage general arrangement drawing in Appendix H and Section 4 of this report and the relevant appendices provide:

- Paragraph 4.7 of this report and the general arrangement plan (Appendix H) demonstrates compliance with drainage hierarchy set out in Approved Document part H of the Building Regulations. While paragraphs 4.22 – 4.29, and 4.34 – 4.36 demonstrate consideration and implementation of the recommendations made by the SuDS Manual.
- Groundwater monitoring has been undertaken, in line with part of condition 12 and Arun District Council's Surface Water Drainage Proposal Checklist. The results show very high levels of groundwater ranging from existing levels down to 0.91m bgl across seven locations (refer to Appendix D for the full results).
- Due to high groundwater levels, infiltration to the ground is deemed an unsuitable means of surface water discharge for the site.
- Calculations (Appendix I) that prove the surface water drainage strategy will be safely contained on-site for up to and including the 1in100 year storm event + 45% climate change allowance.
- Calculations that confirm that the surcharged outfall will safely manage surface water on-site for up to and including the 1in100 year storm event + 45% climate change allowance (Appendix I).
- A discharge rate of 5.08l/s – in accordance with the Flood Risk Assessment undertaken by Brookbanks Consulting Ltd (Appendix N) and agreed at the Outline Planning stage.

4.41 It is considered that the information provided is sufficient to demonstrate that the surface water run-off can be safely collected, conveyed and stored in the surface water network prior to discharging to the ditch on the western boundary, and as such, this evidence provides sufficient information to discharge planning Condition 12.

5 Condition 13 – Typical Details and Greenfield Run-off Rates

5.1 The only proposed alteration to existing watercourses is to facilitate the discharge of surface water at the designated outfall. This is illustrated on the General Arrangement drawing in Appendix H, with a detail provided in Appendix K. Additional details related to the basin, permeable paving, pipes, manholes, Hydrobrake, and other system components are also included in Appendix K.

5.2 The outflow from the site will be restricted to the agreed greenfield run-off rates, as established in the Flood Risk Assessment (FRA) carried out by Brookbanks Consulting Ltd (Appendix N) during the Outline Planning stage.

5.3 Therefore, it is considered that this evidence base provides sufficient information to discharge planning Condition 13.

6 Condition 14 – Management & Maintenance Plan

6.1 A Management and Maintenance Plan has been provided, outlining the strategies and procedures to effectively manage and maintain the various SuDS systems proposed, please refer to Appendix L.

6.2 Therefore, it is considered that this evidence base provides sufficient information to discharge planning Condition 14.

7 Condition 11 - Foul Water Drainage

Existing Foul Water Drainage

7.1 The Southern Water sewer records (Appendix E) show a 150mm diameter public foul water sewer located along Pagham road which continues onto Hook Lane. The nearest public foul sewer manhole 2801 is located to the east of the site in Pagham Road.

7.2 The sewer records (Appendix E) also show a rising main coming from Honeysuckle Drive, crossing the central area of the site which continues into Hook Lane to the east.

7.3 As the site is greenfield, there is currently no discharge of foul effluent.

Existing Rising Main

7.4 The rising main shown on the Southern Water sewer records (Appendix E) is proposed to remain in place, with a 3m easement provided on either side.

Proposed Foul Flows and Drainage

7.5 It is proposed that the development will discharge via gravity to the foul pumping station located in the south western area of the site. A foul pumping station and rising main is required to discharge the foul effluent to the point where a gravity discharge can be achieved within the site, outside plot 5 and into chamber FW31, which eventually discharges into the public foul sewer along Pagham Road, Manhole 2801. A demarcation chamber is proposed within the site boundary, upstream of existing Southern Water Manhole 2801. The sewer is proposed for adoption from the demarcation chamber, with the remainder of the system being private (including foul pump station and rising main). Refer to Appendix H for the Drainage Strategy Drawing.

7.6 The proposals are for the construction of 95 residential dwellings.

7.7 Using the Design and Construction Guidance calculation method for residential development, 4000 litres per dwelling per day, a peak gravity flow rate of 4.40l/s will be generated.

- Peak flow: (95x4000)/86,400 = 4.40l/s

Design Criteria

7.8 The proposed foul sewers will be designed in accordance with the Design and Construction Guidance, BS EN 752 – Drain and sewer systems outside buildings and Building Regulations – part H (2015).

Adoption and Maintenance

7.9 The proposed foul network will remain in private ownership and be maintained by a management company organised by the developer. This should enable tight control over the operation and maintenance of the drainage systems on site.

Condition 11 Conclusion

7.10 Condition 11 states that a Foul Drainage Strategy should be submitted to the Local Planning Authority. A Foul Drainage Strategy has been prepared which is discussed in Section 7 and can be found in Appendix H.

7.11 The drainage general arrangement drawing in Appendix H and Section 7 of this report and the relevant appendices provide the following:

- Foul effluent will discharge to the existing Southern Water public foul sewer located along Pagham Road via Manhole 2801.
- The development generates a total peak gravity foul flow rate of 4.40l/s.

7.12 It is considered that the information provided is sufficient to demonstrate that the foul effluent can be safely collected, conveyed and discharged to the surrounding Southern Water public foul sewer network on a pumped basis and as such, this evidence base provides information to discharge the foul drainage element of Condition 11.

8 Conclusion

8.1 To conclude, it is considered this report, and associated appendices provide sufficient information to discharge conditions 11, 12, 13, and 14.

APPENDIX A: Planning Notice

The Planning Inspectorate

Appeal Decision

Hearing held on 15 November 2022

Site visit made on 16 November 2022

by Tom Gilbert-Wooldridge BA (Hons) MTP MRTPI IHBC

an Inspector appointed by the Secretary of State

Decision date: 14 December 2022

Appeal Ref: APP/C3810/W/22/3302023
Land west of Pagham Road, Pagham

- The appeal is made under section 78 of the Town and Country Planning Act 1990 against a refusal to grant outline planning permission.
- The appeal is made by Hallam Land Management against the decision of Arun District Council.
- The application Ref P/178/21/OUT, dated 17 December 2021, was refused by notice dated 19 May 2022.
- The development proposed is the construction of up to 106 new homes, formation of access onto Pagham Road, new pedestrian and cycle links, the laying out of open space, new strategic landscaping, habitat creation, drainage features and associated ground works and infrastructure.

Decision

1. The appeal is allowed and planning permission is granted for the construction of up to 106 new homes, formation of access onto Pagham Road, new pedestrian and cycle links, the laying out of open space, new strategic landscaping, habitat creation, drainage features and associated ground works and infrastructure at Land west of Pagham Road, Pagham in accordance with the terms of the application, Ref P/178/21/OUT, dated 17 December 2021, subject to the 32 conditions set out in the attached schedule.

Preliminary Matters

2. The original application was made in outline with all matters reserved except for access. Approval is only sought at this stage for the access point onto Pagham Road as shown on plan ref JNY10700-01 Rev D. All other matters relating to access, including internal circulation, would be determined at the reserved matters stage. I have had regard to the illustrative masterplans (ref P21-2766_03 Rev E, P21-2766_03 Rev F and P21-2766_02 Rev G) and landscape masterplan (ref P21-2766_06 Rev B) but consider that all the details shown are indicative only, apart from the access point.

3. A completed and executed Section 106 agreement (S106) was submitted shortly after the close of the hearing. This is assessed below.

Main Issues

4. The original application was refused for five reasons. In the Statement of Common Ground between the main parties, the Council confirmed that it would not seek to defend the second reason for refusal on flood risk subject to a suitably worded condition, or the third, fourth or fifth reasons for refusal on affordable housing, transport and ecology subject to those matters being appropriately addressed as obligations in the S106.

5. Interested parties identified a number of concerns relating to flood risk and so it has been necessary for this topic to remain a main issue at the hearing and in my decision. For clarity, I have also separated out the three topics contained with the first reason for refusal. Therefore, the main issues are as follows:

    a) The effect of the proposed development on the character and appearance of the area including the surrounding countryside;

    b) The effect of the proposed development on the provision of agricultural land;

    c) The effect of the proposed development on flood risk; and

    d) The overall planning balance, having regard to the development plan, national policy and the benefits of the proposal.

Reasons

Main Issue 1: Character and appearance

6. The appeal site comprises an agricultural field immediately to the west of Pagham Road and bordering the northern edge of Pagham. There is existing development to the south, including a small cul-de-sac surrounding a tall Grade II listed building known as Nyetimber Windmill and a much larger residential park home estate known as Mill Farm which extends beyond the south-west corner of the site. There is an area of thick vegetation along the site's western boundary and a hedgerow along its northern boundary that separates the site from open fields and the wider countryside to the north and west. There is a small cluster of buildings around the Grade II listed Rookery Farmhouse next to Pagham Road that extends halfway along the site's northern boundary. The eastern boundary of the site next to Pagham Road is partly contained by hedgerows while on the opposite side of the road is a large field at Hook Lane.

7. With the exception of Mill Farm and small cul-de-sacs to the west of Pagham Road, much of the housing within Pagham is contained to the east of Pagham Road and south-east of Hook Lane. The Pagham Village Design Statement (VDS) refers to the open fields west of Pagham Road and those abutting Hook Lane as especially sensitive and valued rural areas beyond the settlement edge. However, the VDS dates from 2007 and there have been considerable changes that have or will affect the character and appearance of the area.

8. New housing is being built to the west of Pagham Road and to the south of Mill Farm along the northern edge of Summer Lane. There is a strategic allocation in the Arun Local Plan 2018 (ALP) for 400 homes to the south of Summer Lane known as Pagham South which is seeking reserved matters approval. There is another ALP strategic allocation for 800 homes to the north-west of Hook Lane known as Pagham North which is opposite the site. This has secured reserved matters approval and is being implemented.

9. In terms of landscape character, the site lies within coastal plain character areas at the national, county and district level. This landscape is mainly flat and open with arable fields crossed by hedgerows and watercourses (rifes). Large commercial buildings and the proximity of urban fringes are detracting features. The site is part of this landscape character with its flat, open and vegetated qualities but it also has the detracting elements of nearby built development.

10. Public views of the site are limited to the Pagham Road frontage and only in the gaps in hedgerow planting. This allows a clear view of the site as well as buildings to the north and south, including the single storey properties at Mill Farm where there are breaks in boundary planting. These buildings along with trees and hedgerows restrict views of the wider countryside to the north and west. It may be possible to spot the spire of Chichester Cathedral on a fine day, but it is around 5km to the north-west and unlikely to be a significant feature at that distance. The buildings at Mill Farm prevent views of the site from a public footpath through the estate and from footpaths further to west and south-west. Vegetation and intervening buildings prevent views of the site from footpaths to the north and south.

11. The main parties agree that the site is not within any landscape designation and is not part of a valued landscape for the purposes of paragraph 174(a) of the National Planning Policy Framework (NPPF). While it has some value as an open field with hedgerow boundaries, it is well-contained from the surrounding area by buildings and vegetation. From the Pagham Road frontage, it is hard to appreciate the wider countryside beyond. The site is situated in a semi-rural edge of settlement location, but existing residential development to the south already has an urbanising influence. The Pagham North site to the east would add to this influence on the other side of Pagham Road travelling into the settlement from the north, even with landscaping buffers to the road. Therefore, the site only makes a moderate contribution to the character and appearance of the area.

12. The illustrative masterplans show residential development across much of the site with the access point onto Pagham Road approximately halfway along the eastern boundary. While the access point is the only element fixed at this stage, the draft planning conditions agreed between the main parties would set clear parameters for any reserved matters application. Built development would need to avoid the biodiversity improvement area along the western edge of the site and maintain dark wildlife buffer areas along the edges generally. Unless properties are built with a finished floor level of at least 300mm above the modelled 2115 undefended flood event scenario (see below), built development would be even further away from the site's western edge. There would also need to be a development free zone in the south-eastern corner to maintain a sightline of the listed windmill from Pagham Road. The masterplans suggest buildings could set back from the by approximately 30 to 50m.

13. These parameters would ensure that there would be considerable landscaping buffers on all sides of the development. Existing trees and hedges would be strengthened to screen views from the road and elsewhere. The development free zone could incorporate public open space and play equipment and provide a strong green edge for anyone travelling past the site on Pagham Road.

14. The gap in the road frontage would remain for the access point and the view of the currently open site would be lost to built development. The semi-rural character would also diminish. However, the density of development would not be excessive and the exact number of dwellings can be controlled at the reserved matters stage to ensure that it would not be overly urban. The same controls apply in terms of the scale and appearance of each dwelling along with any landscaping measures.

15. It may be possible to see two-storey properties above the existing single storey homes at Mill Farm from public footpaths to the west and south-west, but the effect of this can be successfully mitigated through additional planting. In the context of existing housing to the south of the site and emerging residential development to the south and east, the development would not seem out of place. Any negative effects can be mitigated through the layout of housing and the use of landscaping to screen and soften built forms.

16. In conclusion, the proposed development would have an acceptable effect on the character and appearance of the area including the surrounding countryside. Therefore, it would accord with ALP Policy LAN DM1 which, amongst other things, requires development to respect the particular characteristics and natural features of relevant landscape character areas and seek, wherever possible, to reinforce or repair the character of those areas. It would also accord with ALP Policy D DM1 which, amongst other things, seeks to make the best possible use of available land by reflecting or improving upon the character of the site and surrounding area.

Main Issue 2: Agricultural land

17. The site is used for arable farming and could continue to do so regardless of the outcome of this appeal. Around two-fifths of the site has been surveyed as Grade 3a agricultural land nearest to Pagham Road while the remainder is Grade 3b land. The NPPF defines Grades 1, 2 and 3a as best and most versatile (BMV) agricultural land with NPPF paragraph 174(b) highlighting the economic and other benefits of such land.

18. Most of the countryside surrounding the main coastal towns in Arun is characterised as BMV land. The main parties agree that it is difficult to avoid new development on the edge of such settlements resulting in the loss of some BMV land. In addition to BMV land having good soil for crops, it provides employment benefits as well as bi-products for composting and energy. With rising costs and uncertain food security, such land is an important resource.

19. ALP Policy SO DM1 seeks to protect BMV land unless the need for development outweighs the need to protect such land in the long term. The policy requires the submission of a sustainability and options appraisal to justify the loss of BMV land which has not been provided for this development. It also requires mitigation measures and a soil resources plan to offset any loss.

20. Based on the illustrative masterplan (ref P21-2766_03 Rev E) around two-thirds of the existing site would be lost to residential development and the remainder would be used for landscaping, flood attenuation and public open space. As a consequence, it would no longer be feasible for any commercial farming within the site. However, the main parties have agreed on a draft condition that would require the submission of a soil resources plan to protect and reuse soils within the development. Soils could be recycled for use within individual gardens and the undeveloped parts of the site could be used for small scale crop growing.

21. Compared to the extent of BMV land in Arun, the loss of around 2 hectares of Grade 3a land and 3 hectares of non-BMV Grade 3b land would not be significant. Soils can be protected and reused. Nevertheless, the loss of agricultural land carries moderate weight against the development. Moreover, the development has not provided the sustainability and options appraisal

required by ALP Policy SO DM1. In summary, the development would have a negative effect on the provision of agricultural land and cause some conflict with ALP Policy SO DM1.

Main Issue 3: Flood risk

22. Based on current day flood mapping from the Environment Agency (EA), most of the site lies within Flood Zone 1 apart from the north-west edge. This area lies within Flood Zones 2 and 3 due to the proximity of the Pagham Rife. No housing is proposed within this area on any of the illustrative masterplans and the route into and out of the site would also avoid this area.

23. However, the current day flood mapping does not reflect future climate change considerations. The Council's Strategic Flood Risk Assessment (SFRA) predicts that more of the north-western part of the site would fall within Flood Zone 3 by 2111. This is due to sea level rises and water from Pagham Harbour travelling up the Pagham Rife and flooding onto surrounding land. Pagham Rife already experiences flooding and interested parties have referred to the effect of a spring tide combined with heavy rainfall and the harbour sluice gates being closed leading to the displacement of water sideways from the river.

24. The EA's future flood map data is more recent than the SFRA. It forecasts that the area of the site within Flood Zone 3 by 2115 to be somewhere in between the extent shown in current day mapping and the SFRA assuming a defended flood event. Nevertheless, the appellant has modelled the scenario for a 2115 undefended 1 in 200 year tidal storm event with 1.1m and 1.6m sea level rises. This shows the extent of flooding to be comparable to the SFRA mapping and would affect any properties in the westernmost part of the site.

25. There is no intention for existing flood defences to be abandoned. The above scenario would require a series of defences to fail at the same time as a severe storm event. However, agreement has been reached between the main parties in consultation with the EA that a suitably worded planning condition can be attached to any permission. This condition would require either no properties within the area that would be flooded in the 2115 undefended flood event scenario or any property within that area to have a finished floor level at least 300mm above the modelled flood event. As a consequence, future occupants of the development should be safe from flooding.

26. The appellant has also carried out a sequential test as part of their appeal submission even though it is possible that no housing would be located outside Flood Zone 1. This reveals that alternative sites in the Pagham area are either not suitable/available or not sequentially better than this site in terms of flood risk. Therefore, I concur that there are no reasonably available alternative sites in Pagham for the development proposed in terms of flood risk matters.

27. Surface water would drain into an attenuation pond at the northern end of the site and then into watercourses and the Pagham Rife. The drainage strategy, which can be finalised and secured by condition, would lower existing run-off rates by holding and slowly releasing water. It would also be possible to remove pollutants before discharging off-site. Even if levels in the Pagham Rife are high, the development should not increase the risk of flooding elsewhere but should result in a betterment on existing water flow and quality.

28. It is apparent that the appellant has drainage rights to discharge into the watercourses to the north of the site based on riparian rights and documented easements[1]. Therefore, it seems unlikely that adjoining landowners would be able to withhold permission to drain into these watercourses. In any case, any dispute would be a civil matter separate to the planning process and so I have assumed that off-site drainage is achievable.

29. Interested parties have referred to information from Climate Central which forecasts half of the site to be below the annual flood level by 2030. However, I do not have the full information before me and so have relied on data provided by the EA and in the SFRA. The appellant's Flood Risk Assessment and appeal submission has taken into account baseline conditions and flooding data. It is evident that flooding already occurs from the Pagham Rife with flooding events at Mill Farm and elsewhere, and the bunding at Mill Farm suffering from water ingress. However, it has not been demonstrated that development on this site either on its own or cumulatively with other developments would either increase the risk of flooding elsewhere or put future occupants at risk.

30. Concluding on this main issue, the proposed development would have an acceptable effect on flood risk. Therefore, it would accord with ALP Policy ECC SP1 which, amongst other things, supports development which is located and appropriately designed to adapt to climate change in terms of flooding and drainage. It would also accord with ALP Policy W DM2 which requires development in areas at risk from flooding to meet the sequential test and show that the development will be safe without increasing flood risk elsewhere. The development would also follow the advice in NPPF paragraphs 159 to 169 with regard to the sequential test and addressing flood risk.

Other matters

Sewage

31. Southern Water has stated that there is insufficient capacity to join the development to the existing 150mm foul sewer along Pagham Road. However, they have identified where a connection could take place with foul sewage processed at Pagham Wastewater Treatment Works (WTW). A planning condition can be applied to ensure that a suitable foul drainage system is agreed and implemented. Such a system should be capable of keeping foul water separate from any surface water drainage, particularly as the former would flow eastwards to the road and the latter westwards to the Pagham Rife.

Pagham Harbour Special Protection Area (SPA)

32. The site is within 5km of the Pagham Harbour SPA and Ramsar site. The SPA contains a range of estuarine habitats including salt marsh, mudflats and grassland important for rare bird species like terns and ruffs as well as migratory bird species like brent geese. Potential adverse effects on the SPA from the development relate to recreational disturbance from increased numbers of visitors and their dogs affecting bird populations. This could result in likely significant effects on the integrity of the European site in combination with other plans or projects. As such, it is necessary to carry out an appropriate assessment (AA) as part of my decision.

[1] Hearing Document 6

33. As part of the AA, it is necessary to consider whether any potential effects could be addressed through specific measures. The appellant and the Council have agreed a financial contribution of £871 per dwelling towards the established strategic access management and monitoring (SAMM) project at Pagham Harbour. This would be secured by the S106. The extent of open space within the site would exceed policy requirements based on the illustrative material. This can be secured at the reserved matters stage and so could further help to reduce recreational pressure on the SPA.

34. Natural England (NE) was consulted as part of the appeal process and has confirmed that Pagham Harbour SPA is the only European site potentially affected by the development due to recreational disturbance. NE has also confirmed that the SAMM contribution secured by the S106 would be sufficient to avoid an adverse impact on the integrity of the SPA. Contrary to its response at the application stage, NE has not raised concerns with any effect on European sites in the Solent where wastewater can have negative consequences. This is because the Pagham WTW discharges to the English Channel and not the Solent.

35. Based on the above mitigation measures, the development would not result in a significant effect on the SPA and so would accord with ALP Policy ENV DM2 which seeks to protect the integrity of Pagham Harbour. I am also satisfied that the development would not affect any other European site.

Other ecology matters

36. The appellant has conducted a number of ecological surveys for different species. Trees and hedgerows within the site provide suitable habitats for bats and breeding birds, and some species within these groups have been identified. It is possible to retain the trees with bat roosting potential and much of the other boundary vegetation. Lighting measures can be sympathetic not just for bats and birds, but other species groups too. Additional planting and the use of bat/bird boxes would provide ecological enhancements. Such measures can be secured by condition as part of a landscape and ecology management plan. Further survey work for water voles, badgers, and hedgehogs can be carried out before development commences and mitigation measures agreed if any are found to be present. There would also be a biodiversity net gain for habitats, hedgerows, and river units. Therefore, the development would have an acceptable and beneficial effect on ecology.

Listed buildings

37. The Grade II listed Nyetimber Windmill has architectural and historic interest as a 19th century mill. The Grade II listed Rookery Farmhouse has architectural and historic interest as an 18th century farmhouse. Historically, both buildings were associated with the surrounding fields and countryside, although this has diminished particularly in the case of the windmill which is now integrated with modern residential development. Nevertheless, the windmill remains a prominent feature from Pagham Road and can be seen across the site.

38. The farmhouse is less obvious from either the road or the site due to its height and intervening buildings, although its roof can be glimpsed. The farmhouse is orientated northwards but there are rooflights on the elevation facing towards the site and windmill. The windmill has no upper floor windows facing the site or farmhouse. Therefore, the intervisibility between the two buildings is limited.

Moreover, it is not evident that they share a historic relationship. Therefore, while the existing site makes a moderate positive contribution to the significance of the listed windmill, it makes no more than a minor positive contribution to the significance of the farmhouse.

39. The development may or may not block views from the farmhouse to the windmill depending on the scale and layout of housing. Even if it did, given the limited intervisibility and absence of any specific relationship, the level of harm to significance would be low. The illustrative masterplans and the proposed conditions would provide a development-free zone next to the windmill, which would enable views of the building to be retained from both the road and the site. This would limit any adverse effect of the development on the significance of the listed windmill. In summary, any harm to the significance of the listed buildings would be minor and less than substantial. In line with NPPF paragraph 202, such harm should be weighed against the public benefits which takes place in the planning balance below.

Highway safety and parking

40. The development has been subject to assessment by the local highway authority who have raised no objections. The visibility splays onto Pagham Road are based on speed survey data and can be achieved and maintained. A financial contribution via the S106 can be secured for improvements to the A27 junction at Whyke Hill. While Pagham Road and the wider local road network may be very busy at times, unsafe for cyclists, and suffer from poor surfacing, it has not been demonstrated that the development would make conditions materially worse.

41. Seasonal workers for the agricultural business to the north may use the site as a cut through from Pagham to avoid walking along narrow sections of Pagham Road, but this is not a formal arrangement with the landowners of the site. It is possible that the development could provide a better surfaced route for such workers than the existing field margins if a formal arrangement was agreed. It is evident that on-street parking occurs in the area surrounding the site. However, the development should be able to provide sufficient parking spaces to avoid exacerbating this issue while local services in Pagham are within walking distance. Therefore, the development would have an acceptable effect on highway safety and parking.

Local infrastructure

42. The strategic sites at Pagham North and South are required to provide infrastructure for future occupants of those developments and contribute towards improving existing facilities in the local area including a new primary school. It has not been demonstrated that the development relies on the infrastructure delivered via the two strategic sites in order to be acceptable. In any case, Pagham North has commenced development while reserved matters for Pagham South are being progressed. I have little information to show that the development would cause unacceptable effects on the provision of schools, healthcare or other facilities. Financial contributions via the Community Infrastructure Levy (CIL) could be used to make infrastructure improvements in the local area, with the parish council receiving 15% of the CIL receipts. Therefore, the development would have an acceptable effect on local infrastructure.

Living conditions and local tourism

43. A number of properties at Mill Farm along the southern and south-western boundary of the site currently look directly across the site due to the absence of any planting. However, it should be possible at the reserved matters stage for new housing to be fixed at a sufficient distance from the boundary and screened by landscaping. This would ensure no unacceptable adverse effects on the living conditions of occupants at Mill Farm in terms of outlook, noise or privacy. I have insufficient evidence that odour from nearby land uses including a digestion plant would result in unacceptable living conditions for future occupants of the development. With regard to local tourism, the development would not be so large or urban as to discourage visitors to Pagham.

Main Issue 4: Planning balance

Housing supply/delivery and policy context

44. The main parties agree that the Council cannot demonstrate a five year housing land supply and that it has not been able to do so since 2018. The Council's latest estimate of supply stands at 2.4 years. The housing delivery test result for Arun has also been below 70% since the ALP was adopted in 2018 with the 2021 result standing at 65%.

45. As a consequence of the housing supply and delivery positions, NPPF paragraph 11(d) is triggered as the policies most important for determining the proposal are out of date. NPPF paragraph 11(d)(i) is not relevant as there are no policies in the NPPF that protect areas or assets of particular importance which provide a clear reason for refusing the development. Instead, NPPF paragraph 11(d)(ii) states that planning permission should be granted unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits when assessed against the policies in the NPPF taken as a whole.

46. The main parties agree that the policies listed in the first reason for refusal are the most important policies for determining this proposal. ALP Policies D DM1, LAN DM1 and SO DM1 have been addressed above, but Policies C SP1 and SD SP3 relate to settlement structure and are assessed below.

47. The site adjoins the built-up area boundary for the district's main towns and villages as set out in the ALP. As a consequence, ALP Policy C SP1 defines the site as countryside which will be recognised for its intrinsic character and beauty. The policy states that development will be permitted in the countryside where it meets one of a number of criteria, none of which apply to the proposed development. Therefore, the main parties agree that the development would conflict with ALP Policy C SP1.

