

TECHNICAL NOTE: FLOOD RISK ASSESSMENT & DRAINAGE PHILOSOPHY

Bingham Hall Partnership Limited has been commissioned by Portabella to undertake the Civil and Structural Engineering aspects for the proposed housing development at Bonvilston, Vale of Glamorgan. An initial activity of the commission is to prepare a Flood Risk Assessment (FRA) and an initial FW & SW drainage assessment for the proposed development, in support of a Planning Application.

This technical note has been prepared by Bingham Hall Partnership Limited in advance of the Planning Application; the overall intent being to relay the research and design process undertaken to date, together with the design intent for the proposed foul and surface water drainage systems required to serve the proposed development.

SITE LOCATION

The proposed housing scheme is in the heart of Bonvilston, on a plot of land that is largely greenfield, the exception being a large house (Bolston House) located towards the south of the development site; see Figure 1 below. The site is bounded by the A48 highway to the south fronting the site and existing housing to the west, and eastern boundaries; the “Red Lion” public house lies to the east. The site area is approximately 8,950m² and can be found at National Grid Reference: ST 066740 (306603E;174063N); refer to Figure 1 below.



Figure 1. Site Location Plan

PROPOSED DEVELOPMENT

The proposed housing development comprises a total of 12 individual “plots” of which 8 plots (1-8) are for large, detached properties that will occupy the majority of the northern part of the site, plus 2 smaller semi-detached houses (plots 9 & 10) and a block containing 4 flats (plot 11-14) which are located to the south end of the site, fronting the A48. The development will include the formation a new access off the A48 (utilising and improving the existing junction) that runs along the southern boundary of the site. Refer to Appendix A for a copy of C.W. Architects Proposed Site Layout drawing, reference SP612/P02 for details.

FLOOD RISK ASSESSMENT (FRA)

Technical Advice Note 15 (TAN15) provides technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flood risk, providing a framework within which the risks arising from river, coastal and surface water flooding are considered. In line with TAN15, this section of the report includes a brief review of flooding from rivers & sea; surface water runoff; overwhelmed sewers and drainage systems, and flooding from reservoirs, canals, lakes, and other artificial sources.

Bingham Hall Partnership Limited has consulted the website of Natural Resources Wales. The Development Advice Map (DAM) is based on Natural Resource Wales extreme flood outlines (Zone C) and the British Geological Survey drift data (Zone B). The Zone B data was originally published in 2004, and updated in 2017, whilst the Zone C data is revised quarterly. An extract of the DAM for the site area is presented in Figure 3 below and indicates that the site is located entirely within what is referred to as ‘Zone A’ on the development advice map and within TAN 15. TAN 15 describes Zone A as **“Considered to be at little or no risk of fluvial or tidal/coastal flooding”**. TAN 15 defines the use of an ‘A’ zone within the precautionary framework as **“Used to indicate that justification test is not applicable and no need to consider flood risk further”**. The map also indicates there is little or no risk of flooding from other sources such as reservoirs, sea or any other sources of surface water overland flows. Consequently, the proposed development is not considered to be at risk of flooding.

