

RIVERSIDE – REPLACEMENT DWELLING DRAINAGE – FOR PLANNING DOC

Drainage Information for Proposed Replacement Dwelling & Outbuildings

Revision P9

For;
Southern Rock Property

Site Address
Riverside,
Bolney Chapel Road,
Twineham,
RH17 5NN

Issued
15th July 2025

Our Reference
23-040



CREATIVE
STRUCTURES

DOCUMENT ISSUE REGISTER

Job	RIVERSIDE – REPLACEMENT DWELLING			
Document	DRAINAGE – FOR PLANNING DOC			
Issue	Date	Description	By	Checked
P1	21/04/2022	For DOC Approval	Philip Wainwright, CEng, MIstructE	22/04/2022
P2	27/04/2022	For DOC Approval	Philip Wainwright, CEng, MIstructE	27/04/2022
P3	22/06/2022	For DOC Approval	Philip Wainwright, CEng, MIstructE	23/06/2022
P4	24/07/2023	For DOC Approval	Philip Wainwright, CEng, MIstructE	25/07/2023
P5	27/09/2023	For DOC Approval	Philip Wainwright, CEng, MIstructE	27/09/2023
P6	09/07/2024	For DOC Approval	Philip Wainwright, CEng, MIstructE	09/04/2024
P7	12/12/2024	For DOC Approval	Philip Wainwright, CEng, MIstructE	13/12/2024
P8	28/03/2025	For DOC Approval	Philip Wainwright, CEng, MIstructE	28/03/2025
P9	15/07/2025	For DOC Approval	Philip Wainwright, CEng, MIstructE	15/07/2025

REVISION NOTES

P1 – THIS ISSUE COVERS THE DRAINAGE ONLY AND IS AIMED AT DISCHARGING THE PLANNING CONDITION AS EARLY AS POSSIBLE TO STREAMLINE THE PROGRAMME.

P2 – THIS ISSUE COVERS THE UPDATED FOOTPRINT AND LANDSCAPING TO LOXLEY HOUSE ONLY. THIS INCREASES THE VOLUME OF ATTENUATION REQUIRED.

P3 – THIS ISSUE COVERS THE SPLITTING OF THE DRAINAGE FEATURES, PER DWELLING FOR EASE OF FUTURE MAINTENANCE. THE SITE LEVELS HAVE ALSO BEEN ADDED WITH ALL DRAINAGE LEVELS ADDED TO ADDRESS DRAINAGE OFFICER COMMENTS.

A NOTE HIGHLIGHTING THE NEED FOR A MAINTENANCE AND ACCESS EASEMENT HAS ALSO BEEN ADDED.

P4 – THIS ISSUE COVERS THE CHANGE FROM THE PREVIOUS ‘LITTLE LOXLEY’ PROPOSAL TO THE LARGER ‘RIVERSIDE PROPOSAL. THE POINT OF DISCHARGE TO THE WATERCOURSE HAS BEEN MODIFIED TO SUIT THE NEW BUILDING LOCATION. THE DISCHARGE RATE REMAINS AT 1.0l/s, HOWEVER THE SIZE OF THE ATTENUATION HAS INCREASED TO SUIT THE LARGER CATCHMENT AREA(S).

P5 – THIS ISSUE COVERS THE INCREASE IN THE CLIMATE CHANGE FACTOR, IN LINE WITH GOV.UK GUIDANCE ON PEAK RAINFALL INTENSITIES. THE INCREASE FROM 40% TO 45% CC FACTOR INCREASES THE REQUIRED SIZE OF ATTENUATION FOR THE 1-in-100 YEAR EVENT FROM 51m³ TO 52m³ ONLY.

P6 – THIS ISSUES COVERS THE VOC FOR RIVERSIDE, WHERE THE DWELLING FOOR CATCHMENT AREA IS NOMINALLY INCREASED FROM 474.5m² TO 511.9m² (37.4m² INCREASE) AND THE REAR PATIO HARDSTANDING AREA FROM 187.6m² TO 615.2m²(427.6m² INCREASE). THIS REPRESENTS A 465m² TOTAL CATCHMENT AREA INCREASE THAT REQUIRES AN INCREASE FROM 52m³ OF ATTENUATION TO 102m³ OF ATTENUATION TO LIMIT THE NEW FLOWS TO 1l/s.

PREVIOUSLY THIS REPORT COVERED BOTH LOXLEY HOUSE & RIVERSIDE, AS THESE WERE ORIGINALLY ONE JOINT APPLICATION, HOWEVER THIS PROJECT (RIVERSIDE) IS NOW IN NEW OWNERSHIP AND THUS THE PREVIOUSLY INSTALLED ADJACENT PROPERTY, LOXLEY HOUSE HAS BEEN OMITTED FROM THIS REPORT. THE CONVEYANCING FOR RIVERSIDE INCLUDED THE REQUIRED EASEMENTS FOR LOXLEY TO DRAIN ACROSS THE NEW BOUNDARY LINE, IN ADDITION TO RIVERSIDE HAVING PERMISSION TO ROUTE THE EXISTING LOXLEY DRAINS AROUND ANY NEW EXTERNAL PATIO DEVELOPMENTS.

P7 – THIS ISSUES COVERS THE ADDITION OF THE OUTBUILDINGS AND THE UPDATED LANDSCAPING LEVELS FOR RIVERSIDE. THIS REPRESENTS A NOMINAL INCREASE IN TOTAL CATCHMENT AREA THAT REQUIRES AN INCREASE FROM 102m³ OF ATTENUATION TO 109m³ OF ATTENUATION TO LIMIT THE NEW FLOWS TO 1l/s.

ONLY DRAWING 51 IS UPDATED WITH ALL CHANGES CLOUDED. THE NEW CALCULATIONS ARE INCLUDED WITHIN SECTION C.

P8 – THE FFL & EXTERNAL HARDSCAPING LEVELS HAVE BEEN RAISED 600mm ONLY. THIS DOES NOT AFFECT THE DESIGN, NOR CALCULATIONS. ONLY THE COVER & INVERT LEVELS HAVE BEEN UPDATED, WITH ONLY DRAWING 51 REVISED, TO SUIT

P9 – THE EXTERNAL LANDSCAPING & LEVELS HAS BEEN UPDATED TO SUIT THE AGREED FLOOD RISK COMPENSATION SCHEME. THIS NOMINALLY REDUUCES THE REAR PATIO AREA AND THUS NOMINALLY REDUCES THE SIZE OF ATTENUAITON REQUIRED FROM 109m³ TO 104.7m³. THE CALCULAITONS WITHIN SECTION C ARE UPDATED WITH A REVISED UKSUDS CALCULATION THAT NOW INCLUDES SITE SPECIFIC RAINFALL DATA, PURCHASED FROM THE UK CENTRE FOR ECOLOGY & HYDROLOGY.

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SECTION A

PROJECT DETAILS

1) Local Authority:

MID-SUSSEX DC

2) Based on architectural drawings:

BY GOULD BAXTER

3) Parts of structure:

DRAINAGE ONLY

4) Design assumptions made in calculations:

a) *N/A*

PROJECT OVERVIEW & DESIGN PHILOSOPHY

Introduction

The proposed works at Riverside comprise the demolition of the existing East Hookers) detached annex building and the construction of a new dwelling.

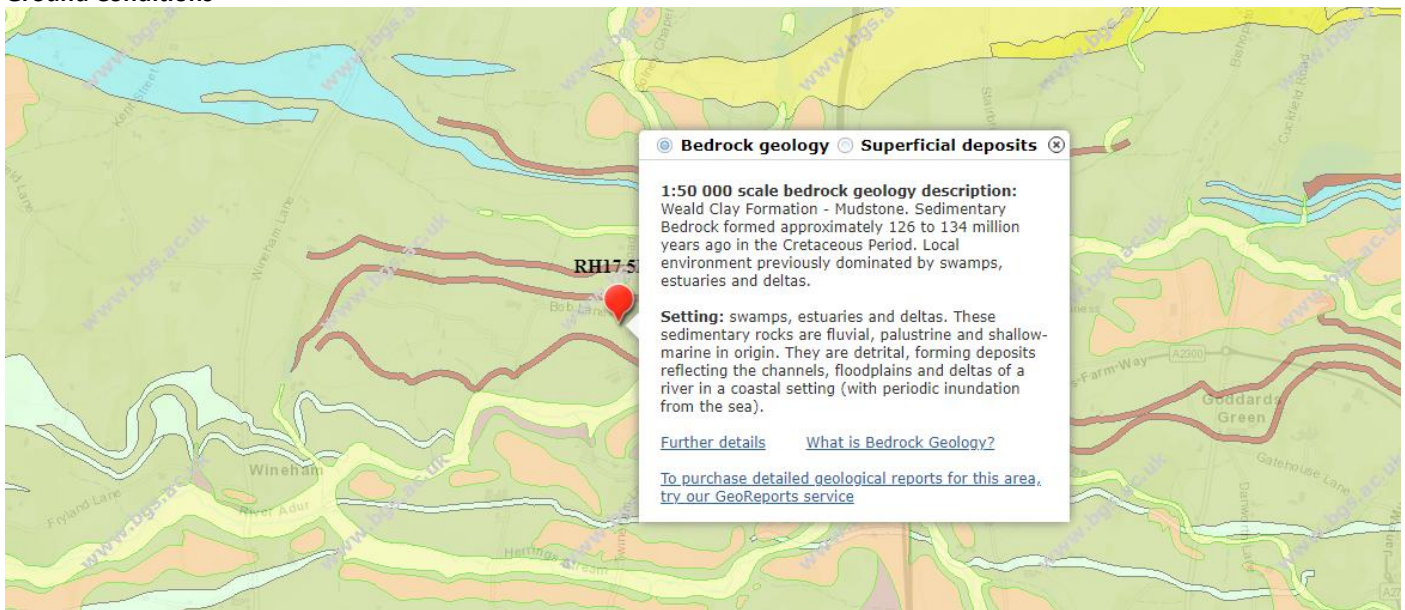
These proposals have previously been approved for the previous scheme. The drainage for the adjacent property, Loxley House have been installed. Thus, this package of information addresses the revised Riverside drainage design to enable the planning condition to be discharged. We have also been appointed to undertake the main sub and super structure design for the replacement building. This is detailed within a separate Building Regulations package of information.

