



Windmill Views, Yapton SuDS Verification Report

Prepared for Redrow Homes Southern Counties
By Technical & Development Services
(Southern) Ltd

Project Information

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Site Location	Windmill Views, Yapton
Client	Prepared for Redrow Homes Southern Counties
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Issue History

Issue	Date	Author	Author signature	Approver	Approved signature
01	08/09/2021	S. Smith		R. Bishop	
02	26/02/2022	S Smith		R. Bishop	
03	12/04/2022	S Smith		R .Bishop	
04	02/11/2022	S Smith		R Bishop	

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1 The Site

Proposed residential development by Windmill Views, Yapton which includes a range of SuDS features to facilitate the storage and removal of the S278 Highway Surface Water.

2. Principal Activity

To provide a detailed Report to the Client (with supporting information), verifying that the construction of the SuDS System has been completed in accordance with the technically approved design and in order to satisfy the requirements of the Planning Permission ,

Condition 3: That is...

Immediately following implementation of the approved SuDS scheme and prior to occupation of any part of the development, the developer/applicant shall provide the Local Planning Authority 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. There shall be no deviation to the approved scheme other than with the written consent of the Local Planning Authority. The scheme shall thereafter be maintained in perpetuity.

Additionally, due to the system being kept within the control of a Management Company, this process will also be undertaken in conjunction with the requirements of both the LLFA and NHBC for the purposes of their sign off.

3. Scope of Works

- Review the relevant drawings and the scheme as a whole, to ensure the Technically Approved status of the design is appropriate for the conditions for which we are reporting against.
- Arrange a prestart meeting to go through the initial comments on how the role will work, including agreeing the requirements of the inspection process, which will include the method for organizing the call off timings required (i.e. minimum 24 hours call out period for any site visits).
- To act as the Client's SuDS installation supervising Engineer/Authority, for the construction of the Attenuation Tank and Pond.
- To monitor and ensure that the installation works are completed in accordance with the approved designs and specifications provided by the client, including the monitoring of both materials and workmanship on site.
- To provide a regular update to the client, including photographic evidence, indicating the progress and status of each of the elements being installed, until such time as the installation is complete.
- To provide a report (see below), once installation has been completed, covering the build out process, including evidence of the initial excavations, the preparation of the Sub-Base, the installation of any reinforcing membrane, the installation of the filtering media itself (Crates), the wrapping and securing of the system with a geomembrane, the appropriate connection of all necessary pipework and fittings, the Testing and Commissioning sign off for each of the systems and finally the backfilling and grading of the specified capping layer (Top Soil etc), where applicable.

4. Report

The pond and attenuation tank construction drawings can be found in Appendix 1.

Construction of the pond commenced mid April 2021 but was delayed due to the availability of a suitable clay liner.

Appendix 2 Photos 1 (Inspection 22nd April) & 2 (Inspection 10th May) show the excavation of the pond box, note Photo 2 the southern bank profile is too steep, this was later regraded with the clay liner.

The construction of the pond through to its completion recommenced during WC 23rd August to the 7th September. Regular inspections were made during the construction of the pond and attenuation tank specifically on 27, 31st August and 2,3,6, & 7th Sept as shown by the sequence of the photos. It should be noted that Blaze worked through both weekends in this period including the Bank Holiday.

The following photos show the construction of the pond and associated attenuation tank:

Photo 3-6 Installation of bentonite liner and placing of suitable clay liner

Photo 7-8 Placing of top soil trimmed and compacted

Photo 9-10 Installation of bio-degradable erosion mat, completed 6th September

Photos 11-12 Excavation for attenuation tank and fines free gravel base

Photos 13-14 Installation of drainage crates sealed in a geo-membrane with a porous pipe running through the middle wrapped in a geotextile and backfilled with a fines free gravel

