

Pell Frischmann

Bonham's Field, Yapton

Drainage Verification Report

Project	Bonham's Field, Yapton – Plots 2-3
Document Title or Subject	Drainage Verification Report
Document Reference	104367-PEF-ZZ-XX-RP-CD-000601
Revision Reference	S2-P02
Date	18 th May 2022

1 Introduction

1.1 Context

- 1.1.1 Pell Frischmann has been appointed by Seaward Properties Ltd to provide an independent drainage verification report in support of a planning application to Arun District Council (ref: Y/186/21/PL).
- 1.1.2 The work relates to a scheme that was consented under planning application Y/1/17/OUT. Conditions 12 and 14 of this application related to surface water drainage and maintenance and management of SuDS. Both these conditions were discharged under a discharge of conditions application ref Y/47/21/DOC.
- 1.1.3 The drainage design was carried out by The Civil Engineering Practice.
- 1.1.4 This Drainage Verification report aims to;
- Set out the principles of the drainage for the scheme according to the provided documentation.
 - Provide a commentary on the compliance of the proposed scheme with relevant standards and best engineering practice.
 - Provide recommendations for future investigation or remedial work.
- 1.1.5 This report has been prepared to review the surface and foul water drainage installed for Plots 2-3 only.

1.2 Provided Information

- 1.2.1 Pell Frischmann has been provided with the following documentation relating to the scheme;
- 'Proposed Drainage and Levels Layout Plan Phase 1 – Whole Site' – 23018 1-200 Revision L (The Civil Engineering Practice) Dated February 2022
 - 'Drainage Maintenance Manual' – 23018 (The Civil Engineering Practice) dated February 2022
 - 'Discharge of Condition Drainage Technical Note' – 23018 (The Civil Engineering Practice) dated February 2021

1.3 Limitations of Scope

- 1.3.1 Pell Frischmann have been provided only with the documentation listed above, there has been no further investigation into the scheme.
- 1.3.2 Pell Frischmann have completed an interim survey of drainage installed as of 29/03/2022 with a subsequent site visit to carry out a visual inspection on 10/05/2022. Pell Frischmann were appointed following the installation of many drainage elements, and so supplementary information has been provided by the Client and groundworks contractor.

2 Drainage Principles

2.1 Surface Water

- 2.1.1 Pell Frischmann understands that the proposed development will incorporate a sustainable drainage system that aims to discharge surface water by infiltration into the ground via an infiltration blanket.
- 2.1.2 On site attenuation is provided via several sections of voided subbase under access roads and shared parking areas.
- 2.1.3 It is understood that the surface water infrastructure for the site will be privately owned and managed. CEP drawing 2001 Revision D included within the Drainage Technical Note shows that this ownership will be split between residents and a management company.

2.2 Foul Water

- 2.2.1 The development proposes to discharge all foul water generated onsite into an existing public sewer running under Main Road to the southwest of the site.
- 2.2.2 It is understood that all foul water drainage infrastructure on site will be privately owned aside from a connection leg (and associated chamber) used to connect to the existing Southern Water sewer. It is understood that this section will be adopted under a Section 104/106 agreement.

3 Drainage Compliance

3.1 Relevant Guidance

- 3.1.1 It is proposed that as the network is largely private, Pell Frischmann will therefore give commentary on how the drainage proposals comply with Part H of Building Regulations (2010) and CIRIA SuDS Manual C753.

3.2 Surface Water Conveyance

- 3.2.1 The impermeable areas that require positive drainage are the roofs of proposed properties and garages and associated access roads and parking areas.
- 3.2.2 Proposed access roads and parking are to be of permeable construction, meaning no surface drainage elements are required as runoff will filter through surface construction directly into the storage provided within the subbase.
- 3.2.3 Water from rainwater down pipes are conveyed to diffuser tanks located within areas of voided subbase under the access roads via a series of pipes and polypropylene inspection chambers.
- 3.2.4 Under Part H of Building Regulations, it is recommended that the minimum gradients for 100mm and 150mm Surface Water Drains are 1:100 and 1:150 respectively.
- 3.2.5 The 'As Built' drainage plan (included as **Appendix A**) shows both 100mm and 150mm surface water pipework are designed to a general minimum of 1:167. It is understood that this has been used to ensure cover is achieved at the upstream end of each surface water run as connections into diffuser tanks located within voided subbase are approximately 600mm deep for the most part.
- 3.2.6 However, The Civil Engineering Practice has confirmed that designs have been provided in line with minimum gradients outlined in BS EN 752-2008 which states *"For small diameter drains and sewers (less than DN300) self-cleansing can generally be achieved by ensuring either that a velocity of 0.7m/s occurs daily, or that a gradient of at least 1:DN is specified"* [paragraph 9.6.3.1]. It goes on to state that *"Where self-cleansing conditions cannot be achieved provision should be made for adequate maintenance activities"*.
- 3.2.7 The pipe run between plots 2 and 3 (upstream and downstream of SW06) that would fall under private homeowner ownership does not meet the Building Regulations requirement, but does meet with the BS EN 752-2008 requirement, where a 1:150 diameter pipe is laid as a 1:167 gradient, giving a maximum velocity of 0.77m/s.
- 3.2.8 The Drainage Maintenance Manual supplied by The Civil Engineering Practice recommends jetting/rodding all surface water pipework at least every 2 years, or as required.
- 3.2.9 Proposed cover levels for surface water pipes are generally lower than optimal e.g. 1.2m under trafficked highway and 0.9m elsewhere however guidance has been given to provide Class Z bedding for pipes within less than this cover and GEN 3 concrete encasement for pipes with less than 450mm of cover. Details for construction of these beddings has not been provided within the construction details in the technical note provided, nor could it be verified during the site visit.