48. The site is also located in a gap between settlements as set out in the ALP. The settlements in question are Bognor Regis and Chichester. ALP Policy SD SP3 states that the generally open and undeveloped nature of these gaps between settlements will be protected to prevent coalescence and retain their separate identity. Development will only be permitted within the gaps if a number of criteria in (a) to (e) can be met. Criteria (a) to (c) all have to be met, while the development only has to meet one of the criteria in (d) or (e).

49. In terms of criterion (a), there is a considerable countryside gap between Bognor Regis and Chichester. It is not possible to see another settlement to the north or west of the site. Therefore, the development would not undermine the

physical or visual separation of settlements. Turning to criterion (b), the development would encroach into the gap but in a relatively limited way compared to the overall size of the gap and the scale of developments coming forward at Pagham North and Pagham South. Moreover, its effect on the character and appearance of the area would be acceptable. Therefore, individually or cumulatively it would not compromise the integrity of the gap.

50. Due to the lack of housing land supply and housing delivery, it is difficult to argue that the development could be located elsewhere. Therefore, criterion (c) would be met. In terms of criteria (d) and (e), the development would either need to maintain the character of the undeveloped coast or be allocated by a subsequent development plan document or neighbourhood plan. The latter does not apply here, but the development would maintain the character of the undeveloped coast given its inland location. The development would not result in the coalescence of settlements and their separate identity would be retained. Therefore, the development would not conflict with ALP Policy SD SP3.

51. The Council produced an Interim Housing Statement (IHS) in February 2021 to address the shortfall in housing land supply. It is not part of the development plan but the main parties agree it is a material consideration for this appeal. The IHS applies to sites adjacent to the built-up area boundary and uses a Red Amber Green rating on matters to be addressed. The main parties agree that the development would score green on most matters. It scores amber as it is outside but physically adjacent to the built-up area boundary. It is within a settlement gap but as noted above in my analysis of ALP Policy SD SP3, it would be of size and location that would not significantly compromise the gap or its purposes and so also scores amber.

52. The IHS explains that amber ratings mean that applicable developments will be encouraged where sustainable. The site is within walking distance of various services and facilities in Pagham. There is also a bus stop immediately adjacent to the site on Pagham Road with regular services between Bognor Regis and Chichester. Therefore, the development would encourage sustainable modes of transport as sought by the IHS.

53. The development would not avoid BMV agricultural land as required by the IHS but would seek to protect and conserve as much soil as possible via a soil resources plan to mitigate that loss. Therefore, any conflict with the IHS in this regard would be limited.

54. The Council's most recent Housing and Employment Land Availability Assessment considers the site to be not currently developable, but this is largely due to being contrary to policies regarding its location in the countryside and a gap between settlements rather than any physical constraints. I have already found that there would be no conflict with ALP Policy SD SP3 regarding the gap, while the conflict with ALP Policy C SP1 needs to be considered in the overall planning balance.

Benefits of the development

55. The development would result the delivery of up to 106 dwellings. The shortfall in housing land supply is significant. It is likely to continue for some time with no imminent remedy through the plan-making process. The update of the ALP has been on pause since autumn 2021 and in July 2022 the Council decided not to resume with the update. The number of dwellings proposed as a percentage

of the housing land supply shortfall is not substantial, but it would still make a meaningful contribution to boosting the supply of housing locally. It could also start delivering units in the next 5 years based on the time limits in the conditions agreed between the main parties. Therefore, I afford the benefit of general housing delivery significant weight.

56. The development would provide up to 32 affordable housing units based on a 30% requirement in ALP Policy AH SP2 and the terms of the S106. While this level of provision is a policy requirement, only 563 affordable dwellings have been delivered between 2016 and 2021 (as shown in the Council's Annual Monitoring Report) compared to a need for 480 affordable dwellings per year as set out in the Council's most recent housing needs evidence from 2016. Thus, significant weight can be afforded to the delivery of affordable housing.

57. I note concerns from some interested parties that Pagham and the western part of the district have already received too many new homes. However, the targets in the ALP are minimums. Moreover, the appellant and the Council agree that new housing sites in Pagham taken together would not achieve the 1,200 minimum homes for Pagham as required by the ALP. I have insufficient evidence to demonstrate that the Council will never meet its five year housing land supply, particularly in the absence of recent progress with the ALP update. Therefore, these matters do not diminish the weight given to the delivery of housing from this development.

58. The development would secure investment and employment at the construction phase, while an employment and skills plan secured by condition has the ability to benefit local people and businesses. An increase in demand for council services from occupants of the development might offset any benefits from increased council tax receipts, but there would also be more expenditure in local services and facilities from new residents. Therefore, I consider the economic benefits of the development carry moderate weight.

59. The provision of real time information screens at the nearest bus stops on Pagham Road, which can be secured by condition, would enhance and encourage people to use sustainable modes of transport. The screens would likely be limited in size and given the proximity of built development would not detract from or urbanise the surrounding area. Therefore, moderate weight can be afforded to this benefit.

60. The forecast level of biodiversity net gain would be greater than any current development plan or legal target and would result in ecological enhancements. The provision of public open space and play facilities would benefit the wider community as well as new residents and in the case of public open space could go beyond the Council's minimum requirements based on the illustrative masterplans. These benefits can be afforded moderate weight. Improvements to on-site drainage represent a benefit although are largely designed in response to the proposed development rather than explicitly addressing an existing issue. Thus, I only give this benefit limited weight. All of the above benefits can be regarded as public ones.

Adverse impacts of the development

61. There would be conflict with ALP Policy C SP1 due to the location of development in the countryside. However, the weight I attribute to that conflict is reduced by the lack of a five year housing land supply. It is also reduced by

the fact that the development site adjoins the built-up area boundary, where the IHS takes a more positive and pro-active approach to the delivery of such sites where appropriate, given the housing supply position. Therefore, I only afford moderate weight to the conflict with this policy.

62. The development would have a moderate negative effect on the provision of agricultural land and result in some conflict with ALP Policy SO DM1 by failing to provide the required sustainability and options appraisals. However, a comparatively small area of BMV land would be lost, while a soil resources plan would minimise and mitigate any loss. On balance, the need for housing outweighs the need to protect this area of BMV land and so there would be overall compliance with ALP Policy SO DM1. The need for the development would also outweigh the limited conflict with the IHS on this matter.

63. The harm to the significance of the listed Nyetimber Windmill and Rookery Farmhouse would be minor and less than substantial. Although great weight should be given to the conservation of designated heritage assets, the public benefits would outweigh the harm on this occasion. There would be no conflict with NPPF paragraph 202 and the clear and convincing justification required by NPPF paragraph 200 would be demonstrated. Thus, the development would have an acceptable effect on the significance and setting of the listed buildings.

Conclusion

64. The adverse impacts of the development carry no more than moderate weight. In contrast, significant weight can be afforded to some of the benefits and moderate weight to others. In the context of NPPF paragraph 11(d), the adverse impacts would not significantly and demonstrably outweigh the benefits. As a consequence, the presumption in favour of sustainable development would apply in line with NPPF paragraph 11(d). The development would have an acceptable effect on the character and appearance of the area as well as flood risk. The negative effects on the provision of agricultural land are outweighed by other considerations. Therefore, despite the conflict with ALP Policy C SP1, there are sufficient material considerations to indicate that planning permission should be granted in this instance.

Planning Obligations

65. The Affordable Housing obligation would ensure that not less than 30% of the residential units are affordable. This would accord with ALP Policy AH SP2 on affordable housing. The Travel Plan Contribution obligation would secure the monitoring of the travel plan aimed at encouraging sustainable modes of transport, in accordance with ALP Policies T SP1 and T DM1. The SAMM Contribution obligation would provide funding towards management measures to mitigate the effect of residential development at Pagham Harbour SPA in line with ALP Policies ENV DM1 and ENV DM2. The Whyke Junction Contribution obligation would provide funding for improvements at the A27 Whyke Hill junction in line with ALP Policies T SP1.

66. Given the policy requirements, I am satisfied that all of the above obligations are necessary to make the development acceptable in planning terms and are directly related to the development and fairly and reasonably related in scale and kind. They would accord with Regulation 122 of the CIL Regulations 2010 (as amended) and NPPF paragraph 57. Therefore, I can take all the obligations in the S106 into account as part of my decision.

Conditions

67. Conditions 1 and 2 are necessary to clarify the reserved matters still to be approved as well as set out the timeframe for applications to be submitted and the development implemented. The timeframes are shorter than the standard amount to encourage the earlier delivery of housing. Condition 3 is necessary to specify the plans to which this decision relates.

68. Conditions 4 to 9 contain a number of details that would need to be addressed at the reserved matters stage. Condition 4 specifies the limits to development within the site, which is necessary in the interests of ecology, heritage, and flood risk. Condition 5 requires details that are necessary in the interests of ecology and the character and appearance of the area. Condition 6 would secure the provision and management of public open space and play areas which are necessary to ensure suitable communal outdoor space. The details in Condition 7 are necessary in the interests of access, parking, sustainable travel, and the character and appearance of the area. Condition 8 is necessary to secure accessible housing. Condition 9 is necessary to ensure that ecological mitigation and enhancement measures are included in the landscaping details.

69. Conditions 10 to 19 are pre-commencement as they concern matters that need to be addressed and/or provided before works begin on site. Condition 10 is necessary to ensure that ecological surveys are up to date and mitigation measures provided if species are found. Conditions 11 to 14 and 29 are necessary to ensure appropriate foul and surface water drainage. Condition 15 is necessary given the site's potential archaeological or historic interest. Conditions 16 and 31 are necessary to ensure the construction phase has an acceptable effect on highway safety, living conditions, and ecology. Conditions 17 and 30 are necessary to address any contaminated land issues. Condition 18 is necessary to protect and reuse the best and most versatile soil within the site, while Condition 19 is necessary for local people have the opportunity to secure employment at the construction phase.

70. Condition 20 is necessary in the interests of character and appearance and Condition 21 is necessary to achieve reductions in energy use. Conditions 22 and 28 are necessary to ensure a satisfactory noise environment for future residents, Condition 23 to provide fire safety equipment, and Condition 24 to secure high speed broadband. Condition 25 is necessary for highway safety and Conditions 26 and 27 for encouraging sustainable transport modes. Condition 32 is necessary to maintain air quality levels.

Conclusion

71. For the above reasons, and having had regard to all other matters raised, I conclude that the appeal should be allowed.

Tom Gilbert-Wooldridge

INSPECTOR

Appearances

For the Appellant:

Thomas Hill KC	Counsel
Owen Jones BA (Hons) DipTP MSc MRTPI PIEMA	LRM Planning
Dean Swan HND Civil Engineering MCIHT FIHE	Brookbanks Consulting

For the Local Planning Authority:

Simon Davis BA (Hons) DipTP MRTPI	Arun District Council

Interested Parties who spoke at the Hearing:

Dawn Hall	Pagham Parish Council
Colin Hamilton	Local resident
Alan Pivett	Local resident

Documents submitted during the Hearing

1. Updated Context Plan ref P21-2766_03 Sheet No. 6 Rev F
2. Pagham Road Illustrative Montage Drawing ref P21-2766_20 Rev A
3. Agricultural Land Classification Areas Plan ref P21-2766_19
4. Statement from Dawn Hall
5. Statement from Colin Hamilton
6. Advice on drainage rights from Shoosmiths LPP dated 14 November 2022

Documents submitted after the Hearing

1. Updated list of conditions
2. Completed and executed Section 106 agreement dated 1 December 2022

Schedule of Conditions (32)

1) Details of the appearance, landscaping, layout, and scale (hereinafter called "the reserved matters"), shall be submitted to and approved in writing by the local planning authority before any development takes place and the development shall be carried out as approved. An application for the approval of the reserved matters shall be made to the local planning authority not later than 2 years from the date of this permission.

2) The development hereby permitted shall take place not later than 4 years from the date of this permission or not later than 2 years from the date of approval of the last of the reserved matters to be approved, whichever is the later.

3) The development hereby permitted shall be carried out in accordance with the following approved plans:

   - Site Location Plan Drawing No P21-2766 05 Rev E
   - Proposed Access Arrangement Drawing No JNY10700-01 Rev D

4) The layout details to be submitted pursuant to condition 1 shall ensure that:

   a) There is no built development placed within the part of the site designated by the Arun Local Plan as part of a Biodiversity Improvement Area;

   b) Either (i) all properties are situated outside the Design Flood Event (which is the Brookbanks Consulting Ltd 0.5% (1 in 200 year) 2115 undefended with climate change) outline as shown on drawing 10821-SK05; or (ii) any properties that fall within the Design Flood Event have a Finished Floor Level of at least 300mm above the Design Flood Event;

   c) Dark wildlife buffer areas are proposed to the site's edges and that these are kept free of lighting; and

   d) As per the submitted Historic Environment Desk Based Assessment (ref PN2721/HEDBA1, October 2021), there is a development free zone in the south-eastern corner in order to maintain a sight line of the Grade II listed Nyetimber Windmill from Pagham Road.

5) The landscape and layout details to be submitted pursuant to condition 1 shall include the following items:

   a) Details of all existing trees and hedgerows on the land indicating which are to be retained and which are to be removed. These required details are to include a Tree Survey Schedule, a Root Protection Area Schedule, a Tree Constraints Plan, and in the event that a root protection area of any tree which is proposed for retention overlaps the development, then an Arboricultural Method Statement and a Tree Protection Plan. Development shall be carried out in accordance with the approved details. No hedge or tree shall be felled, uprooted, or otherwise removed before, during or after the construction period except where removal is indicated on a plan approved by the local planning authority;

b) Full landscaping details including the use of native trees and compensatory planting on the basis of 2 trees/hedge units for every 1 lost;

c) Details of the position, design, materials, height, and type of all boundary treatments to be provided. The boundary treatments shall be provided to each dwelling before the dwelling is occupied or in accordance with the approved phasing plan. Gaps shall be included at the bottom of the fences to allow movement of small mammals across the site. Development shall be carried out in accordance with the approved details and permanently retained in a useable condition thereafter;

d) Full details of how the existing hedgerows are to be protected with secure fencing to establish a 5m buffer zone during construction (unless such a buffer is not possible due to the position of agreed buildings in which case a reduced buffer will be acceptable). The development shall thereafter proceed in accordance with the approved hedgerow protection measures;

e) A Landscape Environmental Management Plan to provide full details on how the habitats and enhancements on the development will be managed post construction; and

f) Full details of all new external lighting (including type of light appliance, the height and position of fitting, predicted illumination levels and light spillage). This submission should also cover new streetlighting if required. The scheme should seek to conform with the recommendations of the Institution of Lighting Professionals (ILP) "Guidance Notes for the Reduction of Obtrusive Light" (GN01:2011) but also minimise potential impacts to any bats using trees and hedgerows (in accordance with the BCT/ILP Guidance Note 08.18) by avoiding unnecessary artificial light spill through the use of directional light sources and shielding. Care should be exercised in respect of lighting directed to the site boundaries. The lighting approved shall be installed and maintained in accordance with the approved details.

6) The layout and landscape details to be submitted pursuant to condition 1 shall include full details of the required public open space (POS) & play areas and management arrangements. The POS and play areas shall thereafter be implemented in accordance with the provision as agreed prior to occupation of 50% of the completed dwellings approved pursuant to condition 1 and then permanently retained thereafter. The approved management details shall be permanently adhered to.

7) The layout, scale, and appearance details to be submitted pursuant to condition 1 shall include the following items:

a) Circulation routes and how these fit into the surrounding access network;

b) A scheme for the provision of facilities to enable the charging of electric vehicles in accordance with the Arun Parking Standards SPD to serve the approved dwellings;

c) A detailed level survey of the site including existing and resulting ground levels and the slab levels of the buildings the subject of this approval;

d) 5% of all parking provided as suitable for disabled persons;

e) Full details of cycle storage including elevations where such is provided in separate buildings; and

f) A colour schedule of the materials and finishes to be used for the external walls and roofs of the proposed buildings.

These items shall be implemented in accordance with the agreed details and permanently retained thereafter.

8) Detailed plans and particulars of the reserved matters submitted to the local planning authority for approval pursuant to condition 1 shall ensure that 50% of the approved dwellings are designed to meet the Building Regulations M4(2) standard and an additional two units shall be constructed to M4(3) standard for every 50 dwellings developed on the site as defined by 'Access to and use of Buildings: Approved Document M'.

9) The development shall be carried out in complete accordance with the mitigations and enhancements set out in sections 6.8-6.22 of the Ecological Appraisal (December 2021) and also in respect of any recommendations in the accompanying supporting survey reports (contained as appendices to the document). All proposed enhancements shall be detailed in the landscape details to be submitted pursuant to condition 1.

10) No development, including site access or associated construction activities, shall commence unless and until the site has been re-surveyed for water voles, badgers, and hedgehogs. If water voles or badgers (or a badger sett) are found to be present, then an appropriate mitigation strategy shall be provided to the local planning authority for approval in writing prior to commencement of the development. Any hedgehogs that are found to be present shall be relocated away from the construction area into surrounding suitable habitats.

11) Prior to the commencement of construction works, 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) and no dwelling shall be occupied until works for the disposal of sewage have been fully implemented in accordance with the approved details.

12) No development shall commence, other than works of site survey and investigation, until full details of the proposed surface water drainage scheme have been submitted to and approved in writing by the local planning authority. The design should follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations, and the recommendations of the SuDS Manual produced by CIRIA. Design considerations must take full account of the 'Supplementary Requirements for Surface Water Drainage Proposals' produced by Arun District Council and are an overriding factor in terms of requirements. Winter groundwater monitoring to establish highest annual ground water

levels and winter percolation testing to BRE 365, or similar approved, will be required to support the design of any infiltration drainage. No dwelling shall be occupied until the complete surface water drainage system serving the property has been implemented in accordance with the agreed details and the details so agreed shall be maintained in good working order in perpetuity.

13) No development shall commence until details have been submitted to and approved in writing by the local planning authority for any proposals to discharge flows to watercourses, or for the culverting, diversion, infilling or obstruction of any watercourse on or adjacent to the site. Any discharge to a watercourse must be at a rate no greater than the pre-development run-off values and in accordance with current policies. No construction is permitted that will restrict current and future landowners from undertaking their riparian maintenance responsibilities in respect to any watercourse or culvert on or adjacent to the site.

14) No development shall commence until full details of the maintenance and management of the surface water drainage system is set out in a site-specific maintenance manual and submitted to, and approved in writing, by the local planning authority. The manual is to include details of financial management and arrangements for the replacement of major components at the end of the manufacturer's recommended design life. Upon completed construction of the surface water drainage system, the owner or management company shall strictly adhere to and implement the recommendations contained within the manual.

15) No development shall commence until the implementation of a programme of archaeological work in accordance with a written scheme of investigation that has been submitted to and approved in writing by the local planning authority. The development shall thereafter proceed in accordance with the approved scheme.

16) No development shall commence, including any works of demolition, until a Construction and Environmental Management Plan (CEMP) and accompanying Site Setup Plan has been submitted to and approved in writing by the local planning authority (who shall consult with the local highway authority and the Council's Environmental Health Officer and Ecologist as appropriate). Thereafter the approved CEMP shall be implemented and adhered to throughout the entire construction period. This shall require disturbance during demolition and construction to be minimised and will include (but not be limited to) details of the following information for approval:

    a) the phased programme of construction works;

    b) the anticipated, number, frequency, types, and timing of vehicles used during construction (construction vehicles should avoid the strategic road network during the peak hours of 0800-0900 and 1700-1800 where practicable);

    c) the sheeting of any loose loads;

    d) the means of access and road routing for all construction traffic associated with the development;

    e) provision of wheel washing facilities (details of their operation & location) and other works required to mitigate the impact of

construction upon the public highway (including the provision of temporary Traffic Regulations Orders);

f) details of street sweeping;

g) construction vehicle delivery times;

h) details of a means of suppressing dust & dirt arising from the development;

i) a scheme for recycling/disposing of waste resulting from demolition and construction works (i.e., no burning permitted);

j) details of all proposed external lighting to be used during construction (including location, height, type & direction of light sources and intensity of illumination);

k) details of areas for the loading, unloading, parking, and turning of vehicles associated with the construction of the development;

l) details of areas to be used for the storage of plant and materials associated with the development;

m) details of the temporary construction site enclosure to be used throughout the course of construction (including access gates, decorative displays & facilities for public viewing, where appropriate);

n) contact details for the site contractor, site supervisor and CDM co-ordinator (including out-of-hours contact details);

o) details of the arrangements for public engagement/consultation both prior to and continued liaison during the construction works;

p) details of any temporary traffic management that may be required to facilitate the development including traffic signage; and

q) measures to minimise the noise (including vibration) generated by the construction process to include hours of work, proposed method of piling for foundations, the careful selection of plant and machinery and use of noise mitigation barrier(s).

Details of how measures will be put in place to address any environmental problems arising from any of the above shall be provided. A named person shall be appointed to deal with complaints and shall be available on site and their availability made known to all relevant parties. The CEMP shall also include reference measures to minimise disturbance to bats and other wildlife during construction including the briefing of site operatives, monitoring by an ecologist, and either securing or providing a means of escape for all deep pits, trenches, and/or holes present on the site during periods of darkness.

17) Prior to commencement of the development hereby approved (or such other date or stage in development as may be agreed in writing with the local planning authority), the following components of a scheme to deal with the risks associated with contamination of the site shall each be submitted to and approved in writing by the local planning authority:

a) A Site Investigation Scheme, based on the Brookbanks Geo-Environmental Phase 1 Desk Study (ref 10821) to provide

information for a detailed assessment of the risk to all receptors that may be affected, including those off-site;

b) Based on the Site Investigation Scheme and the detailed risk assessment in (a), an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken; and

c) A Verification Plan providing details of the data that will be collected in order to demonstrate that the works set out in (b) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance, and arrangements for contingency action and a programme for its implementation.

Any changes to these components in (a) to (c) require the express written consent of the local planning authority. The scheme shall be implemented as approved above. In accordance with the implementation programme agreed under (c) (or such other date or stage in development as may be agreed in writing with the local planning authority), a Verification Report demonstrating completion of the works set out in the approved remediation strategy and the effectiveness of that remediation shall be submitted to and approved in writing by the local planning authority. The report shall include results of sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. The report shall also include a long-term monitoring and maintenance plan for longer-term monitoring of pollutant linkages, maintenance, and arrangements for contingency action, as identified in the verification report, and for the reporting of this in writing to the local planning authority.

18) No development shall commence until a Soil Resource Plan has been submitted to and approved in writing by the local planning authority. This shall set out how soils on the site are to be protected during construction and then recycled/reused in the new development layout. The soil protection/mitigation measures shall be implemented as per the document and then permanently adhered to throughout the construction and development of the site.

19) No development shall commence until an Employment and Skills Plan (ESP) for the construction of the development hereby approved has been submitted to and approved in writing by the local planning authority. The approved ESP shall then be implemented and permanently adhered to throughout the construction phase of the site.

20) Should any temporary showhome/s or sales areas be required then full details shall be provided prior to any part of the development site reaching damp proof course (DPC) level. Such details shall include any temporary buildings or temporary changes to buildings and any temporary change to the development layout. The approved details shall be for a temporary period only ending on or before the date that the last dwelling on the site has been sold. The buildings or area shall then be returned to their approved permanent appearance within 3 months of the date of the last building sold.

21) At least 10% of the energy supply of the development shall be secured from decentralised and renewable or low carbon energy sources (as

described in the glossary at Annex 2 of the NPPF) unless it can be demonstrated that a fabric-first approach would achieve an equivalent energy saving. Details and a timetable of how this is to be achieved for each phase or sub phase of development, including details of physical works on site, shall be submitted to, and approved in writing by the local planning authority prior to construction above damp-proof course (DPC) level in that phase or sub phase. The development shall be implemented in accordance with the approved details and timetable and retained as operational thereafter.

22) No development above DPC level shall take place unless and until a scheme to demonstrate that internal noise levels within the residential units will conform to the 'Indoor ambient noise levels for dwellings' guideline values specified within Table 4 under section 7.7.2 of BS 8233:2014 has been submitted to and approved in writing by the local planning authority.

The submission shall include details compiled by a qualified acoustician on sound insulation and noise reduction for buildings and gardens. The scheme should take into account the correct number of air changes required for noise affected rooms. The works specified in the approved scheme shall then be carried out in accordance with the approved details prior to occupation of the premises and be retained thereafter.

23) No development above DPC level shall take place unless and until details of the proposed location of the required fire hydrants have been submitted to and approved in writing by the local planning authority in consultation with West Sussex County Council's Fire and Rescue Service.

Prior to the first occupation of any dwelling forming part of the proposed development, the developer shall at their own expense install the required fire hydrants (or in a phased programme if a large development) in the approved locations to BS:750 standards or stored water supply and arrange for their connection to a water supply which is appropriate in terms of both pressure and volume for the purposes of firefighting.

The fire hydrants shall thereafter be maintained as part of the development by the water undertaker at the expense of the Fire and Rescue Service if adopted as part of the public mains supply (Fire Services Act 2004) or by the owner/occupier if the installation is retained as a private network.

24) Prior to the occupation of any part of the development, a strategy for the provision of the highest available headline speed of broadband provision to future occupants of the site shall be submitted to and approved in writing by the local planning authority. The strategy shall take into account the timetable for the delivery of 'superfast broadband' (defined as having a headline access speed of 24Mb or more) in the vicinity of the site (to the extent that such information is available). The strategy shall seek to ensure that upon occupation of a dwelling, the provision of the highest available headline speed of broadband service to that dwelling from a site-wide network is in place and provided as part of the initial highway works and in the construction of frontage thresholds to dwellings that abut the highway. Unless evidence is put forward and agreed in writing by the local planning authority that technological advances for the provision of a broadband service for the majority of potential customers

will no longer necessitate below ground infrastructure, the development of the site will continue in accordance with the approved strategy.

25) No part of the development shall be first occupied until such time as the vehicular access, visibility splays and ancillary footway connections serving the development have been constructed in accordance with the details shown on the drawing "Proposed Access Arrangement" ref JNY10700-01 Rev D. Once provided the visibility splays shall thereafter be maintained and kept free of all obstructions over a height of 0.6 metre above the adjoining carriageway level.

26) No part of the development shall be first occupied until a scheme of real time information screens at the two bus stops (north and southbound) on Pagham Road in the immediate vicinity of the development along with a timetable for their installation has been submitted to and agreed in writing by the local planning authority. Once approved the scheme shall thereafter be implemented in accordance with the approved timetable.

27) No part of the development shall be first occupied until a Travel Plan has been submitted to and approved in writing by the local planning authority. The Travel Plan shall accord with the principles set out in the Framework Travel Plan (JNY10700-01a) and once approved shall thereafter be implemented as specified within the approved document.