Photos 15 -16 Show welded geo-membrane wrapped in geo textile

Photos 17-18 Shows the backfilling of the finished attenuation tank

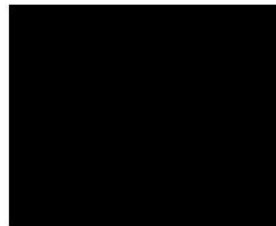
5. Summary

The pond and attenuation tank described in the report and shown in the photographs in Appendix 2 have been constructed in accordance with the construction drawings and specification shown in Appendix 1 with no deviation to the approved scheme

It should be noted that this report has not verified the connections from the weired manhole to the west or the outfall to the existing ditch to the south west of the ditch

6. Declaration of Independence

I Stuart Smith am a Chartered Civil Engineer secured through the ICE and am impartial to the original development proposals. I have a BSc Hons Degree in Civil Engineering , worked for West Sussex County Council from 1985 - 2015 where I became Head of Highway Maintenance and Lead Flood Officer responsible for the implementation of the Flood and Water Management Act. I hereby confirm that the contents of this report are correct and a true reflection of what happened on site between 22nd April - 7th September 2021



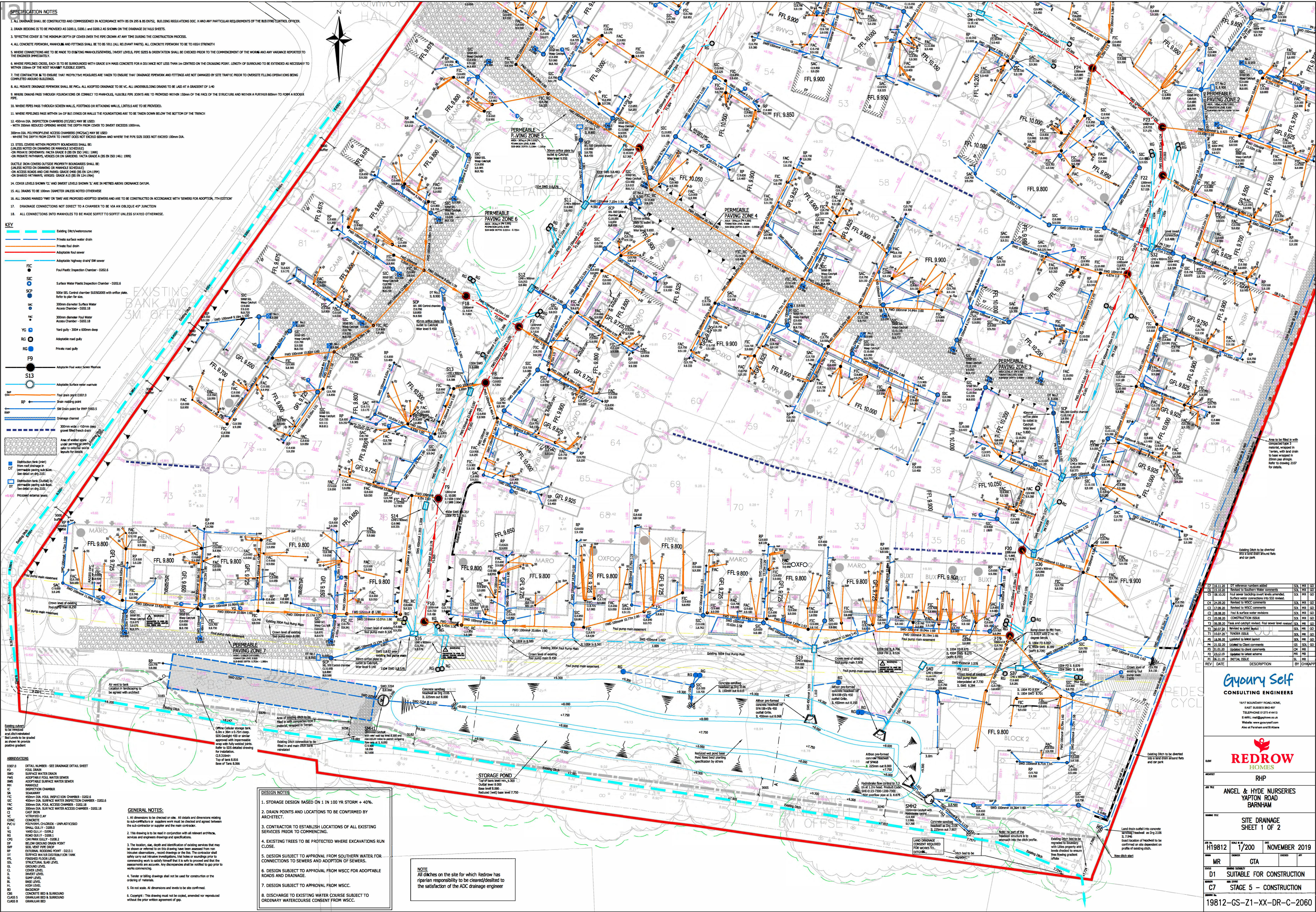
26th February 2022

APPENDIX 1

Site Plan

Pond Construction Details

Attenuation Tank Construction Details



SPECIFICATION NOTES