3.3 Surface Water Storage

- 3.3.1 Surface Water storage is provided within a voided subbase under the shared parking areas and access roads for the development. A 30% void ratio has been assumed for the volumes used for storage. This is a common assumption for such material however no data or investigation has been provided into the properties of the material used on site.
- 3.3.2 The 'As-Built' drainage plan 1-200L shows the development is divided into 8 catchments with separate storage provided for each.

- 3.3.3 Causeway Flow results provided within the drainage technical note appendices show that adequate storage is provided for each catchment under the 100 year + 40% climate change events within the volume of subbase provided that the impermeable areas and gross volume of subbase have been calculated correctly.
- 3.3.4 Concrete baffles have been used to ensure separate storage areas for each catchment. The construction details for these have been provided on drawing 1501 Revision D.
- 3.3.5 Plots 2 and 3 drain to voided subbase Area C. The impermeable area as measured off the as-built drawing draining to this area remains in line with the calculations prepared by The Civil Engineering Practice as part of the Discharge of Conditions Technical Note. It should be ensured that no other drainage from roofs or impermeable area is connected to the voided subbase Area C in line with the original design.
- 3.3.6 As part of the discharge of condition application, the drainage engineer (Civil Engineering Practice) agreed certain design principles with Arun District Council with respect to the invert level of the diffusion tanks, setting them at or above the modelled 10 year+40% water level within the infiltration system. This resulted in the following minimum invert levels being agreed in the respective catchments:
- Catchment E - 5.775m AOD
 - Catchment F - 5.980m AOD
 - Catchment G - 5.980m AOD
 - Catchment H - 6.000m AOD
- 3.3.7 On the as-built drawings, there is a minor variation from this, with the invert level of the diffuser tank in Catchment E set to 5.735m AOD (40mm lower than agreed) and Catchment F set to 5.935m AOD (45mm lower than agreed). Catchment G and H are reported on the as built drawings as per the agreed levels.
- 3.3.8 It is understood that this has been raised with Arun District Council by Civil Engineering Practice and an agreement reached that these levels are sufficient.

3.4 Surface Water Disposal

- 3.4.1 The Ground and Water soakage letter report provided within the drainage technical note show the infiltration tests carried out to BRE 365 guidance for 9 trial pits. Results provided show infiltration rates between 1.71×10^{-6} m/s and 1.509×10^{-5} m/s.
- 3.4.2 It is shown in table 1. of the drainage technical note that the most appropriately located infiltration test value has been used for each catchment calculation.
- 3.4.3 Calculations show storage is sufficient for the runoff generated by the impermeable areas of the developed site. Where sufficient half drain-down times in line with policy cannot be met (catchments F and H), further calculations demonstrate half drain down times for the 10 year event +40% in line with a previous agreement between The Civil Engineering Practice and Arun District Council.
- 3.4.4 The trial pit logs provided as part of the Ground and Water ground investigation show that no groundwater was encountered up to a depth of 700mm for any trial pit.

3.5 Foul Water Conveyance

- 3.5.1 Foul Water produced by the dwellings on site requires conveyance to the existing Southern Water sewer to the south west of the site.
- 3.5.2 Conveyance is provided via pipes, PPICs and PCC manholes across the site.

- 3.5.3 Under Table 6 of Building Regs Part H, the minimum recommended gradients for foul drains are 1:150 for a 150mm pipe serving at least 5 WCs and 1:80 for a 100mm pipe serving at least 1 WC.
- 3.5.4 It is considered that where gradients are shown on the 'As Built' drainage plan, foul drains proposed for the site accord with the above guidance with main run sewers largely proposed to a 1:150 gradient.
- 3.5.5 Construction details for pipe bedding, manholes and inspection chambers have been provided in technical note appendices and are in general accordance with common practice.

