

P1893 Bunting Gardens, Waterlooville

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Rev P01

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BUNTING GARDENS
WATERLOOVILLE
HAMPSHIRE
PO8 9UN

FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY REPORT

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Rev P01

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1. INTRODUCTION

Baker & Associates Ltd have been appointed to provide a Flood Risk Assessment & Drainage Strategy Report for the construction of 3 terraced houses on greenfield land.

This Flood Risk Assessment (FRA) and Drainage Strategy Report is to be submitted as part of the planning application for the development of the site.

This Flood Risk Assessment has been prepared in accordance with Communities & Local Government, National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) and the Lead Local Flood Authorities requirements.



2. SITE DESCRIPTION

2.1 SITE LOCATION AND SURROUNDING AREA

The application site is located at British National Grid reference SU 68603 11716.

The site is located 2,500m north of Waterlooville city centre. It is directly west of Partick Howard-Dobson Court, south of Dove Close with a grassed area on the west boundary. See figures 2.1.1 to 2.1.4.

The site is 1447m² in size, the site is currently open space, largely amenity grassland, between two-storey houses and three storey blocks of flats to the north south and west and a two-storey care home to the east.

Pedestrian access to the site is by way of a network of existing footpaths, one of which runs through the site.



FIGURE 2.1.1 SITE LOCATION



FIGURE 2.1.2 SITE LOCATION



FIGURE 2.1.3 AERIAL IMAGE OF SITE LOCATION

2.2 GEOLOGY

British Geological Survey maps indicate that the bedrock geology beneath the site is Lambeth Group Formation – Clay, Silt and Sand, with a superficial geology of Head – Clay, Silt Sand & Gravel. see figure 2.2.1.

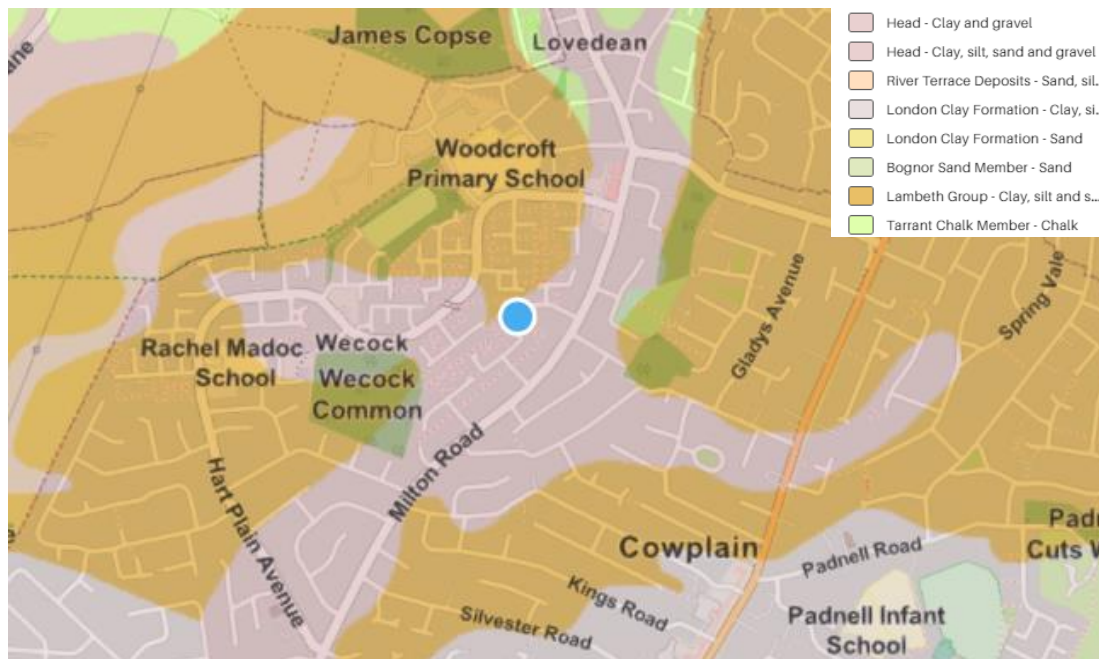


FIGURE 2.2.1 BRITISH GEOLOGICAL SURVEY MAP

A ground investigation undertaken by RSK, reference 305258 R01, confirmed sands and gravels, over clay.