1. ALL DRAINAGE SHALL BE CONSTRUCTED AND COMMISSIONED IN ACCORDANCE WITH BS EN 255 & BS EN 752, BUILDING REGULATIONS DOC. H AND ANY PARTICULAR REQUIREMENTS OF THE BUILDING CONTROL OFFICER.
2. DRAIN BEDDING IS TO BE PROVIDED AS D00.3, D00.1 & D00.2 AS SHOWN ON THE DRAINAGE DETAILS SHEETS.
3. EFFECTIVE COVER IS THE MINIMUM DEPTH OF COVER OVER THE PIPE CROWN AT ANY TIME DURING THE CONSTRUCTION PROCESS.
4. ALL CONCRETE PERKINS, MANHOLES AND FITTINGS SHALL BE TO BS 5911 (ALL RELEVANT PARTS). ALL CONCRETE PERKINS TO BE TO HIGHEST STRENGTH.
5. WHERE CONNECTIONS ARE TO BE MADE TO EXISTING MANHOLES/SEWERS, INVERT LEVELS, PIPE SIZES & ORIENTATION SHALL BE CHECKED PRIOR TO THE COMMENCEMENT OF THE WORKING AND ANY VARIANCE REPORTED TO THE BUILDING CONTROL OFFICER.
6. WHERE PERKINS CROSS, SUCH AS TO BE SUBORDINATE WITH GRADE 4 MASS CONCRETE FOR A DISTANCE NOT LESS THAN 1m CENTRED ON THE CROSSING POINT. LENGTH OF SUBORDINATE TO BE WITHIN 150mm OF THE NEXT MAJOR FLEXIBLE JOINTS.
7. THE CONTRACTOR IS TO ENSURE THAT PROTECTIVE MEASURES ARE TAKEN TO ENSURE THAT DRAINAGE PERKINS AND FITTINGS ARE NOT DAMAGED BY SITE TRAFFIC PRIOR TO OVERLIFT FILLING OPERATIONS BEING COMPLETED AROUND BUILDINGS.
8. ALL PRIVATE DRAINAGE PERKINS SHALL BE PVC-U. ALL ADOPTED DRAINAGE TO BE VC. ALL UNDERBUILDING DRAINS TO BE LAID AT A GRADIENT OF 1:40.
9. WHERE DRAINS PASS THROUGH FOUNDATIONS OR CONNECT TO MANHOLES, FLEXIBLE PIPE JOINTS ARE TO PROVIDE WITHIN 150mm OF THE FACE OF THE STRUCTURE AND WITHIN A FURTHER 600mm TO FORM A ROOFER PIPE.