4 Site Visit Observations

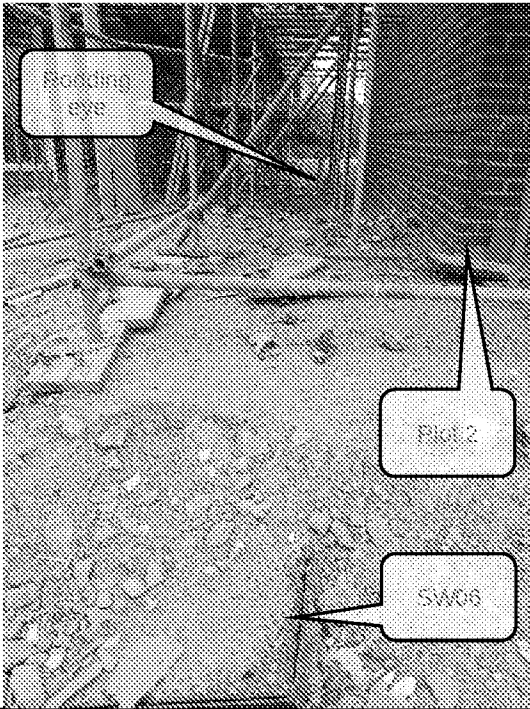
4.1 Drainage Survey

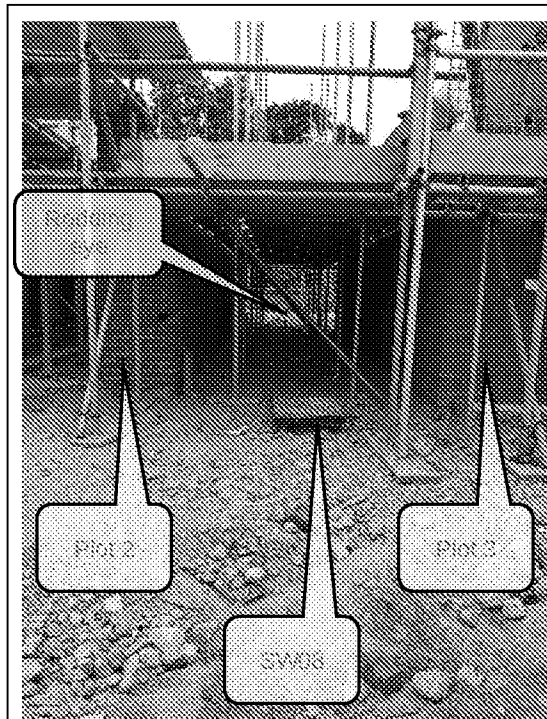
- 4.1.1 A drainage survey of the works constructed as of 29th March 2022 is included for reference as **Appendix B**. Commentary on this is limited to the drainage serving Plots 2 and 3 as per the scope of this report.
- 4.1.2 With respect to foul drainage connections, the survey shows the position of FW102 serving Plot 2 has moved to the southern corner of the plot. The manhole was noted a 'Unable to Lift' (UTL) and so incoming pipes or invert levels could not be verified.
- 4.1.3 An assumed route to manhole F02 was noted on the survey, connecting to the main spine drainage network under the access road. The survey confirms this pipe run between F01 and F04 is in place (extending further into the site, but not part of the scope of this report). A 150mm pipe has been constructed in line with the as-built drawings, although the invert level of F01 has been constructed with an invert level of 3.44m AOD compared to an as-built design level of 3.082m AOD.
- 4.1.4 This will require rectifying prior to connecting to the public sewer assets and connecting Plots 2 and 3 due to the fact the main sewer run between F03 and F01 is at an inadequate gradient.
- 4.1.5 Surface water information for Plots 2 and 3 was limited at the time of the survey, although it did record the position of surface water manholes SW08 and SW10. The invert level of SW08 was surveyed as 5.36m AOD compared to an as-built level of 5.455m AOD (-0.095m) and SW10 was surveyed as 5.46m AOD compared to an as-built level of 5.550m AOD (-0.09m).

4.2 Site Visit

- 4.2.1 A site visit was carried out by a Pell Frischmann representative on 10th May 2022 to observe other drainage elements rectified since the March survey.
- 4.2.2 Several elements of the below ground drainage system were in place, with manholes SW06, SW08 and SW10 in place to serve Plots 2 and 3. Above-ground connections for rainwater pipes were present, but at this stage were not connected as construction remains in progress on the individual houses.
- 4.2.3 Connections to the various voided sub-bases downstream of the catchpit manholes could not be verified as part of the site visit. However, the groundworks contractor has confirmed that these were installed, and quality controlled by others at the time of construction (prior to Pell Frischmann's commission). An email to this effect is included as **Appendix C**.