The existing site comprises a two-storey brick building with pitched roof and a detached annex bungalow in addition to fields and a tennis court. At the bottom of the site (to the South-East) is the Holmbush Gill portion or the River Adur (see OS map extract on the next page).

The existing foul drainage arrangement comprises a shared foul treatment plant/septic tank between the original East Hookers dwelling & detached bungalow/annex. There are no known overflows or drains running down to the watercourse. The new foul drainage strategy comprises a foul treatment plant, which discharges to the watercourse at the bottom (north) of the site.

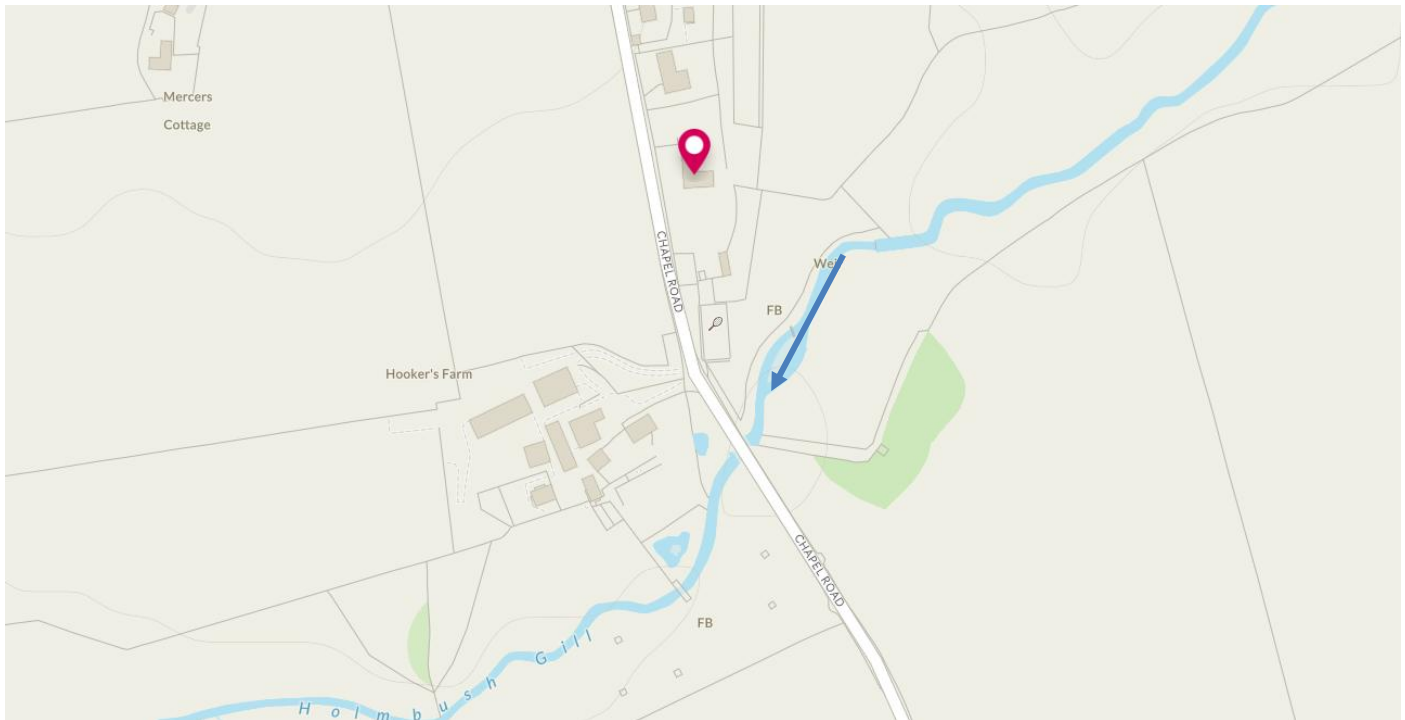
The new stormwater drainage proposals for Riverside, the Outbuildings and the rear Patio Area(s) comprise typical RWP that route to an attenuation tank with a controlled outflow to the adjacent river. The flows are controlled to 1.0 l/s,

Ground Conditions



The above figure is taken from the British Geological Survey website and shows that the site lies within the Weald Clay Formations. We are involved in a site just 200m away, where falling head tests confirmed the subsoils are non-porous.

Watercourse Network



The image above is taken from the Ordnance Survey (OS) website and shows the site location (red drop) with the river network connecting to the South-East. The arrow in blue shows the direction that the river flows.

The links below show videos taken from site on 23rd March 2022. They show the river at the base of the site.

https://www.dropbox.com/s/mmdnvzwld1m6wcw/IMG_6601.MOV?dl=0

https://www.dropbox.com/s/gatv0nikbnivcuv/IMG_6605.MOV?dl=0

See photos on the following pages – These are to be read in conjunction with plan drawing 24-040-51



Image 01 – Showing the existing East Hookers Dwelling



Image 02 – View looking South from the main dwelling showing the detached Annex/Bunglallow



Image 03 – View looking South along the River Adur at the base of the garden (direction of flow)



Image 04 – View looking North along the River Adur at the base of the garden (against the flow).

SECTION B

DRAWINGS

- 22-016-51_P8 PROPOSED SITE DRAINAGE PLAN (PREVIOUS INCLUDED FOR COMPARISON)
- 22-016-51_P9 PROPOSED SITE DRAINAGE PLAN (UPDATED TO SUIT RAISED LEVELS)
- 22-016-52 PROPOSED DRAINAGE DETAILS – SHEET 1 of 2
- 22-016-53 PROPOSED DRAINAGE DETAILS – SHEET 2 of 2

COMING SOON LANDSCAPE

SITE NOTES/OBSERVATIONS

THE SITE IS LOCATED WITHIN THE WEALD CHURCH PARISH.
THE SITE ADJACENT TO PUBLIC RIGHTS WITHIN THE HIGHWAY (BOLNEY CHAPEL ROAD).
THE EXISTING DWELLINGS WERE SERVED BY AN EXISTING SEPTIC TANK.
THE EXISTING STORMWATER SYSTEMS COULD NOT BE CONFIRMED DURING OUR VISIT ON 23rd MARCH 2022. THESE EITHER DISCHARGED IN TO THE LOCAL DITCHES ON SITE WHICH ULTIMATELY RUN DOWN TO THE RIVER ADJUR AT THE BASE OF THE SITE OR THEY ROUTE DIRECTLY TO THE RIVER ADJUR.
THE ADJACENT DWELLINGS (THE ADJACENT CONSTRUCTED LOKLEY HOUSE & THE RIVERSIDE PROJECT) ARE TO BE PROVIDED WITH SEPARATE FOUL TREATMENT PLANTS & SEPARATE STORMWATER ATTENUATION SYSTEMS.

PLEASE NOTE: ALL COVER LEVELS TO BE CONFIRMED FOLLOWING CONFIRMATION OF ALL EXTERNAL LEVELS.

MAIN CONTRACTOR TO CHECK EXISTING INVERT LEVELS IN ROAD PRIOR TO ANY DRAINAGE WORKS COMMENCING TO ENSURE THAT THE LEVELS AS STATED ON THIS DRAWING ARE CORRECT AND THAT THE PROPOSED DRAINAGE SCHEME WORKS.

MAIN CONTRACTOR TO CONFIRM AND ALLOW FOR REMOVAL OF ALL REDUNDANT DRAINS ON SITE AND CAPPING OFF TO LIVE DRAINS, ETC AS REQUIRED.

ALL RWP AND SVP'S TO HAVE RODDING EYES.

ALL GAS, TELECOMMS, WATER etc UTILITY SERVICES TO BE DIVERTED/RELOCATED AS REQUIRED. SERVICES DESIGN BY OTHERS.