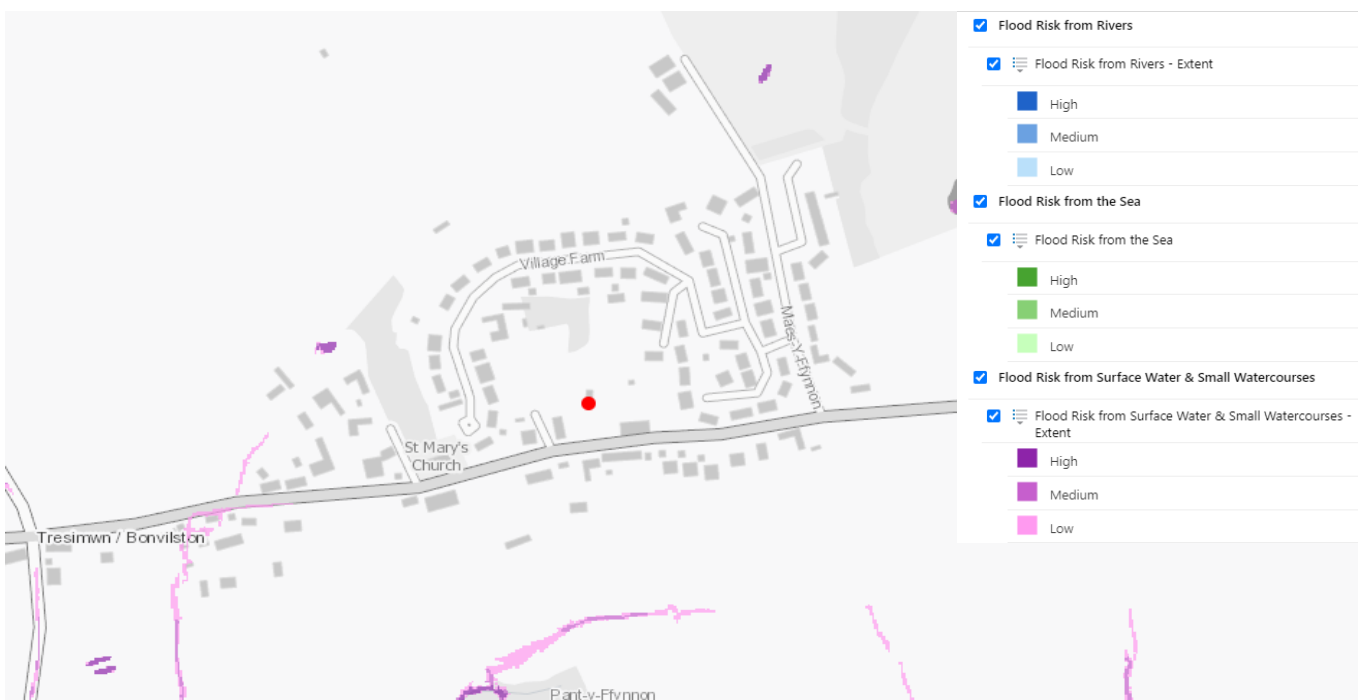


Figure 3. Extract of NRW Development Flood Map for Planning

EXISTING DRAINAGE

Figure 4 below is an extract from Dwr Cymru/Welsh Water’s adopted sewer records plan which gives locations of sewers local to the development area, with the site area shown edged by a blue boundary line. A copy of DC/WW Records Map is given in Appendix A. The extract indicates that there is an existing combined water sewer running along the southern boundary of the site which serves the existing house (which is to be demolished) and the adjacent Red Lion public house.