28) Prior to the first use of the electricity substation, an acoustic report assessing the impact shall be submitted to and approved in writing by the local planning authority. The report shall address the issue of noise (including low frequency noise) and vibration from the station to ensure that there is no adverse effect to residential or commercial properties.

The scheme shall ensure that the low frequency noise emitted from the substation is controlled so that it does not exceed the 'Low Frequency Criterion Curve' for the 10 to 160 Hz third octave bands inside residential accommodation as described in the DEFRA funded University of Salford guidance document entitled 'Procedure for the Assessment of Low Frequency Noise Complaints' (NANR45 Rev.1 – December 2011).

The electricity substation equipment shall be maintained in a condition so that it complies with the levels and mitigation measures specified in the approved acoustic report, whenever it is operating. After installation of the approved plant, no new plant shall be used without the written consent of the local planning authority. Where substation plant is replaced, it shall adhere to the noise and vibration levels specified herein.

29) Immediately following implementation of the approved surface water drainage system and prior to the occupation of any part of the development, the local planning authority shall be provided with as-built drawings of the implemented scheme together with a completion report prepared by an independent engineer that confirms that the scheme was built in accordance with the approved drawing/s and is fit for purpose. The scheme shall thereafter be maintained in perpetuity.

30) If during development any visible contaminated or odorous material, (for example, asbestos containing material, stained soil, petrol / diesel / solvent odour, underground tanks, or associated pipework) not previously identified is found to be present at the site, no further development (unless otherwise expressly agreed in writing with the local planning

authority) shall be carried out until it has been fully investigated using suitably qualified independent consultant(s). The local planning authority must be informed immediately of the nature and degree of the contamination present. A method statement detailing how the unsuspected contamination shall be dealt with must be prepared and submitted to the local planning authority for approval in writing before being implemented. If no such contaminated material is identified during the development, a statement to this effect must be submitted in writing to the local planning authority prior to completion of the development.

31) No demolition/construction activities shall take place other than from 08:00 hours until 18:00 hours on Mondays to Fridays and from 08:00 hours until 13:00 hours on Saturdays, with no work on Sundays or Bank/Public Holidays.

32) Should any gas boilers be installed in the dwellings then they shall meet the minimum standard set out in paragraph 8.6 of the Air Quality Assessment JAR02954 Rev 1 16/02/22.

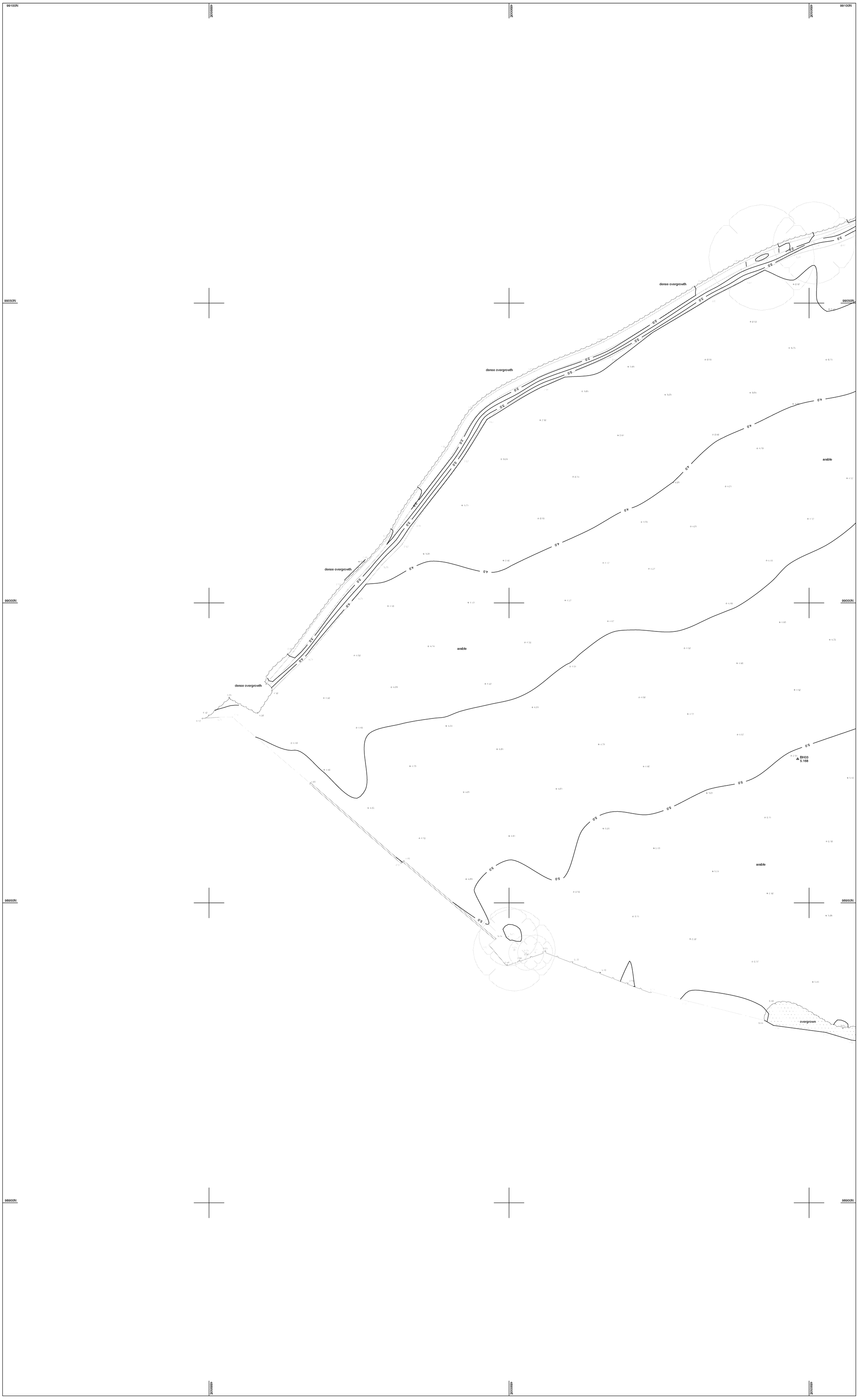
APPENDIX B: Site Location Plan

LAND WEST OF PAGHAM ROAD - **SITE LOCATION PLAN**

Pegasus
Design

PLANNING | DESIGN | ENVIRONMENT | ECONOMICS | www.pegasusgroup.co.uk | TEAM/DRAWN BY: KLB | APPROVED BY: TL | DATE: 10/01/2022 | SCALE: 1:1250 @ A2 | DRWG: **P21-2766_05** SHEET NO: 2 REV: E | CLIENT: **HALLAM LAND MANAGEMENT** |

APPENDIX C: Topographical Survey



Symbol & Abbreviation Key.

BARBED WIRE FENCE
POST & RAIL FENCE
CLOSE BOARD FENCE
RAILINGS
CHAIN LINK FENCE
OTHER FENCE
KERB
DROPPED KERB
GULLY CHANNEL
TOP / BOTTOM OF BANK
FOLIAGE
DITCH
VERGE
OVERHEAD CABLES
GATE
HEDGE
TREE - BROAD LEAVED
TREE - CONIFEROUS
BUSH
BUILDING
BOREHOLE
SURVEY STATION
ORDNANCE SURVEY BENCH MARK

A/C	AIR CONDITIONING UNIT	KO	KERB OFFLET
AV	AIR VALVE	LC	LIGHTING COLUMN
BOL	BOLLARD	LP	LAMP POST
BH	BOREHOLE	NP	NAME PLATE
BL	BED LEVEL	NB	NOTICE BOARD
BM	BENCH MARK	PR	PIPE RISER
BT	BRITISH TELECOM	RP	RODDING POINT
CTV	CABLE TV	RS	ROAD SIGN
CL	COVER LEVEL	SP	SIGN POST
CR	CABLE RISER	SV	STOP VALVE
DP	DOWN PIPE	TL	TRAFFIC LIGHT
ER	EARTH ROD	TP	TELEGRAPH POLE
EP	ELECTRICITY POLE	TOF	TOP OF FENCE
EM	ELECTRICITY MARKER	TOH	TOP OF HEDGE
FB	FUSE BOX	TOR	TOP OF RAILINGS
FH	FIRE HYDRANT	TOS	SERVICE LEVEL
FP	FENCE POST	TOW	TOP OF WALL
FL	FLOOR LEVEL	UTL	UNABLE TO LIFT
GV	GAS VALVE	VM	VALVE MARKER
GM	GAS MARKER	VP	VENT PIPE
GU	GULLY	WL	WATER LEVEL
HM	HYDRANT MARKER	WM	WATER MARKER
IL	INVERT LEVEL	WO	WASH OUT

General.

This survey has been prepared with a scaling accuracy for a plot at a scale of 1:200.

All tree heights and spreads are approximate. We have tried to identify tree types, however if tree species are critical specialist advice should be gained.

Drainage pipe sizes have been measured from the surface. Chamber access has not been gained for safety reasons, therefore sizes should be regarded as approximate.

Some detail may have been omitted due to parked vehicles.

Notes.

Coordinates related to previous survey, drawing number 210841.
Levels related to previous survey, drawing number 210841.

INDICATIVE ONLY

Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
BH	BH	15/10/21	GD	18/10/21	GD	18/10/21

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Client.

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3RD FLOOR
43 PORTLAND ROAD
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W1B 1QH

Title.

TOPOGRAPHICAL SURVEY

LAND WEST OF PAGHAM ROAD
PAGHAM
WEST SUSSEX
(PAGHAM II)

Dwg No. **210841** Sheet **1 of 3**

Scale 1:200 A0 Sheet Rev. -

99050N
489300E
489350E
489400E
99000N
98950N
98900N
98850N
489200E
489250E
arable
overgrown
BH01
6.258
BUS SHELTER
GRASS
BITUMEN
CONCRETE
PAGHAM ROAD
HOOK LANE
INDICATIVE ONLY

Symbol & Abbreviation Key.

- BARBED WIRE FENCE
- POST & RAIL FENCE
- CLOSE BOARD FENCE
- RAILINGS
- CHAIN LINK FENCE
- OTHER FENCE
- KERB
- DROPPED KERB
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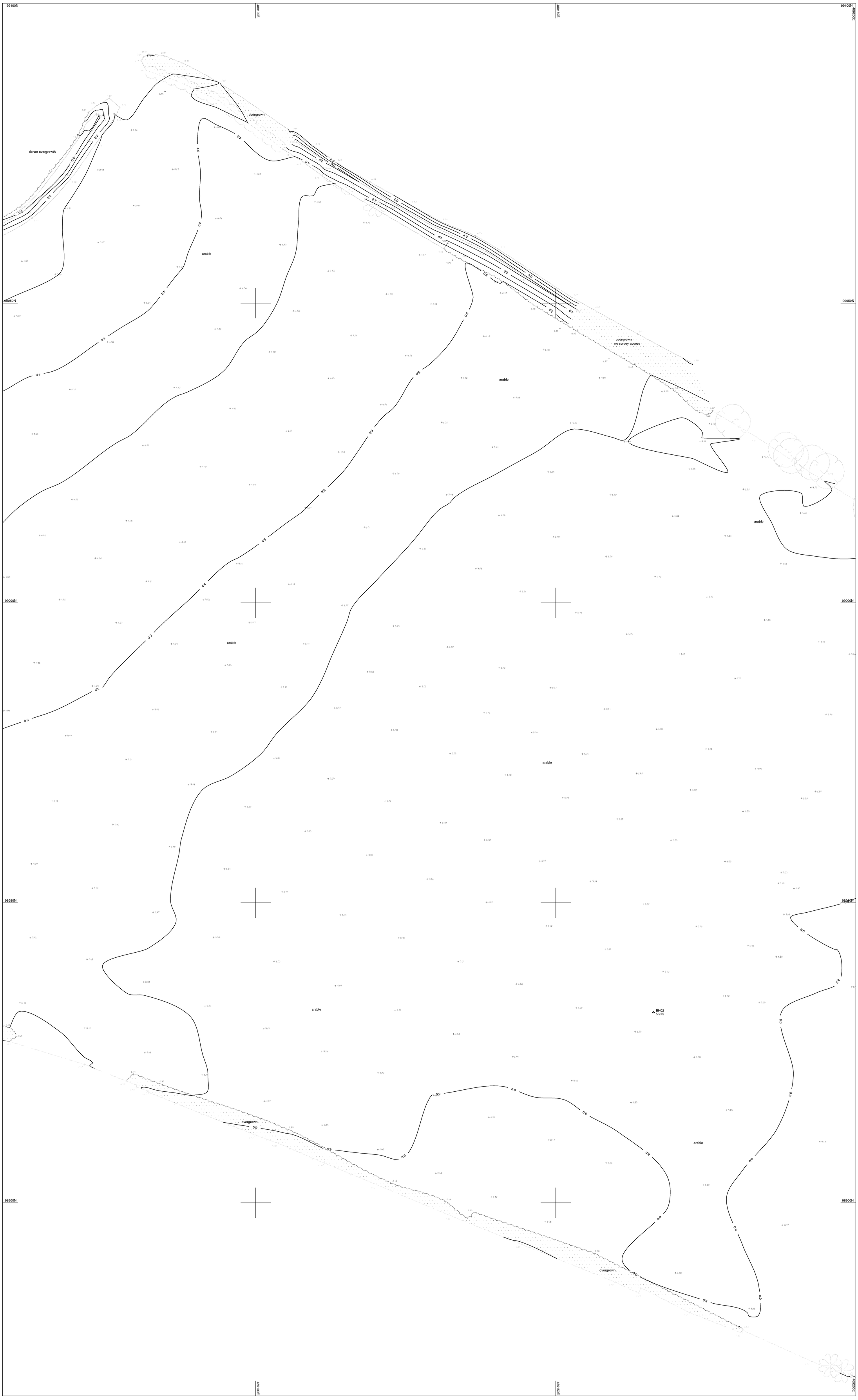
Title.

TOPOGRAPHICAL SURVEY

LAND WEST OF PAGHAM ROAD
PAGHAM
WEST SUSSEX
(PAGHAM II)

Dwg No. **210841** Sheet **3 of 3**

Scale 1:200 A0 Sheet Rev. -



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TOPOGRAPHICAL SURVEY

LAND WEST OF PAGHAM ROAD
PAGHAM
WEST SUSSEX
(PAGHAM II)

Dwg No. **210841** Sheet **2 of 3**

Scale 1:200 A0 Sheet Rev. -

APPENDIX D: Groundwater Monitoring Results

Ground Condition Consultants

Ref: J23-072-R02

Date: 14th March 2024

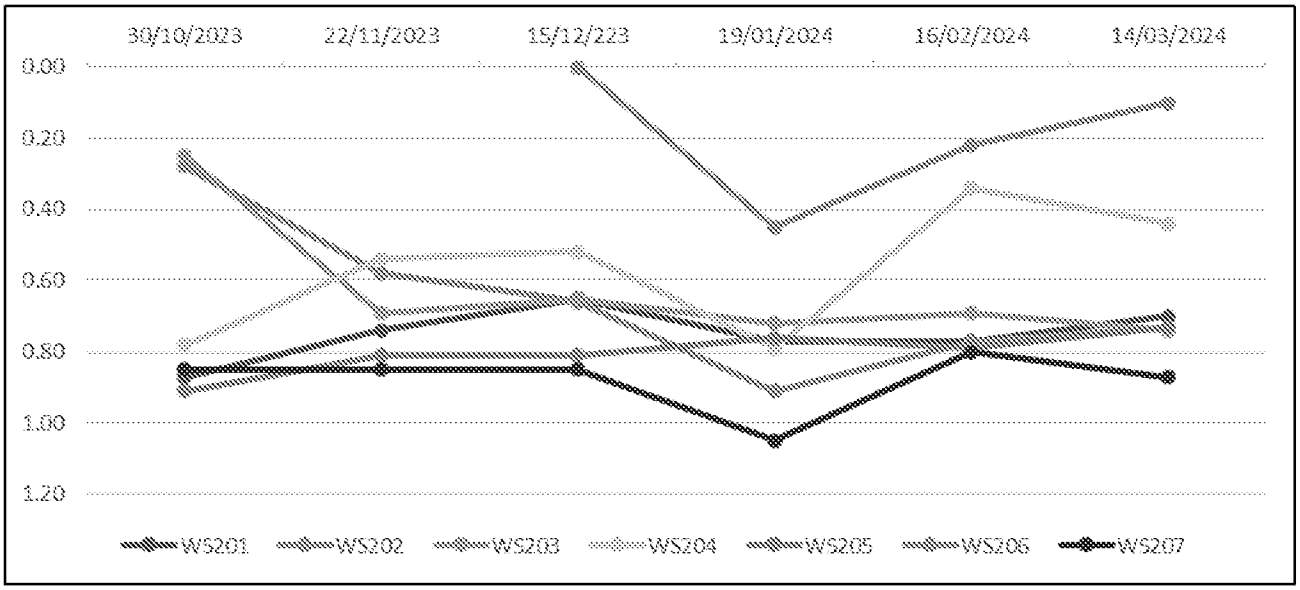
FAO: Luke Vallins
Bargate Homes
The New Barn, Vicarage Farm Business Park
Winchester Road, Fair Oak
Hampshire, SO50 7HD

Dear Luke,

Re: Groundwater Level Monitoring – Land West of Pagham Rd, Bognor Regis

GCC was commissioned by Bargate Homes in October 2023 to undertake Groundwater monitoring (6 rounds, Oct 23 – Mar 24) of previously installed groundwater monitoring wells at the site. The locations of the installed monitoring wells are shown on Figure 1.

A graph showing the groundwater variations monitored over the rounds is presented below with the full monitoring data sets attached to this letter.



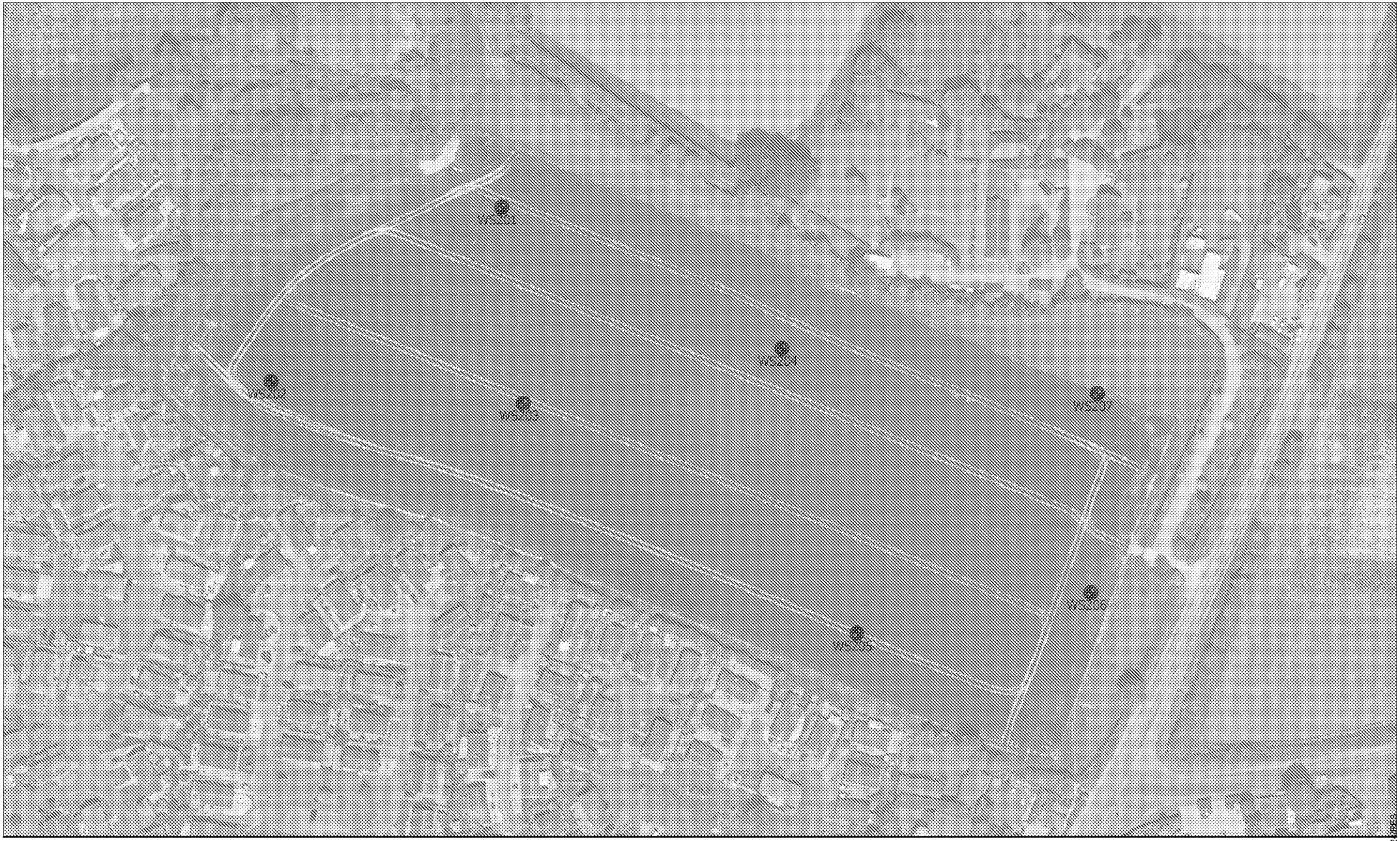
Yours sincerely

[redacted]

ANTONY PLATT
Director
For Ground Condition Consultants Ltd

RASMUS PALMGREN
Director
For Ground Condition Consultants Ltd

Encl: Figure 1 – Investigation Plan
Groundwater monitoring data



Ground Condition Consultants Ltd
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Telephone 07971 450113
ask@groundcc.co.uk www.groundcc.co.uk

client
BARGATE HOMES

project
PAGHAM ROAD, BOGNOR REGIS

title
SITE INVESTIGATION PLAN

scale	drawn by	checked by
NTS	DP	RP

date	cad file
20 DEC 2023	J22-072

drawing number
FIGURE 1

rev.
1

ARUN DISTRICT COUNCIL P/116/24/PES

GROUND GAS AND GROUNDWATER MONITORING RESULTS

SITE/REF:	Pagham Rd					
DATE:	30.10.23		……1... of ……1…			
OPERATOR(S):	RP					
Ambient Conditions:		Barometric Pressure (mb)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	PID (ppm)
Before Monitoring		-	-	-	-	-
After Monitoring		-	-	-	-	-
Atmospheric Pressure Trend:						
Ground Conditions:		Wet				
Weather Conditions:		Rainy				

General Site comments

EQUIPMENT		
Instrument / Model Type	Serial Number	Comments
GA2000 Gas Analyser	GA12820	
Standard Dipmeter	79301	

Ground Gas Note: "0" readings to be recorded as instrument detection limit

Borehole ID	Time	Flow (l/hr)	Relative Pressure (mb)	Steady CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Peak CH_4 (%v/v)	% of Lower Explosive Limit	CO (ppm)	H_2S (ppm)	Balance (%)	PID (ppm)	Response Zone		Response Strata	Gas screening value CH_4	Gas screening value CO_2
													From (mbgl)	To (mbgl)			

Groundwater

Borehole ID	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Free Phase LNAPL Thickness (m)	Free Phase DNAPL Thickness (m)	Water Quality Indicators					Well Volume (l)	Purge Volume (l)	Comments (samples)
					Eh	EC	pH	DO	Temp			
WS201	0.87	3.15										
WS202	0.28	2.00										
WS203	0.25	1.70										
WS204	0.78	2.28										
WS205	0.91	3.93										
WS206	Area Flooded											
WS207	0.85	2.93										

Well volume (l) = (3.14 x (hole diameter (m)/2)^2 x (base dip (m) - standing water level (m)))x1000 (2l/m in 50mm well)

Gas screening value = gas concentration (%) x gas flow rate (l/hr)

%v/v - Percentage volume by total volume; mbgl - metres below ground level; ppm - parts per million; mb - milibars; l/hr - litres per hour; wv - water vial; gb - 1l glass bottle; pb - 1l plastic bottle

GROUND GAS AND GROUNDWATER MONITORING RESULTS

SITE/REF:	Pagham Rd					
DATE:	22.11.23		……1... of ……1…			
OPERATOR(S):	RP					
Ambient Conditions:		Barometric Pressure (mb)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	PID (ppm)
Before Monitoring		-	-	-	-	-
After Monitoring		-	-	-	-	-
Atmospheric Pressure Trend:						
Ground Conditions:		Damp				
Weather Conditions:		Overcast				

General Site comments

EQUIPMENT		
Instrument / Model Type	Serial Number	Comments
GA2000 Gas Analyser	GA12820	
Standard Dipmeter	79301	

Ground Gas Note: "0" readings to be recorded as instrument detection limit

Borehole ID	Time	Flow (l/hr)	Relative Pressure (mb)	Steady CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Peak CH_4 (%v/v)	% of Lower Explosive Limit	CO (ppm)	H_2S (ppm)	Balance (%)	PID (ppm)	Response Zone		Response Strata	Gas screening value CH_4	Gas screening value CO_2
													From (mbgl)	To (mbgl)			

Groundwater

Borehole ID	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Free Phase LNAPL Thickness (m)	Free Phase DNAPL Thickness (m)	Water Quality Indicators					Well Volume (l)	Purge Volume (l)	Comments (samples)
					Eh	EC	pH	DO	Temp			
WS201	0.74	3.06										
WS202	0.58	1.98										
WS203	0.69	1.72										
WS204	0.54	2.14										
WS205	0.81	3.85										
WS206	Area Flooded											
WS207	0.85	2.86										

Well volume (l) = (3.14 x (hole diameter (m)/2)^2 x (base dip (m) - standing water level (m)))x1000 (2l/m in 50mm well)

Gas screening value = gas concentration (%) x gas flow rate (l/hr)

%v/v - Percentage volume by total volume; mbgl - metres below ground level; ppm - parts per million; mb - milibars; l/hr - litres per hour; wv - water vial; gb - 1l glass bottle; pb - 1l plastic bottle

GROUND GAS AND GROUNDWATER MONITORING RESULTS

SITE/REF:	Pagham Rd					
DATE:	15.12.23		……1... of ……1…			
OPERATOR(S):	RP					
Ambient Conditions:		Barometric Pressure (mb)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	PID (ppm)
Before Monitoring		-	-	-	-	-
After Monitoring		-	-	-	-	-
Atmospheric Pressure Trend:						
Ground Conditions:		Damp/Wet				
Weather Conditions:		Overcast				

General Site comments

Ground Condition Consultants

EQUIPMENT		
Instrument / Model Type	Serial Number	Comments
GA2000 Gas Analyser	GA12820	
Standard Dipmeter	79301	