DRAINAGE NOTES:

- PIPEWORK TO BE UPVC-U PIPES & INSPECTION CHAMBERS TO BS EN 13598-1:2020
- ALL PRIVATE DRAINAGE TO BE IN ACCORDANCE WITH THE BUILDING REGULATIONS APPROVED DOCUMENT 'F', BS EN 752:2017 AND TO THE SATISFACTION OF THE BUILDING CONTROL OFFICER
- ALL ADOPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH 'SEWERS FOR ADOPTION' 7TH EDITION AND THE RELEVANT COUNCIL DESIGN GUIDE.
- ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 80 UNLESS OTHERWISE STATED ON THE DRAWING.
- ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
- ALL PRIVATE SEWER PIPES TO BE 110 DIAMETER UNLESS OTHERWISE STATED ON THE DRAWING.
- EXISTING SEWER PIPE(S), WHERE APPLICABLE TO BE RE-USED TO BE SURVEYED AND LEVELLED PRIOR TO THE COMMENCEMENT OF THE DRAINAGE WORKS AND REFURBISHED IF NECESSARY.
- CONNECTIONS TO AN ADOPTED SEWER ONLY TO BE MADE FOLLOWING APPROVAL FROM THE RELEVANT ADOPTING AUTHORITY. (ALL APPROVALS TO BE BY OTHERS)
- ALL SEWER PIPE AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.
- ALL SVP'S TO HAVE TELESCOPIC PIPES BETWEEN GF & IL OF PIPE.

RAINWATER / STORM ATTENUATION DESIGN

EXISTING CATCHMENT AREA(S)
EXISTING ANNEX/BUNGALOW & HARDSTANDING = 78.51m²

EXISTING DESIGN RAINFALL (WALLINGFORD PROCEDURE):
1 IN 2 YEAR = 0.71%
1 IN 100 YEAR = 1.51%

PROPOSED CATCHMENT AREA = 511.9m²
PROPOSED MAIN DWELLING ROOF = 222.6m²
PROPOSED REAR PATIO(S) = 421.6m²
PROPOSED SHED = 13.5m²
PROPOSED TOTAL CATCHMENT AREA = 1175m² (0.1175ha)
PROPOSED RIVERSIDE SITE AREA = 6378.4m² (0.63784ha)

REQUIRED ATTENUATION VOLUME TO LIMIT FLOW RATES TO 1.01% IS = 109.0m³

PROPOSED SIZE IS 24m LONG x 6m WIDE x 0.8m DEEP & LOCATED WHERE THE GROUND LEVEL IS ABOVE 10.70m. THIS PROVIDES 109.44m³ OF EFFECTIVE STORAGE WITH 95% FREE AREA CRATES.

DESIGN VARIABLES INC 45% GLOBAL WARMING FACTOR FOR A 6-HOUR STORM & a 1-IN-100 YEAR EVENT

THE EXISTING FLOW RATES IGNORE THE HARDSTANDING AND PATIO AREAS. THE NEW DEVELOPMENT WILL UTILISE PERMEABLE FINISHES THROUGHOUT THE FRONT/UPPER DRIVEWAY AND FOOTPATH AREAS.

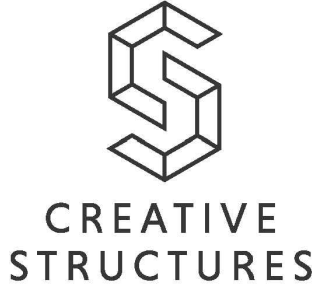
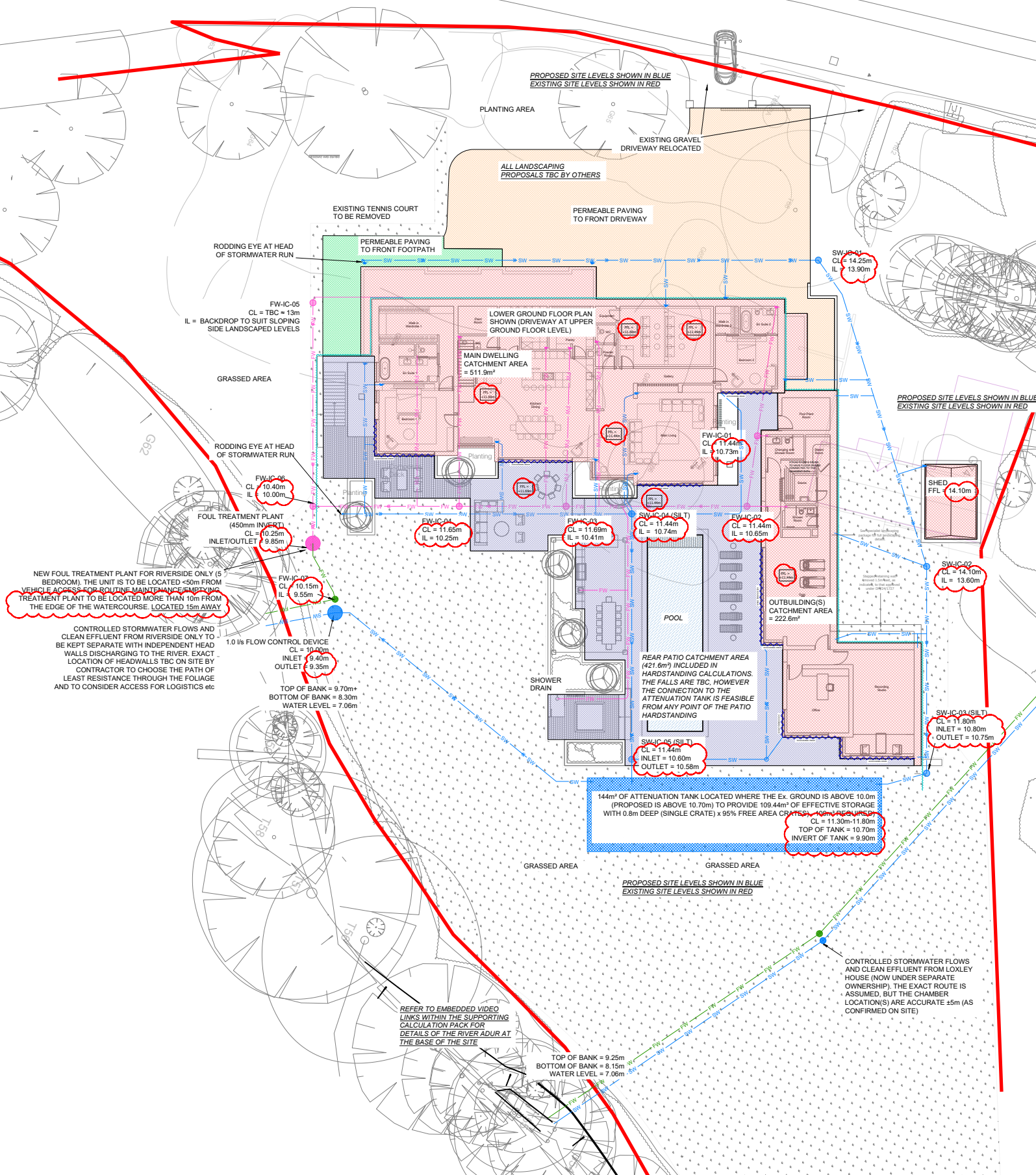
THE POOL DRAINAGE WILL BE BY THE SPECIALIST POOL SUPPLIER. THIS WILL BE VIA A HOLDING TANK FOR ANY BACK WASH. THIS TANK HOLDS THE CHLORINATED WATER FOR THE REQUIRED LENGTH OF TIME (~10 DAYS) SUCH THAT THE CHLORINE EVAPORATES AND POTABLE WATER IS LEFT, WHICH CAN BE DISCHARGED VIA THE MAINS DRAINS, OR TO THE WATERCOURSE VIA THE STORMWATER DRAINS. THIS AMOUNTS TO <1m³ EVERY 2 WEEKS, THIS VERY NOMINAL.

FOUL DRAINAGE DESIGN

THE NEW FOUL DRAINS FOR THE DWELLING IS TO ROUTE TO NEW INDEPENDENT FOUL TREATMENT PLANT. THIS THEN DISCHARGE THE CLEAN EFFLUENT TO THE WATERCOURSE/RIVER NETWORK AT THE BOTTOM OF THE SITE VIA A NEW INDEPENDENT HEADWALL INSTALLATION, OR AS REQUIRED TO MEET THE EA BINDING RULES.