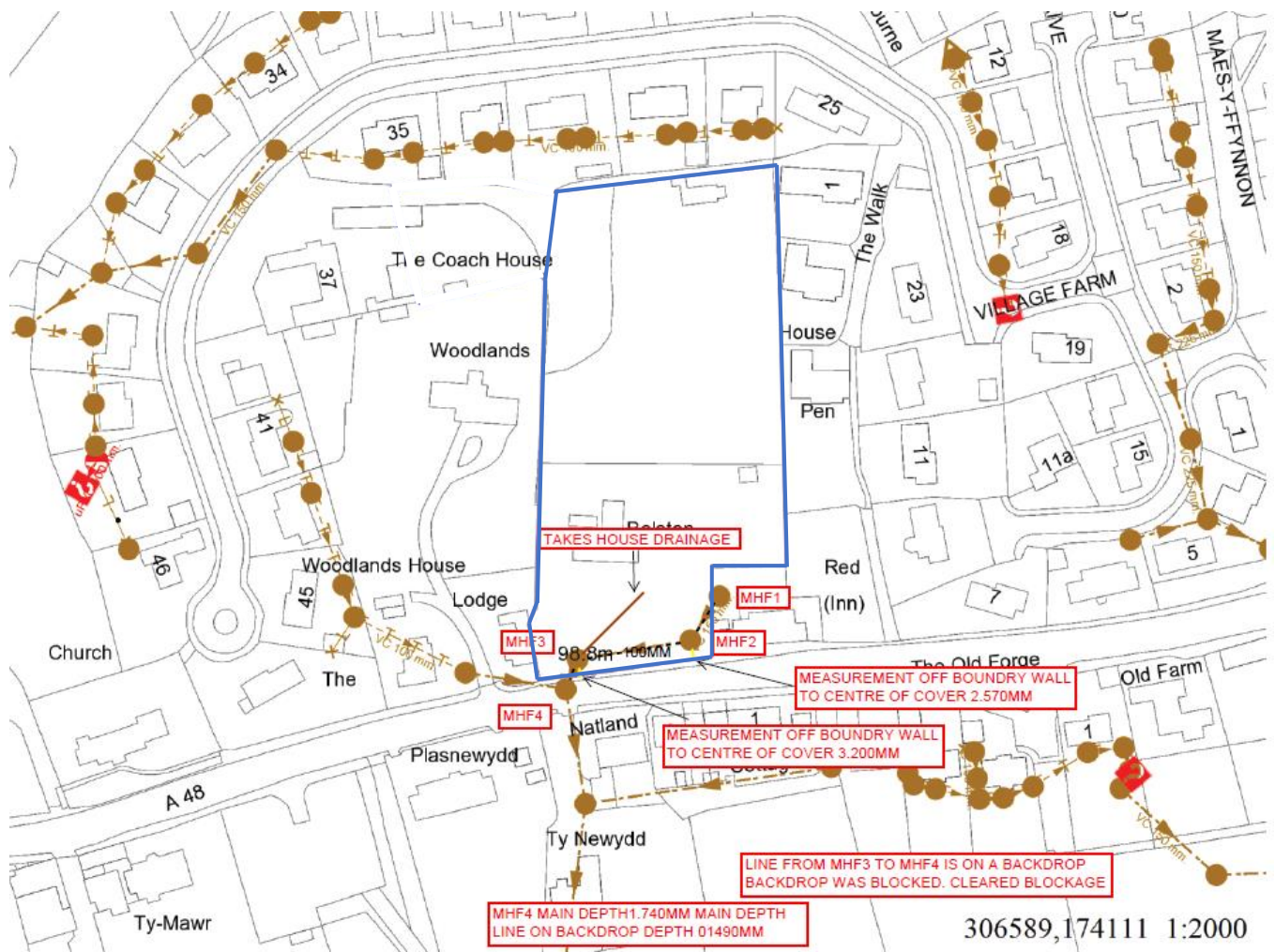


Figure 4. Extract of DCWW’s Adopted Sewers

INITIAL FOUL WATER DRAINAGE ASSESSMENT

Given the largely greenfield nature of the site and the lack of existing infrastructure, a new foul water network will be required to serve the development. Foul water flows will be collected via traditional below ground sewers and directed under gravity towards the south of the site where it will connect to the existing DC/WW adopted combined sewer located at the front entrance to the site. The DC/WW sewer continues to flow to the south, beyond the A48.