Ground Gas Note: "0" readings to be recorded as instrument detection limit

Borehole ID	Time	Flow (l/hr)	Relative Pressure (mb)	Steady CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Peak CH_4 (%v/v)	% of Lower Explosive Limit	CO (ppm)	H_2S (ppm)	Balance (%)	PID (ppm)	Response Zone		Response Strata	Gas screening value CH_4	Gas screening value CO_2
													From (mbgl)	To (mbgl)			

Groundwater

Borehole ID	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Free Phase LNAPL Thickness (m)	Free Phase DNAPL Thickness (m)	Water Quality Indicators					Well Volume (l)	Purge Volume (l)	Comments (samples)
					Eh	EC	pH	DO	Temp			
WS201	0.65	3.04										
WS202	0.66	1.95										
WS203	0.65	1.71										
WS204	0.52	2.13										
WS205	0.81	3.85										
WS206	Area Flooded											
WS207	0.85	2.86										

Well volume (l) = (3.14 x (hole diameter (m)/2)^2 x (base dip (m) - standing water level (m)))x1000 (2l/m in 50mm well)

Gas screening value = gas concentration (%) x gas flow rate (l/hr)

%v/v - Percentage volume by total volume; mbgl - metres below ground level; ppm - parts per million; mb - milibars; l/hr - litres per hour; wv - water vial; gb - 1l glass bottle; pb - 1l plastic bottle

GROUND GAS AND GROUNDWATER MONITORING RESULTS

SITE/REF:	Pagham Rd
DATE:	19.01.24 ……1… of ……1…
OPERATOR(S):	RP

Ambient Conditions:	Barometric Pressure (mb)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	PID (ppm)
Before Monitoring	-	-	-	-	-
After Monitoring	-	-	-	-	-

Atmospheric Pressure Trend:	
Ground Conditions:	Frozen
Weather Conditions:	Sunny

General Site comments

EQUIPMENT		
Instrument / Model Type	Serial Number	Comments
GA2000 Gas Analyser	GA12820	
Standard Dipmeter	79301	

Ground Gas Note: "0" readings to be recorded as instrument detection limit

Borehole ID	Time	Flow (l/hr)	Relative Pressure (mb)	Steady CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Peak CH_4 (%v/v)	% of Lower Explosive Limit	CO (ppm)	H_2S (ppm)	Balance (%)	PID (ppm)	Response Zone		Response Strata	Gas screening value CH_4	Gas screening value CO_2
													From (mbgl)	To (mbgl)			

Groundwater

Borehole ID	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Free Phase LNAPL Thickness (m)	Free Phase DNAPL Thickness (m)	Water Quality Indicators					Well Volume (l)	Purge Volume (l)	Comments (samples)
					Eh	EC	pH	DO	Temp			
WS201	0.77	3.08										
WS202	0.91	1.85										
WS203	0.72	1.69										
WS204	0.79	2.14										
WS205	0.76	3.87										
WS206	0.45	3.77										
WS207	1.05	2.80										

Well volume (l) = (3.14 x (hole diameter (m)/2)^2 x (base dip (m) - standing water level (m)))x1000 (2l/m in 50mm well) Gas screening value = gas concentration (%) x gas flow rate (l/hr)

%v/v - Percentage volume by total volume; mbgl - metres below ground level; ppm - parts per million; mb - milibars; l/hr - litres per hour; wv - water vial; gb - 1l glass bottle; pb - 1l plastic bottle

GROUND GAS AND GROUNDWATER MONITORING RESULTS

SITE/REF:	Pagham Rd
DATE:	16.02.24 ……1… of ……1…
OPERATOR(S):	RP

Ambient Conditions:	Barometric Pressure (mb)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	PID (ppm)
Before Monitoring	-	-	-	-	-
After Monitoring	-	-	-	-	-

Atmospheric Pressure Trend:	
Ground Conditions:	Wet/Soft
Weather Conditions:	Ssunny

General Site comments

EQUIPMENT		
Instrument / Model Type	Serial Number	Comments
GA2000 Gas Analyser	GA12820	
Standard Dipmeter	79301	

Ground Gas Note: "0" readings to be recorded as instrument detection limit

Borehole ID	Time	Flow (l/hr)	Relative Pressure (mb)	Steady CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Peak CH_4 (%v/v)	% of Lower Explosive Limit	CO (ppm)	H_2S (ppm)	Balance (%)	PID (ppm)	Response Zone		Response Strata	Gas screening value CH_4	Gas screening value CO_2
													From (mbgl)	To (mbgl)			

Groundwater

Borehole ID	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Free Phase LNAPL Thickness (m)	Free Phase DNAPL Thickness (m)	Water Quality Indicators					Well Volume (l)	Purge Volume (l)	Comments (samples)
					Eh	EC	pH	DO	Temp			
WS201	0.77	3.06										
WS202	0.77	1.84										
WS203	0.69	1.68										
WS204	0.34	2.12										
WS205	0.79	3.86										
WS206	0.22	3.75										
WS207	0.80	2.79										

Well volume (l) = (3.14 x (hole diameter (m)/2)^2 x (base dip (m) - standing water level (m)))x1000 (2l/m in 50mm well)

Gas screening value = gas concentration (%) x gas flow rate (l/hr)

%v/v - Percentage volume by total volume; mbgl - metres below ground level; ppm - parts per million; mb - milibars; l/hr - litres per hour; wv - water vial; gb - 1l glass bottle; pb - 1l plastic bottle

GROUND GAS AND GROUNDWATER MONITORING RESULTS

SITE/REF:	Pagham Rd
DATE:	14.03.24 ……1… of ……1…
OPERATOR(S):	RP

Ambient Conditions:	Barometric Pressure (mb)	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	PID (ppm)
Before Monitoring	-	-	-	-	-
After Monitoring	-	-	-	-	-
Atmospheric Pressure Trend:					
Ground Conditions:	Wet/Soft				
Weather Conditions:	Sunny				

General Site comments

EQUIPMENT		
Instrument / Model Type	Serial Number	Comments
GA2000 Gas Analyser	GA12820	
Standard Dipmeter	79301	

Ground Gas Note: "0" readings to be recorded as instrument detection limit

Borehole ID	Time	Flow (l/hr)	Relative Pressure (mb)	Steady CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Peak CH_4 (%v/v)	% of Lower Explosive Limit	CO (ppm)	H_2S (ppm)	Balance (%)	PID (ppm)	Response Zone		Response Strata	Gas screening value CH_4	Gas screening value CO_2
													From (mbgl)	To (mbgl)			

Groundwater

Borehole ID	Standing Water Level (mbgl)	Installation Base Dip (mbgl)	Free Phase LNAPL Thickness (m)	Free Phase DNAPL Thickness (m)	Water Quality Indicators					Well Volume (l)	Purge Volume (l)	Comments (samples)
					Eh	EC	pH	DO	Temp			
WS201	0.7	3.04										
WS202	0.73	1.83										
WS203	0.74	1.68										
WS204	0.44	2.11										
WS205	0.73	3.85										
WS206	0.10	3.74										
WS207	0.87	2.78										

Well volume (l) = (3.14 x (hole diameter (m)/2)^2 x (base dip (m) - standing water level (m)))x1000 (2l/m in 50mm well) Gas screening value = gas concentration (%) x gas flow rate (l/hr)

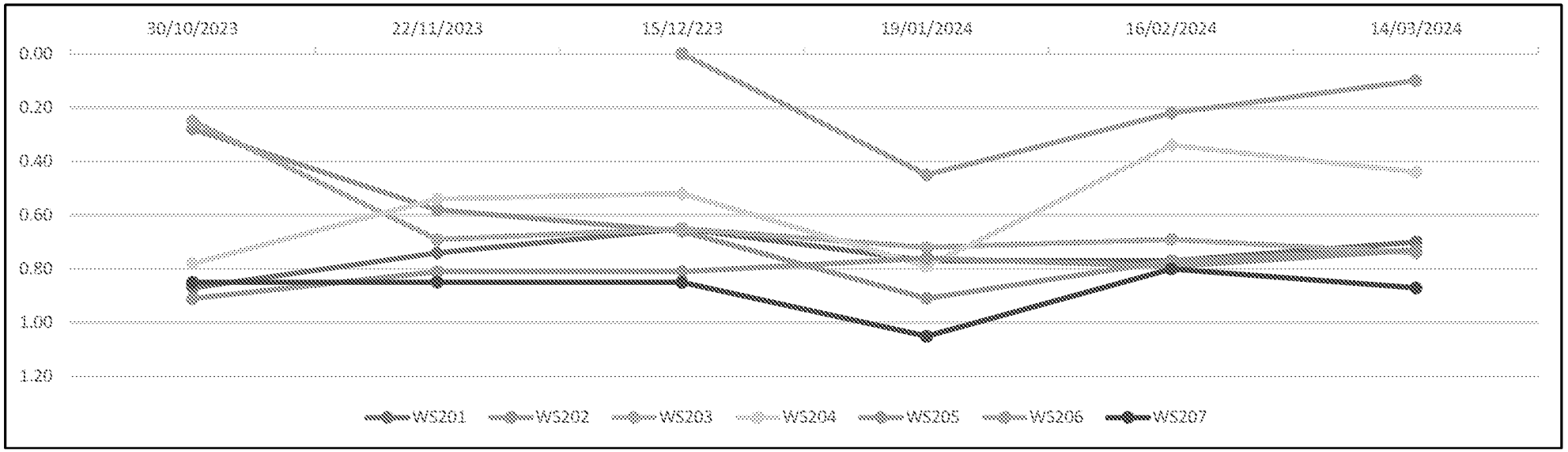
%v/v - Percentage volume by total volume; mbgl - metres below ground level; ppm - parts per million; mb - milibars; l/hr - litres per hour; wv - water vial; gb - 1l glass bottle; pb - 1l plastic bottle

Site: Pagham Rd

Job No: J23-072

GCC
Ground Condition Consultants

Date:	30/10/2023		22/11/2023		15/12/223		19/01/2024		16/02/2024		14/03/2024	
Borehole ID	Standing Water Level (mbgl)	Installation Base Depth (mbgl)	Standing Water Level (mbgl)	Installation Base Depth (mbgl)	Standing Water Level (mbgl)	Installation Base Depth (mbgl)	Standing Water Level (mbgl)	Installation Base Depth (mbgl)	Standing Water Level (mbgl)	Installation Base Depth (mbgl)	Standing Water Level (mbgl)	Installation Base Depth (mbgl)
WSS201	0.87	3.15	0.74	3.06	0.65	3.04	0.77	3.08	0.77	3.06	0.70	3.04
WSS202	0.28	2.00	0.58	1.98	0.66	1.95	0.91	1.85	0.77	1.84	0.73	1.83
WSS203	0.25	1.70	0.69	1.72	0.65	1.71	0.72	1.69	0.69	1.68	0.74	1.68
WSS204	0.78	2.28	0.54	2.14	0.52	2.13	0.79	2.14	0.34	2.12	0.44	2.11
WSS205	0.91	3.93	0.81	3.85	0.81	3.85	0.76	3.87	0.79	3.86	0.73	3.85
WSS206	Area Flooded		Area Flooded		Area Flooded		0.45	3.77	0.22	3.75	0.10	3.74
WSS207	0.85	2.93	0.85	2.86	0.85	2.86	1.05	2.80	0.80	2.79	0.87	2.78



BOREHOLE LOG WS201

Ground Condition Consultants

PROJECT NUMBER J23-072
PROJECT NAME Land West of Pagham Road
CLIENT Bargate Homes
ADDRESS Bognor Regis
DATE 24/10/23

DRILLING COMPANY Oakland SI
DRILLING METHOD Windowless Sampling
DRILLING RIG Terrier
LOGGED BY RP

CASING

COMMENTS Groundwater encountered at 1.60m bgl.

Samples	SPT N	Water	Depth (m)	Graphic Log	Material Description	Well Installation
			0		Grass over soft dark brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			0.5		Soft to firm light brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
		▽	1.5		Brown silty gravelly fine to medium SAND. Gravel is fine to medium angular to sub angular flint.	
			2.5		Firm to stiff grey CLAY	
			5		Termination Depth at: 5.0m.	
			5.5			

BOREHOLE LOG WS202

Ground Condition Consultants

PROJECT NUMBER J23-072
PROJECT NAME Land West of Pagham Road
CLIENT Bargate Homes
ADDRESS Bognor Regis
DATE 24/10/23

DRILLING COMPANY Oakland SI
DRILLING METHOD Windowless Sampling
DRILLING RIG Terrier
LOGGED BY RP

CASING

COMMENTS Groundwater encountered at 0.40m bgl.

Samples	SPT N	Water	Depth (m)	Graphic Log	Material Description	Well Installation
		▽	0.5		Grass over soft dark brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			1		Soft to firm light brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			1.5			
			2		Brown silty gravelly fine to medium SAND. Gravel is fine to medium angular to sub angular flint.	
			2.5		Firm to stiff grey CLAY	
			3			
			3.5			
			4		Termination Depth at: 4.0m.	
			4.5			
			5			
			5.5			

BOREHOLE LOG WS203

PROJECT NUMBER J23-072
PROJECT NAME Land West of Pagham Road
CLIENT Bargate Homes
ADDRESS Bognor Regis
DATE 24/10/23

DRILLING COMPANY Oakland SI
DRILLING METHOD Windowless Sampling
DRILLING RIG Terrier
LOGGED BY RP

CASING

COMMENTS Groundwater encountered at 1.20m bgl.

Samples	SPT N	Water	Depth (m)	Graphic Log	Material Description	Well Installation
			0		Grass over soft dark brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			0.5		Soft to firm brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
		▽	1			
			1.5		Brown grey fine to medium SAND	
			2		Brown silty gravelly fine to medium SAND. Gravel is fine to medium angular to sub angular flint.	
			2.5		Firm to stiff grey CLAY	
			3			
			3.5			
			4		Termination Depth at: 4.0m.	
			4.5			
			5			
			5.5			

BOREHOLE LOG WS204

Ground Condition Consultants

PROJECT NUMBER J23-072
PROJECT NAME Land West of Pagham Road
CLIENT Bargate Homes
ADDRESS Bognor Regis
DATE 24/10/23

DRILLING COMPANY Oakland SI
DRILLING METHOD Windowless Sampling
DRILLING RIG Terrier
LOGGED BY RP

CASING

COMMENTS Groundwater encountered at 0.40m bgl.

Samples	SPT N	Water	Depth (m)	Graphic Log	Material Description	Well Installation
					Grass over soft dark brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			0.5		Firm brown mottled grey slightly silty CLAY	
			1			
			1.5		Soft to firm brown mottled grey slightly silty slightly sandy slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			2		Brown silty gravelly fine to medium SAND. Gravel is fine to medium angular to sub angular flint.	
			2.5			
			3			
			3.5		Firm to stiff grey CLAY	
			4			
			4.5			
			5			
			5.5		Termination Depth at: 5.0m.	

BOREHOLE LOG WS205

Ground Condition Consultants

PROJECT NUMBER J23-072
PROJECT NAME Land West of Pagham Road
CLIENT Bargate Homes
ADDRESS Bognor Regis
DATE 24/10/23

DRILLING COMPANY Oakland SI
DRILLING METHOD Windowless Sampling
DRILLING RIG Terrier
LOGGED BY RP

CASING

COMMENTS Groundwater not encountered.

Samples	SPT N	Water	Depth (m)	Graphic Log	Material Description	Well Installation
					Grass over soft dark brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			0.5		Soft to firm brown CLAY	
			1			
			1.5		Firm brown mottled grey slightly silty CLAY	
			2			
			2.5			
			3			
			3.5		Firm to stiff grey CLAY	
			4		Termination Depth at: 4.0m.	
			4.5			
			5			
			5.5			

BOREHOLE LOG WS206

PROJECT NUMBER J23-072
PROJECT NAME Land West of Pagham Road
CLIENT Bargate Homes
ADDRESS Bognor Regis
DATE 24/10/23

DRILLING COMPANY Oakland SI
DRILLING METHOD Windowless Sampling
DRILLING RIG Terrier
LOGGED BY RP

CASING

COMMENTS Groundwater encountered at 0.40m and 1.30 bgl.

Samples	SPT N	Water	Depth (m)	Graphic Log	Material Description	Well Installation
		1	0.5		Grass over soft dark brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
					Soft to firm brown silty CLAY	
		2	1		Brown silty sandy slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			1.5			
			2			
			2.5		Brown silty gravelly fine to medium SAND. Gravel is fine to medium angular to sub angular flint.	
			3		Firm brown CLAY	
			3.5		Firm to stiff grey CLAY	
			4			
			4.5			
			5			
			5.5		Termination Depth at: 5.0m.	

BOREHOLE LOG WS207

PROJECT NUMBER J23-072	**DRILLING COMPANY** Oakland SI
PROJECT NAME Land West of Pagham Road	**DRILLING METHOD** Windowless Sampling
CLIENT Bargate Homes	**DRILLING RIG** Terrier
ADDRESS Bognor Regis	**LOGGED BY** RP
DATE 24/10/23	

CASING

COMMENTS Groundwater encountered at 1.90 bgl.

Samples	SPT N	Water	Depth (m)	Graphic Log	Material Description	Well Installation
					Grass over soft dark brown slightly silty slightly gravelly CLAY. Gravel is fine to medium angular to sub angular flint.	
			0.5		Soft brown mottled grey slightly silty CLAY	
			1			
					Firm brown silty sandy CLAY	
			1.5			
		▽				
			2		Brown silty gravelly fine to medium SAND. Gravel is fine to medium angular to sub angular flint.	
			2.5			
					Soft brown CLAY	
			3		Firm to stiff grey CLAY	
			3.5			
			4			
					Termination Depth at: 4.0m.	
			4.5			
			5			
			5.5			

APPENDIX E: Southern Water Sewer Records

(c) Crown copyright and database rights 2023 Ordnance Survey 100031673	Date: 18/10/23	Scale: 1:1250	Map Centre: 489205,98934	Data updated: 21/08/23	Our Ref: 1299417 - 1	Wastewater Plan A2

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer | Combined Gravity Sewer | Culverted Water Course or Treated Effluent | Surface Water Gravity Sewer | Rising Main, Vacuum or Syphon

Combined Outfall | Foul Outfall | Surface Water Outfall | Surface Water Inlet

Combined Pumping Station | Surface Water Pumping Station | Foul Pumping Station | Water Treatment Works | Section 104 Area | Building Over Agreement Area

Foul Manhole | Combined Manhole | Surface Water Manhole | Side Entry Manhole, Dissipation Chamber, Dummy Manhole or Surface Water Soakaway

falkhatib@mayerbrown.co.uk

BHPAGHAMROAD.10

WATER for LIFE from Southern Water

ARUN DISTRICT COUNCIL P/114/24/RES

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
2702	F	6.23	4.99	
2703	F	5.84	4.42	
2801	F	6.10	4.19	
3701	F	6.59	5.50	
3801	F	5.67	3.77	
4701	F	6.53	4.27	
4702	F	0.00	0.00	
4801	F	5.94	3.92	
4802	F	5.89	3.39	
5701	F	5.92	4.55	
5801	F	6.16	2.48	
5902	F	5.99	3.20	
2752	S	5.86	4.44	
2753	S	6.19	5.31	
3751	S	6.54	4.96	
3851	S	6.17	4.15	
3951	S	6.25	4.04	
3952	S	6.17	3.97	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

APPENDIX F: Proposed Layout

A1

SITE LEGEND:

- Application Boundary Line
- Buffer Zone
- Affordable
- First Homes
- M4(2) Compliant Units
- Brick Boundary Wall - 1.8M hight
- Close Board Fence - 1.8M hight
- Metal Estate Railing - 1.2M hight
- Parking Bay
- EV Charging Point
- Bin Collection Point
- Timber Shed - 1.2X1.8M
- Proposed Tree

Refer to drawings D3322-FAB-00-XX-DR-L 1000 to 1006 for detailed landscape proposals.

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Rev	Description	Date	Au	Ch
P1	First issue.	04.03.24	CMI	-
P2	Scheme development.	18.06.24	CMI	-
P3	Scheme development.	27.06.24	CMI	-
P4	Scheme development.	26.07.24	CMI	-
P5	Scheme development.	13.08.24	CMI	-
P6	Garden gate locations shown. Fencing to plots 83 & 84 updated. House Type text rotation updated for clarity.	25.09.24	CJB	-
P7	Scheme development.	14.10.24	CMI	-
P8	Scheme development.	15.10.24	CMI	-
P9	Scheme development.	21.10.24	CMI	-

Project	**Land West of Pagham Road**
Drawing	**Site Layout**

Client	**Bargate Homes**				
Job no.	**BARG230419**			Date	**01.03.24**
Dwg no.	**SL.01**			Rev.	**P9**
Author	**CMI**	Checked	-	Scale	**1:500 at A1**
Status	PRELIMINARY			Office	**Romsey**
Client ref.					

thrive. architects

ARUN DISTRICT COUNCIL P/114/24/RES

APPENDIX G: Contributing Areas Plan

NOTES:

1. This drawing is based on the proposed layout undertaken by Thrive Architects, drawing number: BARG230419_SL.01_P9, received 22/10/2024.
2. The contributing areas delineated on this plan are based on the proposed layout and may be subject to adjustment based on modifications.
4. The total hardstanding area of 21,800 m² shown on the drawing includes a 10% allowance for urban creep associated with the dwellings.
5. 100% Impermeable area for the basin has been added to the total hardstanding area, bringing the overall hardstanding area to 24,780m².

A0 ORIGINAL

KEY

- SITE BOUNDARY
- CONTRIBUTING HARDSTANDING AREA
- AREA OF BASIN 1 ADDED TO HARDSTANDING
- AREA OF BASIN 2 ADDED TO HARDSTANDING

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rev.	amendment	checked	date
P3	Revised Following Updated Layout. (JB)	SL	23/10/2024
P2	Revised Following Updated Layout. (FA)	SL	18/10/2024
P1	Initial Issue. (FA)	SL	25/09/2024

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BARGATE HOMES LTD

project
LAND WEST OF PAGHAM ROAD, PAGHAM

scale	drawn by	checked by
1:500	FA	SL

date	cad file
OCTOBER 2024	CONTRIBUTING AREAS PLAN

title
CONTRIBUTING HARDSTANDING AREAS PLAN

Mayer Brown Limited jobcode	suitability	revision
SL/BHPAGHAM.10	-	P3

drawing number
SL/BHPAGHAM.10/13

APPENDIX H: Proposed Drainage Strategy

1:500 0 10 20 30 40 50 m

1:1 0 10 20 30 40 50 60 70 80 90 100 mm

NOTES:

1. The proposed drainage strategy is indicative and is subject to detailed design.
2. This drawing is based on the levels design undertaken by Mayer Brown in October 2024, drawing number: MBSK241003-02-P3.
3. This drawing is based on the proposed layout undertaken by Thrive Architects, drawing number: BARG230419_SL_01_P9, received 22/10/2024.
4. CL'S and IL's are based on the proposed levels on the proposed contours drawing, MBSK241003-02-P3.
5. The attenuation features shown on this drawing are based on hardstanding surfaces in the development and and will need to be reviewed if the layout is amended. A 10% allowance for urban creep has been allowed for dwellings.
6. The QBAR run-off rates have been obtained from the from the Flood Risk Assessment undertaken by Brookbanks Consulting Ltd in December 2021, which accompanied the Outline Planning Application. The Climate Change Allowances has been updated from 40% to 45% for the 1in100 year return period, in accordance with the Department for Environment Food & Rural Affairs Climate Change Allowances for peak rainfall.
7. Habitable dwellings should be located 15m from the wet well of the private foul pump station, where possible. Where this is not possible, this should be confirmed by a pump designer/manufacturer.
8. This drawing should be read in conjunction with all other relevant engineering drawings.
9. The connection points and associated routes to the Southern Water Foul Drainage Network are shown indicatively and will be determined at the detailed design stage.
4. A 3m easement either side of the existing southern water rising main is required and all drainage features must be positioned outside of the easement area, where possible.
5. The location of the existing southern water rising main has been obtained from the Rising Main Survey drawing issued by Viking Project's UK Ltd on 24/11/2023.
6. The proposed floor levels shown on this drawing are indicative and are subject to detailed design.
7. All porous surfaces will be lined with an impermeable membrane.