10. WHERE PIPES PASS THROUGH SCREEN WALLS, FOOTINGS OR RETAINING WALLS, LIMITS ARE TO BE PROVIDED.
11. WHERE PERKINS PASS WITHIN 1m OF BUILDINGS OR WALLS THE FOUNDATIONS ARE TO BE TAKEN DOWN BELOW THE BOTTOM OF THE TRENCH.
12. 450mm DIA. INSPECTION CHAMBERS (IC) ARE TO BE USED:
 - WITH 150mm REDUCED OPENING WHERE THE DEPTH FROM COVER TO INVERT EXCEEDS 1000mm.
 - 300mm DIA. POLYPROPYLENE ACCESS CHAMBERS (AC) MAY BE USED WHERE THE DEPTH FROM COVER TO INVERT DOES NOT EXCEED 600mm AND WHERE THE PIPE SIZE DOES NOT EXCEED 100mm DIA.
13. STEEL COVERS WITH PROPERTY BOUNDARIES SHALL BE:
 - (UNLESS NOTED ON DRAWING OR MANHOLE SCHEDULE)
 - ON PRIVATE DRIVEWAYS, FACING GRADE 4 (BS EN ISO 1461:1999)
 - ON PRIVATE PATHWAYS, VERGES OR ON CARPARKS, FACING GRADE 4 (BS EN ISO 1461:1999)
 - ON ACCESS ROADS AND ON PAVED GRADE 4 (BS EN ISO 1461:1999)
 - ON SHARED PATHWAYS, VERGES, GRADE 4 (BS EN ISO 1461:1999)
14. COVER LEVELS SHOWN 'CL' AND INVERT LEVELS SHOWN 'IL' ARE IN METRES ABOVE ORDNANCE DATUM.
15. ALL DRAINS TO BE 100mm COMPETER UNLESS NOTED OTHERWISE.
16. ALL DRAINS MARKED 'W' OR 'SW' ARE PROPOSED SEWERS AND ARE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR ADOPTION, 7TH EDITION.
17. DRAINAGE CONNECTIONS NOT DIRECT TO A CHAMBER TO BE VIA AN OBlique 45° JUNCTION.
18. ALL CONNECTIONS INTO MANHOLES TO BE MADE SOFFIT TO SOFFIT UNLESS STATED OTHERWISE.