The existing adopted length of sewer serving MHF4 rear of the Red Lion Public House will require diverting around the rear of the new plots which are to be constructed in the front part of the site. A S185 Agreement with DC/WW will be required for this diversion and will attract a minimum 6m easement zone to the diverted pipe.

INITIAL SURFACE WATER DRAINAGE ASSESSMENT

The proposed surface water drainage design will consider the sequential approach as defined by the National Planning Policy Framework (NPPF), the Sustainable Urban Drainage Manual and Part H of Building Regulations.

From 7th January 2019, all new developments of more than 1no. dwelling house or where the construction area is 100m² or more, will require Sustainable Drainage Systems (SuDS) for surface water. From this date, SuDS on new developments must be designed and built, in accordance with the Statutory SuDS Standards published by Welsh Ministers and SuDS schemes must be approved by the local authority acting in its SuDS Approving Body (SAB) role, prior to construction work being undertaken. The principles which underpin the design of surface water management schemes to meet the Standards are as follows:

SuDS schemes should aim to address the following:

- Manage water on or close to the surface and as close to the source of the runoff as possible,
- Treat rainfall as a valuable natural resource,
- Ensure pollution is prevented at source, rather than relying on the drainage system to treat or intercept it,
- Manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by the development,
- Take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep,
- Use the SuDS Management Train, using drainage components in series across a site to achieve a robust surface water management system (rather than using a single “end of pipe” feature, such as a pond, to serve the whole development)
- Maximise the delivery of benefits for amenity and biodiversity,
- Seek to make the best use of available land through multifunctional usage of public spaces and the public realm,
- Perform safely, reliably, and effectively over the design life of the development considering the need for reasonable levels of maintenance,
- Avoid the need for pumping where possible,
- Be affordable, considering both construction and long-term maintenance costs and the additional environmental and social benefits afforded by the system.

There are six mandatory standards to be achieved within the National SuDS standards, S1 to S6. The following section has considered Standard S1 only, specifically, the various priority levels considered for discharge of surface water.

The Statutory Standards for Sustainable Drainage Systems published by the Welsh Government sets out five priority levels regarding the destination of runoff from sites; see Table below:

Table 1. Priority Levels Considered for Surface Water Runoff Destination

Priority Level and Definition	Assessment
<p>Priority Level 1: Collected for use</p>	<p>There is no foreseeable significant demand for non-potable water for the proposed site therefore rainwater harvesting is considered not a viable/cost effective solution. It is however recognised as a requirement of the Welsh Statutory National Standards for Sustainable Drainage Systems, that as far as reasonably possible, there will be no discharge from the site for the majority of rainfall events of less than 5mm. To achieve this requirement, permeable paving has been adopted for car parking areas and where feasible, rainwater pipe flows directed towards distribution/soakaway boxes located below the permeable surfacing with localised deepening of the sub-base to accommodate. Additionally, where roof water runoff has not been directed towards a distribution box, it is proposed to utilise water butts and/or SuDS planters to store and re-use the surface water.</p> <p>For this development it is proposed for individual plots to use impermeable lined permeable block paved areas, rain gardens and swales. It is proposed to plant the raingardens/swales with primary native species shrub planting which will assist with storm water management through absorption and transpiration.</p>
<p>Priority Level 2: Infiltrated to ground</p>	<p>The site investigation report indicates the site is underlain by made ground / clayey deposits and limestone bedrock with the possibility of solution holes/cavitation being present within the limestone. The results of the infiltration tests indicate the ground is not suitable for the use of infiltration techniques and given there is a risk of limestone cavitation being present (or created/worsened) beneath the site due to point source infiltration, the use of soakaways or any other form of infiltration techniques is not appropriate for use on this site.</p>
<p>Priority Level 3: Discharged to a surface water body</p>	<p>There are no watercourses on or close to the site area.</p>
<p>Priority Level 4: Discharged to surface water sewer.</p>	<p>There are no surface water sewers on or local to the site area.</p>
<p>Priority Level 5: Discharged to a combined sewer</p>	<p>There is an adopted combined sewer crossing the front part of site to which all new foul water flows from the proposed housing will be directed. The treatment of surface water arising from the site will use impermeable lined suds features throughout with any excess flows from the network being directed to the combined sewer with outflow being controlled to the current greenfield run off rate; final rates are to be discussed and agreed with asset owner DC/WW & the SuDS Approving Body (SAB). It is likely that on-site SW attenuation will be required, an indicative position for which is shown on BHPL Proposed Drainage drawing.</p>

CONCLUSIONS AND FURTHER WORK

Flooding

Reference has been made to NRW's flood risk maps for the development site and has been found to lie entirely within 'Zone A'. In line with the guidance stipulated in TAN 15, Zone A is considered to be **"an area at little or no risk of fluvial or tidal / coastal flooding"** and therefore flooding does not have to be considered further.