A0 ORIGINAL

KEY

- SITE BOUNDARY
- EXISTING SOUTHERN WATER RISING MAIN
- 3M EASEMENT FROM EXISTING SOUTHERN WATER RISING MAIN
- PROPOSED SURFACE WATER SEWER AND MANHOLE
- PROPOSED FOUL WATER SEWER AND MANHOLE
- PROPOSED FOUL WATER RISING MAIN
- EXISTING SOUTHERN WATER FOUL WATER MANHOLE
- PROPOSED ATTENUATION BASIN 1
- PROPOSED ATTENUATION BASIN 2
- ROOT PROTECTION AREA
- PERMEABLE PAVING - SURFACE LEVEL AND FORMATION LEVELS SHOWN AT KEY POINTS
- PROPOSED CONVEYANCE SWALE & UNDERDRAIN
- PERMEABLE GOPLA (OR SIMILAR APPROVED) SURFACE
- POROUS ASPHALT
- 3M EASEMENT FROM BASINS/ NORTHERN & WESTERN DITCHS
- PROPOSED ADOPTABLE FOUL PLOT DRAINAGE
- PROPOSED ADOPTABLE SURFACE WATER PLOT DRAINAGE
- 2M WIDE SERVICE MARGIN (INDICATIVE)

FOR INFORMATION
NOT FOR CONSTRUCTION

rev.	amendment	checked	date
P3	Updated Following Revised Layout. (FA)	SL	23/10/2024
P2	Updated Following Updated Layout. (FA)	SL	18/10/2024
P1	Initial Issue. (FA)	SL	25/09/2024

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client
BARGATE HOMES LTD

project
LAND WEST OF PAGHAM ROAD, PAGHAM

scale	drawn by	checked by
1:500	FA	SL

date	cad file
OCTOBER 2024	MASTER.DWG

title
PROPOSED DRAINAGE STRATEGY

Mayer Brown Limited jobcode	suitability	revision
SL/BHPAGHAM.10	-	P3

drawing number
SL/BHPAGHAM.10/10

APPENDIX I: Proposed Network Calculations

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP1	0.118	5.00	6.300	1200	489278.841	98898.054	0.600
PP2	0.088	5.00	6.250	1200	489269.483	98933.810	0.600
PP3	0.104	5.00	6.100	1200	489240.540	98985.693	0.600
PP4	0.210	5.00	6.100	1200	489239.525	98994.901	0.600
PP4A	0.303	5.00	5.250	1200	489097.447	99032.564	0.600
PP5	0.167	5.00	5.950	1200	489130.791	98963.417	0.600
PP6	0.208	5.00	6.100	1200	489196.270	98934.973	0.600
PP7	0.136	5.00	5.500	1200	489074.982	98961.212	0.600
PP8	0.093	5.00	5.500	1200	489041.140	98965.662	0.600
PP9	0.052	5.00	5.250	1200	489014.462	98954.178	0.500
PP10	0.059	5.00	6.250	1200	489258.162	98922.322	0.600
PP11	0.129	5.00	5.700	1200	489091.211	98956.327	0.600
PP12	0.056	5.00	5.750	1200	489083.075	98973.233	0.600
PP13	0.110	5.00	5.250	1200	489060.581	99005.346	0.600
BASIN 1	0.106	5.00	4.700	1200	489090.949	99047.801	1.200
BASIN 2	0.192	5.00	4.700	1200	489026.167	99006.960	1.200
SW01	0.061	5.00	6.000	1350	489300.865	98892.267	0.900
SW02A	0.000		6.600	1200	489268.564	98937.567	1.300
SW02	0.056	5.00	6.300	1350	489261.729	98924.034	1.400
SW03	0.059	5.00	6.100	1350	489212.883	98939.483	1.400
SW04	0.057	5.00	6.000	1350	489163.326	98938.847	1.500
SW05	0.050	5.00	5.750	1350	489112.473	98957.615	1.460
SW06	0.064	5.00	5.350	1350	489032.555	98972.665	1.210
SW07	0.000		5.200	1200	489086.858	99032.901	1.000

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW08	0.000		5.200	1200	488998.671	98967.038	1.290
SW09	0.000		5.150	1200	488995.970	98976.802	1.310
HYDROBRAKE	0.000		4.700	1200	489035.335	99029.336	1.300
OUTFALL	0.000		3.000	1200	489018.563	99048.399	0.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	SW01	SW02	50.406	0.600	5.100	4.900	0.200	252.0	375	5.92	50.0
2.001	SW02A	SW02	15.161	0.600	5.400	4.900	0.500	30.3	225	5.12	50.0
1.002	SW02	SW03	51.231	0.600	4.900	4.700	0.200	256.2	375	6.67	50.0
1.003	SW03	SW04	49.561	0.600	4.700	4.500	0.200	247.8	375	7.40	50.0
1.004	SW04	SW05	54.206	0.600	4.500	4.320	0.180	301.1	375	8.27	50.0
1.005	SW05	SW06	81.323	0.600	4.320	4.140	0.180	451.8	375	9.87	50.0
1.006	SW06	SW08	34.348	0.600	4.140	3.910	0.230	149.3	375	10.25	50.0
1.007	SW08	SW09	10.131	0.600	3.910	3.840	0.070	144.7	375	10.37	50.0
1.008	SW09	BASIN 2	42.677	0.600	3.840	3.500	0.340	125.5	375	10.81	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.001	1.136	125.5	32.3	0.525	1.025	0.179	0.0	129	0.958
2.001	2.384	94.8	15.9	0.975	1.175	0.088	0.0	62	1.781
1.002	1.127	124.5	58.4	1.025	1.025	0.323	0.0	181	1.110
1.003	1.146	126.6	117.3	1.025	1.125	0.649	0.0	287	1.294
1.004	1.039	114.7	157.8	1.125	1.055	0.873	0.0	375	1.052
1.005	0.846	93.4	224.8	1.055	0.835	1.244	0.0	375	0.857
1.006	1.480	163.5	262.6	0.835	0.915	1.453	0.0	375	1.499
1.007	1.504	166.1	262.6	0.915	0.985	1.453	0.0	375	1.523
1.008	1.616	178.4	262.6	0.985	0.625	1.453	0.0	375	1.636

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
11.004	BASIN 1	BASIN 2	76.521	0.600	3.500	3.500	0.000	0.0	150	9.83	50.0
1.010	HYDROBRAKE	OUTFALL	25.391	0.600	3.400	2.500	0.900	28.2	150	11.66	50.0
1.009	BASIN 2	HYDROBRAKE	24.181	0.600	3.500	3.400	0.100	241.8	150	11.44	50.0
1.000	PP1	SW01	22.772	0.600	5.700	5.100	0.600	38.0	225	5.18	50.0
2.000	PP2	SW02A	3.868	0.600	5.650	5.300	0.350	11.1	225	5.02	50.0
11.000	PP3	PP4	9.264	0.600	5.500	5.500	0.000	0.0	150	5.15	50.0
11.001	PP4	PP4A	146.985	0.600	5.500	4.650	0.850	172.9	150	8.37	50.0
11.002	PP4A	SW07	10.594	0.600	4.650	4.200	0.450	23.5	150	8.46	50.0
11.003	SW07	BASIN 1	15.451	0.600	4.200	3.500	0.700	22.1	225	8.55	50.0
5.000	PP5	SW04	40.770	0.600	5.350	4.500	0.850	48.0	150	5.47	50.0
4.000	PP6	SW03	17.214	0.600	5.500	4.700	0.800	21.5	150	5.13	50.0
6.000	PP7	SW05	37.663	0.600	4.900	4.290	0.610	61.7	225	5.38	50.0
10.000	PP8	SW06	11.079	0.600	4.900	4.140	0.760	14.6	150	5.07	50.0
9.000	PP9	SW06	25.867	0.600	4.750	4.140	0.610	42.4	150	5.26	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
11.004	1.000	17.7	150.5	1.050	1.050	0.833	0.0	0	∞
1.010	1.903	33.6	447.8	1.150	0.350	2.478	0.0	150	1.938
1.009	0.642	11.3	447.8	1.050	1.150	2.478	0.0	150	0.654
1.000	2.130	84.7	21.3	0.375	0.675	0.118	0.0	77	1.784
2.000	3.058	157.4	15.9	0.375	1.075	0.088	0.0	48	2.558
11.000	1.000	17.7	18.8	0.450	0.450	0.104	0.0	0	∞
11.001	0.761	13.4	56.7	0.450	0.450	0.314	0.0	150	0.775
11.002	2.084	36.8	111.5	0.450	0.850	0.617	0.0	150	2.123
11.003	2.797	111.2	131.4	0.775	0.975	0.727	0.0	225	2.848
5.000	1.456	25.7	30.2	0.450	1.350	0.167	0.0	150	1.483
4.000	2.180	38.5	37.6	0.450	1.250	0.208	0.0	120	2.476
6.000	1.667	66.3	24.6	0.375	1.235	0.136	0.0	94	1.544
10.000	2.652	46.9	16.8	0.450	1.060	0.093	0.0	62	2.432
9.000	1.549	27.4	9.4	0.350	1.060	0.052	0.0	61	1.408

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	PP10	SW03	48.422	0.600	5.650	4.700	0.950	51.0	150	5.57	50.0
8.000	PP11	SW05	21.301	0.600	5.100	4.290	0.810	26.3	150	5.18	50.0
7.000	PP12	SW05	33.289	0.600	5.150	4.290	0.860	38.7	150	5.24	50.0
12.000	PP13	SW07	38.076	0.600	4.650	4.200	0.450	84.6	150	5.58	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.412	25.0	10.7	0.450	1.250	0.059	0.0	68	1.356
8.000	1.971	34.8	23.3	0.450	1.310	0.129	0.0	90	2.109
7.000	1.622	28.7	10.1	0.450	1.310	0.056	0.0	61	1.481
12.000	1.093	19.3	19.9	0.450	0.450	0.110	0.0	128	1.239

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	30	40	0	0
10	40	0	0	100	45	0	0

Node HYDROBRAKE Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	3.400	Product Number	CTL-SHE-0102-5100-1300-5100
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.1	Min Node Diameter (mm)	1200

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	12.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.700	Length (m)	56.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	12	Slope (1:X)	373.0		

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.650	Length (m)	45.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	8	Slope (1:X)	50.0		

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.500	Length (m)	47.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	134	Slope (1:X)	188.0		

Node PP4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	23.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.500	Length (m)	63.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	98	Slope (1:X)	210.0		

Node PP4A Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	12.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.650	Length (m)	160.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	50	Slope (1:X)	188.0		

Node PP5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.350	Length (m)	78.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	42	Slope (1:X)	222.0		

Node PP6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	14.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.500	Length (m)	79.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	42	Slope (1:X)	500.0		

Node PP7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.900	Length (m)	170.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	26	Slope (1:X)	157.0		

Node PP8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.900	Length (m)	31.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	14	Slope (1:X)	615.0		

Node PP9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.750	Length (m)	33.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	20	Slope (1:X)	220.0		

Node PP10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	17.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.650	Length (m)	14.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	18	Slope (1:X)	93.0		

Node PP11 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	43.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.100	Length (m)	13.500	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	42	Slope (1:X)	150.0		

Node PP12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.150	Length (m)	123.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	26	Slope (1:X)	276.0		

Node PP13 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.650	Length (m)	69.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	18	Slope (1:X)	276.0		

Node BASIN 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	569.0	0.0	1.200	1060.0	0.0

Node BASIN 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1249.0	0.0	1.200	1920.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	66	5.744	0.044	7.8	1.3785	0.0000	OK
120 minute summer	PP2	64	5.680	0.030	5.8	0.0722	0.0000	OK
120 minute summer	PP3	72	5.617	0.117	6.8	3.6252	0.0000	OK
120 minute summer	PP4	72	5.608	0.108	17.8	8.8417	0.0000	OK
120 minute summer	PP4A	68	4.759	0.109	30.1	4.1810	0.0000	OK
120 minute summer	PP5	66	5.416	0.066	11.0	1.3289	0.0000	OK
120 minute summer	PP6	66	5.557	0.057	13.7	3.6287	0.0000	OK
120 minute summer	PP7	64	4.955	0.055	8.9	0.4282	0.0000	OK
120 minute summer	PP8	66	4.935	0.035	6.1	1.0843	0.0000	OK
120 minute summer	PP9	64	4.785	0.035	3.4	0.4251	0.0000	OK
120 minute summer	PP10	64	5.689	0.039	3.9	0.4127	0.0000	OK
120 minute summer	PP11	66	5.147	0.047	8.5	2.1997	0.0000	OK
120 minute summer	PP12	64	5.186	0.036	3.7	0.3392	0.0000	OK
120 minute summer	PP13	66	4.710	0.060	7.2	1.5503	0.0000	OK
960 minute summer	BASIN 1	765	3.743	0.243	13.9	150.7740	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	1.000	SW01	7.3	0.873	0.086	0.1926	
120 minute summer	PP2	2.000	SW02A	5.8	0.433	0.037	0.0551	
120 minute summer	PP3	11.000	PP4	4.3	0.316	0.245	0.1316	
120 minute summer	PP4	11.001	PP4A	11.6	0.915	0.863	1.9892	
120 minute summer	PP4A	11.002	SW07	27.5	2.211	0.747	0.1328	
120 minute summer	PP5	5.000	SW04	10.4	0.716	0.405	0.5122	
120 minute summer	PP6	4.000	SW03	11.9	0.970	0.308	0.2016	
120 minute summer	PP7	6.000	SW05	8.9	0.411	0.134	0.8913	
120 minute summer	PP8	10.000	SW06	5.7	0.474	0.122	0.1151	
120 minute summer	PP9	9.000	SW06	3.3	0.261	0.119	0.2679	
120 minute summer	PP10	3.000	SW03	3.7	0.341	0.150	0.5056	
120 minute summer	PP11	8.000	SW05	7.4	0.558	0.213	0.2378	
120 minute summer	PP12	7.000	SW05	3.6	0.288	0.126	0.3470	
120 minute summer	PP13	12.000	SW07	6.5	0.721	0.336	0.3424	
960 minute summer	BASIN 1	11.004	BASIN 2	2.5	0.158	0.139	1.3482	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute summer	BASIN 2	795	3.735	0.235	30.8	308.9520	0.0000	SURCHARGED
120 minute summer	SW01	66	5.174	0.074	11.1	0.1061	0.0000	OK
120 minute summer	SW02A	64	5.438	0.138	5.8	0.1557	0.0000	OK
120 minute summer	SW02	64	5.000	0.100	20.5	0.1437	0.0000	OK
120 minute summer	SW03	66	4.842	0.142	39.2	0.2031	0.0000	OK
120 minute summer	SW04	66	4.676	0.176	53.2	0.2517	0.0000	OK
120 minute summer	SW05	66	4.581	0.291	75.6	0.4162	0.0000	OK
120 minute summer	SW06	68	4.347	0.207	87.3	0.2968	0.0000	OK
120 minute summer	SW07	66	4.293	0.093	33.9	0.1050	0.0000	OK
120 minute summer	SW08	68	4.134	0.224	86.9	0.2536	0.0000	OK
120 minute summer	SW09	66	4.049	0.209	87.3	0.2369	0.0000	OK
960 minute summer	HYDROBRAKE	795	3.712	0.312	5.0	0.3531	0.0000	SURCHARGED
960 minute summer	OUTFALL	795	2.539	0.039	5.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute summer	BASIN 2	1.009	HYDROBRAKE	5.0	0.297	0.440	0.4257	
120 minute summer	SW01	1.001	SW02	11.1	0.569	0.088	0.9844	
120 minute summer	SW02A	2.001	SW02	5.8	0.577	0.061	0.1629	
120 minute summer	SW02	1.002	SW03	20.1	0.661	0.162	1.5847	
120 minute summer	SW03	1.003	SW04	39.4	0.887	0.311	2.2037	
120 minute summer	SW04	1.004	SW05	53.1	0.798	0.463	3.5928	
120 minute summer	SW05	1.005	SW06	74.5	1.032	0.798	5.8666	
120 minute summer	SW06	1.006	SW08	86.9	1.325	0.532	2.2539	
120 minute summer	SW07	11.003	BASIN 1	34.0	2.603	0.306	0.2667	
120 minute summer	SW08	1.007	SW09	87.3	1.325	0.525	0.6678	
120 minute summer	SW09	1.008	BASIN 2	87.7	2.300	0.491	1.6980	
960 minute summer	HYDROBRAKE	1.010	OUTFALL	5.0	1.354	0.148	0.0936	559.2

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	66	5.782	0.082	26.1	4.6139	0.0000	OK
120 minute summer	PP2	62	5.704	0.054	19.5	0.1856	0.0000	OK
120 minute summer	PP3	82	5.782	0.282	23.0	20.2716	0.0000	SURCHARGED
120 minute summer	PP4	90	5.772	0.272	53.2	55.1560	0.0000	SURCHARGED
120 minute summer	PP4A	76	5.006	0.356	79.5	43.3109	0.0000	FLOOD RISK
120 minute summer	PP5	76	5.620	0.270	37.0	20.9174	0.0000	SURCHARGED
120 minute summer	PP6	76	5.663	0.163	46.0	29.1162	0.0000	SURCHARGED
120 minute summer	PP7	72	5.254	0.354	36.1	15.2178	0.0000	FLOOD RISK
120 minute summer	PP8	68	4.978	0.078	20.6	4.5279	0.0000	OK
120 minute summer	PP9	66	4.819	0.069	11.5	1.5627	0.0000	OK
120 minute summer	PP10	68	5.736	0.086	13.1	1.8562	0.0000	OK
120 minute summer	PP11	76	5.253	0.153	28.6	18.9899	0.0000	SURCHARGED
120 minute summer	PP12	72	5.258	0.108	12.4	2.7703	0.0000	OK
120 minute summer	PP13	68	4.777	0.127	24.3	6.8720	0.0000	OK
1440 minute winter	BASIN 1	1440	4.201	0.701	18.1	499.7998	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	1.000	SW01	24.3	1.149	0.287	0.6016	
120 minute summer	PP2	2.000	SW02A	19.5	0.990	0.124	0.0908	
120 minute summer	PP3	11.000	PP4	6.8	0.389	0.388	0.1631	
120 minute summer	PP4	11.001	PP4A	15.3	1.032	1.134	2.5876	
120 minute summer	PP4A	11.002	SW07	38.6	2.365	1.047	0.1695	
120 minute summer	PP5	5.000	SW04	25.0	1.422	0.971	0.7177	
120 minute summer	PP6	4.000	SW03	33.2	1.920	0.861	0.3030	
120 minute summer	PP7	6.000	SW05	30.7	0.809	0.463	1.4979	
120 minute summer	PP8	10.000	SW06	17.0	1.108	0.362	0.1491	
120 minute summer	PP9	9.000	SW06	10.3	0.706	0.375	0.3294	
120 minute summer	PP10	3.000	SW03	11.6	0.780	0.466	0.6794	
120 minute summer	PP11	8.000	SW05	22.7	1.335	0.651	0.3750	
120 minute summer	PP12	7.000	SW05	10.3	0.705	0.361	0.5183	
120 minute summer	PP13	12.000	SW07	19.0	1.248	0.982	0.5775	
1440 minute winter	BASIN 1	11.004	BASIN 2	2.3	0.155	0.129	1.3482	

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	BASIN 2	1410	4.194	0.694	37.6	1002.9440	0.0000	SURCHARGED
120 minute summer	SW01	66	5.656	0.556	37.3	0.7960	0.0000	SURCHARGED
120 minute summer	SW02A	66	5.661	0.361	19.5	0.4082	0.0000	SURCHARGED
120 minute summer	SW02	66	5.637	0.737	66.9	1.0542	0.0000	SURCHARGED
120 minute summer	SW03	66	5.572	0.872	101.9	1.2472	0.0000	SURCHARGED
120 minute summer	SW04	66	5.429	0.929	122.1	1.3295	0.0000	SURCHARGED
120 minute summer	SW05	68	5.214	0.924	149.5	1.3221	0.0000	SURCHARGED
120 minute summer	SW06	68	4.719	0.579	185.1	0.8286	0.0000	SURCHARGED
120 minute summer	SW07	68	4.314	0.114	57.1	0.1292	0.0000	OK
120 minute summer	SW08	68	4.347	0.437	185.1	0.4941	0.0000	SURCHARGED
1440 minute winter	SW09	1410	4.195	0.355	31.5	0.4010	0.0000	OK
1440 minute winter	HYDROBRAKE	1410	4.176	0.776	5.1	0.8778	0.0000	SURCHARGED
120 minute winter	OUTFALL	1276	2.540	0.040	5.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	BASIN 2	1.009	HYDROBRAKE	5.1	0.295	0.452	0.4257	
120 minute summer	SW01	1.001	SW02	36.8	0.716	0.293	5.5596	
120 minute summer	SW02A	2.001	SW02	19.3	0.779	0.203	0.6030	
120 minute summer	SW02	1.002	SW03	66.2	0.815	0.532	5.6506	
120 minute summer	SW03	1.003	SW04	99.5	0.941	0.786	5.4664	
120 minute summer	SW04	1.004	SW05	121.3	1.100	1.057	5.9788	
120 minute summer	SW05	1.005	SW06	148.1	1.343	1.585	8.9697	
120 minute summer	SW06	1.006	SW08	185.1	1.678	1.132	3.7885	
120 minute summer	SW07	11.003	BASIN 1	57.1	2.639	0.513	0.4627	
120 minute summer	SW08	1.007	SW09	185.1	1.679	1.115	1.0914	
1440 minute winter	SW09	1.008	BASIN 2	31.5	1.148	0.177	4.6567	
1440 minute winter	HYDROBRAKE	1.010	OUTFALL	5.1	1.362	0.152	0.0951	748.1

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	68	5.813	0.113	33.3	8.6329	0.0000	OK
120 minute summer	PP2	66	5.800	0.150	24.9	1.1141	0.0000	OK
120 minute summer	PP3	84	5.839	0.339	29.4	27.5150	0.0000	FLOOD RISK
120 minute summer	PP4	98	5.827	0.327	66.7	78.9919	0.0000	FLOOD RISK
120 minute summer	PP4A	78	5.083	0.433	97.8	64.0607	0.0000	FLOOD RISK
120 minute summer	PP5	80	5.705	0.355	47.2	36.0566	0.0000	FLOOD RISK
120 minute summer	PP6	78	5.732	0.232	58.8	52.9871	0.0000	SURCHARGED
120 minute summer	PP7	74	5.361	0.461	44.7	25.5276	0.0000	FLOOD RISK
120 minute summer	PP8	68	5.006	0.106	26.3	6.8458	0.0000	OK
120 minute summer	PP9	72	4.862	0.112	14.7	4.0593	0.0000	OK
120 minute summer	PP10	72	5.797	0.147	16.7	5.2795	0.0000	OK
120 minute summer	PP11	80	5.347	0.247	40.6	35.4508	0.0000	SURCHARGED
120 minute summer	PP12	76	5.341	0.191	15.8	8.4924	0.0000	SURCHARGED
120 minute summer	PP13	70	4.812	0.162	31.1	11.1193	0.0000	SURCHARGED
1440 minute winter	BASIN 1	1440	4.365	0.865	22.1	646.3671	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	1.000	SW01	29.4	1.126	0.347	0.6787	
120 minute summer	PP2	2.000	SW02A	22.5	0.990	0.143	0.1314	
120 minute summer	PP3	11.000	PP4	8.3	0.471	0.469	0.1631	
120 minute summer	PP4	11.001	PP4A	15.5	1.032	1.150	2.5876	
120 minute summer	PP4A	11.002	SW07	41.0	2.368	1.113	0.1776	
120 minute summer	PP5	5.000	SW04	25.6	1.467	0.995	0.7177	
120 minute summer	PP6	4.000	SW03	37.1	2.112	0.964	0.3030	
120 minute summer	PP7	6.000	SW05	29.3	0.736	0.441	1.4979	
120 minute summer	PP8	10.000	SW06	20.6	1.230	0.439	0.1712	
120 minute summer	PP9	9.000	SW06	10.4	0.706	0.378	0.4100	
120 minute summer	PP10	3.000	SW03	14.5	0.853	0.580	0.8503	
120 minute summer	PP11	8.000	SW05	27.3	1.556	0.784	0.3750	
120 minute summer	PP12	7.000	SW05	14.1	0.825	0.493	0.5860	
120 minute summer	PP13	12.000	SW07	19.9	1.250	1.030	0.6335	
1440 minute winter	BASIN 1	11.004	BASIN 2	2.2	0.152	0.127	1.3482	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	BASIN 2	1440	4.359	0.859	45.6	1280.8610	0.0000	SURCHARGED
120 minute summer	SW01	66	5.779	0.679	40.6	0.9713	0.0000	FLOOD RISK
120 minute summer	SW02A	66	5.795	0.495	22.5	0.5600	0.0000	SURCHARGED
120 minute summer	SW02	66	5.758	0.858	76.1	1.2277	0.0000	SURCHARGED
120 minute summer	SW03	68	5.675	0.975	104.7	1.3959	0.0000	SURCHARGED
120 minute summer	SW04	68	5.532	1.032	128.1	1.4762	0.0000	SURCHARGED
120 minute summer	SW05	72	5.309	1.019	152.3	1.4582	0.0000	SURCHARGED
120 minute summer	SW06	68	4.809	0.669	192.5	0.9578	0.0000	SURCHARGED
1440 minute winter	SW07	1440	4.365	0.165	19.3	0.1868	0.0000	OK
120 minute summer	SW08	76	4.422	0.512	191.9	0.5786	0.0000	SURCHARGED
1440 minute winter	SW09	1440	4.359	0.519	39.0	0.5875	0.0000	SURCHARGED
1440 minute winter	HYDROBRAKE	1440	4.343	0.943	5.1	1.0660	0.0000	SURCHARGED
1440 minute summer	OUTFALL	690	2.540	0.040	5.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	BASIN 2	1.009	HYDROBRAKE	5.1	0.297	0.452	0.4257	
120 minute summer	SW01	1.001	SW02	39.7	0.702	0.317	5.5596	
120 minute summer	SW02A	2.001	SW02	22.9	0.772	0.241	0.6030	
120 minute summer	SW02	1.002	SW03	75.7	0.795	0.608	5.6506	
120 minute summer	SW03	1.003	SW04	103.9	0.944	0.821	5.4664	
120 minute summer	SW04	1.004	SW05	127.5	1.157	1.112	5.9788	
120 minute summer	SW05	1.005	SW06	149.7	1.358	1.603	8.9697	
120 minute summer	SW06	1.006	SW08	191.9	1.740	1.174	3.7885	
1440 minute winter	SW07	11.003	BASIN 1	19.3	1.603	0.174	0.5486	
120 minute summer	SW08	1.007	SW09	191.8	1.739	1.155	1.1174	
1440 minute winter	SW09	1.008	BASIN 2	38.7	1.176	0.217	4.7071	
1440 minute winter	HYDROBRAKE	1.010	OUTFALL	5.1	1.362	0.152	0.0951	697.0