Table 4.1 Photographs of surface water drainage for plots 2 and 3

Photograph	Manhole ref (refer to 'as-built' drawing)	Comments
	SW06	Plot 2 Drainage. Unable to lift manhole due to overlying debris. Positioned in line with rodding eye to back of property. Rainwater pipe connections observed above surface on SE elevation corner and NW elevation corner as per as-built drawing.

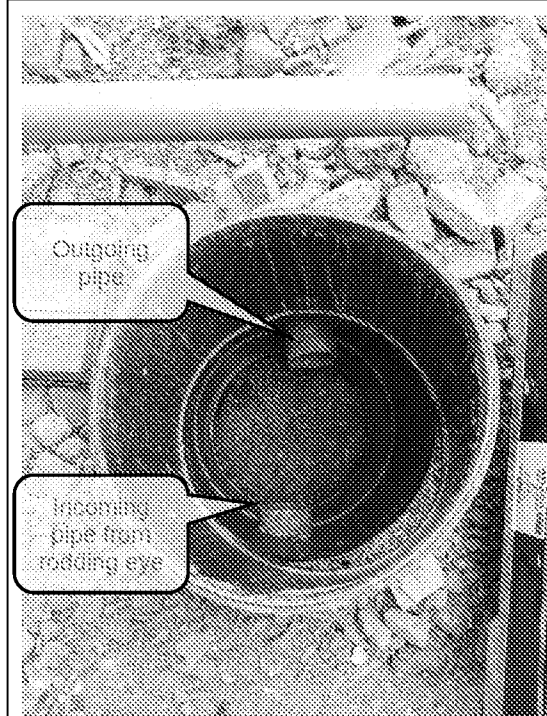


SW08

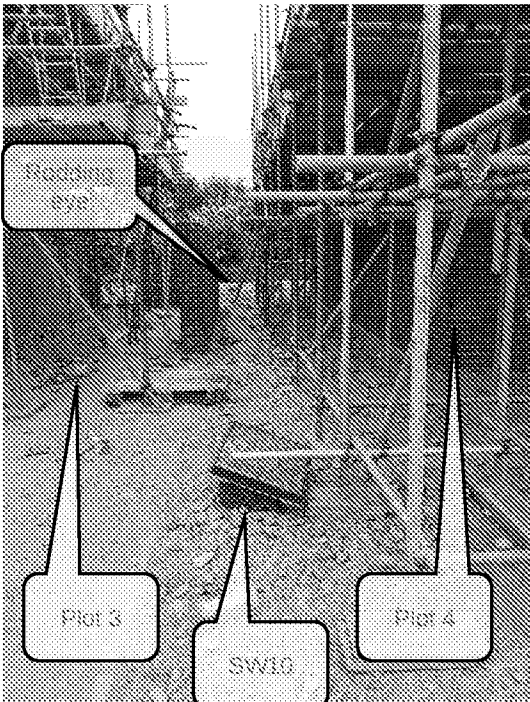
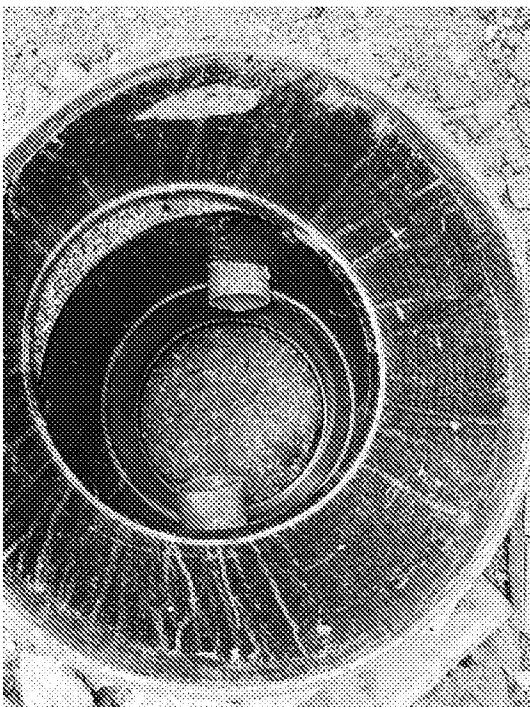
Plot 2 and 3 Drainage.

Located between Plot 2 and Plot 3. Manhole lifted (see below).

Positioned in line with rodding eye to back of property. Rainwater pipe connections observed above surface on NW elevation on Plot 2 garage, NE elevation on Plot 2 garage.



Internal photo of SW08 manhole, raised inverts to intercept debris etc prior to discharge into voided subbase. Additional PVC collar installed above manhole to limit entry of debris. Granular surround possibly present around chamber and bedding around pipes. Bedding material within chamber unknown.