MEMBER KEY:

- FW - PROPOSED FOUL WATER DRAIN
- SW - PROPOSED SURFACE WATER DRAIN
- PROPOSED CLEAN EFFLUENT DRAIN FROM FOUL TREATMENT PLANT
- LAND DRAIN TO REVERSE FACE OF RETAINING WALL TO DISCHARGE TO LOWER GARDEN AREA ONLY
- AC/CHANNEL DRAIN
- FW-IC-01 - PROPOSED FOUL WATER INSPECTION CHAMBER / FOUL TREATMENT PLANT
- SW-IC-01 - PROPOSED SURFACE WATER INSPECTION CHAMBER / SILT TRAP / FLOW CONTROL DEVICE
- PROPOSED SURFACE WATER ATTENUATION TANK
- DENOTES ARE OF PERMEABLE PAVING AROUND DWELLING - BODPAVE, FORMPAVE, OR SIMILAR
- DENOTES AREA OF PERMEABLE ROADS AND HARDSTANDING FOR VEHICLE TRAFFIC - BODPAVE, FORMPAVE, OR SIMILAR
- DENOTES ARE OF NON-PERMEABLE INDIAN PAVING, OR SIMILAR TO REAR PATIO(S) - 421.6m²
- DENOTES ROOF CATCHMENT AREAS - 748m²
- SVP - SOIL AND VENT PIPE
- RWP - RAINWATER PIPE
- N/A + LEVELS



Client
SOUTHERN ROCK PROPERTY

Project
RIVERSIDE
TWINEHAM, RH17 5NN

Title
SITE DRAINAGE PLAN

FOR PLANNING DOC

Date 09.07.2024 Checked 09.07.2024

Sheet 23-040

Scale AS SHOWN AT A1 Engineer PW

Status FOR PLANNING DOC

Project Number Drawing Number Revision

23-040 51 P8

REV	DESCRIPTION	DATE	BY
B2	RIVERSIDE ATTENUATION INCREASED TO SUIT 45% CC	27.09.2023	PW
P6	RIVERSIDE ATTENUATION INCREASED TO SUIT LARGER VOC ROOF & REAR PATIO CATCHMENT AREAS	09.07.2024	PW
P7	OUTBUILDINGS ADDED & LANDSCAPING LEVELS UPDATED (ATTENUATION REQ INCREASES FROM 102.2m ³ TO 109m ³). TANK LOCATION RELOCATED TO HIGHER GROUND LEVEL(S)	13.12.2024	PW
P8	LEVELS RAISED 600mm, FOUL TREATMENT LOCATION NOTE ADDED & LAND DRAIN TERMINATION UPDATED TO LOWER GARDEN AREA(S)	28.03.2025	PW

NOTES:-

- THIS DRAWING IS NOT TO BE SCALED. WORK FROM GIVEN DIMENSIONS ONLY.
- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICE ENGINEERS AND SPECIALISTS DRAWINGS.
- ANY DISCREPANCIES OR VARIATIONS ARE TO BE REPORTED IMMEDIATELY TO ENGINEER FOR CLARIFICATION BEFORE THE AFFECTED WORK COMMENCES.
- ALL DIMENSIONS ARE TO BE CHECKED ON SITE. ANY DISCREPANCIES TO BE REPORTED TO ENGINEER IMMEDIATELY BEFORE THE AFFECTED WORK COMMENCES.
- ALL PROPRIETARY PRODUCTS ARE TO BE USED IN ACCORDANCE WITH THE MANUFACTURERS DETAILS AND SPECIFICATIONS.
- THE CONTRACTOR IS TO ENSURE THAT TEMPORARY LOADS PLACED ONTO THE NEW STRUCTURES SHALL BE LESS THAN THE LOADS FOR WHICH IT HAS BEEN DESIGNED.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
- THESE DRAWINGS CONSTITUTE A FULL DESIGN FOR BUILDING CONTROL APPROVAL. THEY ARE NOT CONSTRUCTION STAGE DRAWINGS UNTIL BUILDING CONTROL HAVE APPROVED THE DESIGN(S).
- FOR THE FULL COMPREHENSIVE GENERAL NOTES SEE GENERAL NOTES DRAWING 99.

WARNING IDENTIFICATION

PARTICULAR ATTENTION TO BE PAID WHERE THE HAZARD SYMBOL IS PLACED ON A DRAWING. THIS SYMBOL HIGHLIGHTS A PARTICULAR CONCERN IN RELATION TO THE DESIGN, SITE WORKING OR WHERE THE CONTRACTORS ATTENTION IS REQUIRED.

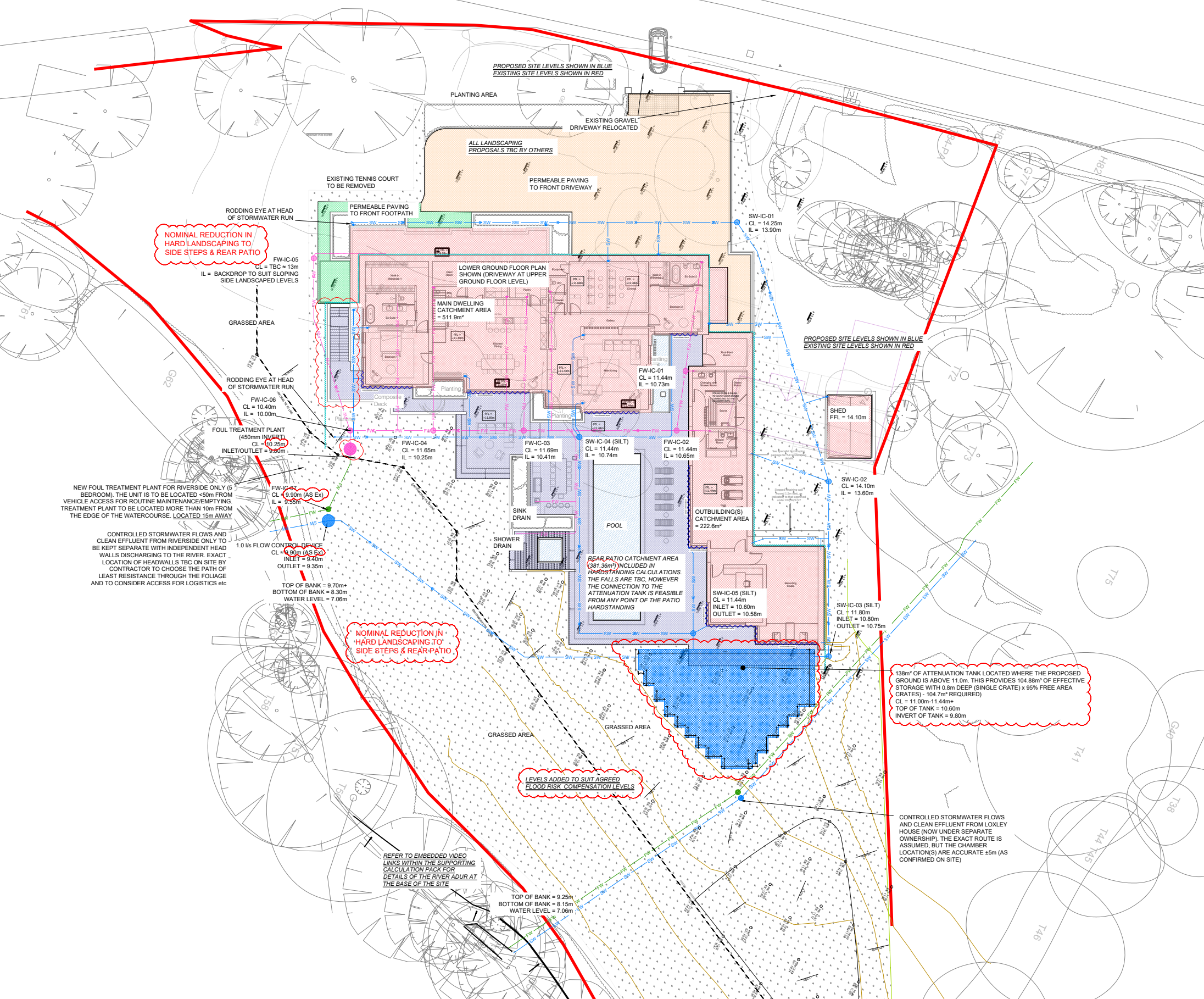
MEASURES TO MITIGATE RISK SHOULD BE CONSIDERED AT ALL STAGES OF DESIGN DEVELOPMENT AND CONSTRUCTION.

COORDINATION HIGHLIGHT

WHERE THE BLUE HIGHLIGHT SYMBOL IS PLACED ON A DRAWING PARTICULAR ATTENTION IS REQUIRED WITH REGARD TO COORDINATION.

STABILITY REQUIREMENT HIGHLIGHT

WHERE THE GREEN HIGHLIGHT SYMBOL IS PLACED ON A DRAWING THIS REFERS TO THIS ELEMENT OF THE DESIGN BEING CRITICAL TO THE STABILITY STRATEGY



SITE NOTES/OBSERVATIONS

THE SITE IS LOCATED WITHIN THE WEALD CLAY FORMATION.

THERE ARE NO PUBLIC SEWERS WITHIN THE HIGHWAY (BOLNEY CHAPEL ROAD).

THE EXISTING DWELLINGS WERE SERVED BY AN EXISTING SEPTIC TANK.

THE EXISTING STORMWATER FLOWS COULD NOT BE CONFIRMED DURING OUR VISIT ON 23rd MARCH 2022. THESE EITHER DISCHARGED IN TO THE LOCAL DITCHES ON SITE, WHICH ULTIMATELY RUN DOWN TO THE RIVER ADUR AT THE BASE OF THE SITE, OR THEY RAN DIRECTLY TO THE RIVER ADUR.

THE 2ND NEW DWELLINGS (THE ADJACENT CONSTRUCTED LUXLEY HOUSE & THIS RIVERSIDE PROJECT) ARE TO BE PROVIDED WITH SEPARATE FOUL TREATMENT PLANTS & SEPARATE STORMWATER ATTENUATION SYSTEMS.

PLEASE NOTE: ALL COVER LEVELS TO BE CONFIRMED FOLLOWING CONFIRMATION OF ALL EXTERNAL LEVELS.