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	74	5.892	0.192	43.2	23.8066	0.0000	OK
120 minute summer	PP2	68	5.921	0.271	32.2	3.3586	0.0000	SURCHARGED
120 minute summer	PP3	84	5.918	0.418	38.1	37.6079	0.0000	FLOOD RISK
120 minute winter	PP4	114	5.908	0.408	61.0	115.0314	0.0000	FLOOD RISK
120 minute summer	PP4A	80	5.176	0.526	122.9	94.3020	0.0000	FLOOD RISK
120 minute summer	PP5	84	5.811	0.461	61.1	57.3160	0.0000	FLOOD RISK
120 minute summer	PP6	84	5.830	0.330	82.4	86.8038	0.0000	FLOOD RISK
120 minute summer	PP7	76	5.471	0.571	49.8	39.1455	0.0000	FLOOD RISK
120 minute summer	PP8	72	5.070	0.170	34.0	12.2617	0.0000	SURCHARGED
120 minute summer	PP9	78	4.935	0.185	19.0	10.5530	0.0000	SURCHARGED
120 minute summer	PP10	76	5.885	0.235	21.6	11.6356	0.0000	SURCHARGED
120 minute summer	PP11	84	5.460	0.360	54.1	55.3201	0.0000	FLOOD RISK
120 minute summer	PP12	80	5.432	0.282	23.2	18.4664	0.0000	SURCHARGED
120 minute summer	PP13	74	4.862	0.212	40.3	18.8222	0.0000	SURCHARGED
1440 minute winter	BASIN 1	1440	4.596	1.096	28.7	870.1124	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	1.000	SW01	35.8	1.135	0.423	0.8641	
120 minute summer	PP2	2.000	SW02A	27.5	0.979	0.174	0.1538	
120 minute summer	PP3	11.000	PP4	10.5	0.597	0.595	0.1631	
120 minute winter	PP4	11.001	PP4A	15.9	1.056	1.186	2.5876	
120 minute summer	PP4A	11.002	SW07	44.3	2.515	1.202	0.1864	
120 minute summer	PP5	5.000	SW04	24.5	1.389	0.950	0.7177	
120 minute summer	PP6	4.000	SW03	38.0	2.231	0.985	0.3030	
120 minute summer	PP7	6.000	SW05	26.1	0.706	0.394	1.4979	
120 minute summer	PP8	10.000	SW06	21.0	1.212	0.449	0.1950	
120 minute summer	PP9	9.000	SW06	11.0	0.737	0.401	0.4554	
120 minute summer	PP10	3.000	SW03	15.8	0.918	0.632	0.8525	
120 minute summer	PP11	8.000	SW05	28.0	1.593	0.803	0.3750	
120 minute summer	PP12	7.000	SW05	14.6	0.865	0.509	0.5860	
120 minute summer	PP13	12.000	SW07	20.9	1.248	1.084	0.6666	
1440 minute winter	BASIN 1	11.004	BASIN 2	2.2	0.149	0.123	1.3482	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.93%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	BASIN 2	1440	4.589	1.089	57.7	1692.6340	0.0000	FLOOD RISK
120 minute summer	SW01	70	5.861	0.761	41.3	1.0894	0.0000	FLOOD RISK
120 minute summer	SW02A	68	5.899	0.599	27.5	0.6771	0.0000	SURCHARGED
120 minute summer	SW02	70	5.845	0.945	78.8	1.3525	0.0000	SURCHARGED
120 minute summer	SW03	70	5.769	1.069	106.5	1.5301	0.0000	SURCHARGED
120 minute summer	SW04	70	5.630	1.130	128.8	1.6168	0.0000	SURCHARGED
120 minute summer	SW05	74	5.411	1.121	155.5	1.6044	0.0000	SURCHARGED
120 minute summer	SW06	74	4.889	0.749	195.0	1.0716	0.0000	SURCHARGED
1440 minute winter	SW07	1440	4.596	0.396	25.0	0.4474	0.0000	SURCHARGED
1440 minute winter	SW08	1440	4.588	0.678	50.1	0.7669	0.0000	SURCHARGED
1440 minute winter	SW09	1440	4.590	0.750	49.8	0.8478	0.0000	SURCHARGED
1440 minute winter	HYDROBRAKE	1440	4.568	1.168	5.1	1.3212	0.0000	FLOOD RISK
240 minute winter	OUTFALL	116	2.540	0.040	5.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	BASIN 2	1.009	HYDROBRAKE	5.1	0.296	0.452	0.4257	
120 minute summer	SW01	1.001	SW02	41.6	0.716	0.332	5.5596	
120 minute summer	SW02A	2.001	SW02	27.4	0.791	0.289	0.6030	
120 minute summer	SW02	1.002	SW03	78.3	0.810	0.629	5.6506	
120 minute summer	SW03	1.003	SW04	104.5	0.947	0.825	5.4664	
120 minute summer	SW04	1.004	SW05	128.4	1.164	1.119	5.9788	
120 minute summer	SW05	1.005	SW06	151.1	1.370	1.618	8.9697	
120 minute summer	SW06	1.006	SW08	194.9	1.767	1.192	3.7885	
1440 minute winter	SW07	11.003	BASIN 1	25.0	1.698	0.225	0.6145	
1440 minute winter	SW08	1.007	SW09	49.8	1.245	0.300	1.1174	
1440 minute winter	SW09	1.008	BASIN 2	49.5	1.273	0.278	4.7071	
1440 minute winter	HYDROBRAKE	1.010	OUTFALL	5.1	1.362	0.152	0.0951	754.1

APPENDIX J: Surcharged Outfall Calculations

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	x
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	0.200		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PP1	0.118	5.00	6.300	1200	489278.841	98898.054	0.600
PP2	0.088	5.00	6.250	1200	489269.483	98933.810	0.600
PP3	0.104	5.00	6.100	1200	489240.540	98985.693	0.600
PP4	0.210	5.00	6.100	1200	489239.525	98994.901	0.600
PP4A	0.303	5.00	5.250	1200	489097.447	99032.564	0.600
PP5	0.167	5.00	5.950	1200	489130.791	98963.417	0.600
PP6	0.208	5.00	6.100	1200	489196.270	98934.973	0.600
PP7	0.136	5.00	5.500	1200	489074.982	98961.212	0.600
PP8	0.093	5.00	5.500	1200	489041.140	98965.662	0.600
PP9	0.052	5.00	5.250	1200	489014.462	98954.178	0.500
PP10	0.059	5.00	6.250	1200	489258.162	98922.322	0.600
PP11	0.129	5.00	5.700	1200	489091.211	98956.327	0.600
PP12	0.056	5.00	5.750	1200	489083.075	98973.233	0.600
PP13	0.110	5.00	5.250	1200	489060.581	99005.346	0.600
BASIN 1	0.106	5.00	4.700	1200	489090.949	99047.801	1.200
BASIN 2	0.192	5.00	4.700	1200	489026.167	99006.960	1.200
SW01	0.061	5.00	6.000	1350	489300.865	98892.267	0.900
SW02A	0.000		6.500	1200	489268.564	98937.567	1.200
SW02	0.056	5.00	6.300	1350	489261.729	98924.034	1.400
SW03	0.059	5.00	6.100	1350	489212.883	98939.483	1.400
SW04	0.057	5.00	6.000	1350	489163.326	98938.847	1.500
SW05	0.050	5.00	5.750	1350	489112.473	98957.615	1.460
SW06	0.064	5.00	5.350	1350	489032.555	98972.665	1.210
SW07	0.000		5.200	1200	489086.858	99032.901	1.000

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW08	0.000		5.200	1200	488998.671	98967.038	1.290
SW09	0.000		5.150	1200	488995.970	98976.802	1.310
HYDROBRAKE	0.000		4.700	1200	489035.335	99029.336	1.300
OUTFALL	0.000		3.000	1200	489018.563	99048.399	0.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.001	SW01	SW02	50.406	0.600	5.100	4.900	0.200	252.0	375	5.92	50.0
2.001	SW02A	SW02	15.161	0.600	5.400	4.900	0.500	30.3	225	5.12	50.0
1.002	SW02	SW03	51.231	0.600	4.900	4.700	0.200	256.2	375	6.67	50.0
1.003	SW03	SW04	49.561	0.600	4.700	4.500	0.200	247.8	375	7.40	50.0
1.004	SW04	SW05	54.206	0.600	4.500	4.320	0.180	301.1	375	8.27	50.0
1.005	SW05	SW06	81.323	0.600	4.320	4.140	0.180	451.8	375	9.87	50.0
1.006	SW06	SW08	34.348	0.600	4.140	3.910	0.230	149.3	375	10.25	50.0
1.007	SW08	SW09	10.131	0.600	3.910	3.840	0.070	144.7	375	10.37	50.0
1.008	SW09	BASIN 2	42.677	0.600	3.840	3.500	0.340	125.5	375	10.81	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.001	1.136	125.5	32.3	0.525	1.025	0.179	0.0	129	0.958
2.001	2.384	94.8	15.9	0.875	1.175	0.088	0.0	62	1.781
1.002	1.127	124.5	58.4	1.025	1.025	0.323	0.0	181	1.110
1.003	1.146	126.6	117.3	1.025	1.125	0.649	0.0	287	1.294
1.004	1.039	114.7	157.8	1.125	1.055	0.873	0.0	375	1.052
1.005	0.846	93.4	224.8	1.055	0.835	1.244	0.0	375	0.857
1.006	1.480	163.5	262.6	0.835	0.915	1.453	0.0	375	1.499
1.007	1.504	166.1	262.6	0.915	0.985	1.453	0.0	375	1.523
1.008	1.616	178.4	262.6	0.985	0.625	1.453	0.0	375	1.636

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
11.004	BASIN 1	BASIN 2	76.521	0.600	3.500	3.500	0.000	0.0	150	9.83	50.0
1.010	HYDROBRAKE	OUTFALL	25.391	0.600	3.400	2.500	0.900	28.2	150	11.66	50.0
1.009	BASIN 2	HYDROBRAKE	24.181	0.600	3.500	3.400	0.100	241.8	150	11.44	50.0
1.000	PP1	SW01	22.772	0.600	5.700	5.100	0.600	38.0	225	5.18	50.0
2.000	PP2	SW02A	3.868	0.600	5.650	5.300	0.350	11.1	225	5.02	50.0
11.000	PP3	PP4	9.264	0.600	5.500	5.500	0.000	0.0	150	5.15	50.0
11.001	PP4	PP4A	146.985	0.600	5.500	4.650	0.850	172.9	150	8.37	50.0
11.002	PP4A	SW07	10.594	0.600	4.650	4.200	0.450	23.5	150	8.46	50.0
11.003	SW07	BASIN 1	15.451	0.600	4.200	3.500	0.700	22.1	225	8.55	50.0
5.000	PP5	SW04	40.770	0.600	5.350	4.500	0.850	48.0	150	5.47	50.0
4.000	PP6	SW03	17.214	0.600	5.500	4.700	0.800	21.5	150	5.13	50.0
6.000	PP7	SW05	37.663	0.600	4.900	4.290	0.610	61.7	225	5.38	50.0
10.000	PP8	SW06	11.079	0.600	4.900	4.140	0.760	14.6	150	5.07	50.0
9.000	PP9	SW06	25.867	0.600	4.750	4.140	0.610	42.4	150	5.26	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
11.004	1.000	17.7	150.5	1.050	1.050	0.833	0.0	0	∞
1.010	1.903	33.6	447.8	1.150	0.350	2.478	0.0	150	1.938
1.009	0.642	11.3	447.8	1.050	1.150	2.478	0.0	150	0.654
1.000	2.130	84.7	21.3	0.675	0.675	0.118	0.0	77	1.784
2.000	3.058	157.4	15.9	0.375	0.975	0.088	0.0	48	2.558
11.000	1.000	17.7	18.8	0.450	0.450	0.104	0.0	0	∞
11.001	0.761	13.4	56.7	0.450	0.450	0.314	0.0	150	0.775
11.002	2.084	36.8	111.5	0.450	0.850	0.617	0.0	150	2.123
11.003	2.797	111.2	131.4	0.775	0.975	0.727	0.0	225	2.848
5.000	1.456	25.7	30.2	0.450	1.350	0.167	0.0	150	1.483
4.000	2.180	38.5	37.6	0.450	1.250	0.208	0.0	120	2.476
6.000	1.667	66.3	24.6	0.375	1.235	0.136	0.0	94	1.544
10.000	2.652	46.9	16.8	0.450	1.060	0.093	0.0	62	2.432
9.000	1.549	27.4	9.4	0.350	1.060	0.052	0.0	61	1.408

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	PP10	SW03	48.422	0.600	5.650	4.700	0.950	51.0	150	5.57	50.0
8.000	PP11	SW05	21.301	0.600	5.100	4.290	0.810	26.3	150	5.18	50.0
7.000	PP12	SW05	33.289	0.600	5.150	4.290	0.860	38.7	150	5.24	50.0
12.000	PP13	SW07	38.076	0.600	4.650	4.200	0.450	84.6	150	5.58	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.412	25.0	10.7	0.450	1.250	0.059	0.0	68	1.356
8.000	1.971	34.8	23.3	0.450	1.310	0.129	0.0	90	2.109
7.000	1.622	28.7	10.1	0.450	1.310	0.056	0.0	61	1.481
12.000	1.093	19.3	19.9	0.450	0.450	0.110	0.0	128	1.239

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	x	Starting Level (m)			

Storm Durations

120 | 180 | 240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0	30	40	0	0
10	40	0	0	100	45	0	0

Node OUTFALL Surcharged Outfall

Overrides Design Area	x	Depression Storage Area (m²)	0	Evapo-transpiration (mm/day)	0
Overrides Design Additional Inflow	x	Depression Storage Depth (mm)	0		
		Applies to All storms			

Time (mins)	Depth (m)	Time (mins)	Depth (m)
0	1.380	1440	1.380

Node HYDROBRAKE Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	3.400	Product Number	CTL-SHE-0102-5100-1300-5100
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.1	Min Node Diameter (mm)	1200

Node PP1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	12.000	Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.700	Length (m)	56.000	Inf Depth (m)
Safety Factor	2.0	Time to half empty (mins)	12	Slope (1:X)	373.0	

Node PP2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.500	Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.650	Length (m)	45.000	Inf Depth (m)
Safety Factor	2.0	Time to half empty (mins)	8	Slope (1:X)	50.0	

Node PP3 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.000	Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.500	Length (m)	47.000	Inf Depth (m)
Safety Factor	2.0	Time to half empty (mins)	134	Slope (1:X)	188.0	

Node PP4 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	23.500	Depth (m)
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.500	Length (m)	63.000	Inf Depth (m)
Safety Factor	2.0	Time to half empty (mins)	98	Slope (1:X)	210.0	

Node PP4A Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	12.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.650	Length (m)	160.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	50	Slope (1:X)	188.0		

Node PP5 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	8.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.350	Length (m)	78.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	44	Slope (1:X)	222.0		

Node PP6 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	14.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.500	Length (m)	79.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	42	Slope (1:X)	500.0		

Node PP7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.900	Length (m)	170.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	26	Slope (1:X)	157.0		

Node PP8 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.900	Length (m)	31.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	14	Slope (1:X)	615.0		

Node PP9 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	9.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.750	Length (m)	33.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	20	Slope (1:X)	220.0		

Node PP10 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	17.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.650	Length (m)	14.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	18	Slope (1:X)	93.0		

Node PP11 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	43.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.100	Length (m)	13.500	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	42	Slope (1:X)	150.0		

Node PP12 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	5.500	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.150	Length (m)	123.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	26	Slope (1:X)	276.0		

Node PP13 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.000	Depth (m)	
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.650	Length (m)	69.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	18	Slope (1:X)	276.0		

Node BASIN 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	569.0	0.0	1.200	1060.0	0.0

Node BASIN 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	1249.0	0.0	1.200	1920.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	66	5.744	0.044	7.8	1.3785	0.0000	OK
120 minute summer	PP2	64	5.680	0.030	5.8	0.0722	0.0000	OK
120 minute summer	PP3	72	5.617	0.117	6.8	3.6252	0.0000	OK
120 minute summer	PP4	72	5.608	0.108	17.8	8.8417	0.0000	OK
120 minute summer	PP4A	68	4.759	0.109	30.1	4.1810	0.0000	OK
120 minute summer	PP5	66	5.416	0.066	11.0	1.3289	0.0000	OK
120 minute summer	PP6	66	5.557	0.057	13.7	3.6287	0.0000	OK
120 minute summer	PP7	64	4.955	0.055	8.9	0.4282	0.0000	OK
120 minute summer	PP8	66	4.935	0.035	6.1	1.0843	0.0000	OK
120 minute summer	PP9	64	4.785	0.035	3.4	0.4251	0.0000	OK
120 minute summer	PP10	64	5.689	0.039	3.9	0.4127	0.0000	OK
120 minute summer	PP11	66	5.147	0.047	8.5	2.1997	0.0000	OK
120 minute summer	PP12	64	5.186	0.036	3.7	0.3392	0.0000	OK
120 minute summer	PP13	66	4.710	0.060	7.2	1.5503	0.0000	OK
1440 minute summer	BASIN 1	1830	3.858	0.358	10.3	230.5176	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	1.000	SW01	7.3	0.873	0.086	0.1926	
120 minute summer	PP2	2.000	SW02A	5.8	0.433	0.037	0.0551	
120 minute summer	PP3	11.000	PP4	4.3	0.316	0.245	0.1316	
120 minute summer	PP4	11.001	PP4A	11.6	0.915	0.863	1.9893	
120 minute summer	PP4A	11.002	SW07	27.5	2.211	0.747	0.1328	
120 minute summer	PP5	5.000	SW04	10.4	0.716	0.405	0.5122	
120 minute summer	PP6	4.000	SW03	11.9	0.970	0.308	0.2016	
120 minute summer	PP7	6.000	SW05	8.9	0.411	0.134	0.8913	
120 minute summer	PP8	10.000	SW06	5.7	0.474	0.122	0.1151	
120 minute summer	PP9	9.000	SW06	3.3	0.261	0.119	0.2679	
120 minute summer	PP10	3.000	SW03	3.7	0.341	0.150	0.5056	
120 minute summer	PP11	8.000	SW05	7.4	0.558	0.213	0.2378	
120 minute summer	PP12	7.000	SW05	3.6	0.288	0.126	0.3470	
120 minute summer	PP13	12.000	SW07	6.5	0.721	0.336	0.3424	
1440 minute summer	BASIN 1	11.004	BASIN 2	0.4	0.031	0.021	1.3482	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute summer	BASIN 2	2100	3.858	0.358	20.9	483.7608	0.0000	SURCHARGED
120 minute summer	SW01	66	5.174	0.074	11.1	0.1061	0.0000	OK
120 minute summer	SW02A	64	5.438	0.138	5.8	0.1557	0.0000	OK
120 minute summer	SW02	64	5.000	0.100	20.5	0.1437	0.0000	OK
120 minute summer	SW03	66	4.842	0.142	39.2	0.2031	0.0000	OK
120 minute summer	SW04	66	4.676	0.176	53.2	0.2517	0.0000	OK
120 minute summer	SW05	66	4.581	0.291	75.6	0.4162	0.0000	OK
120 minute summer	SW06	68	4.347	0.207	87.3	0.2968	0.0000	OK
120 minute summer	SW07	66	4.293	0.093	33.9	0.1050	0.0000	OK
120 minute summer	SW08	68	4.134	0.224	86.9	0.2533	0.0000	OK
120 minute summer	SW09	66	4.049	0.209	87.2	0.2364	0.0000	OK
1440 minute summer	HYDROBRAKE	1620	3.859	0.459	0.2	0.5186	0.0000	SURCHARGED
120 minute summer	OUTFALL	2	3.880	1.380	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute summer	BASIN 2	1.009	HYDROBRAKE	0.2	0.123	0.016	0.4257	
120 minute summer	SW01	1.001	SW02	11.1	0.569	0.088	0.9844	
120 minute summer	SW02A	2.001	SW02	5.8	0.577	0.061	0.1629	
120 minute summer	SW02	1.002	SW03	20.1	0.661	0.162	1.5847	
120 minute summer	SW03	1.003	SW04	39.4	0.887	0.311	2.2037	
120 minute summer	SW04	1.004	SW05	53.1	0.798	0.463	3.5928	
120 minute summer	SW05	1.005	SW06	74.5	1.032	0.798	5.8661	
120 minute summer	SW06	1.006	SW08	86.9	1.326	0.532	2.2521	
120 minute summer	SW07	11.003	BASIN 1	34.0	2.603	0.306	0.2726	
120 minute summer	SW08	1.007	SW09	87.2	1.328	0.525	0.6663	
120 minute summer	SW09	1.008	BASIN 2	87.7	2.292	0.491	1.7038	
1440 minute summer	HYDROBRAKE	1.010	OUTFALL	0.0	0.000	0.000	0.4470	0.0

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	66	5.782	0.082	26.1	4.6139	0.0000	OK
120 minute summer	PP2	62	5.704	0.054	19.5	0.1856	0.0000	OK
120 minute summer	PP3	82	5.782	0.282	23.0	20.2716	0.0000	SURCHARGED
120 minute summer	PP4	90	5.772	0.272	53.2	55.1560	0.0000	SURCHARGED
120 minute summer	PP4A	76	5.006	0.356	79.5	43.3122	0.0000	FLOOD RISK
120 minute summer	PP5	76	5.620	0.270	37.0	20.9165	0.0000	SURCHARGED
120 minute summer	PP6	76	5.663	0.163	46.0	29.1144	0.0000	SURCHARGED
120 minute summer	PP7	72	5.254	0.354	36.1	15.2160	0.0000	FLOOD RISK
120 minute summer	PP8	68	4.978	0.078	20.6	4.5275	0.0000	OK
120 minute summer	PP9	66	4.819	0.069	11.5	1.5622	0.0000	OK
120 minute summer	PP10	68	5.736	0.086	13.1	1.8559	0.0000	OK
120 minute summer	PP11	76	5.253	0.153	28.6	18.9898	0.0000	SURCHARGED
120 minute summer	PP12	72	5.258	0.108	12.4	2.7698	0.0000	OK
120 minute summer	PP13	68	4.777	0.127	24.3	6.8726	0.0000	OK
1440 minute winter	BASIN 1	1410	4.254	0.754	18.1	546.5120	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	1.000	SW01	24.3	1.149	0.287	0.6016	
120 minute summer	PP2	2.000	SW02A	19.5	0.990	0.124	0.0908	
120 minute summer	PP3	11.000	PP4	6.8	0.389	0.388	0.1631	
120 minute summer	PP4	11.001	PP4A	15.2	1.032	1.134	2.5876	
120 minute summer	PP4A	11.002	SW07	38.6	2.365	1.047	0.1694	
120 minute summer	PP5	5.000	SW04	25.0	1.421	0.971	0.7177	
120 minute summer	PP6	4.000	SW03	33.2	1.919	0.861	0.3030	
120 minute summer	PP7	6.000	SW05	30.7	0.809	0.463	1.4979	
120 minute summer	PP8	10.000	SW06	17.0	1.108	0.362	0.1491	
120 minute summer	PP9	9.000	SW06	10.3	0.706	0.375	0.3294	
120 minute summer	PP10	3.000	SW03	11.6	0.780	0.466	0.6794	
120 minute summer	PP11	8.000	SW05	22.7	1.335	0.651	0.3750	
120 minute summer	PP12	7.000	SW05	10.3	0.705	0.360	0.5183	
120 minute summer	PP13	12.000	SW07	19.0	1.248	0.982	0.5774	
1440 minute winter	BASIN 1	11.004	BASIN 2	1.7	0.099	0.099	1.3482	

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	BASIN 2	1410	4.247	0.747	36.0	1089.4630	0.0000	SURCHARGED
120 minute summer	SW01	66	5.656	0.556	37.3	0.7960	0.0000	SURCHARGED
120 minute summer	SW02A	66	5.661	0.361	19.5	0.4081	0.0000	SURCHARGED
120 minute summer	SW02	66	5.637	0.737	66.9	1.0541	0.0000	SURCHARGED
120 minute summer	SW03	66	5.572	0.872	101.9	1.2472	0.0000	SURCHARGED
120 minute summer	SW04	66	5.429	0.929	122.1	1.3295	0.0000	SURCHARGED
120 minute summer	SW05	68	5.214	0.924	149.5	1.3221	0.0000	SURCHARGED
120 minute summer	SW06	68	4.719	0.579	185.1	0.8287	0.0000	SURCHARGED
120 minute summer	SW07	68	4.314	0.114	57.1	0.1291	0.0000	OK
120 minute summer	SW08	68	4.347	0.437	185.1	0.4943	0.0000	SURCHARGED
1440 minute winter	SW09	1410	4.247	0.407	31.5	0.4602	0.0000	SURCHARGED
1440 minute winter	HYDROBRAKE	1410	4.224	0.824	5.1	0.9314	0.0000	SURCHARGED
120 minute summer	OUTFALL	2	3.880	1.380	3.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	BASIN 2	1.009	HYDROBRAKE	5.1	0.288	0.447	0.4257	
120 minute summer	SW01	1.001	SW02	36.8	0.716	0.293	5.5596	
120 minute summer	SW02A	2.001	SW02	19.3	0.779	0.203	0.6030	
120 minute summer	SW02	1.002	SW03	66.2	0.815	0.532	5.6506	
120 minute summer	SW03	1.003	SW04	99.5	0.941	0.786	5.4664	
120 minute summer	SW04	1.004	SW05	121.3	1.100	1.057	5.9788	
120 minute summer	SW05	1.005	SW06	148.0	1.342	1.585	8.9697	
120 minute summer	SW06	1.006	SW08	185.1	1.678	1.132	3.7885	
120 minute summer	SW07	11.003	BASIN 1	57.1	2.639	0.513	0.4628	
120 minute summer	SW08	1.007	SW09	185.1	1.679	1.114	1.0916	
1440 minute winter	SW09	1.008	BASIN 2	31.3	1.148	0.175	4.7071	
1440 minute winter	HYDROBRAKE	1.010	OUTFALL	5.1	0.288	0.151	0.4470	621.0

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	68	5.813	0.113	33.3	8.6327	0.0000	OK
120 minute summer	PP2	66	5.800	0.150	24.9	1.1143	0.0000	OK
120 minute summer	PP3	84	5.839	0.339	29.4	27.5150	0.0000	FLOOD RISK
120 minute summer	PP4	98	5.827	0.327	66.7	78.9919	0.0000	FLOOD RISK
120 minute summer	PP4A	78	5.083	0.433	97.8	64.0613	0.0000	FLOOD RISK
120 minute summer	PP5	80	5.705	0.355	47.2	36.0659	0.0000	FLOOD RISK
120 minute summer	PP6	78	5.732	0.232	58.8	52.9964	0.0000	SURCHARGED
120 minute summer	PP7	74	5.361	0.461	44.7	25.5298	0.0000	FLOOD RISK
120 minute summer	PP8	68	5.006	0.106	26.3	6.8468	0.0000	OK
120 minute summer	PP9	72	4.862	0.112	14.7	4.0602	0.0000	OK
120 minute summer	PP10	72	5.797	0.147	16.7	5.2791	0.0000	OK
120 minute summer	PP11	80	5.347	0.247	40.6	35.4871	0.0000	SURCHARGED
120 minute summer	PP12	76	5.341	0.191	15.8	8.5096	0.0000	SURCHARGED
120 minute summer	PP13	70	4.812	0.162	31.1	11.1197	0.0000	SURCHARGED
1440 minute winter	BASIN 1	1440	4.407	0.907	22.1	685.5219	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	1.000	SW01	29.4	1.126	0.347	0.6787	
120 minute summer	PP2	2.000	SW02A	22.5	0.990	0.143	0.1314	
120 minute summer	PP3	11.000	PP4	8.3	0.471	0.469	0.1631	
120 minute summer	PP4	11.001	PP4A	15.5	1.032	1.150	2.5876	
120 minute summer	PP4A	11.002	SW07	41.0	2.368	1.113	0.1776	
120 minute summer	PP5	5.000	SW04	25.5	1.458	0.992	0.7177	
120 minute summer	PP6	4.000	SW03	36.9	2.112	0.957	0.3030	
120 minute summer	PP7	6.000	SW05	29.1	0.733	0.440	1.4979	
120 minute summer	PP8	10.000	SW06	20.6	1.230	0.439	0.1712	
120 minute summer	PP9	9.000	SW06	10.4	0.706	0.379	0.4100	
120 minute summer	PP10	3.000	SW03	14.5	0.852	0.579	0.8503	
120 minute summer	PP11	8.000	SW05	26.8	1.527	0.771	0.3750	
120 minute summer	PP12	7.000	SW05	14.1	0.820	0.491	0.5860	
120 minute summer	PP13	12.000	SW07	19.9	1.250	1.030	0.6338	
1440 minute winter	BASIN 1	11.004	BASIN 2	1.8	0.100	0.100	1.3482	