		Plot 3 (and 4) Drainage. Located between Plot 3 and Plot 4. Manhole cover lifted (see below). Positioned in line with rodding eye to back of property. Rainwater pipe connections observed on NE elevation.
	SW10	Internal photo of SW10 manhole, raised inverts to intercept debris etc prior to discharge into voided subbase. Additional PVC collar installed above manhole to limit entry of debris. Granular surround possibly present around chamber and bedding around pipes. Bedding material within chamber unknown.

5 Conclusions

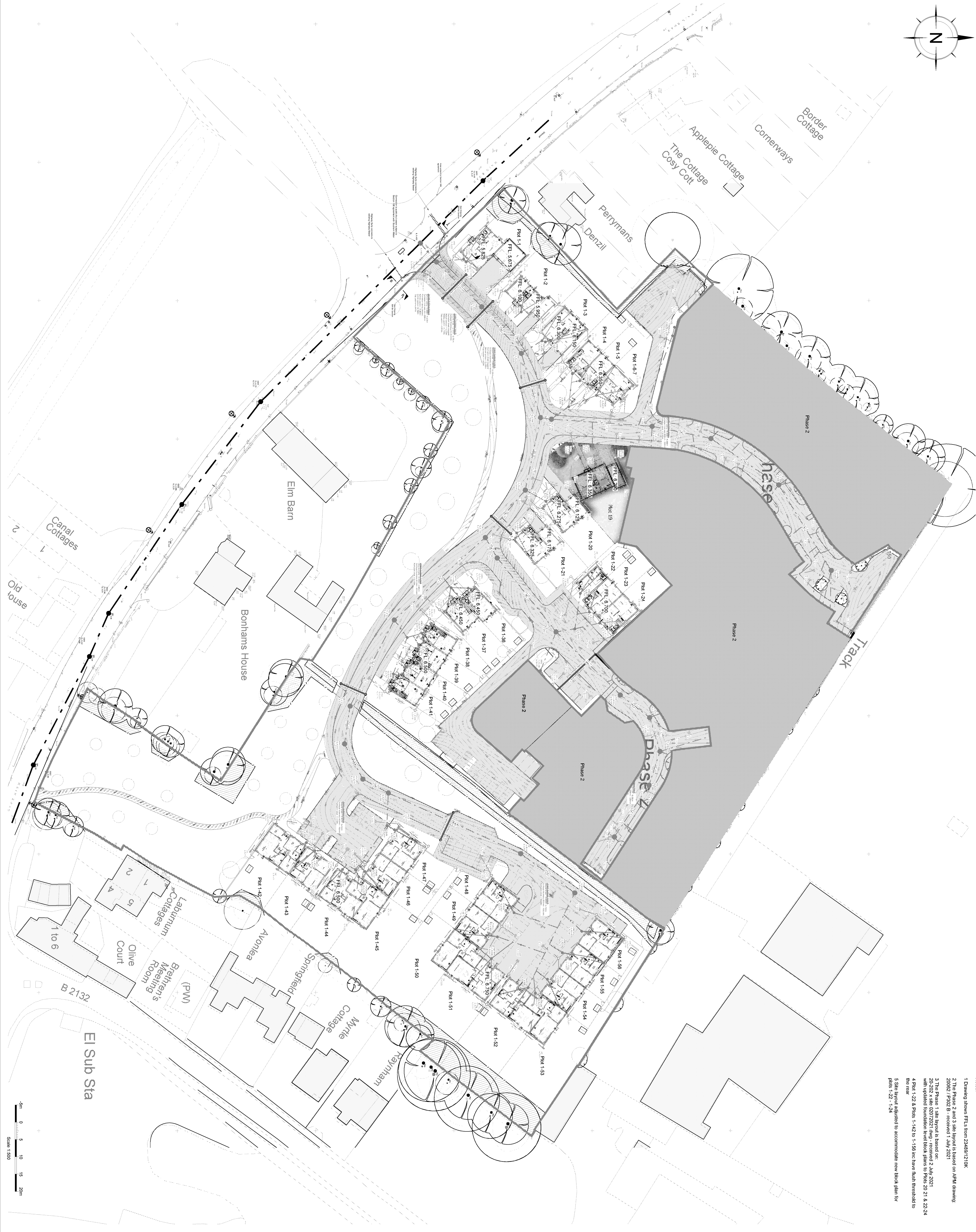
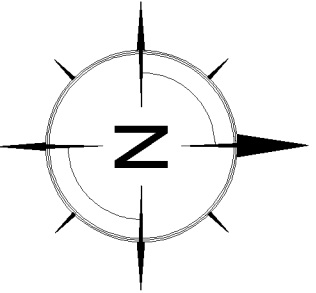
- 5.1.1 Pell Frischmann agree that the principles set out in the provided documentation are sound in principle and are in line with Buildings Regulations, BS EN 752-2008 and the previously agreed principles in the reserved matters application.
- 5.1.2 Several below-ground surface water drainage elements have been observed as in place for Plots 2 and 3, in line with the principles of the approved applications with the remainder confirmed as installed by the groundworks contractor. There is some finishing required, to ensure rodding eyes, inspection chambers, covers and other manholes are finished correctly, and the system is cleared and jetted to remove any accumulation of construction debris observed within several elements. The client has confirmed a final survey will take place to identify any defects that will be captured and rectified ahead of final handover and signed off by Local Authority Building Control.
- 5.1.3 Due to the timing of Pell Frischmann's involvement, any work associated with the voided subbases for infiltration of surface water could not be observed or verified. This has been agreed between the Client and Arun District Council due to the time at which the policy was updated.
- 5.1.4 Foul manhole F01 at the site entrance is currently surveyed to have an incorrect invert level, which is elevated above the design level, meaning the gradient up to F02 (point of connection for Plot 2) and F03 (point of connection for Plot 3) is currently unacceptable. This will require rectifying and resurveying.