Infiltration testing has confirmed that the substrata has poor infiltration characteristics

2.3 TOPOGRAPHY

A Topographical Survey was carried out on the application site in February 2022 by Solent Surveys.

Site levels vary by 3.22m. The highest level on site is 52.87mAOD situated northwest corner of the site at the edge of the footpath and the lowest is 49.65mAOD on the south boundary line where the grass meets the first existing parking bay, see Appendix A.

3. POTENTIAL SOURCES OF EXTERNAL FLOODING

3.1. TIDAL

The site is located 6.5km north of the nearest coastline therefore, not at any risk of tidal flooding.

3.2. FLUVIAL (RIVERS)

The Environment Agency (EA) produces floodplain maps for the UK which show the areas at risk of fluvial and tidal flooding. The magnitudes of the flooding events considered are defined in terms of their return period. Generally, when determining the impact of any development within the floodplain of a fluvial reach, the design standard, against which the EA will consider the feasibility of any scheme, is typically the 1% annual probability flood (1 in 100 year return period flood) for sites within the floodplain, or the effects of a 1 in 100 year storm if outside the floodplain.

The EA flood zone maps identify undefended floodplain, giving the horizontal extent of low (Zone 1), medium (Zone 2) and high-risk flood zones (Zones 3a and 3b) depending on the severity of the flood event.