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	BASIN 2	1440	4.399	0.899	44.8	1349.7100	0.0000	SURCHARGED
120 minute summer	SW01	66	5.779	0.679	40.6	0.9712	0.0000	FLOOD RISK
120 minute summer	SW02A	66	5.795	0.495	22.5	0.5600	0.0000	SURCHARGED
120 minute summer	SW02	66	5.758	0.858	76.1	1.2277	0.0000	SURCHARGED
120 minute summer	SW03	68	5.675	0.975	104.8	1.3959	0.0000	SURCHARGED
120 minute summer	SW04	68	5.532	1.032	128.1	1.4762	0.0000	SURCHARGED
120 minute summer	SW05	72	5.309	1.019	152.3	1.4582	0.0000	SURCHARGED
120 minute summer	SW06	68	4.809	0.669	192.5	0.9574	0.0000	SURCHARGED
1440 minute winter	SW07	1440	4.407	0.207	19.3	0.2343	0.0000	OK
180 minute summer	SW08	108	4.431	0.521	184.3	0.5892	0.0000	SURCHARGED
1440 minute winter	SW09	1410	4.399	0.559	38.9	0.6323	0.0000	SURCHARGED
1440 minute winter	HYDROBRAKE	1440	4.376	0.976	5.1	1.1035	0.0000	SURCHARGED
120 minute summer	OUTFALL	2	3.880	1.380	4.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	BASIN 2	1.009	HYDROBRAKE	5.1	0.290	0.451	0.4257	
120 minute summer	SW01	1.001	SW02	39.7	0.702	0.317	5.5596	
120 minute summer	SW02A	2.001	SW02	22.8	0.772	0.241	0.6030	
120 minute summer	SW02	1.002	SW03	75.7	0.795	0.608	5.6506	
120 minute summer	SW03	1.003	SW04	103.9	0.944	0.821	5.4664	
120 minute summer	SW04	1.004	SW05	127.6	1.157	1.112	5.9788	
120 minute summer	SW05	1.005	SW06	149.5	1.355	1.600	8.9697	
120 minute summer	SW06	1.006	SW08	191.9	1.740	1.174	3.7885	
1440 minute winter	SW07	11.003	BASIN 1	19.3	1.603	0.174	0.6029	
180 minute summer	SW08	1.007	SW09	184.2	1.670	1.109	1.1174	
1440 minute winter	SW09	1.008	BASIN 2	38.7	1.176	0.217	4.7071	
1440 minute winter	HYDROBRAKE	1.010	OUTFALL	5.1	0.290	0.152	0.4470	661.6

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PP1	74	5.892	0.192	43.2	23.8118	0.0000	OK
120 minute summer	PP2	68	5.921	0.271	32.2	3.3586	0.0000	SURCHARGED
120 minute summer	PP3	84	5.918	0.418	38.1	37.6079	0.0000	FLOOD RISK
120 minute winter	PP4	114	5.908	0.408	61.0	115.0313	0.0000	FLOOD RISK
120 minute summer	PP4A	80	5.176	0.526	122.9	94.2984	0.0000	FLOOD RISK
120 minute summer	PP5	84	5.811	0.461	61.1	57.3295	0.0000	FLOOD RISK
120 minute summer	PP6	84	5.831	0.331	82.4	86.8250	0.0000	FLOOD RISK
120 minute summer	PP7	76	5.472	0.572	49.8	39.1859	0.0000	FLOOD RISK
120 minute summer	PP8	72	5.071	0.171	34.0	12.2983	0.0000	SURCHARGED
120 minute summer	PP9	78	4.936	0.186	19.0	10.6715	0.0000	SURCHARGED
120 minute summer	PP10	76	5.885	0.235	21.6	11.6382	0.0000	SURCHARGED
120 minute summer	PP11	84	5.461	0.361	54.1	55.3907	0.0000	FLOOD RISK
120 minute summer	PP12	80	5.433	0.283	23.2	18.5279	0.0000	SURCHARGED
120 minute summer	PP13	74	4.862	0.212	40.3	18.8242	0.0000	SURCHARGED
1440 minute winter	BASIN 1	1440	4.636	1.136	28.7	911.4554	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	PP1	1.000	SW01	35.8	1.135	0.423	0.8641	
120 minute summer	PP2	2.000	SW02A	27.5	0.980	0.174	0.1538	
120 minute summer	PP3	11.000	PP4	10.5	0.597	0.595	0.1631	
120 minute winter	PP4	11.001	PP4A	15.9	1.056	1.186	2.5876	
120 minute summer	PP4A	11.002	SW07	44.2	2.514	1.202	0.1864	
120 minute summer	PP5	5.000	SW04	24.4	1.386	0.948	0.7177	
120 minute summer	PP6	4.000	SW03	38.0	2.227	0.985	0.3030	
120 minute summer	PP7	6.000	SW05	26.0	0.706	0.392	1.4979	
120 minute summer	PP8	10.000	SW06	21.0	1.212	0.449	0.1950	
120 minute summer	PP9	9.000	SW06	10.9	0.737	0.398	0.4554	
120 minute summer	PP10	3.000	SW03	15.7	0.915	0.631	0.8525	
120 minute summer	PP11	8.000	SW05	27.5	1.601	0.791	0.3750	
120 minute summer	PP12	7.000	SW05	14.7	0.863	0.512	0.5860	
120 minute summer	PP13	12.000	SW07	20.9	1.248	1.084	0.6668	
1440 minute winter	BASIN 1	11.004	BASIN 2	1.7	0.098	0.097	1.3482	

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	BASIN 2	1440	4.629	1.129	57.5	1768.5690	0.0000	FLOOD RISK
120 minute summer	SW01	70	5.861	0.761	41.3	1.0896	0.0000	FLOOD RISK
120 minute summer	SW02A	68	5.899	0.599	27.5	0.6771	0.0000	SURCHARGED
120 minute summer	SW02	70	5.845	0.945	78.8	1.3526	0.0000	SURCHARGED
120 minute summer	SW03	70	5.769	1.069	106.5	1.5303	0.0000	SURCHARGED
120 minute summer	SW04	72	5.630	1.130	128.8	1.6172	0.0000	SURCHARGED
120 minute summer	SW05	74	5.412	1.122	155.5	1.6056	0.0000	SURCHARGED
120 minute summer	SW06	76	4.892	0.752	195.0	1.0764	0.0000	SURCHARGED
1440 minute winter	SW07	1440	4.636	0.436	25.0	0.4930	0.0000	SURCHARGED
1440 minute winter	SW08	1440	4.630	0.720	50.1	0.8140	0.0000	SURCHARGED
1440 minute winter	SW09	1440	4.629	0.789	49.8	0.8926	0.0000	SURCHARGED
1440 minute winter	HYDROBRAKE	1440	4.610	1.210	5.1	1.3687	0.0000	FLOOD RISK
120 minute summer	OUTFALL	2	3.880	1.380	5.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	BASIN 2	1.009	HYDROBRAKE	5.1	0.291	0.452	0.4257	
120 minute summer	SW01	1.001	SW02	41.6	0.717	0.331	5.5596	
120 minute summer	SW02A	2.001	SW02	27.4	0.791	0.289	0.6030	
120 minute summer	SW02	1.002	SW03	78.3	0.810	0.629	5.6506	
120 minute summer	SW03	1.003	SW04	104.5	0.947	0.825	5.4664	
120 minute summer	SW04	1.004	SW05	128.4	1.164	1.119	5.9788	
120 minute summer	SW05	1.005	SW06	150.8	1.367	1.614	8.9697	
120 minute summer	SW06	1.006	SW08	195.0	1.768	1.193	3.7885	
1440 minute winter	SW07	11.003	BASIN 1	25.0	1.698	0.225	0.6145	
1440 minute winter	SW08	1.007	SW09	49.8	1.188	0.300	1.1174	
1440 minute winter	SW09	1.008	BASIN 2	49.7	1.273	0.279	4.7071	
1440 minute winter	HYDROBRAKE	1.010	OUTFALL	5.1	0.290	0.152	0.4470	648.9

APPENDIX K: Typical Section Details

FIGURE B.5
TYPICAL MANHOLE DETAIL - TYPE A1

Depth from cover level to soffit of pipe 3 m to 6 m with ladder and reducing slab
Rigid material construction with concrete surround

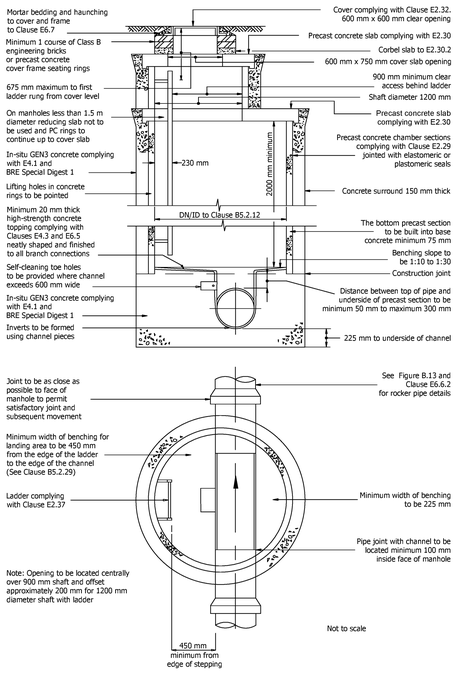


FIGURE B.6
TYPICAL MANHOLE DETAIL - TYPE A2

Depth from cover level to soffit of pipe 3 m to 6 m with ladder
Rigid material construction without concrete surround

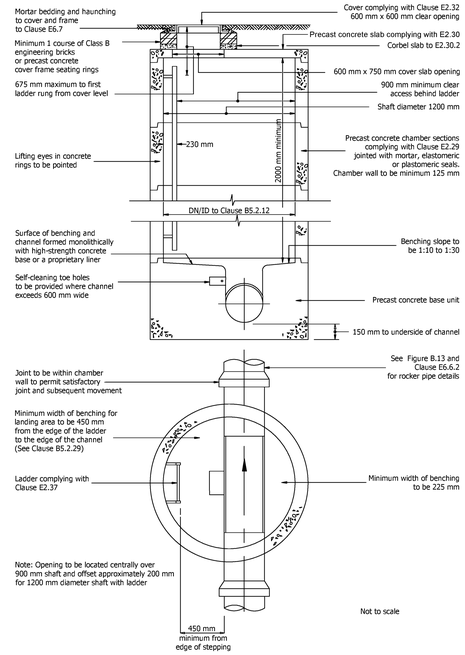


FIGURE B.8
TYPICAL MANHOLE DETAIL - TYPE A2
Depth from cover level to soffit of pipe 3 m to 6 m with ladder
Flexible material construction

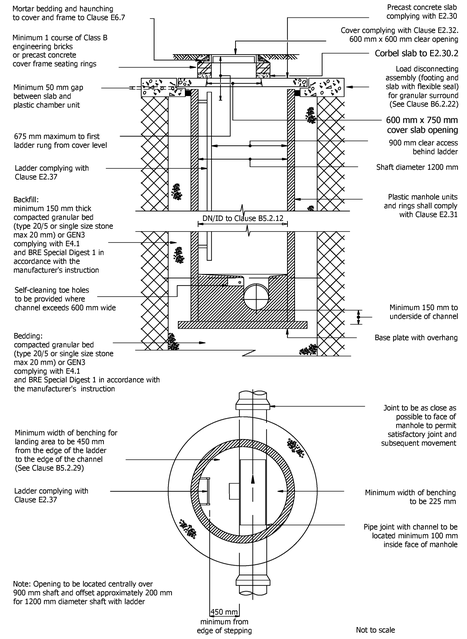


FIGURE B.9
TYPICAL MANHOLE DETAIL - TYPE B
Depth from cover level to soffit of pipe 1.5 m to 3.0 m
Rigid material construction without concrete surround

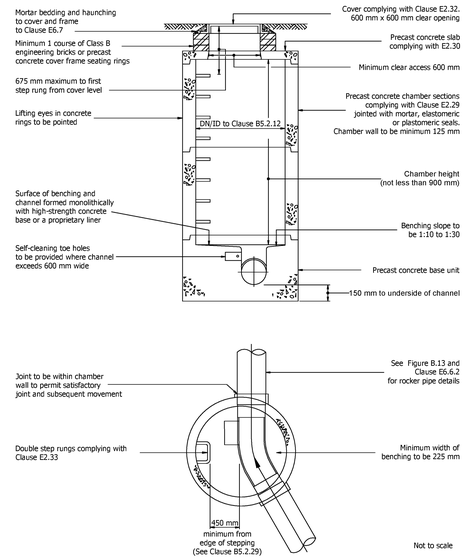


FIGURE B.12
TYPICAL MANHOLE DETAIL - TYPE B
Depth from cover level to soffit of pipe 1.5 m to 3 m
Flexible material construction

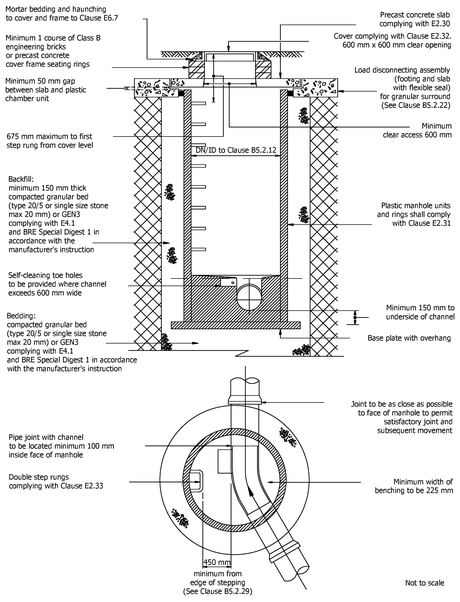


FIGURE B.14
TYPICAL MANHOLE DETAIL - TYPE C
Depth from cover level to soffit of pipe less than 1.5 m
Maximum pipe size 450 mm diameter
Rigid material construction

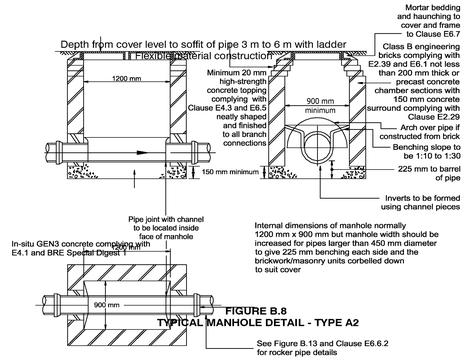
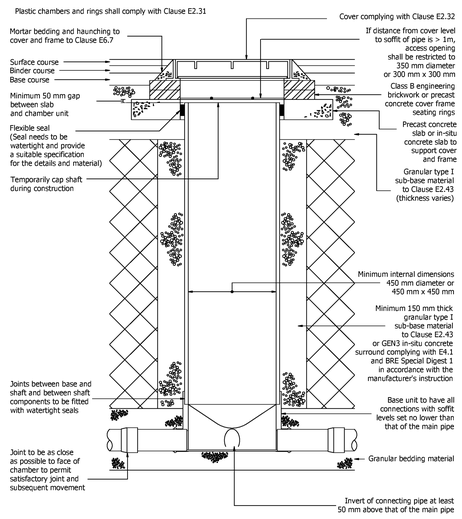


FIGURE B.8
TYPICAL MANHOLE DETAIL - TYPE A2

Note: The use of precast concrete chamber units to E2.29
with 150 mm GEN3 in-situ concrete complying with E4.1 and BRE Special Digest 1
in place of brickwork construction is permitted.

Not to scale

FIGURE B.18
TYPICAL INSPECTION CHAMBER DETAIL - TYPE D
Depth from cover level to soffit of pipe up to 2 m
Flexible material construction for use in areas subject to vehicle loading

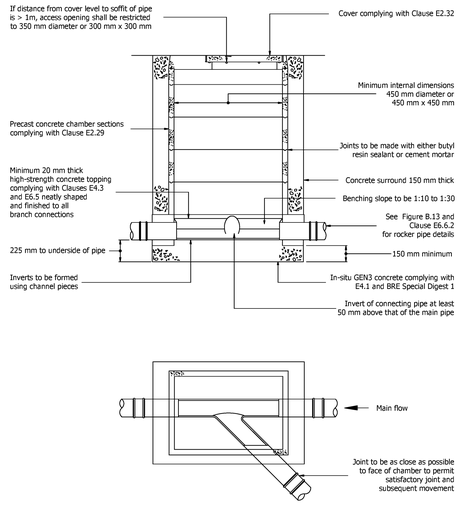


Note: Where the access chamber is in the highway (including any footway), the highway authority can have specific requirements.

Not to scale

FIGURE B.21
TYPICAL INSPECTION CHAMBER DETAIL - TYPE D

Depth from cover level to soffit of pipe up to 3 m
Rigid material construction for use in areas
of light vehicle loading or landscaped areas



Note: Where the access chamber is in the highway (including any footway), the highway authority can have specific requirements.

Not to scale

A0 ORIGINAL

NOTES:

1. This detail is indicative and is subject to detailed design.
2. This detail is indicative and the manholes / Catchpits to be in accordance with the adopting authorities and Clients requirements.

PRELIMINARY
NOT FOR CONSTRUCTION

rev.	amendment	checked	date
P2	Updated as per Client comments. (FA)	SL	29/10/2024
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project
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scale	drawn by	checked by
NTS	FA	SL

date	cad file
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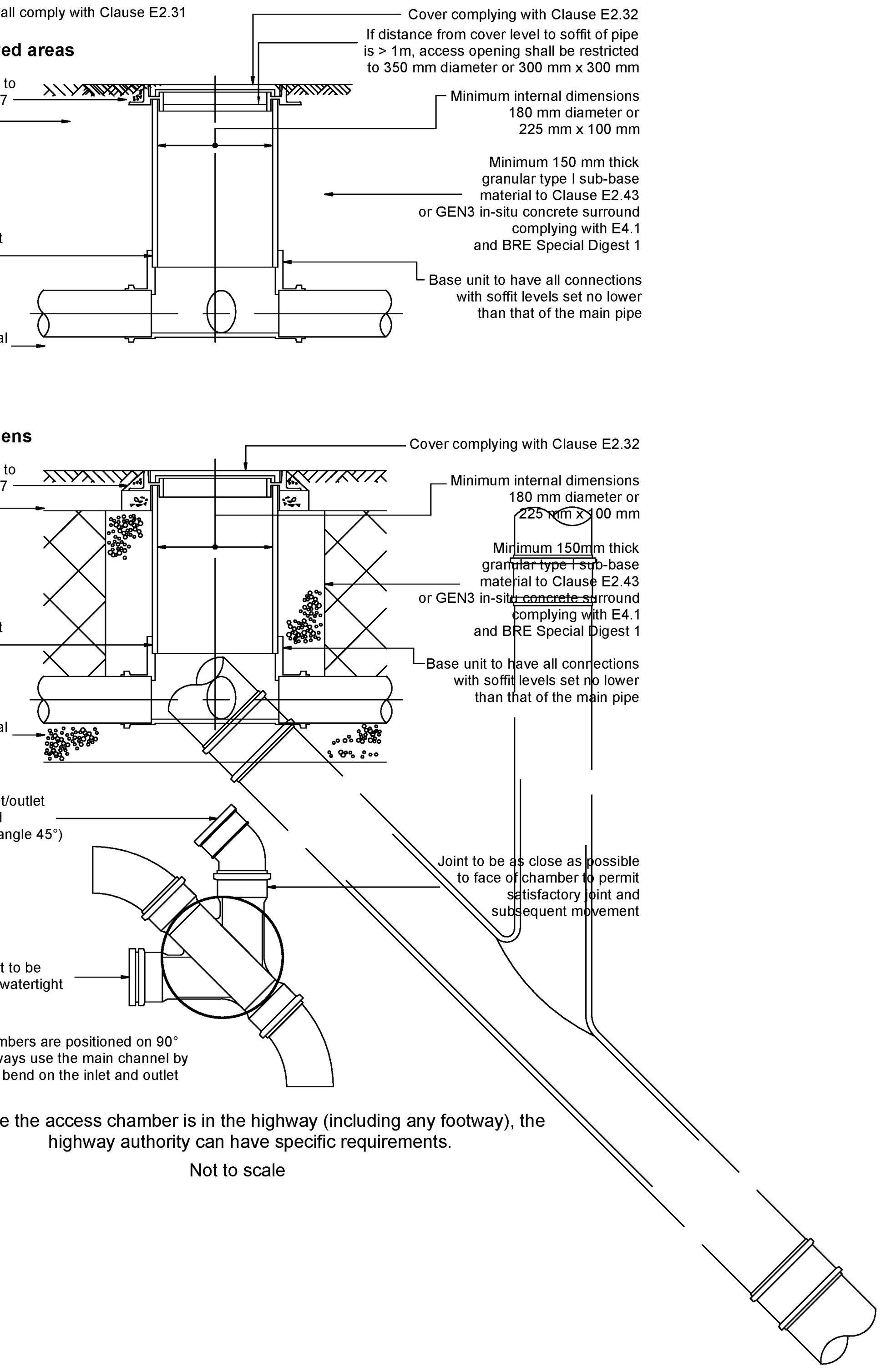
title
TYPICAL MANHOLE & PIPE DETAILS
1 of 2

Mayer Brown Limited jobcode	suitability	revision
SL/BHPAGHAM.10		P2

drawing number
SL/BHPAGHAM.10-CD-01-1

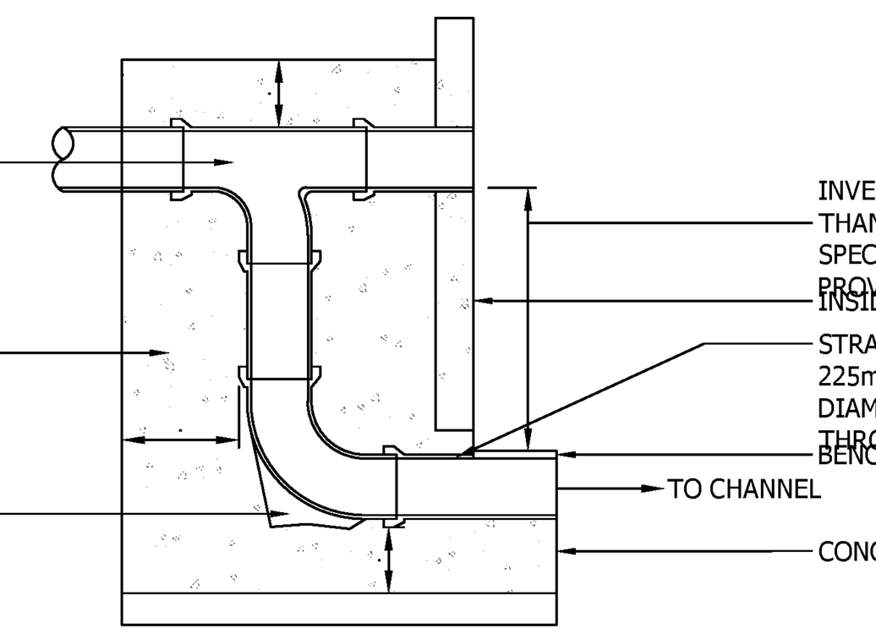
FIGURE B.23
TYPICAL INSPECTION CHAMBER DETAIL - TYPE E

Depth from cover level to soffit of pipe up to 2 m
Flexible material construction

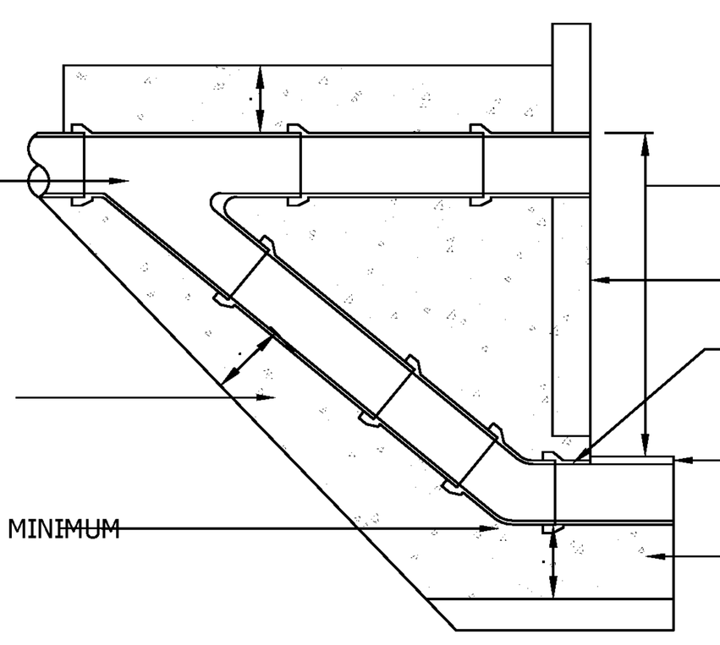


Note: Where the access chamber is in the highway (including any footway), the highway authority can have specific requirements.