This report is to be regarded as confidential to our Client and is intended for their use only and may not be assigned except in accordance with the contract. Consequently, and in accordance with current practice, any liability to any third party in respect of the whole or any part of its contents is hereby expressly excluded, except to the extent that the report has been assigned in accordance with the contract. Before the report or any part of it is reproduced or referred to in any document, circular or statement and before its contents or the contents of any part of it are disclosed orally to any third party, our written approval as to the form and context of such a publication or disclosure must be obtained.

Report Ref. 104367-PEF-ZZ-XX-RP-CD-000601

Suit	Rev	Description	Date	Originator	Checker	Approver
S2	P01	Preliminary Issue	11/05/2022	D. Allum-Rooney	R. Holmes	D. Allum-Rooney
S2	P02	Updated	18/05/2022	D. Allum-Rooney	R. Holmes	D. Allum-Rooney
Ref: reference Suit: suitability Rev: revision						

Appendix A As Built Drainage Drawing



- Notes:
- Drawing shows FFLs from 23489/1210K
 - The Phase 2 and 3 site layout is based on APV drawing 20082 / P302 B - received 1 July 2021
 - The Phase 1 site layout is based on 20/202 X site 02072021.dwg - received 2 July 2021
 - Pnt 1-22 & Pnt 1-142 to 1-150 are have been thresholded to the new
 - 5 Site layout adjusted to accommodate new block plan for pnt 1-22 - 1-150

- GENERAL NOTES:
- All dimensions to be checked on site. All details and dimensions to be agreed between the sub-contractor or supplier and the general Contractor.
 - The drawing is to be read in conjunction with all relevant Architect's and Engineer's drawings and specifications.
 - The main Contractor is responsible for ensuring the stability of the structure whilst the works are in progress.
 - Any information given regarding existing underground services is given in good faith after consultation with the relevant authority. No liability is accepted by the Consultant and the main Contractor is responsible for the accuracy of the information and taking due care and attention while undertaking the works.

DRAINAGE NOTES:

- All accessible pipes, boxes and junctions shall be visible day in accordance with the current version of BS EN 295-1, with flexible joints and manhole certified.
- All accessible sewers shall be in strict accordance with the SSG Appendix C - Design and Construction Guidance. Unless otherwise stated, adoptable sewers shall be 150mm diameter and shall be laid in a class S bedding. Where the depth to soffit is less than 1.2m under a public highway or 0.7m elsewhere the pipe shall be laid with a class 2 bedding.
- All private building drainage shall be constructed in strict in accordance with the current version of BS EN 12207-1. Unless otherwise specified, all building drains shall be laid in class B bedding unless otherwise specified.
- Where a pipe is within 1m of a foundation the trench shall be filled with class GEN 3 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN 3 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN 3 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN 3 concrete up to the lowest level of the foundation. Where the trench is further than 1m from the foundation, the trench shall be filled with class GEN 3 concrete up to the lowest level of the foundation.
- Where pipes, external to the structures, have a depth to soffit from ground level of less than 450mm they shall have a class GEN 3 concrete encasement (150mm thick). In all other cases the pipes shall be bedded and surrounded with 100mm thick granular material.
- In any circumstances where pipes are bedded and surrounded in concrete flexible joints should be provided. Compressible boards (such as those used for bedding) should not be used to support the pipe (considering with any abandoned manholes). The bedding shall be pre-cast to pipe diameter and to a height and width equal to the concrete cross section. A board thickness of 100mm for pipes up to 450mm nominal diameter and 300mm for pipes over 450mm nominal diameter.
- All pipes shall have rodding access plates fitted at their bases (ground floor level).
- When existing pipes are to be abandoned they shall be dug out together with any abandoned manholes.
- Any discrepancy between the drawing and site should be reported immediately to the Engineer.
- All manhole and chamber sizes are given as a minimum to meet the SSG Appendix C Design and Construction Guidance.