MAIN CONTRACTOR TO CHECK EXISTING INVERT LEVELS IN ROAD PRIOR TO ANY DRAINAGE WORKS COMMENCING TO ENSURE THAT THE LEVELS AS STATED ON THIS DRAWING ARE CORRECT AND THAT THE PROPOSED DRAINAGE SCHEME WORKS.

MAIN CONTRACTOR TO CONFIRM AND ALLOW FOR REMOVAL OF ALL REDUNDANT DRAINS ON SITE AND CAPPING OFF TO LIVE DRAINS, ETC AS REQUIRED.

ALL RWP AND SVP'S TO HAVE RODDING EYES.

ALL GAS, TELECOMMS, WATER etc UTILITY SERVICES TO BE DIVERTED/RELOCATED AS REQUIRED. SERVICES DESIGN BY OTHERS.

RAINWATER / STORM ATTENUATION DESIGN

EXISTING CATCHMENT AREA(S)
EXISTING ANNEX/BUNGALOW & HARDSTANDING = 78.51m²

EXISTING DESIGN RAINFALL (WALLINGFORD PROCEDURE):
1 IN 2 YEAR = 0.7 l/s
1 IN 100 YEAR = 1.5 l/s

PROPOSED CATCHMENT AREA
PROPOSED MAIN DWELLING ROOF = 511.9m²
PROPOSED OUTBUILDING(S) = 222.6m²
PROPOSED SHED = 13.50m²
TOTAL ROOF AREA(S) = 748.0m² (0.0748ha)

PROPOSED REAR PATIO(S) = 381.4m² (0.03814ha)

PROPOSED TOTAL CATCHMENT AREA = 1129.4m² (0.11294ha)

PROPOSED RIVERSIDE SITE AREA = 6378.4m² (0.63784a)

REQUIRED ATTENUATION VOLUME TO LIMIT FLOW RATES TO 1.0 l/s IS = 104.7m³

138m³ OF ATTENUATION TANK LOCATED WHERE THE PROPOSED GROUND IS ABOVE 11.0m. THIS PROVIDES 104.88m³ OF EFFECTIVE STORAGE WITH 0.8m DEEP (SINGLE CRATE) x 95% FREE AREA (CRATES)

DESIGN VARIABLES INC 45% GLOBAL WARMING FACTOR FOR A 6-HOUR STORM & a 1-IN-100 YEAR EVENT BASED ON SPECIFIC RAINFALL DATA FOR THE SITE COORDINATES (OBTAINED FROM THE UK CENTRE FOR ECOLOGY & HYDROLOGY USING THE FEH22 METHOD).

THE EXISTING FLOW RATES IGNORE THE HARDSTANDING AND PATIO AREAS. THE NEW DEVELOPMENT WILL UTILISE PERMEABLE FINISHES THROUGHOUT THE FRONT/UPPER DRIVEWAY AND FOOTPATH AREAS.

THE POOL DRAINAGE WILL BE BY THE SPECIALIST POOL SUPPLIER. THIS WILL BE VIA A HOLDING TANK FOR ANY BACK WASH. THIS TANK HOLDS THE CHLORINATED WATER FOR THE REQUIRED LENGTH OF TIME (~10 DAYS) SUCH THAT THE CHLORINE EVAPORATES AND POTABLE WATER IS LEFT, WHICH CAN BE DISCHARGED VIA THE MAINS DRAINS, OR TO THE WATERCOURSE VIA THE STORMWATER DRAINS. THIS AMOUNTS TO <1m³ EVERY 2 WEEKS, THUS VERY NOMINAL.

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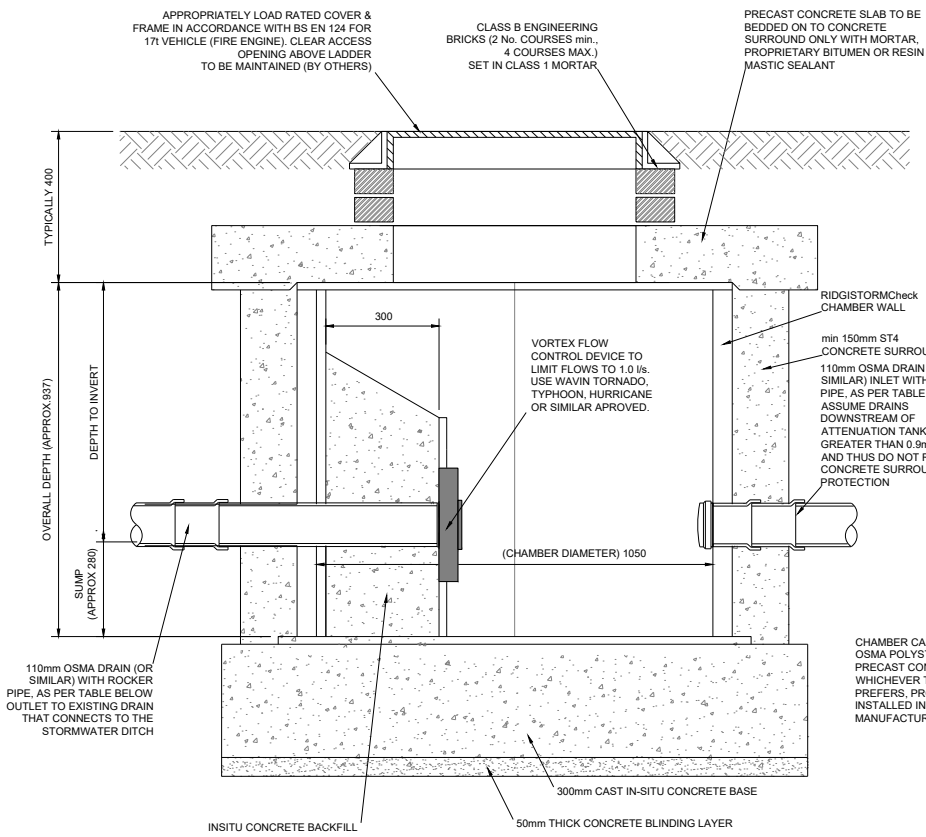
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- LAND DRAIN TO REVERSE FACE OF RC RETAINING WALL TO DISCHARGE TO LOWER GARDEN AREA ONLY
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- DENOTES ARE OF NON-PERMEABLE INDIAN PAVING, OR SIMILAR TO REAR PATIO(S) - 681.36m²
- DENOTES ROOF CATCHMENT AREAS - 748m²
- SVP SOIL AND VENT PIPE
- RWP RAINWATER PIPE
- N/A + LEVELS

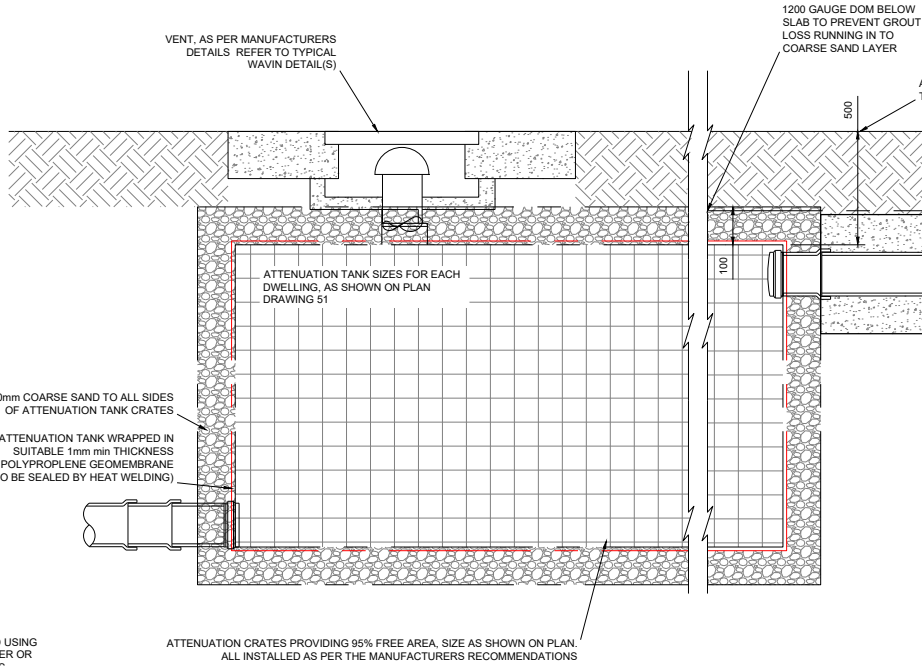
DRAINAGE NOTES:

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- ALL ADOPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH 'SEWERS FOR ADOPTION' 7TH EDITION AND THE RELEVANT COUNCIL DESIGN GUIDE.
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- ALL PRIVATE FOUL WATER SEWERS TO BE LAID AT 1 IN 40 AT THE HEAD OF PIPE RUNS AND 1 IN 80 ELSEWHERE UNLESS OTHERWISE STATED.
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- ALL SVP'S TO HAVE TELESCOPIC PIPES BETWEEN GF & IL OF PIPE.