Not to scale

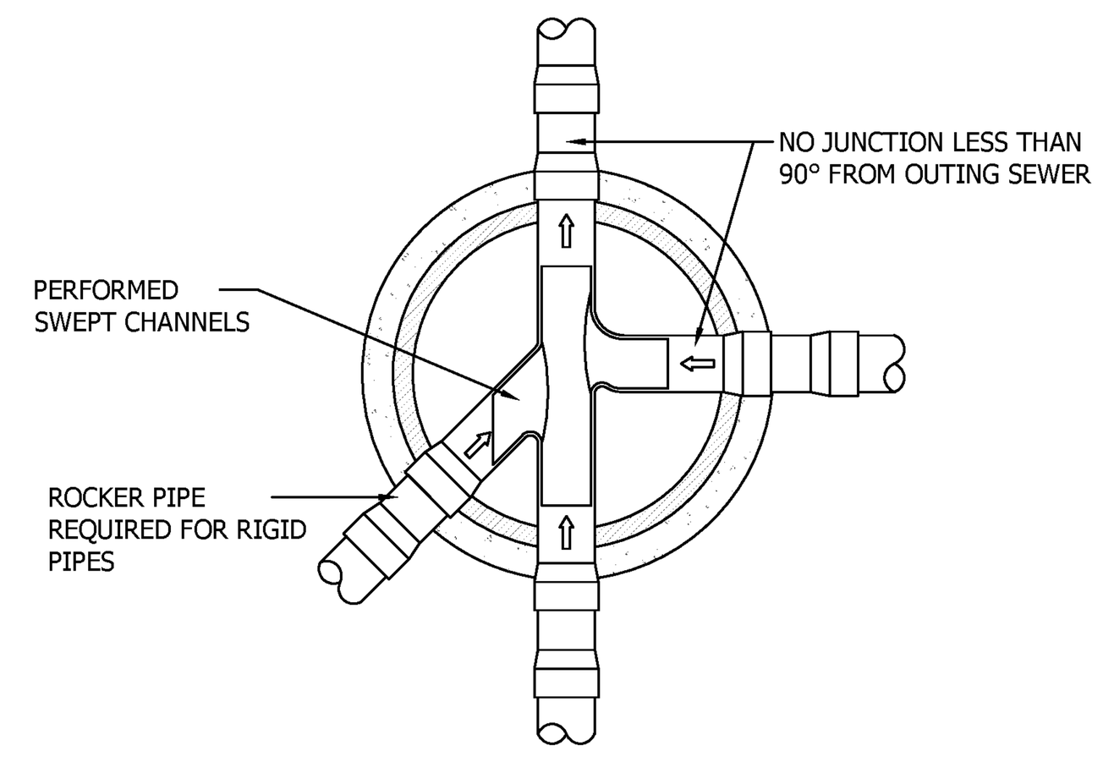


EXTERNAL VERTICAL BACKDROP



EXTERNAL RAMPED BACKDROP

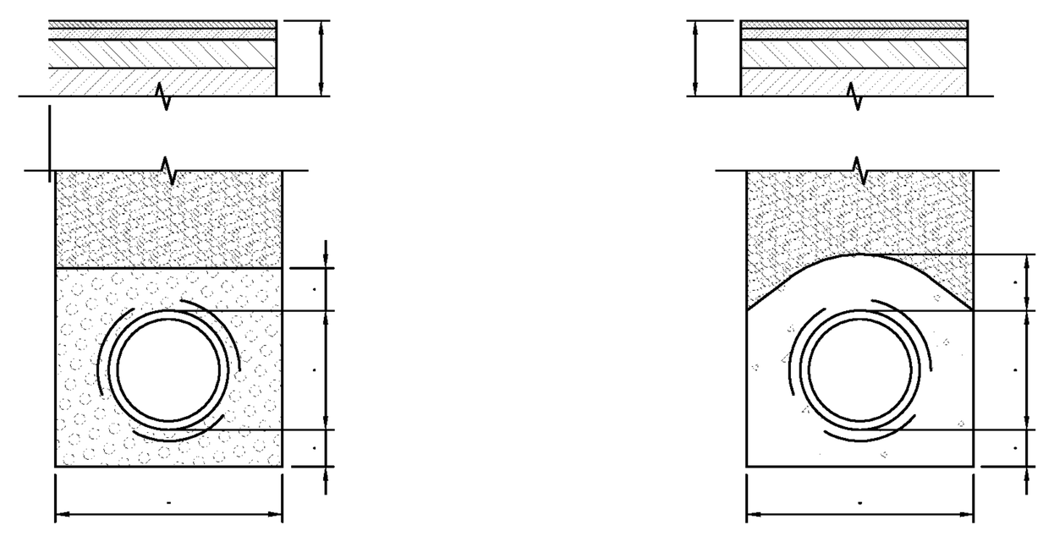
FIGURE B.14
TYPICAL ARRANGEMENT OF PIPE JUNCTIONS WITH MANHOLES



NOMINAL DIAMETER (mm)	MAXIMUM EFFECTIVE LENGTH (m)
150–600	0.6
601–750	1.00
OVER 750	1.25

RIGID PIPES BUILT INTO MANHOLE SHOULD HAVE A FLEXIBLE JOINT AS CLOSE AS FEASABLE TO THE EXTERNAL FACE OF THE STRUCTURE AND THE LENGTH OF THE NEXT ROCKER PIPE SHOULD BE AS SHOWN.

ALL PIPES ENTERING THE BOTTOM OF THE MANHOLE SHOULD HAVE SOFFITS LEVEL



GRANULAR BED AND SURROUND CLASS `S'
WHERE DEPTH OF COVER TO PIPE SOFFIT IS 1200mm OR GREATER

CONCRETE BED AND SURROUND CLASS `Z'
WHERE DEPTH OF COVER TO PIPE SOFFIT IS LESS THAN 1200mm

KEY

- TYPE 1 SUB BASE MATERIAL BACKFILL TO FORMATION LEVEL
- SINGLE SIZE GRANULAR MATERIAL.
- GEN3 CONCRETE BED AND SURROUND.

DN = NOMINAL INTERNAL DIAMETER OF PIPE.
BC = OUTSIDE DIAMETER OF PIPE.

DIMENSION Y

CLASS	MACHINE DUG UNIFORM SOIL	ROCK OR MIXED SOILS
S	NOTE (i)	NOTE (ii)
Z	NOTE (ii)	NOTE (ii)

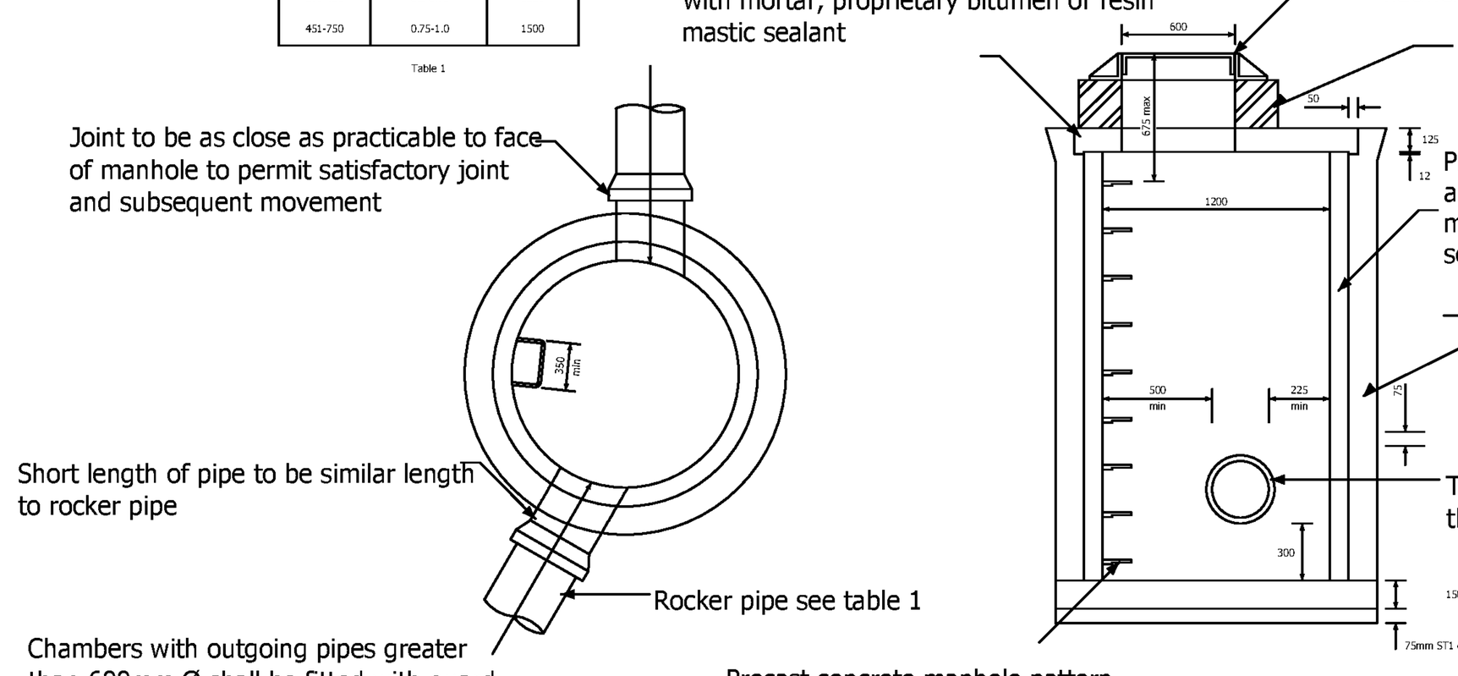
(i) Y=BC/6, WITH MIN 150 UNDER BARRELS (150 FOR SLEEVE JOINTED) AND MIN 150 UNDER SOCKETS, WHICHEVER IS THE GREATER, WITH MAX OF 400.
(ii) Y=BC/4, WITH MIN 200 UNDER BARRELS (150 FOR SLEEVE JOINTED) AND MIN 150 UNDER SOCKETS, WHICHEVER IS THE GREATER, WITH A MAX OF 400.

Pipe bed and surround to be minimum 150mm

TYPICAL CATCHPIT DETAIL

Pipe Diameter	Rocker Pipe Length	Manhole Diameter
150-375	0.5-0.75	1200
376-450	0.5-0.75	1350
451-750	0.75-1.0	1500

Table 1



A0 ORIGINAL

NOTES:

1. This detail is indicative and is subject to detailed design.
2. This detail is indicative and the manholes / Catchpits to be in accordance with the adopting authorities and Clients requirements.

PRELIMINARY
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rev.	amendment	checked	date
P2	Updated as per Client comments. (FA)	SL	29/10/2024
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project: LAND WEST OF PAGHAM ROAD, PAGHAM

scale	drawn by	checked by
NTS	FA	SL

date	cad file
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title: TYPICAL MANHOLE & PIPE DETAILS
2 of 2

Mayer Brown Limited jobcode	suitability	revision
SL/BHPAGHAM.10		P2

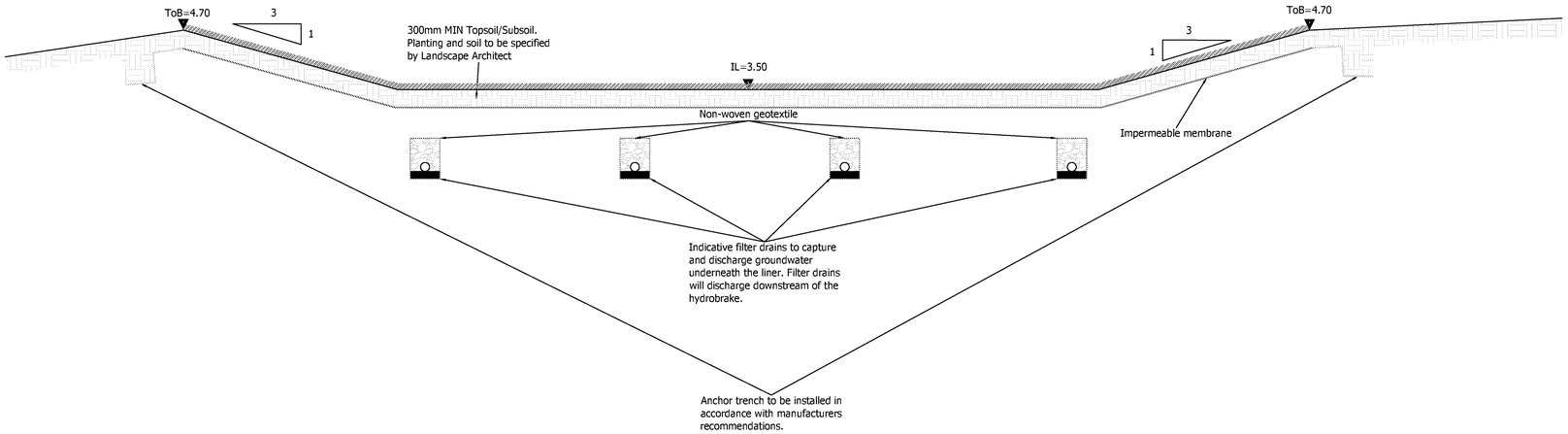
drawing number: SL/BHPAGHAM.10-CD-01-2

A1 ORIGINAL

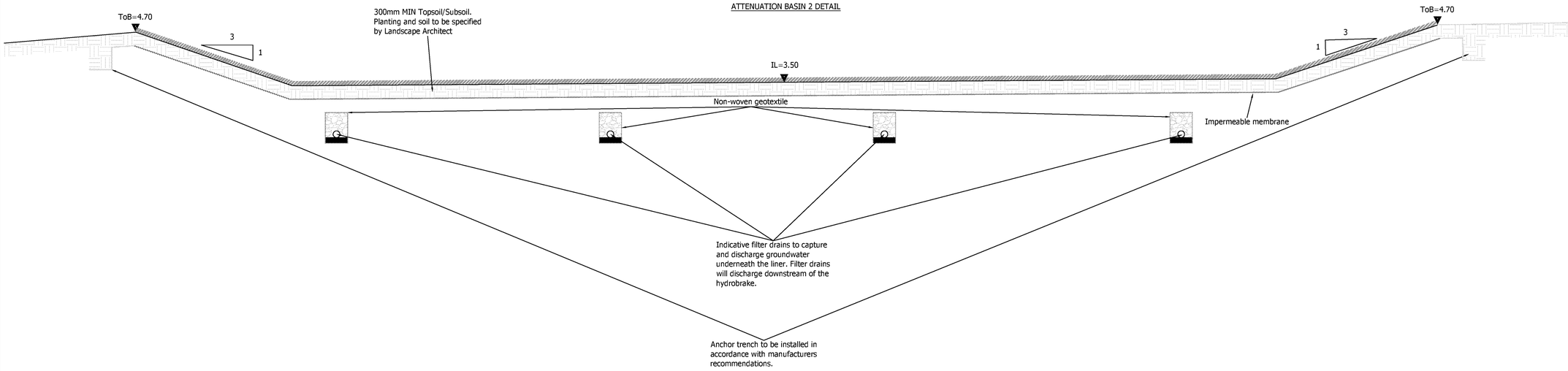
NOTES:

1. This detail is indicative and is subject to detailed design.
2. Basin detail to be in accordance with recommendations in C753 CIRIA SuDS Manual.

ATTENUATION BASIN 1 DETAIL



ATTENUATION BASIN 2 DETAIL



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PAGHAM

scale	drawn by	checked by
1:50	FA	SL

date	cad file
OCTOBER 2024	BHPAGHAM.10-CD-02.DWG

title
ATTENUATION BASIN DETAILS

Mayer Brown Limited jobcode	suitability	revision
SL/BHPAGHAMROAD.10	-	P2

drawing number
BHPAGHAMROAD.10/CD-02

ARUN DISTRICT COUNCIL P/142/RES

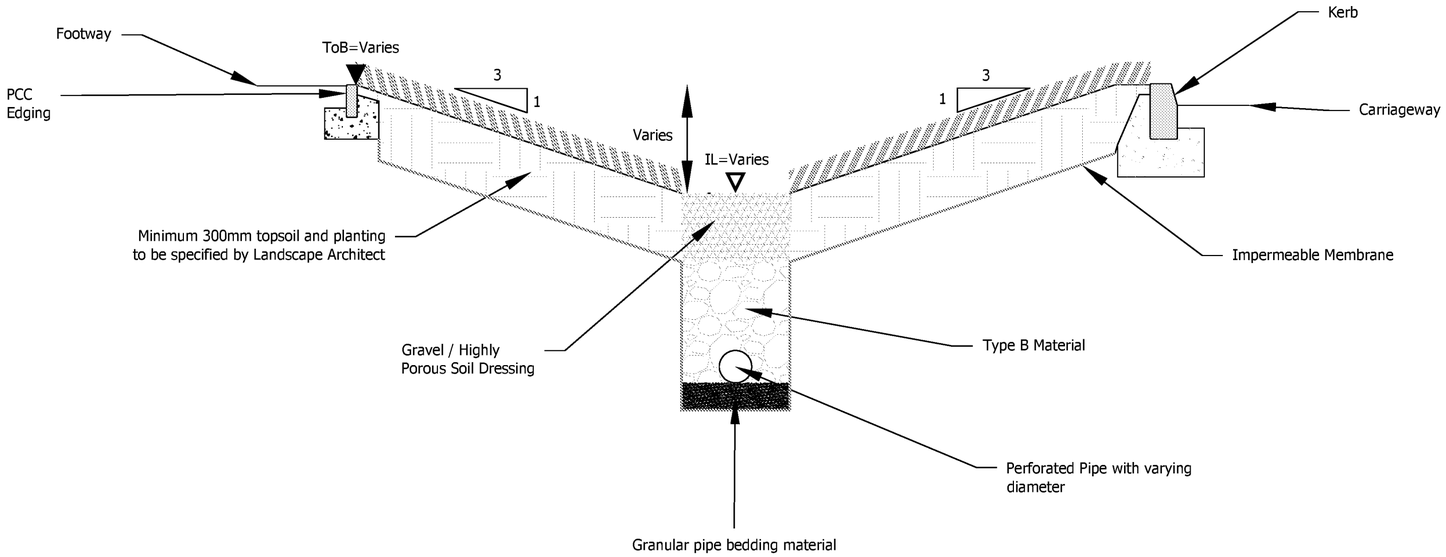
A2 ORIGINAL

NOTES:

1. This detail is indicative and is subject to detailed design.
2. Details to be in accordance with recommendations in C753 CIRIA SuDS Design Manual.
3. Refer to the Proposed Surface Water Drainage Strategy drawing reference BHPAGHAM.10/10 for the location of the SuDS Features.

PRELIMINARY
NOT FOR CONSTRUCTION

TYPICAL CONVEYANCE SWALE SECTION



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P1	Initial Issue. (FA)	SL	23/09/2024

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date	cad file
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title
TYPICAL CONVEYANCE SWALE DETAIL

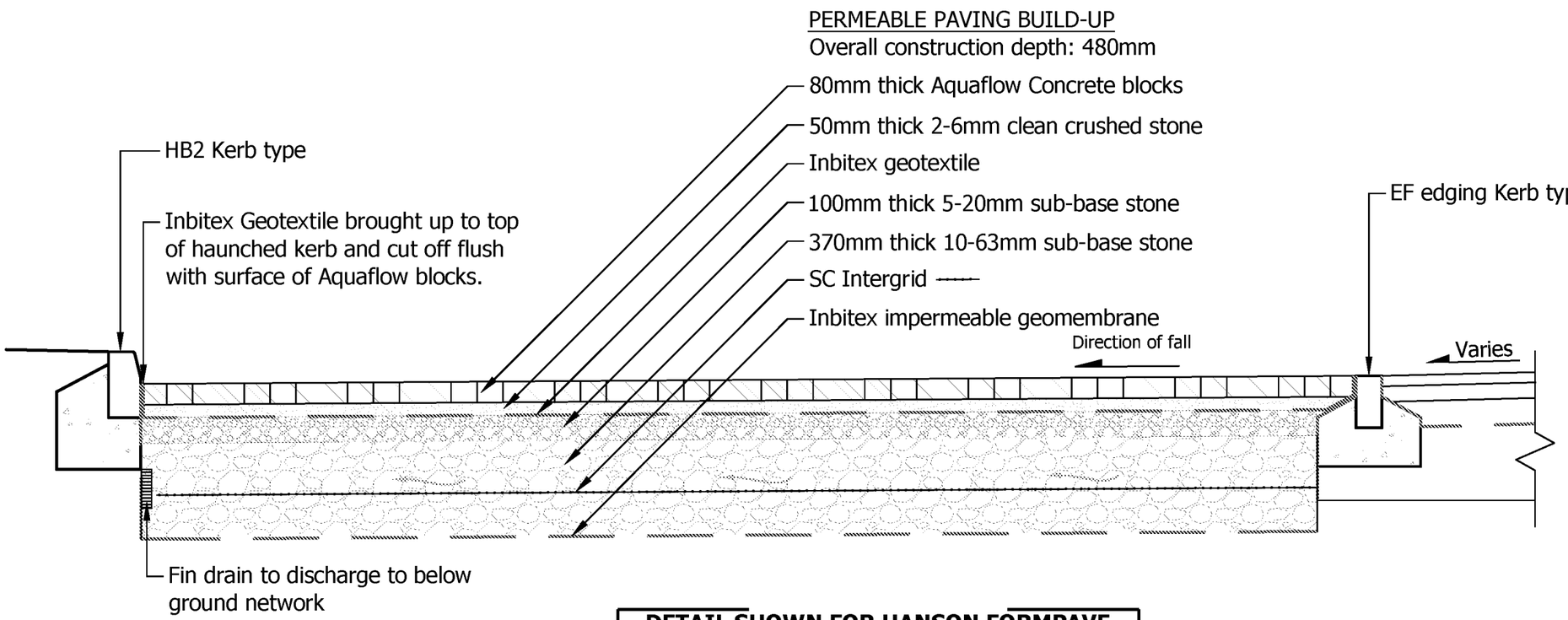
Mayer Brown Limited jobcode	suitability	revision
BHPAGHAMROAD.10	-	P2

drawing number
SL/BHPAGHAM.10/CD-03

NOTES:

1. This detail is indicative and is subject to detailed design.

2. Permeable paving to be designed and constructed in accordance with manufacturers recommendations



DETAIL SHOWN FOR HANSON FORMPAVE PROPRIETARY PERMEABLE PAVING SYSTEM BASED ON 5% CBR VALUE

PRELIMINARY
NOT FOR CONSTRUCTION

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LAND WEST OF PAGHAM ROAD, PAGHAM

title
TYPICAL PERMEABLE PAVING DETAIL

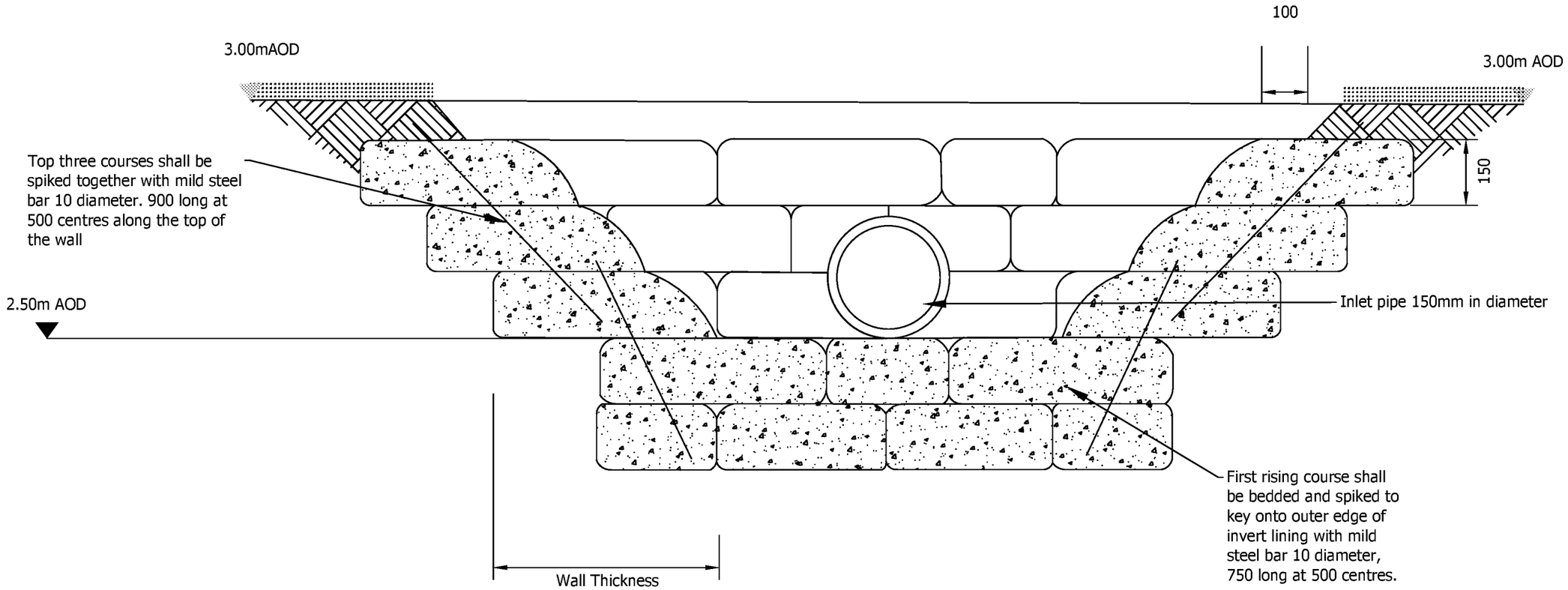
scale	drawn by	checked by
1:20 @ A3	FA	SL

date created	date revised	cad file	suitability	rev.
OCTOBER 2024		PERMEABLE PAVING - CD04	-	P3

drawing number
BHPAGHAM.10-CD-04

NOTES:

1. This detail is indicative and is subject to detailed design.



BAGWORK HEADWALL CROSS SECTION

PRELIMINARY
NOT FOR CONSTRUCTION

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project
LAND WEST OF PAGHAM ROAD, PAGHAM

title
BAGWORK HEADWALL SECTION DRAWING

scale	drawn by	checked by
1:10 @ A3	FA	SL

date created	date revised	cad file	suitability	rev.
OCTOBER 2024	-	BAGWORK HEADWALL	-	P3

drawing number
SL/BHPAGHAM.10-CD-05

SALES QUOTE

Hydro International
A CRH COMPANY

Quote No: HQT-174626
Quote Date: 27/09/2024

Sell To: Farris Alkhatib
Mayer Brown Ltd Woking
Lion House
Oriental Road
WOKING
GU22 8AR

Site Address:
Bognor Regis
PO21 3

Account No: CON-012213
Hydro Ref: 24_21_5580 Land West of Pagham Road, Bognor Regis

Item No	Description	Q
PQT1410.SHE	Hydro-Brake®Optimum Type HBO-SHE Product Code: SHE-0102-5080-1300-5080 Design Objective: Minimise upstream storage Design Flow = 5.08l/s; Design Head = 1.3m Design Flow Adjustment Range = 19.7% BBA Approved (08/4596 Product Sheet 1) WRc Approved (PT/329/0412) 3 mm thick Stainless Steel Grade 304L Designed to suit a minimum 150 mm outlet pipe and a minimum 1200 mm chamber Complete with: Lugs; Adjustable Inlet and Pivoting Bypass Door Designed in accordance with drawing ref: **as per customer email **. **alternative to Optimum, if Optimum is not specified **	[redacted]
PQT1460.S	Hydro-Brake® Basic-S 82mm Hydro-Brake® Basic-S Design Flow = 5.08l/s; Design Head = 1.3m Material Thickness: 3 mm Designed to suit a minimum 100 mm outlet pipe Mounting Style: Lugs	
		TO

Product design, fabrication, standard installation details and delivery to UK mainland site or port included.
Delivery via specialist vehicle (Hiab, FORS, Crossrail etc.) not included, rates available on request.
Off-loading (unless specified) and equipment installation at site excluded.
Prices valid for 30 days from issue, standard payment terms 100% due with order unless alternative credit terms have been agreed in writing.
Flow control lead time 2 to 3 working weeks (unless stated otherwise) from receipt of approved drawings and checklists.
Lead time for all other products is longer and should be confirmed before ordering.
Product warranty - one year from date of purchase, only considered for those defects or faults reported in writing.