Legend:

- Site Boundary
- Existing Foul Sewers
- Adoptable Type 2 Foul Water Mainline and lateral connection from proposed site
- Private Type 2 Foul Water Mainline
- Private Type 4 / 3
- Foul Water Inspection Chamber
- Private Type 4 or catchpit
- Storm Water Inspection Chamber
- Private Storm Water Roofing Eye
- Single Diffuser Tank up to 2000mm
- Double Diffuser Tank up to 2000mm
- Double Diffuser Tank up to 2000mm
- Area of voided subbase for storm water storage
- Type 1 Concrete baffles in voided subbase. Baffle separates areas.

Issue Status

REV	DATE	BY	DESCRIPTION	CHK
L	23.02.22	MJP	Constructed roads added to phase 1	SRM
K	08.02.22	PR	Pnts 33-35 added	SRM
J	04.02.22	MJP	Updated block plans and drainage to suit	SRM
H	04.02.22	MJP	Drainage connections added to pnts 22-24	SRM
G	04.02.22	MJP	Purple lines to pnt 1 drive removed	SRM
F	01.02.21	MJP	Aso added to key, coloured orange	SRM
E	01.02.21	MJP	Minor amendments	SRM
D	22.09.21	PR	Minor amendments	SRM
C	08.09.21	PR	Minor amendments	SRM
B	07.07.21	MJP	Minor amendments	SRM
A	08.07.21	MJP	Surface finishes updated to suit new site layout	SRM

AS BUILT

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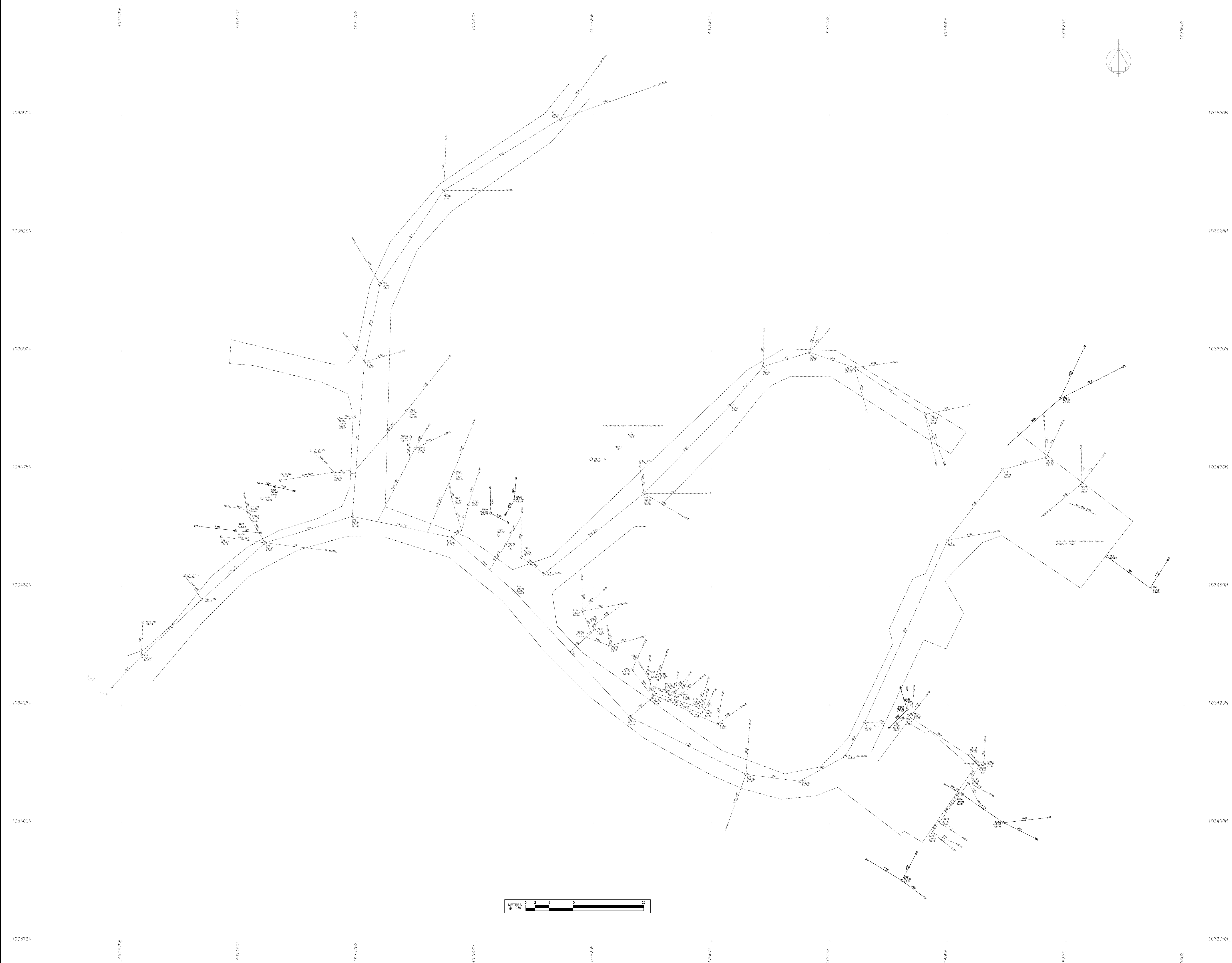
75 Dwellings