KEY

- Existing Ditch/Watercourse
- Private surface water drain
- Private foul drain
- Adoptable foul sewer
- Adoptable highway drain SW sewer
- Foul Plastic Inspection Chamber - D002.6
- Surface Water Plastic Inspection Chamber - D002.6
- 500mm SCL Corrugated Chamber SUS304SS with office plate. Refer to plan for size.
- 300mm diameter Surface Water Access Chamber - D002.18
- 300mm diameter Foul Water Access Chamber - D002.18
- Yard gully - 300 x 600mm deep
- Adoptable road gully
- Private road gully
- Adoptable foul water sewer manhole
- Adoptable surface water manhole
- Four drain gully D007.0
- Drain road gully
- SW Drain gully for SWP D003.5
- Drainage channel
- 300mm wide x 100mm deep ground filled trench drain
- Area of voided space under permeable paving note to be noted on drawings for details
- Distribution tank (pilot) from roof drainage in permeable paving sub-base. See detail on drawing D001.1
- Distribution tank (D001.1) in permeable paving sub-base. See detail on drawing D001.1
- Proposed external levels

ABBREVIATIONS

- D007.0 DETAIL NUMBER - SEE DRAINAGE DETAIL SHEET
- FOUL DRAIN
- SURFACE WATER DRAIN
- ADAPTABLE Foul WATER SEWER
- ADAPTABLE SURFACE WATER SEWER
- MANHOLE
- INSPECTION CHAMBER
- SKIDWAY
- 450mm DIA. FOUL INSPECTION CHAMBER - D002.6
- 450mm DIA. SURFACE WATER INSPECTION CHAMBER - D002.6
- 300mm DIA. FOUL ACCESS CHAMBER - D002.18
- 300mm DIA. SURFACE WATER ACCESS CHAMBER - D002.18
- CASE IRON
- VC CONCRETE
- VITRIFIED CLAY
- SHALL GULLY - D008.1
- ROAD GULLY - D008.1
- ROAD GULLY - D008.2
- BELOW GROUND DRAIN POINT
- SOIL VENT PIPE DRAIN
- EXTENDED ROOFTOP POINT - D001.1
- SURFACE WATER DISTRIBUTION TANK
- FINISHED FLOOR LEVEL
- STRUCTURAL SLAB LEVEL
- GROUND LEVEL
- COVER LEVEL
- INVERT LEVEL
- SUMP LEVEL
- BASE LEVEL
- HYD LEVEL
- ROOF LEVEL
- CONCRETE BED & SUBGRADE
- CLASS 5 GRANULAR BED

DESIGN NOTES

1. STORAGE DESIGN BASED ON 1 IN 100 YR STORM + 40%.
2. DRAIN POINTS AND LOCATIONS TO BE CONFIRMED BY ARCHITECT.
3. CONTRACTOR TO ESTABLISH LOCATIONS OF ALL EXISTING SERVICES PRIOR TO COMMENCING.
4. EXISTING TREES TO BE PROTECTED WHERE EXCAVATIONS RUN CLOSE.
5. DESIGN SUBJECT TO APPROVAL FROM SOUTHERN WATER FOR CONNECTIONS TO SEWERS AND ADOPTION OF SEWERS.
6. DESIGN SUBJECT TO APPROVAL FROM WSCC FOR ADOPTABLE ROADS AND DRAINAGE.
7. DESIGN SUBJECT TO APPROVAL FROM WSCC.
8. DISCHARGE TO EXISTING WATER COURSE SUBJECT TO ORDINARY WATERCOURSE CONSENT FROM WSCC.

GENERAL NOTES

1. All dimensions to be checked on site. All details and dimensions relating to sub-contractors or suppliers must be checked and agreed between the sub-contractor or supplier and the main contractor.
2. This drawing is to be read in conjunction with all relevant architectural, services and engineering drawings and specifications.
3. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been ascertained from non-invasive observations, record drawings or the site. The contractor shall satisfy carry out intrusive investigations, trial holes or sounding prior to commencing work to satisfy himself that it is safe to proceed and that the assumptions are accurate. Any discrepancies shall be notified to the client prior to works commencing.
4. Tender or billing drawings shall not be used for construction or the ordering of materials.
5. Do not scale. All dimensions and levels to be site confirmed.
6. Copyright - This drawing must not be copied, amended nor reproduced without the prior written agreement of the client.

NOTE

All ditches on the site for which Redrow has riparian responsibility to be cleared/desilted to the satisfaction of the ADC drainage engineer

