

Pell Frischmann

Bonham's Field, Yapton

Drainage Verification Report

Project	Bonham's Field, Yapton
Document Title or Subject	Drainage Verification Report
Document Reference	104367-PEF-ZZ-XX-RP-CD-000600
Revision Reference	S2-P01
Date	18 th March 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.

1.2 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 not carried out a site visit to confirm that the drainage or highways elements of the proposal have been constructed to the details provided within the drainage technical note.

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 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 There are a number of pipe runs that would fall under private homeowner ownership that do not meet the Building Regulations requirement, but do meet with the BS EN 752-2008 requirement, namely plots 42-47 and 51-56 where a 1:150 diameter pipe is laid as a 1:167 gradient, giving a maximum velocity of 0.77m/s. Plots 48-50 are noted as a 100mm diameter pipe at 1:167 gradient that gives rise to a maximum velocity of 0.59m/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.
- 3.2.10 Pell Frischmann cannot confirm the structural performance of any proposed pipes or chambers or the standard to which these have been constructed.

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. **Pell Frischmann** have not re-modelled this to confirm.
- 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 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
- 3.3.6 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.
- 3.3.7 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^{-3} 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 Conclusions

- 4.1.1 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
- 4.1.2 Survey work is currently ongoing to validate the on-site drainage elements.

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Report Ref. 104367-PEF-ZZ-XX-RP-CD-000600

Suit	Rev	Description	Date	Originator	Checker	Approver
S2	P01	Preliminary Issue	01/04/2022	H. McColl	R. Holmes	D. Allum-Romney

Ref. reference, Suit suitability, Rev revision.