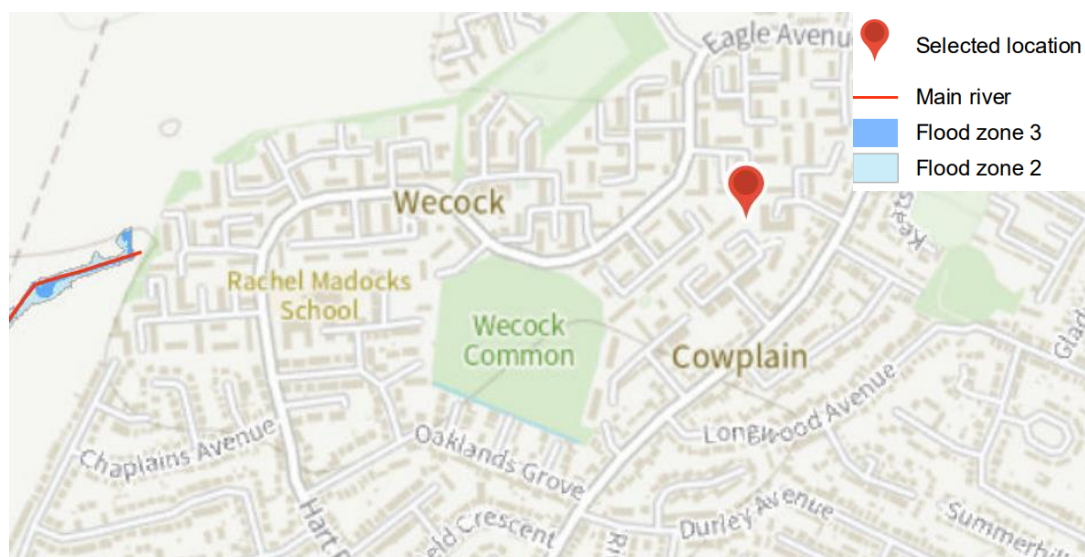


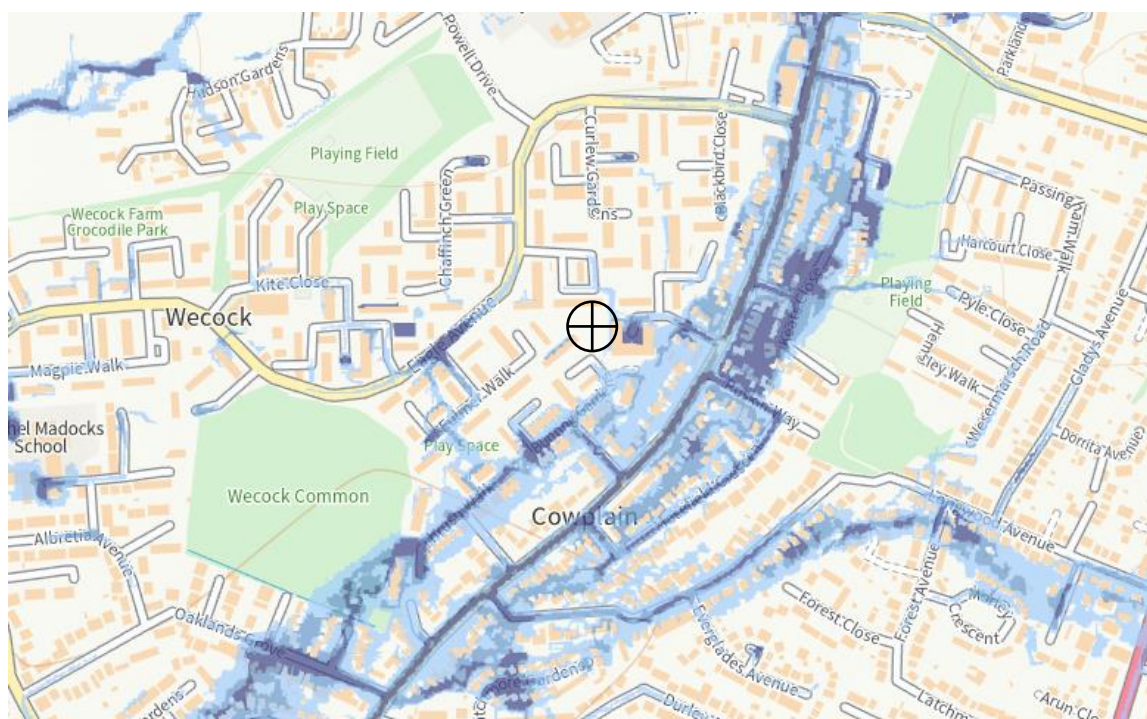
FIGURE 3.2.1 ENVIRONMENT AGENCY FLOOD ZONE MAP

The site falls under flood zone 1 as indicated on the Environment Agency's Risk of Flood Zone Map (Figure 3.2.1).

3.3. PLUVIAL (SURFACE WATER)

The Environment Agency also produce maps which highlight the risk of flooding from surface water flows. These illustrate when the capacity of existing surface water drainage networks and channels are exceeded in extreme rainfall events.

The Environment Agency's risk of flooding from surface water map (Figure 3.3) indicates the existing road for Bunting Gardens has a risk ranging from low to high for pluvial flooding, however the site itself is free from risk and only has a small area of low risk flooding to the east.



High
 Medium
 Low
 Very low

+
 Location you selected

FIGURE 3.3 ENVIRONMENT AGENCY PLUVIAL FLOOD RISK MAP

3.4. FOUL/SURFACE WATER SEWERS

There have been no historic reported incidents of sewer flooding within the area.

3.5. GROUNDWATER

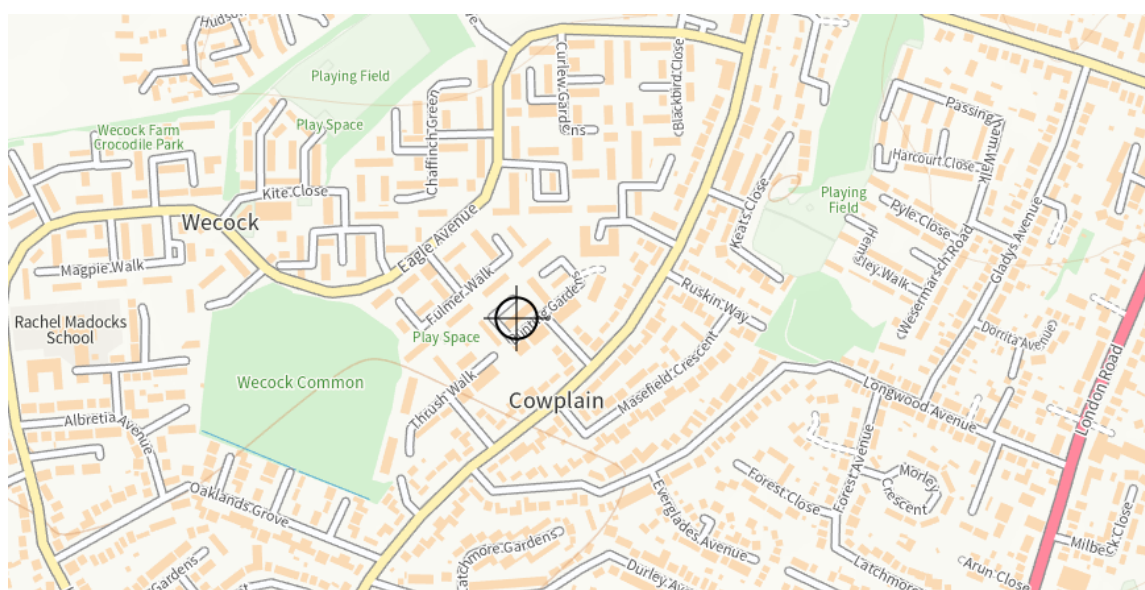
According to the Environment Agency (EA) Source Protection Maps the application site is within a source protection zone, it falls into a Zone 1 – inner protection zone.