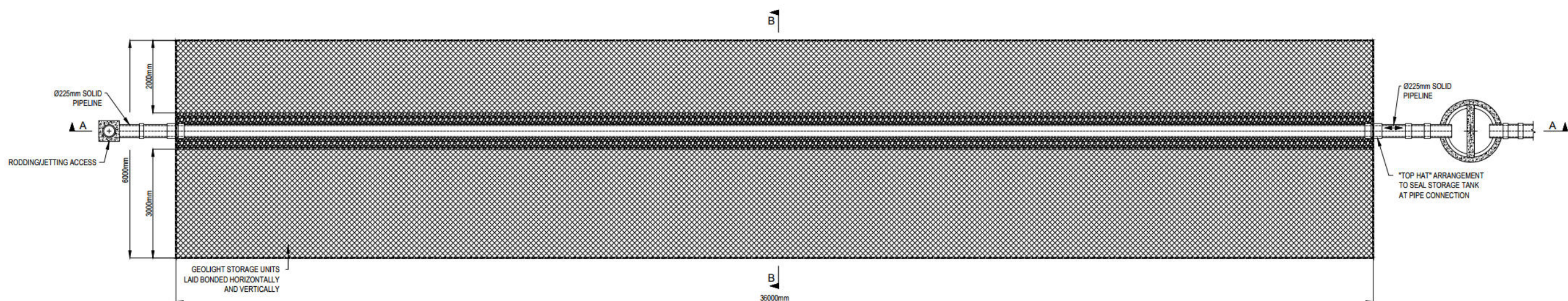
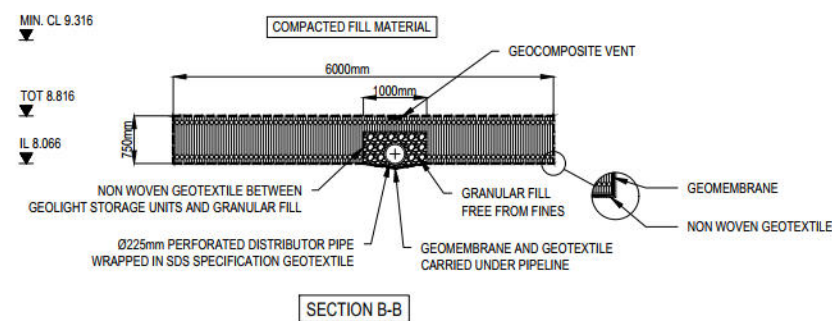
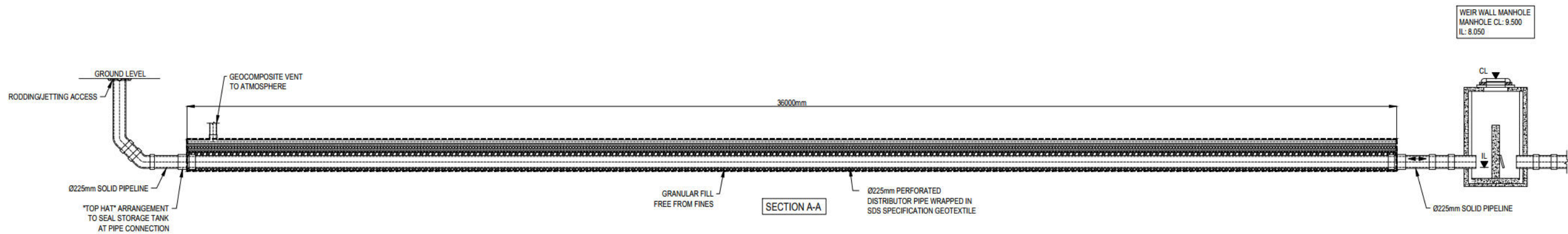
REV	DATE	DESCRIPTION	BY	CHKD
01	15.11.20	DT reference numbers added	SRL	MR
02	15.11.20	Revised to Southern Water comments	SRL	MR
03	15.11.20	Revised to WSCC comments	SRL	MR
04	15.11.20	Revised to WSCC comments	SRL	MR
05	15.11.20	Revised to WSCC comments	SRL	MR
06	15.11.20	Revised to WSCC comments	SRL	MR
07	15.11.20	Revised to WSCC comments	SRL	MR
08	15.11.20	Revised to WSCC comments	SRL	MR
09	15.11.20	Revised to WSCC comments	SRL	MR
10	15.11.20	Revised to WSCC comments	SRL	MR
11	15.11.20	Revised to WSCC comments	SRL	MR
12	15.11.20	Revised to WSCC comments	SRL	MR
13	15.11.20	Revised to WSCC comments	SRL	MR
14	15.11.20	Revised to WSCC comments	SRL	MR
15	15.11.20	Revised to WSCC comments	SRL	MR
16	15.11.20	Revised to WSCC comments	SRL	MR
17	15.11.20	Revised to WSCC comments	SRL	MR
18	15.11.20	Revised to WSCC comments	SRL	MR
19	15.11.20	Revised to WSCC comments	SRL	MR
20	15.11.20	Revised to WSCC comments	SRL	MR

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REDROW
HOMES
RHP
ANGEL & HYDE NURSERIES
YAPTON ROAD
BARNHAM

SITE DRAINAGE
SHEET 1 OF 2

11/19812 1/200 NOVEMBER 2019
MR D1 SUITABLE FOR CONSTRUCTION
C7 STAGE 5 - CONSTRUCTION
19812-GS-Z1-XX-DR-C-2060



Notes:

This Drawing is to be read in conjunction with all relevant Architect's Engineer's and specialists' drawings and specifications.