Foul Water

The philosophy for the disposal of domestic foul water flows from the development is to discharge all foul water from the housing via gravity sewers to the existing combined sewer located at the entrance to the site. The new network will make connection to the existing on-site adopted manhole that previously served the house that occupies the site. Given the new development involves the construction of several plots, the proposed foul water drainage network will be subject to an S104 adoption agreement with DC/WW plus a S106 Agreement to convey flows to the existing network. It will also be necessary for a S185 Agreement to be put in place for the proposed diversion of the existing adopted foul water sewer serving the rear of the adjacent Red Lion Public House. It is recognised that such a diversion will attract a 6m wide easement zone for which the housing has been carefully planned to accommodate. Details of the proposed S185 diversion works are shown by BHPL Drawing 6709-BHP-XX-XX-DR-C-(S185)002 PO4; a copy of which is given in the Appendix.

Surface Water

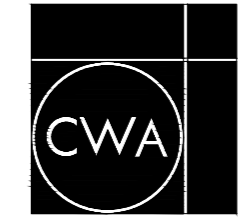
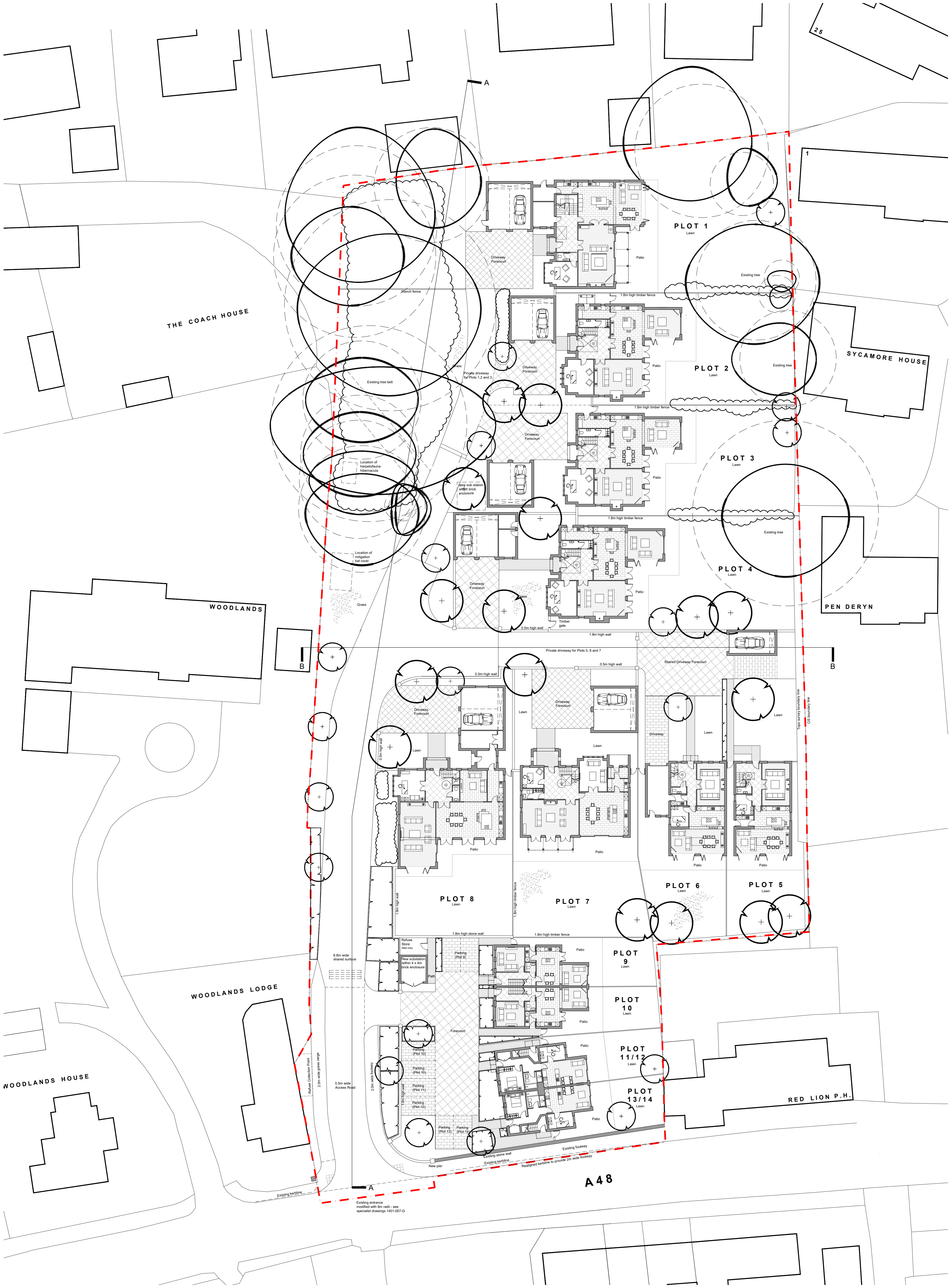
The philosophy underpinning the management of surface water runoff for the development will be subject to discussions with the local authorities SuDS Approving Body (SAB). Based on the risk/possibility of limestone cavitation being present below the site, and the lack of demand for non-potable water; controlled discharge of surface water to the DC/WW combined sewer is currently deemed the only form of discharge. In line with current practice and in accordance with the SUDS manual and CIRIA document C753, the discharge of surface water runoff is anticipated to be restricted to greenfield runoff rate for its respective drained area. In addition, to comply with the six National SuDS Standards, SuDS features will need to be incorporated upstream; the extent and nature of which is to be discussed with the Vale of Glamorgan's County Borough Council's SuDS Approving Body.