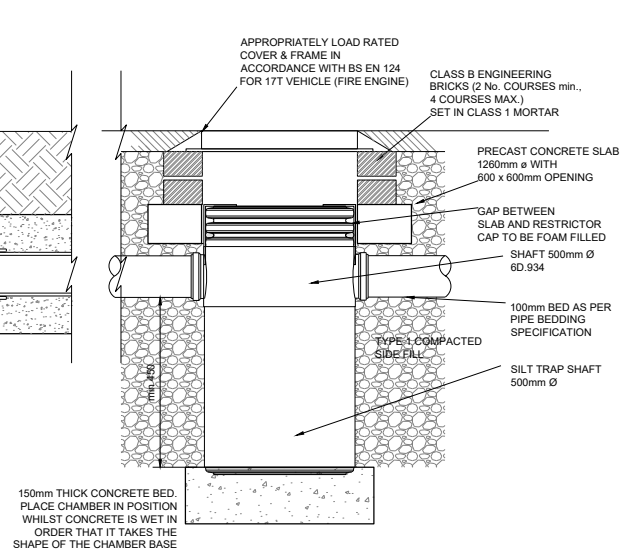
 CREATIVE STRUCTURES	Client SOUTHERN ROCK PROPERTY		FOR PLANNING DOC			REV	DESCRIPTION	DATE	BY	NOTES:- 1. THIS DRAWING IS NOT TO BE SCALED. WORK FROM GIVEN DIMENSIONS ONLY. 2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICE ENGINEERS AND SPECIALISTS DRAWINGS. 3. ANY DISCREPANCIES OR VARIATIONS ARE TO BE REPORTED IMMEDIATELY TO ENGINEER FOR CLARIFICATION BEFORE THE AFFECTED WORK COMMENCES. 4. ALL DIMENSIONS ARE TO BE CHECKED ON SITE. ANY DISCREPANCIES TO BE REPORTED TO ENGINEER IMMEDIATELY BEFORE THE AFFECTED WORK COMMENCES. 5. ALL PROPRIETARY PRODUCTS ARE TO BE USED IN ACCORDANCE WITH THE MANUFACTURERS DETAILS AND SPECIFICATIONS 6. THE CONTRACTOR IS TO ENSURE THAT TEMPORARY LOADS PLACED ONTO THE NEW STRUCTURES SHALL BE LESS THAN THE LOADS FOR WHICH IT HAS BEEN DESIGNED. 7. THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS. 8. THESE DRAWINGS CONSTITUTE A FULL DESIGN FOR BUILDING CONTROL APPROVAL. THEY ARE NOT CONSTRUCTION STAGE DRAWINGS UNTIL BUILDING CONTROL HAVE APPROVED THE DESIGN(S) 9. FOR THE FULL COMPREHENSIVE GENERAL NOTES SEE GENERAL NOTES DRAWING 99.	WARNING IDENTIFICATION  PARTICULAR ATTENTION TO BE PAID WHERE THE HAZARD SYMBOL IS PLACED ON A DRAWING. THIS SYMBOL HIGHLIGHTS A PARTICULAR CONCERN IN RELATION TO THE DESIGN, SITE WORKING OR WHERE THE CONTRACTORS ATTENTION IS REQUIRED. MEASURES TO MITIGATE RISK SHOULD BE CONSIDERED AT ALL STAGES OF DESIGN DEVELOPMENT AND CONSTRUCTION. COORDINATION HIGHLIGHT  WHERE THE BLUE HIGHLIGHT SYMBOL IS PLACED ON A DRAWING PARTICULAR ATTENTION IS REQUIRED WITH REGARD TO COORDINATION. STABILITY REQUIREMENT HIGHLIGHT  WHERE THE GREEN HIGHLIGHT SYMBOL IS PLACED ON A DRAWING THIS REFERS TO THIS ELEMENT OF THE DESIGN BEING CRITICAL TO THE STABILITY STRATEGY
	Project RIVERSIDE					P7	OUTBUILDINGS ADDED & LANDSCAPING LEVELS UPDATED (ATTENUATION REQ INCREASES FROM 102.2m³ TO 109m³). TANK LOCATION RELOCATED TO HIGHER GROUND LEVEL(S)	13.12.2024	PW		
	Project TWINEHAM, RH17 5NN					P8	LEVELS RAISED 600mm, FOUL TREATMENT LOCATION NOTE ADDED & LAND DRAIN TERMINATION UPDATED TO LOWER GARDEN AREA(S)	28.03.2025	PW		
	Title SITE DRAINAGE PLAN					P9	LANDSCAPING & LEVELS UPDATED TO AGREED FLOOD COMPENSATION SCHEME	15.07.2025	PW		
Date 09.07.2024		Checked 09.07.2024									
Sheet 23-040											
Scale AS SHOWN AT A1		Engineer PW									
Status FOR PLANNING DOC											
Project Number		Drawing Number		Revision							
23-040		51		P9							
© Copyright											



**1.0 l/s RESTRICTED
OUTFLOW CHAMBER**
(1:10)



ON-LINE ATTENUATION TANK DETAILS
(1:10)



SILT TRAP
(1:10)

MAINTENANCE NOTES
1. THE OWNER OF EACH DWELLING IS RESPONSIBLE FOR THE MAINTENANCE OF EACH DWELLING'S DRAINAGE ARRANGEMENT RESPECTIVELY.
2. NOTE THAT AN EASEMENT FOR MAINTENANCE AND ACCESS IS REQUIRED ON THE LAND OF RIVERSIDE TO SERVE THE LOXLEY HOUSE DRAINAGE.
THIS IS TO BE ENTERED IN TO ALL LEGAL DOCUMENTS

MAINTENANCE SCHEDULE - AS TAKEN FROM SUDS MANUAL, TABLE 21.3 FOR DOMESTIC FLOW CONTROL DEVICE
(THIS INFORMATION IS TO BE WRITTEN IN TO THE O&M MANUAL)

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY	PERSON RESPONSIBLE FOR UNDERTAKING OR COMMISSIONING SUITABLE PROFESSIONAL
	INSPECT AND IDENTIFY ANY AREAS THAT ARE NOT OPERATING CORRECTLY. IF REQUIRE, TAKE REMEDIAL ACTION	MONTHLY FOR 3 MONTHS, THEN ANNUALLY	CLIENT / END USER / BUILDING OWNER
REGULAR MAINTENANCE (ATTENUATION TANKS & FLOW CONTROL DEVICE/CHAMBER)	REMOVE DEBRIS FROM THE CATCHMENT SURFACE (WHERE IT MAY CAUSE RISKS TO PERFORMANCE)	MONTHLY	CLIENT / END USER / BUILDING OWNER
	FOR SYSTEMS WHERE RAINFALL INFILTRATES IN TO THE TANK FROM ABOVE, CHECK SURFACE OF FILTER FOR BLOCKAGE BY SEDIMENT, ALGAE OR OTHER MATTER; REMOVE AND REPLACE SURFACE INFILTRATION MEDIUM AS NECESSARY	ANNUALLY	CLIENT / END USER / BUILDING OWNER
REMEDIAL ACTIONS (ALL SUDS PARTS)	REPAIR / REHABILITATE INLETS, OUTLETS, OVERFLOW AND VENTS	AS REQUIRED	CLIENT / END USER / BUILDING OWNER
REMEDIAL ACTIONS (FLOW CONTROL DEVICE)	REMOVE BLOCKAGES TO THE FLOW CONTROL DEVICE, AS REQUIRED BY FOLLOWING THE MAINTENANCE INSTRUCTIONS RELATING TO THAT PARTICULAR DEVICE, i.e. FOR TORNADO STYLE DEVICE, OPEN DOOR USING STAINLESS STEEL ROPE PROVIDED, FOR TYPHOON STYLE DEVICE PULL OUT UP-STAND PIPE TO ACTIVATE DRAIN DOWN, AND FOR HURRICANE STYLE DEVICE, USE THE LIFTING ROD TO DRAIN DOWN AND CLEAR BLOCKAGE(S).	AS REQUIRED	CLIENT / END USER / BUILDING OWNER
MONITORING	INSPECT / CHECK ALL INLETS, OUTLETS, VENTS AND OVERFLOWS TO ENSURE THAT THEY ARE IN GOOD CONDITION AND OPERATING AS DESIGNED	ANNUALLY	CLIENT / END USER / BUILDING OWNER
	SURVEY INSIDE OF TANK FOR SEDIMENT BUILD-UP AND REMOVE, IF NECESSARY	EVERY 5 YEARS, OR AS REQUIRED	CLIENT / END USER / BUILDING OWNER

MAINTENANCE SCHEDULE - AS TAKEN FROM SUDS MANUA C753, APPENDIX B, BOX-B2 FOR PERVIOUS PAVEMENTS

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY	PERSON RESPONSIBLE FOR UNDERTAKING OR COMMISSIONING SUITABLE PROFESSIONAL
REGULAR MAINTENANCE	CLEANING BRUSH REGULARLY AND REMOVE SWEEPINGS FROM ALL HARD SURFACE	MONTHLY	SITE OWNER (MAINTENANCE CONTRACT)
OCCASIONAL TANKS	BRUSH AND VACUUM PERMEABLE PAVING SURFACE ONCE A YEAR TO PREVENT SILT BLOCKAGE AND ENHANCE DESIGN LIFE	ANNUALLY	SITE OWNER (MAINTENANCE CONTRACT)
REMEDIAL WORK	MONITOR EFFECTIVENESS OF PERMEABLE PAVEMENT, AND WHEN WATER DOES NOT INFILTRATE IMMEDIATELY ADVISE THE CLIENT OF POSSIBLE NEED FOR REINSTATEMENT OF TOP LAYERS OR SPECIALIST CLEANING. RECENT EXPERIENCE SUGGESTS THAT WET WASHING AND SUCTION CLEANING WILL SUBSTANTIALLY REINSTATE PAVEMENT TO 90% EFFICIENCY	AS REQUIRED	SITE OWNER (MAINTENANCE CONTRACT)