The site also falls into a Drinking water safeguard zone for ground water.

A ground investigation was undertaken by RSK in June 2022, trial pits and boreholes were taken to a maximum depth of 5.5m below ground level and groundwater was not encountered.

3.6. RESERVOIRS/CANALS AND OTHER ARTIFICIAL SOURCES

There is no risk of flooding to the site from reservoirs/canals, when there is also flooding from rivers, see Figure 3.6.



● when river levels are normal ■ when there is also flooding from rivers ⊕ Location you selected

FIGURE 3.6 ENVIRONMENT AGENCY RESERVOIR FLOOD RISK MAP



4. STRATEGIC FLOOD RISK ASSESSMENT

Havant Borough Council undertook a Level 1 Strategic Flood Risk Assessment (SFRA) of the District in November 2018, to inform the preparation of the Core Strategy, to identify those parts of the District that are most at risk from flooding. The SFRA identified areas within Havant which maybe prone to possible flood risk from tidal, fluvial, pluvial, groundwater and sewer flooding.

The SFRA indicates the site location is not in an area with historic fluvial and pluvial flooding.

5. DEVELOPMENT PROPOSALS

The proposal is for a terrace of 3 new 4-bedroom houses on land to the north of Bunting Gardens in Wecock Farm.

The site is currently open space, largely amenity grassland, between two-storey houses and three storey blocks of flats to the north south and west and a two-storey care home to the east.

Pedestrian access to the site is by way of a network of existing footpaths, one of which would have to be re-routed to the east of the proposal. Part of the site falls within adopted highway. Refer to Appendix B for proposed site plan.

5.1 EXISTING SITE DRAINAGE

Surface Water

The existing site is greenfield and therefore has no surface water drainage system.

Foul Water

There is currently no foul water drainage system in place as the site is greenfield.





5.2 PROPOSED SITE SURFACE WATER DRAINAGE STRATEGY

SuDS Hierarchy of Systems and Justification of Usage

We have reviewed and taken into consideration the Environment Agency SuDS Hierarchy for SuDS systems which are noted below in order of preference:

1. Living Roofs
2. Basins and Ponds
3. Filter Strips and Swales
4. Infiltration Devices
5. Permeable Surfaces and Filter Drains
6. Tanked Systems

Below is the response to these systems identifying the most suitable system for the scheme and why the more favourable are unsuitable.

1. Living and green roofs impose a large load on the roof structure and require relatively flat roofs to ensure water retention, the existing structure will not be able to cater for the large loads of a green roof system.
2. Attenuation basins will be unfeasible due to the compact nature of the site.
3. Impermeable and permeable Filter strips and swales will be unfeasible due to the compact nature of the site and poor infiltration.
4. Infiltration devices will be unfeasible due to poor infiltration characteristics of the substrata.
5. Permeable surfaces are unfeasible due to the proposed layout of the site and poor infiltration characteristics of the substrata.
6. A positive surface water storage tank system with restricted connection to a drainage ditch, sewer or watercourse is feasible, as a surface water sewer is located on the eastern boundary of the site.

Due to poor infiltration, the surface water drainage strategy will be to attenuate flows and discharge to the surface water sewer. Attenuation, provide below ground, will be designed to cater for the 1% annual probability storm plus 40% allowance for climate change, (Appendix C).