The landscape proposals for the SuDS elements will be developed with input from the team Ecologist and Landscape Architect to best deliver a suitable visual amenity and biodiversity gain for the site, appropriate to the site context and wider environmental proposals, balanced with site constraints, species, and opportunities. To this end the Landscape proposals within SuDS features will focus on the provision of diverse planting, providing habitat and food source with native species which support a wide range of insects supporting nectar requiring insects and common bird species preying insects and seed sources. An added benefit to native species is provided by supporting the formation of a healthy soil structure and soil diverse microbiome, which contributes to addressing climate change, carbon locking and the natural filtration of water. Overall, the landscape treatment should allow safe maintenance access and contribute to the multifunctional aspect of the SuDS features as part of the wider sites Green Infrastructure objectives targeted to the habitat and wildlife context.

Initial drainage proposals for the proposed housing development are shown by BHPL drawing ref 6709-BHP-XX-XX-DR-C (50)001 PO2 given in Appendix A of this report plus BHPL drawing ref 6709-BHP-XX-XX-DR-C (S185)002 PO4 which shows the proposed S185 Sewer Diversion for the existing foul water sewer from the Red Lion property, crossing the southern part of the site.

APPENDIX A

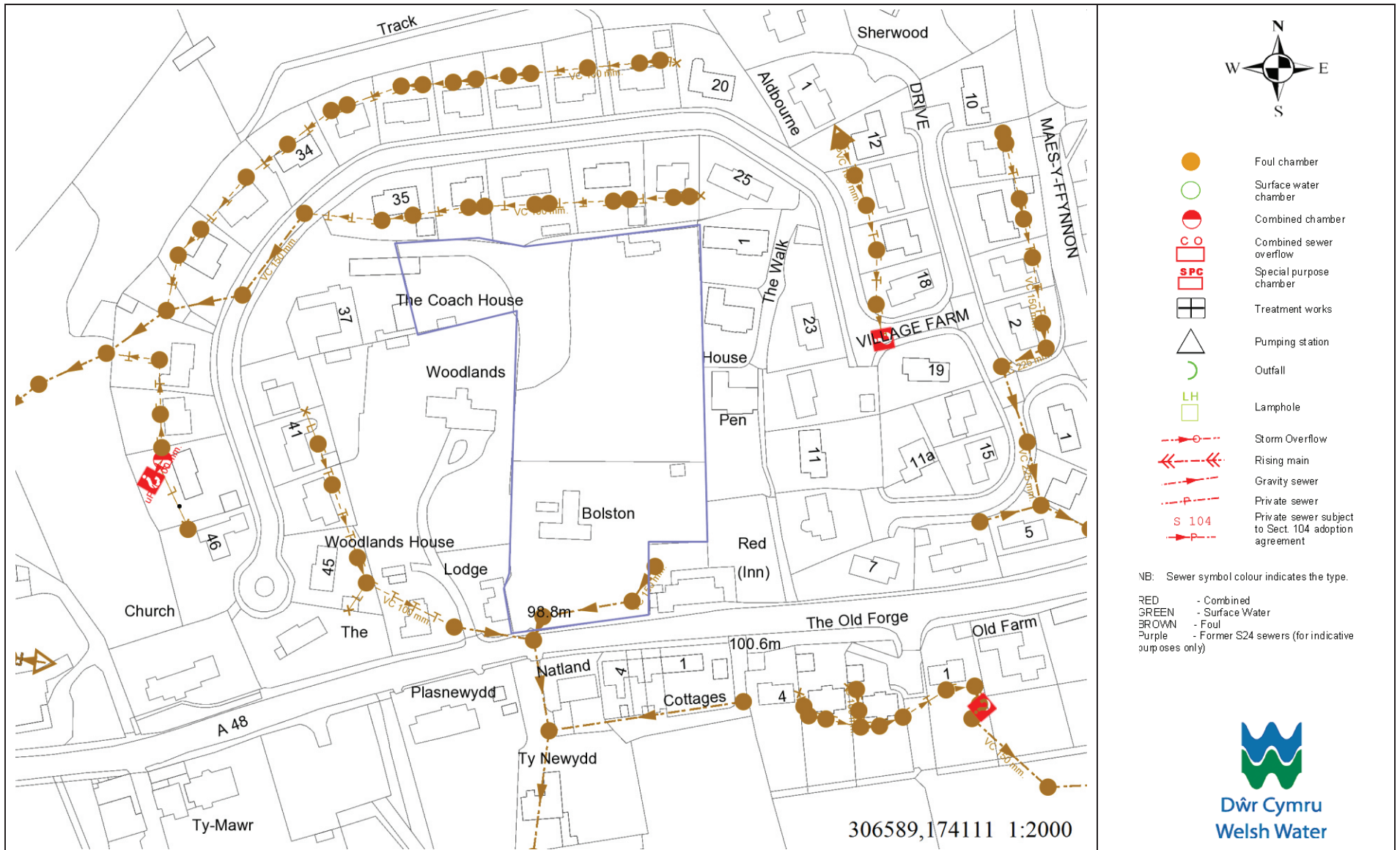
- C.W. Architects Proposed site layout drawing SP612/P02.
- Dwr Cymru/Welsh Water Sewer Records Drawing.
- BHPL drawing ref 6709-BHP-XX-XX-DR-C (50)001 PO2 – Proposed Site Drainage.
- BHPL drawing ref 6709-BHP-XX-XX-DR-C (S185)002 PO4 – Proposed S185 Sewer Diversion.