Do not scale from this drawing in either paper or digital form. Use written dimensions only.

SDS to leave solid stub only, exiting tank for connection by others.

All external Manholes, Access Points, Junctions & Pipes are shown for guidance only and not part of the SDS program unless otherwise agreed.

Rev	Comments	Date	DRW	CHK
A	AMENDED PER NEW REF DRAWING	30.09.20	GM	SP
	ISSUED FOR APPROVAL	08.09.20	GM	SP
	ISSUED FOR APPROVAL	08.09.20	GM	SP



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ATTENUATION TANK 1 DETAIL

Drawing Number	Revision	Drawing Title	Date
2060	C4	SITE DRAINAGE SHEET 1 of 2	24.09.20

Scale	NTS	Date	08.09.20
Drawing No	E199320_01_A	Rev	A

APPENDIX 2 - AS-BUILT CONSTRUCTION PHOTOGRAPHS

The following photographs 1-18 were taken during the course of construction between 22nd April to 7th September, 2021 to demonstrate that the works were undertaken in accordance with the design and specification



Photo 1 - Excavation of pond looking from east to west



Photo 2 - Excavation of pond looking from west to east, note slope of southern bank too steep, corrected later with clay liner



Photo 3 - Installation of bentonite liner and placement of blue clay pond liner



Photo 4 - Shaping southern bank to achieve 1 in 3 slope



Photo 5 - Compaction of blue clay liner



Photo 6 - Blue clay liner looking west towards inlet pipe



Photo 7 - Placing 150mm topsoil layer over clay



Photo 8 - Top soil layer looking east, trimmed and compacted



Photo 9 - Installation of bio-degradable erosion mat, east end looking at outfall



Photo 10 - Finished bio-degradable erosion mat looking west



Photo 11 - Excavation for attenuation tank, note level control, and fines free shingle backfill



Photo 12 - Shingle base complete



Box 13 - Shows central perforated pipe wrapped in geotextile back filled with fines free shingle crates both sides looking east



Box 14 - Shows central perforated pipe wrapped in geotextile back filled with fines free shingle crates both sides looking west



Photo 15 - Drainage crates wrapped in geo-membrane (seen here black), welded joints and wrapped in a geotextile (seen here white)



Photo 16 - Shows welded geo-membrane around air vent



Photo 17 - Backfill of attenuation tank looking east



Photo 18- Backfill of attenuation tank looking west

ADDENDUM

Further to the initial brief TDS were requested to undertake further works to include:

- 1) Confirm the volume of the pond
- 2) Confirm the installation and construction of the permeable paving