MAINTENANCE SCHEDULE - AS TAKEN FROM SUDS MANUA C753, APPENDIX B, BOX-B2 FOR INLETS, OUTLETS & INSPECTION CHAMBERS

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY	PERSON RESPONSIBLE FOR UNDERTAKING OR COMMISSIONING SUITABLE PROFESSIONAL
REGULAR MAINTENANCE	INLETS, OUTLETS AND SURFACE CONTROL STRUCTURES INSPECT SURFACE STRUCTURES, REMOVING OBSTRUCTIONS AND SILT AS NECESSARY. CHECK THERE IS NO PHYSICAL DAMAGE. STRIM VEGETATION 1m MIN. SURROUND TO STRUCTURES AND KEEP HARD APRONS FREE FROM SILT AND DEBRIS INSPECTION CHAMBERS AND BELOW-GROUND CONTROL CHAMBERS REMOVE COVER AND INSPECT, ENSURING THAT WATER IS FLOWING FREELY AND THAT THE EXIT ROUTE FOR WATER IS UNOBSTRUCTED. REMOVE DEBRIS AND SILT. UNDERTAKE INSPECTION AFTER LEAF FALL IN AUTUMN	MONTHLY (OR AS REQUIRED)	SITE OWNER (MAINTENANCE CONTRACT)
		MONTHLY	SITE OWNER (MAINTENANCE CONTRACT)
		ANNUALLY	SITE OWNER (MAINTENANCE CONTRACT)
OCCASIONAL TANKS	CHECK TOPSOIL LEVELS ARE 20mm ABOVE EDGES OF BASKETS AND CHAMBERS TO AVOID MOWER DAMAGE	ANNUALLY (OR AS REQUIRED)	SITE OWNER (MAINTENANCE CONTRACT)
REMEDIAL WORK	REPAIR PHYSICAL DAMAGE IF NECESSARY	AS REQUIRED	SITE OWNER (MAINTENANCE CONTRACT)



**CREATIVE
STRUCTURES**

Client
SOUTHERN ROCK PROPERTY

Project
**RIVERSIDE
TWINEHAM, RH17 5NN**

Title
TYPICAL DRAINAGE DETAILS

SHEET 2 of 2

ISSUED FOR PLANNING DOC

Date **JULY 2023** Checked **25/07/2023**

Sheet **23-040**

Scale **AS SHOWN AT A1** Engineer **PW**

Status **PLANNING**

Project Number Drawing Number Revision

23-040

51

P6

REV	DESCRIPTION	DATE	BY
B1	DOC / BUILDING REGS	25.07.2023	PW
P6	CLIENT UPDATED ONLY	09.07.2024	PW

NOTES:-

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- FOR THE FULL COMPREHENSIVE GENERAL NOTES SEE GENERAL NOTES DRAWING 99.

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MEASURES TO MITIGATE RISK SHOULD BE CONSIDERED AT ALL STAGES OF DESIGN DEVELOPMENT AND CONSTRUCTION.

COORDINATION HIGHLIGHT

COORDINATION HIGHLIGHT
WHERE THE BLUE HIGHLIGHT SYMBOL IS PLACED ON A DRAWING PARTICULAR ATTENTION IS REQUIRED WITH REGARD TO COORDINATION.

STABILITY REQUIREMENT HIGHLIGHT

STABILITY REQUIREMENT HIGHLIGHT
WHERE THE GREEN HIGHLIGHT SYMBOL IS PLACED ON A DRAWING THIS REFERS TO THIS ELEMENT OF THE DESIGN BEING CRITICAL TO THE STABILITY STRATEGY

SECTION C

CALCULATIONS

Rainwater / storm attenuation design

The replacement dwelling is to route to a new attenuation tank, which is to outfall to the river Adur network with a controlled 1 litre/sec flow.

Existing catchment area(s)

Existing east hookers (main dwelling)	= 303.42m ²
Existing annex/bungalow & hardstanding	= 78.51m ²
Existing total	= 381.93m ²

Existing design rainfall (Wallingford procedure):

1 in 2 year	= 0.7 l/s
1 in 100 year	= 1.5 l/s

Existing site Qbar = 7.37 l/s

Proposed catchment areas – Riverside only

Proposed Main Dwelling Roof	= 511.9m ²
Proposed Outbuilding(S)	= 222.6m ²
Proposed Shed	= 13.50m ²
Total Roof Area(S)	= 748.0m ² (0.0748ha)

Proposed rear patio(s) = 381.4m² (0.03814ha)

Proposed total catchment area = 1129.4m² (0.11294ha)

Proposed Riverside Site Area = 6378.4m² (0.63784a)

Required attenuation to limit flow rates to 1.0l/s is 104.7m³

Required Tank size(s):

138m² of attenuation tank located where the proposed ground is above 11.0m. This provides 104.88m³ of effective storage with 0.8m deep (single crate) x 95% free area crates)

Design variables inc 45% global warming factor for a 6-hour storm

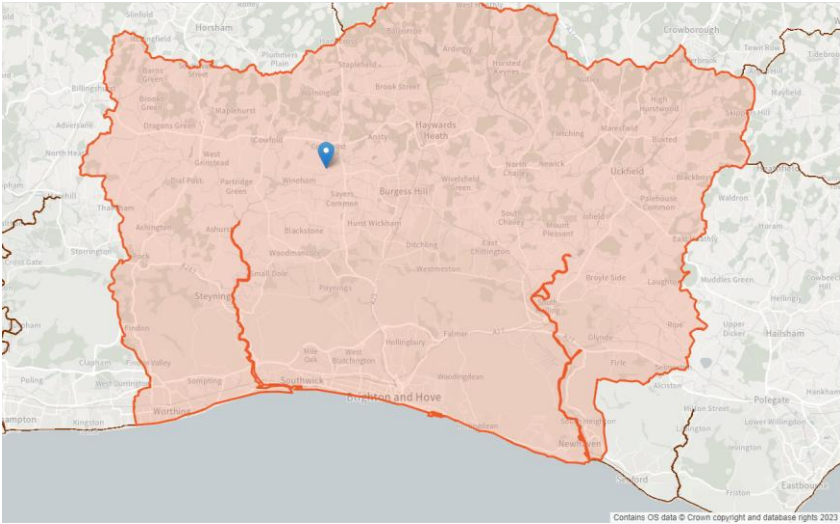
The existing flow rates ignore the hardstanding and patio areas. The new development will utilise permeable paving to the front area and impermeable but attenuated rear patio areas.

The pool drainage will be by the specialist pool supplier. This will be via a holding tank for any back wash. This tank holds the chlorinated water for the required length of time (~10 days) such that the chlorine evaporates, and potable water is left, which can be discharged via the mains drains, or to the watercourse via the stormwater drains. This amounts to <1m³ every 2 weeks, thus very nominal.

SUPPORTING CALCULATIONS

- PROPOSED ATTENUATION TO LIMIT FLOWS TO 1l/s

IN LINE WITH LATEST GOV.UK PEAK RAINFALL INTENSITY, THE PROPOSED ATTENUATION HAS BEEN INCREASED TO SUIT THE 45% CLIMATE CHANGE FACTOR & THE LARGER CATCHMENT AREAS. THIS RESULTS IN AN INCREASE FROM 102.2m³ TO 109m³



3.3% annual exceedance rainfall event		
Epoch	Central allowance	Upper end allowance
2050s	20%	35%
2070s	20%	40%

1% annual exceedance rainfall event		
Epoch	Central allowance	Upper end allowance
2050s	20%	45%
2070s	25%	45%

*Use '2050s' for development with a lifetime up to 2060 and use the 2070s epoch for development with a lifetime between 2061 and 2125.