Proposed Drainage and Levels Layout Plan

Phase 1 - Whole Site

DRAWN	DATE	PROJECT NO.	REV
M Pacifico	July 2021	23489	
Reviewed	CHECKED	SHEET NO.	
S Magowan	SRM	1-200 L	
1:500 @ A1 : 1:1000 @ A3			

Appendix B Drainage Survey



GENERAL NOTES

G1. DO NOT SCALE THIS DRAWING.

G2. ANY DIMENSIONAL DISCREPANCIES SHOULD BE NOTIFIED TO THE ENGINEER IMMEDIATELY.

G3. ALL DIMENSIONS ARE IN MILLIMETRES - (mm)
ALL LEVELS ARE IN METRES - (m) AND ARE ABOVE ORDNANCE DATUM AT NEWLYN, CORNWALL UNLESS NOTED OTHERWISE.

G4. NORTH SHOWN INDICATIVE ONLY

G5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, DRAWINGS, DETAILS AND OTHER DESIGN INFORMATION.

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Abbreviations (Where Applicable)

AR	Assumed Route
CL	Cover Level
IC	Inspection Cover
IL	Invert Level
SA	Sockaway
SL	Sump Level
SW	Switch To
UTL	Unable To Lift

P01	-	JB	JB	JB	00.00.00
REV	DESCRIPTION	DRN	CHK	APP	DATE
Pell Frischmann AMP HOUSE, DINGWALL ROAD, GREATER LONDON CR9 2LX Telephone 444 (0)207 486 3061 Email: pfrischmann@pellfrischmann.com www.pellfrischmann.com					
Architect/Client/Contractor					
Project YAPTON					
Drawing Title DRAINAGE CHECK SURVEY					
Drawing Status INFORMATION					
Drawn	Name T SHAW	Date 11.05.22	Status Code S0		
Designed			Scale 1:250		
Eng Chk			Revision		
Approved	A.MUR	XX.11.05.22	X01		
Drawing No. 104376 - PEL-XX- XX - UG - SU -00001					

Appendix C Groundworks Contractor Confirmation

Daniel Allum-Rooney

From: Tom Hunter <tom.hunter@parchowgroundworks.co.uk>
Sent: 10 May 2022 09:36
To: Andy Howe; Andy Mckeown-Mundy
Cc: Ben Haskins; David West
Subject: Re: Urgent Reply Please - Planning Consultation on: Y/48/22/DOC - Yapton Drainage As built verification survey

Morning all,

On site at the moment and can confirm all SW drainage is in on plots 2-7. Plot 1, now scaffold is done we'll start installing the storm drainage around the plot.

Kind regards,

Tom Hunter
Operations Manager
Parchow Groundworks

From: Andy Howe <[REDACTED]>
Sent: Tuesday, May 10, 2022 6:08:35 AM

Subject: Re: Urgent Reply Please - Planning Consultation on: Y/48/22/DOC - Yapton Drainage As built verification survey

Tom
Please can we update all

Kind Regards,
Andy Howe

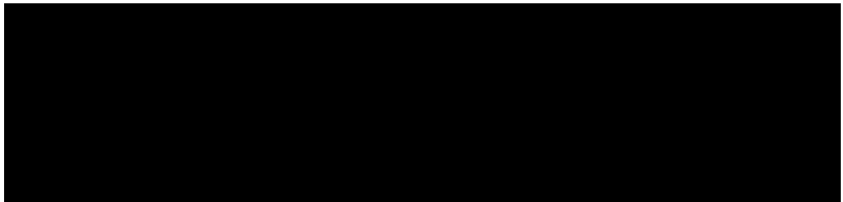
On 10 May 2022, at 06:05, Andy Mckeown-Mundy <[REDACTED]>
[REDACTED] wrote:

Morning Andy

Can I get from you a quick update please on any issues/corrective work carried out yesterday in the vicinity of plots 1-7..? With special focus on plots 2 and 3?

Thank you

A
Andy McKeown-Mundy / Technical Manager



www.seawardproperties.co.uk

Company Registration No. 02595439

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