Existing & Proposed Runoff Rates

The existing greenfield run off rates have been calculated as follows.

ICP SUDS Mean Annual Flood

Input			
Return Period (years)	100	Soil	0.450
Area (ha)	0.145	Urban	0.000
SAAR (mm)	800	Region Number	Region 7
Results 1/s			
QBAR Rural	0.7		
QBAR Urban	0.7		
Q100 years	2.4		
Q1 year	0.6		
Q30 years	1.7		
Q100 years	2.4		

FIGURE 5.2.1 GREENFIELD RUNOFF RATES

Due to the low greenfield run-off rates and to minimise the risk of blockage due to small orifice diameters, it is proposed to limit the flow rate from the site to 2.5 l/s up to the 1:100+40% storm return period.

Existing & Proposed Runoff Volumes

The existing greenfield runoff volumes have been calculated as follows

Greenfield Runoff Volume Input				Results
Rainfall Model	FSR Rainfall	Return Period (Years)	100	PR%
		Storm Duration (mins)	360	49.73
Region	England and Wales	Area (ha)	0.145	Greenfield Runoff Volume (m³)
Map	M5-60 (mm)	SAAR (mm)	811	48.244
	Ratio R	CWI	117.873	
		Urban	0.000	
Areal Reduction Factor	1.00	SPR	47.000	
Calculate				

FIGURE 5.2.2 EXISTING GREENFIELD RUNOFF VOLUME

The proposed brownfield and remaining greenfield areas runoff volumes have been calculated as follows





100 year +40% CC 360 minute winter Results for 100 year +40% CC 360 minute winter, 600 minute analysis at 8 minute timestep.														
US Node ID	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link ID	DS Node ID	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
SW MH 1.0	8	49.000	0.000	2.5	0.0000	0.0000	OK							
SW MH 2.0	192	50.602	0.102	2.5	0.1148	0.0000	SURCHARGED	Hydro-Brake®	SW MH 1.0	2.5				22.3
SW MH 3.0	184	50.876	0.030	2.6	0.0170	0.0000	OK	1.002	SW TANK	2.6	0.950	0.189	0.0210	
SW MH 4.0	184	51.012	0.032	1.3	0.0162	0.0000	OK	1.001	SW MH 3.0	1.3	0.628	0.214	0.0275	
SW MH 6.0	168	51.117	0.017	0.4	0.0066	0.0000	OK	1.000	SW MH 4.0	0.4	0.284	0.066	0.0186	
SW TANK	192	50.614	0.064	2.6	0.9073	0.0000	OK	1.003	SW MH 2.0	2.5	0.390	0.525	0.0537	

FIGURE 5.2.3 PROPOSED BROWNFIELD RUNOFF VOLUME

Greenfield Runoff Volume Input				Results	
Rainfall Model	FSR Rainfall	Return Period (Years)	100	PR%	49.73
		Storm Duration (mins)	360		
Region	England and Wales	Area (ha)	0.115	Greenfield Runoff Volume (m³)	38.263
Map	M5-60 (mm)	SAAR (mm)	811		
	Ratio R	CWI	117.873		
		Urban	0.000		
Areal Reduction Factor	1.00	SPR	47.000		
Calculate					

FIGURE 5.2.2 REMAINING GREENFIELD RUNOFF VOLUME

Water Quality

Water quality management of surface water should be carried out in accordance with the SuDS Manual (Ciria C753, November 2015).

C753 Part E Chapter 26 describes risks posed by surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e. the pollution source).
- The effectiveness of SuDS treatment components in reducing levels of pollutants the environmentally acceptable levels.
- The sensitivity of the receiving environment.

The recommended approaches for water quality risk management are given in the SuDS Manual Table 26.1.