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Project Name : Bolston House, Bonvilston		Scale : 1:250 @ A1
Project Ref : SP612		
Drawing Title : Proposed Site Plan	Scale : 1:250 @ A1	
Drawing Number : P02	Scale : 1:250 @ A1	
Revision: PAC	Drawn by: rb	Date: Jan' 2024

Appendix 3 - Extract of the Public Sewer Map for the area surrounding the property/plot [20/05/2020]

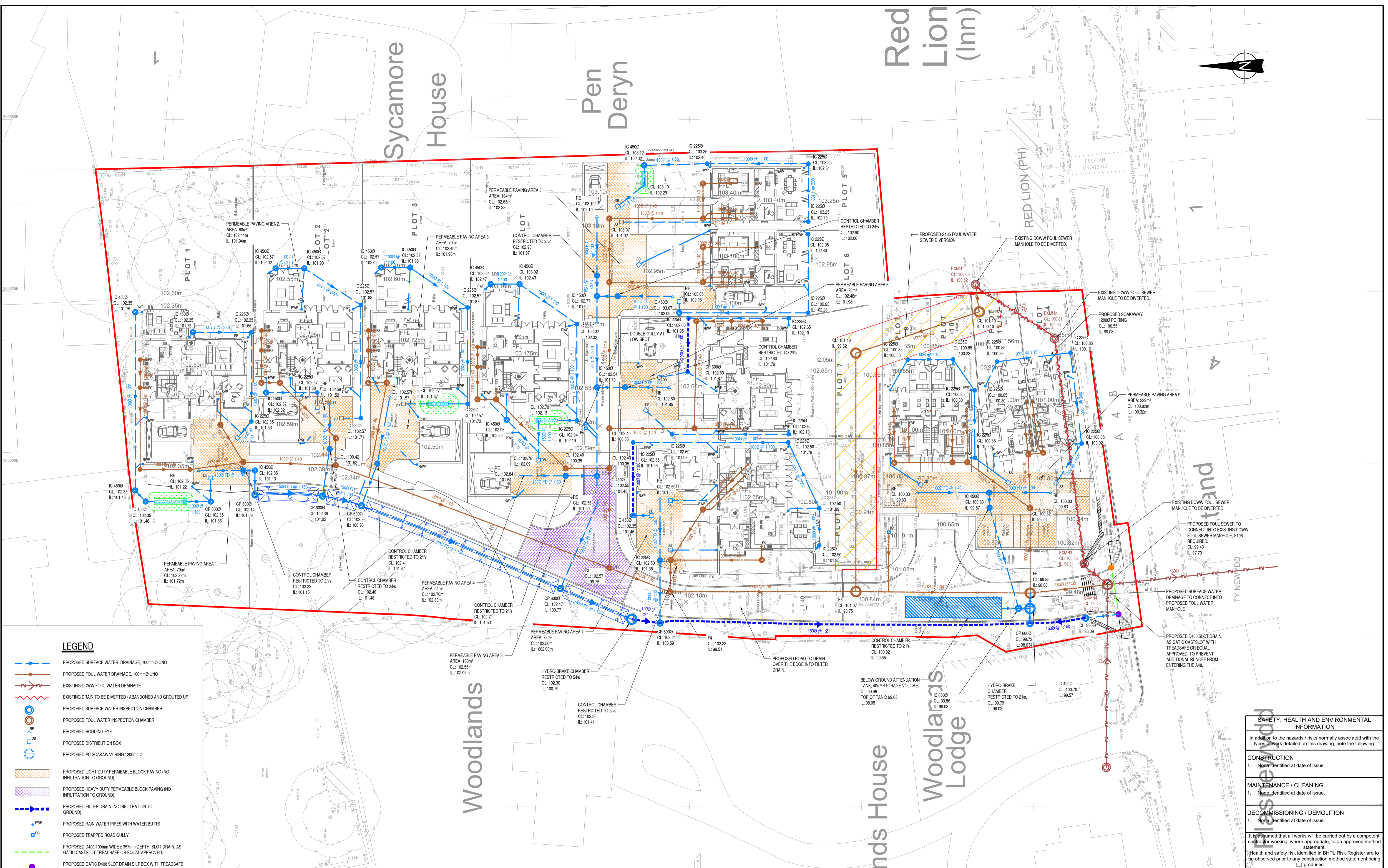


Dwr Cymru Cyf gives this information as to the position of its underground apparatus by way of general guidance only on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works in vicinity of the Company's apparatus and any onus of locating the apparatus before carrying out any excavations rests entirely with you. It must be understood that the furnishing of information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and of the Company's right to be compensated for any damage to its apparatus. Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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- LEGEND**
- PROPOSED SURFACE WATER DRAINAGE, 100mm Ø UNO
 - PROPOSED FOUL WATER DRAINAGE, 100mm Ø UNO
 - EXISTING DOWN FOUL WATER DRAINAGE
 - - - EXISTING DRAIN TO BE DIVERTED / ABANDONED AND GROUTED UP
 - PROPOSED SURFACE WATER INSPECTION CHAMBER
 - PROPOSED FOUL WATER INSPECTION CHAMBER
 - PROPOSED RODDING EYE
 - PROPOSED DISTRIBUTION BOX
 - ⊕ PROPOSED PC SOAKAWAY RING 1200mm Ø
 - PROPOSED LIGHT DUTY PERMEABLE BLOCK PAVING (NO INFILTRATION TO GROUND)
 - PROPOSED HEAVY DUTY PERMEABLE BLOCK PAVING (NO INFILTRATION TO GROUND)
 - - - PROPOSED FILTER DRAIN (NO INFILTRATION TO GROUND)
 - PROPOSED RAIN WATER PIPES WITH WATER BUTTS
 - PROPOSED TRAPPED ROAD GULLY
 - - - PROPOSED D400 100mm WIDE x 357mm DEPTH, SLOTTED DRAIN, AS GATIC CASTSLOT TREADSAFE OR EQUAL APPROVED.
 - PROPOSED GATIC D400 SLOTTED DRAIN SILT BOX WITH TREADSAFE DOUBLE TRIANGULAR GRATING OR EQUAL APPROVED.
 - PROPOSED GATIC D400 SLOTTED DRAIN ACCESS BOX WITH TREADSAFE DOUBLE TRIANGULAR GRATING OR EQUAL APPROVED.
 - - - PROPOSED COMBINED SWALE AND FILTER DRAIN (NO INFILTRATION TO GROUND)
 - PROPOSED RAINWATER GARDEN (NO INFILTRATION TO GROUND)

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards / risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

- None identified at date of issue.

MAINTENANCE / CLEANING

- None identified at date of issue.

DECOMMISSIONING / DEMOLITION

- None identified at date of issue.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.

Health and safety risk identified in BHP/L Risk Register are to be observed prior to any construction method statement being produced.

Rev	By	Date	Revision
P10	MPC	19/11/2021	DRAINAGE UPDATED DUE TO CHANGES TO ARCHITECT'S LAYOUT
P01	MPC	20/05/2021	INITIAL ISSUE

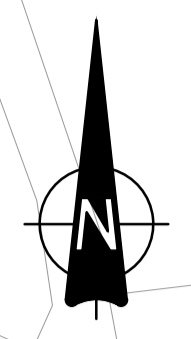
WORK IN PROGRESS					
Drawing Status					
Architect C.W. ARCHITECTS					
Client PORTABELLA LTD					
Scale 1:250	Drawn MPC	Drawing Size A1	Date 09/04/21	Checked DTH	

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Project Title HOUSING, BONVILSTON	
Drawing Title DRAINAGE PLAN	
Project No. - Originator - Volume - Level - Type - Role - Number 6709 - BHP - XX - XX - DR - C - (50)001	Rev P02