This map contains information generated by Met Office Hadley Centre (2019) UKCP Local Projections on a 5km grid over the UK for 1980-2080. Centre for Environmental Data Analysis, 2022

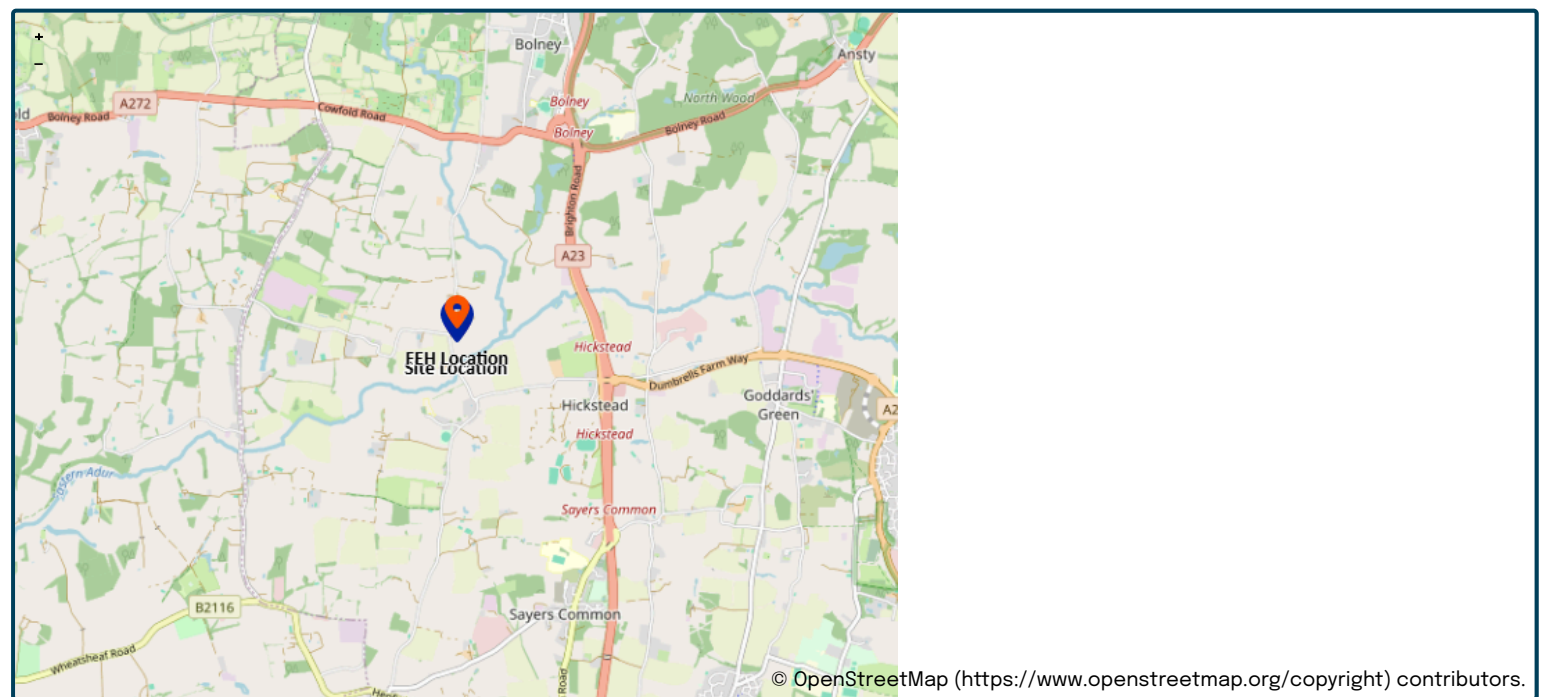
This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). It is recommended that the total storage volume for the site is distributed across the site using multiple SuDS and that hydraulic modelling software is used to undertake and finalise the detailed design of the drainage system.

Project details

Date	15/07/2025
Calculated by	Phil W
Reference	23-040
Model version	2.0.1

Location

Site name	Riverside
Site location	Twineham



Site easting	525563
Site northing	120414

Site areas

Total site area (ha)

0.63784

ha

Roof area

Total roof area (ha)

0.0748

ha

Contributing roof area (ha)

0.0748

ha

Non-contributing roof area (ha)

0

ha

Paved area

Total paved area (ha)

0.03814

ha

Contributing paved area (ha)

0.03814

ha

Non-contributing paved area (ha)

0

ha

Grass / vegetated area

Total grass / vegetated area (ha)

0.52489

ha

Contributing grass / vegetated area (ha)

0

ha

Non-contributing grass / vegetated area (ha)

0.52489

ha

Total area

Total contributing area (ha)

0.11294

ha

Contributing areas with urban creep allowance

Urban creep allowance factor

+0% (no creep)

Storage design parameters

Storage base shape

Rectangular / square

Storage base length to width ratio

3:1

Storage design depth (mm)

800

mm

Storage side slope (1 in x)

1 in 3

Storage voids ratio (%)

100% (all voids)

Storage volume design return period (years)

1:100 years

Discharge flow rate from the site

Method

Type of site	Previously developed
Specify the method	User specified

User specified discharge

Flow rate (user specified) (l/s)	1.0	l/s
----------------------------------	----------------	----------------

Final discharge rate

Runoff calculation method	User specified	
Design flow rate (l/s)	1	l/s

Blockage risk

Specify the method	Flow rate		
Minimum discharge flow rate to prevent blockage	1l/s		
	<u>My value</u>	<u>Calculated value</u>	
Design orifice diameter (mm)	23.5	mm	☐
			23
Flow rate of orifice (l/s)	1	l/s	

Rainfall and runoff

Rainfall input type	FEH22 CSV file		
	FEH_Point_Rainfall_FEH22_AM_525558_120445.csv		
Distance from FEH location to site (km)	0	km	
Climate change allowance factor	145%		
Specify the runoff method from grass / vegetated areas	Fixed percentage - based on rainfall event depth and SPR		
	<u>My value</u>	<u>Map value</u>	
How should SPR be derived?	WRAP soil type		
WRAP soil type	4	☐	4
SPR	0.47		

Model results

- **Maximum discharge flow rate:** 1 (l/s)
- **Outflow orifice diameter:** 23.5 (mm)
- **Storage base length:** 15.04 (m)
- **Storage base width:** 5.01 (m)
- **Storage base area:** 75.37 (m²)
- **Storage total volume:** 104.7 (m³)
- **Storage total water volume:** 104.7 (m³)
- **Storm return periods run:** 1, 2, 10, 30, 100, 200 (years)
- **Storm durations run:** 15, 30, 60, 120, 180, 240, 360, 540, 720, 900, 1080, 1440, 1800, 2160, 2880 (minutes)

Return Period (years)	Critical Duration (minutes)	Peak Flow Rate (l/s)	Max Depth (m)	Max water volume (m ³)	Max storage volume (m ³)
1	720	0.65	0.33	31.7	31.7
2	720	0.7	0.38	37.8	37.8
10	720	0.85	0.56	62.6	62.6
30	720	0.93	0.66	80	80
<u>100</u>	<u>900</u>	<u>1</u>	<u>0.8</u>	<u>104.7</u>	<u>104.7</u>
200	1080	1.1	0.9	124.8	124.8

Disclaimer

This report was produced using the surface water storage volume design tool (2.0.1) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate surface water storage volumes for the whole site based on a limiting discharge rate from the site. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

HR Wallingford are not responsible for any rainfall data shared that is subject to licensing terms imposed by UK Centre for Ecology & Hydrology's Flood Estimation Handbook web service (<https://fehweb.ceh.ac.uk/Home/Terms>) (<https://fehweb.ceh.ac.uk/Home/Terms>)).

Appendix A - Rainfall Depths

Rainfall depths (mm) with climate change

Duration (minutes)	Duration (hours)	1 years	2 years	10 years	30 years	100 years	200 years
15	0.25	8.49	11.31	22.18	28.84	36.28	40.74
30	0.5	11.24	14.91	29.29	38.48	48.65	54.98
60	1	14.2	18.82	36.98	48.84	62.47	70.8
120	2	21.49	26.75	47.3	60.39	75.65	85.32
180	3	26.11	31.77	53.71	67.7	84.25	94.99
240	4	29.51	35.42	58.33	73.04	90.7	102.47
360	6	34.28	40.53	64.79	80.58	100.21	113.97
540	9	38.96	45.56	71.21	88.26	110.49	126.79
720	12	42.31	49.17	75.86	93.87	118.23	136.52
900	15	44.97	52.04	79.59	98.37	124.45	144.28
1080	18	47.24	54.48	82.71	102.12	129.7	150.76
1440	24	51.17	58.64	87.86	108.29	138.3	161.17
1800	30	54.62	62.28	92.31	113.51	145.16	169.16
2160	36	57.76	65.6	96.32	118.16	151.05	175.86
2880	48	63.57	71.7	103.6	126.4	161.01	186.89

Rainfall depths (mm) without climate change

Duration (minutes)	Duration (hours)	1 years	2 years	10 years	30 years	100 years	200 years
15	0.25	5.85	7.8	15.3	19.89	25.02	28.1
30	0.5	7.75	10.28	20.2	26.54	33.55	37.92
60	1	9.8	12.98	25.5	33.68	43.08	48.83
120	2	14.82	18.45	32.62	41.65	52.17	58.84
180	3	18.01	21.91	37.04	46.69	58.1	65.51
240	4	20.35	24.43	40.23	50.37	62.55	70.67
360	6	23.64	27.95	44.68	55.57	69.11	78.6
540	9	26.87	31.42	49.11	60.87	76.2	87.44
720	12	29.18	33.91	52.32	64.74	81.54	94.15
900	15	31.02	35.89	54.89	67.84	85.83	99.5
1080	18	32.58	37.57	57.04	70.43	89.45	103.97
1440	24	35.29	40.44	60.59	74.68	95.38	111.15
1800	30	37.67	42.95	63.66	78.28	100.11	116.66
2160	36	39.83	45.24	66.43	81.49	104.17	121.28
2880	48	43.84	49.45	71.45	87.17	111.04	128.89