1. The Pond

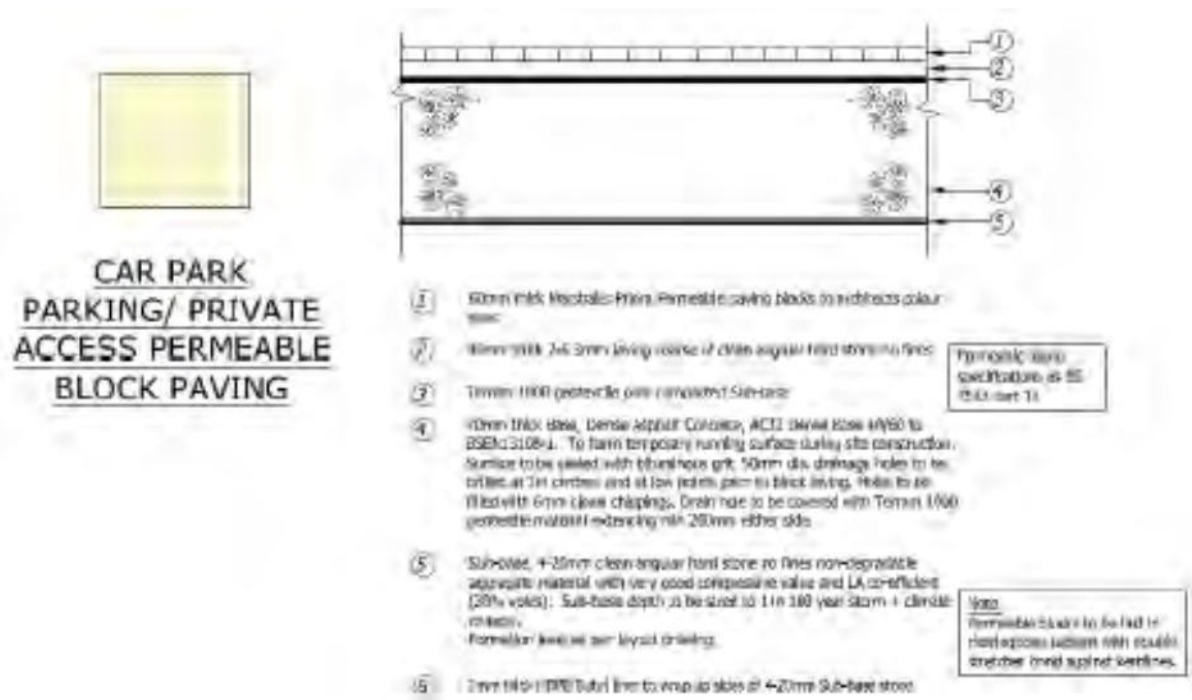
In order to determine the volume of the pond TDS were provided with a drone GPS survey of the site. Inspection of the data showed that this survey did not show any levels on the top of the embankment along the southern boundary. A subsequent site inspection revealed a possible low section on the eastern half of the embankment, consequently a further level survey was requested which confirmed that a section was low by up to 200mm. Remedial works were undertaken and a further survey verified a minimum top of embankment level of 9.3m as per design which exceeds the requirement for a 1 in 100 storm + 40%.



The GPS survey confirms the footprint of the pond and base levels were as per the design. Consequently, TDS can confirm therefore that the volume of the pond would be as per design

2. Permeable Paving

TDS have observed the installation of the permeable paving zones 3, 4 and 5 and can confirm that these areas have been constructed as per the design, see Drawing No. 19812-GS-Z1-XX-DR-C-2103 Private External Works Construction Details (below)



Additionally TDS can confirm the installation of the collection / distribution tanks and their connection to wiered control chambers which in turn connect to the main system at MH's S11 and S35 (See Appendix 1 Site Drainage)

The photographs 1- 5 below show the installation of the permeable paving, Zones 3&4 undertaken between the 29th June - 7th July 2022; Zone 5 was undertaken between the 10th-28th October 2022.

Further to the original report I Stuart Smith hereby confirm that the contents of this Addendum are correct and a true reflection of what happened on site between 29th July - 1st November 2022.



2nd November, 2022



Photo taken 29/06/22

Zone 3 and 4



Photo taken 01/11/22

Zone 5

Photo 1 - Drainage holes drilled through asphalt base (Zone 5 also shows terram layer)



Photo 2 – Laying of Terram and 6mm chip bed (Photo taken 30/06/22)



Photo 3 – Laying 60mm permeable blocks zone 3 and 4 (Photo taken 6/07/22)



Photos taken 24/10/22

Photo 4 - Zone 5 Permeable paving mid construction, shows paving blocks on grit bed over terram



Photo 5 - Permeable Paving complete Zone 5 (Picture taken 1/11/22)

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