O.S. Grid North



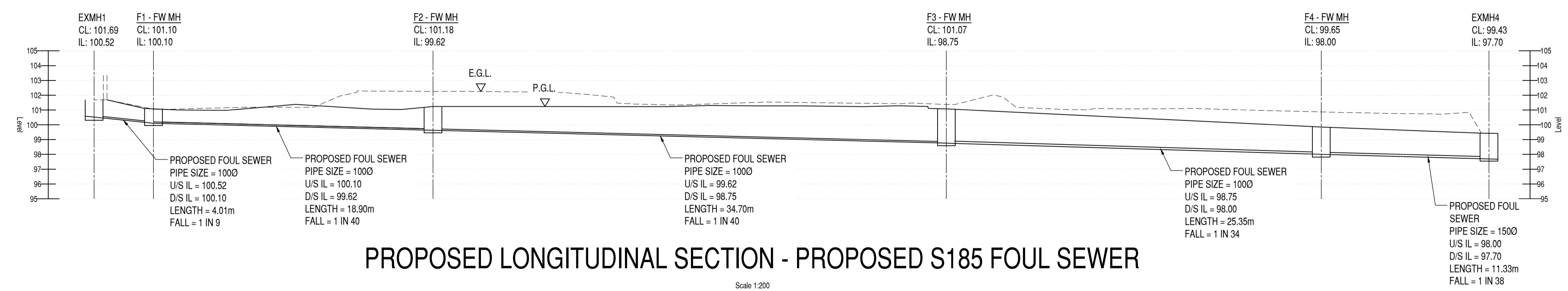
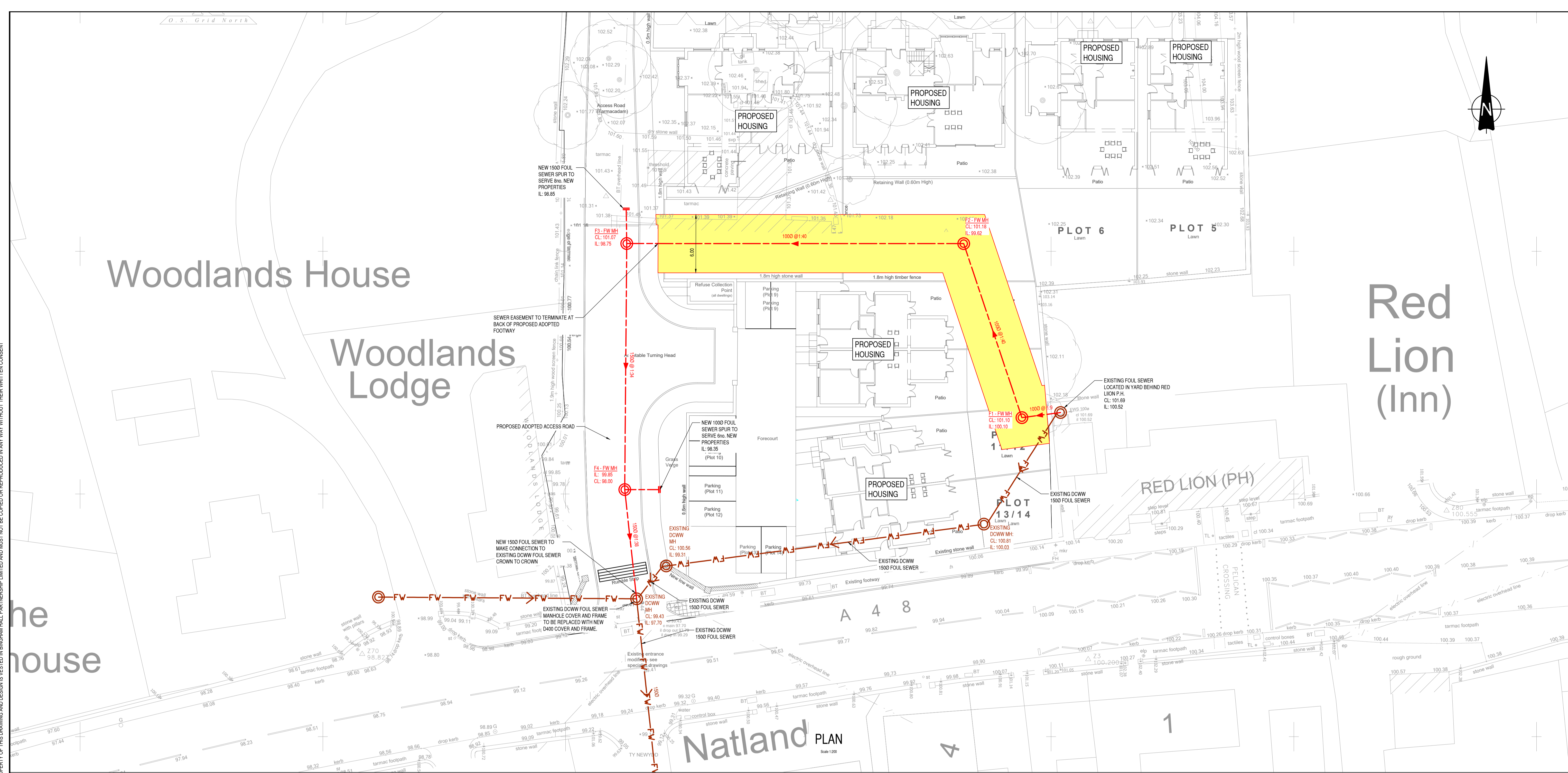
Woodlands House

Woodlands Lodge

Red Lion (Inn)

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the house



PROPOSED LONGITUDINAL SECTION - PROPOSED S185 FOUL SEWER

LEGEND

- EXISTING DCWW FOUL WATER DRAINAGE
- PROPOSED DIVERTED DCWW FOUL WATER DRAINAGE
- PROPOSED 3m EASEMENT ZONE

Rev	By	Date	Revision
P04	MPC	19/11/2021	MINOR AMENDMENTS TO ARCHITECT'S LAYOUT.
P03	MPC	10/11/2021	SEWER DIVERSION ROUTE AMENDED TO REFLECT NEW ARCHITECT'S LAYOUT.
P02	MPC	11/10/2021	SEWER DIVERSION ROUTE AMENDED TO REFLECT NEW ARCHITECT'S LAYOUT.
P01	MPC	25/05/2021	INITIAL ISSUE

Drawing Status					
INFORMATION					
Architect C.W. ARCHITECTS					
Client PORTABELLA LTD					
Scale AS NOTED	Drawn MPC	Drawing Size A1	Date 24/05/21	Checked DTH	

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Project Title PROPOSED HOUSING, BONVILSTON	
Drawing Title FW S185 DIVERSION PLAN	
Project No. - Originator - Volume - Level - Type - Role - Number 6709 - BHP - XX - XX - DR - C - (S185)002	Rev P04