TABLE 26.1 Approaches to water quality risk management

Design method	Hazard characterisation	Risk reduction	
		For surface water	For groundwater
Simple index approach	Simple pollution hazard indices based on land use (eg Table 26.2 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.3 or equivalent)	Simple SuDS hazard mitigation indices (eg Table 26.4 or equivalent)
Risk screening ¹	Factors characterising traffic density and extent of infiltration likely to occur (eg Table 26.5 or equivalent)	N/A	Factors characterising unsaturated soil depth and type, and predominant flow type through the soils (eg Table 26.5 or equivalent)
Detailed risk assessment	Site specific information used to define likely pollutants and their significance	More detailed, component specific performance information used to demonstrate that the proposed SuDS components reduce the hazard to acceptable levels	
Process-based treatment modelling	Time series rainfall used with generic pollution characteristics to determine statistical distributions of likely concentrations and loadings in the runoff	Models that represent the treatment processes in the proposed SuDS components give estimates of reductions in event mean discharge concentrations and total annual load reductions delivered by the system	

Note

¹ Risk assessment may be required as a result of the risk screening process.

As per Table 26.1 the Simple Index approach will be used as a design method for this site. Table 26.2 provides hazard classification of different land uses. The land uses for the surface water drainage for this site are:

- Roofs -impermeable surface.

To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index for each contaminant type. Therefore, the following will have to be achieved for the surface running off the site.

$$\text{Total SuDS mitigation index} \geq \text{pollution hazard index}$$

Pollution Hazard Indices are given for different land uses in Table 26.2 of the SuDS manual:



**TABLE 26.2 Pollution hazard indices for different land use classifications**

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

From Table 26.2 the following information is tabulated in Table 1.

Land Use	Destination of Runoff	Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Roofs	Surface water	Very Low	0.2	0.2	0.05
TOTALS			0.7	0.6	0.45

Table 1: Pollution hazard index and destination of runoff for the proposed site

The SuDS mitigation index will be obtained from Table 26.3 (for discharges to surface waters) of the SuDS manual.



**TABLE 26.3** Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

To provide the required mitigation is proposed to use a proprietary treatment system, refer to Appendix C for manufactures details that contains pollution mitigations indices on page 5.

SuDS mitigation indexes are tabulated in Table 5 as follows:

			Mitigation Indices			
Runoff Source	Destination of Runoff	Mitigation Index Source	Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Roofs	Surface water	Table 26.4	Proprietary treatment system.	0.8	0.8	0.8
TOTALS				0.8	0.8	0.8

Table 2: SuDS mitigation index

In summary, the SuDS component mitigation indices (Table 2) are greater than pollution hazard indices (Table 1) and therefore deliver adequate treatment

Storm Design Exceedance

It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible, however, it is practicable to minimise the risk by careful design of the layout of the development such that internal flooding is avoided. Areas of hard standing will be laid to falls away from the building to direct surface water runoff to areas where damage and disruption to operations will be minimised, Appendix D.





Urban Creep

Urban creep is the conversion of permeable surfaces to impermeable over time e.g. surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas. Much research has been carried out into the effect of urban creep and its effect on the drainage systems which cater for urban areas. It has been shown that, over the lifetime of a development, urban creep can increase impermeable areas by as much as 10%.

Due to the nature of the development being local authority owned housing with restricted plot footprints, applying urban creep is deemed unnecessary.

5.3 PROPOSED SITE FOUL WATER DRAINAGE STRATEGY

The foul water drainage for the site will be discharged to the foul water sewer located south west of the site. This will be subject to a Southern Water capacity check and Section 106 connection agreement.

Due to site levels and the invert level of the existing foul sewer, foul water flows will be pumped to the sewer network.

5.4 FUTURE MAINTENANCE OF SYSTEM

The owner of the property will be responsible the maintenance of the system and a preliminary maintenance document for the system is within Appendix E.





6. SUMMARY AND CONCLUSIONS

The proposed development is considered to be fully appropriate for its location as it will not be subject to any significant flood risks i.e. tidal, fluvial, ground water or sewer.

Surface water drainage will be dealt with in a sustainable way by discharging runoff to a Surface Water Sewer at 2.5l/s, with attenuation designed to cater for the 1% (1:100 year storm) with 40% additional storage to allow for climate change.

The drainage system will be designed to comply with the SuDS Manual water quality criteria.

The owner of the property will be responsible for the maintenance of the system.

This Flood Risk Assessment has been prepared in accordance with Communities & Local Government, National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) and the requirement of the Lead Local Flood Authority (LLFA).





APPENDIX A – TOPOGRAPHICAL SURVEY



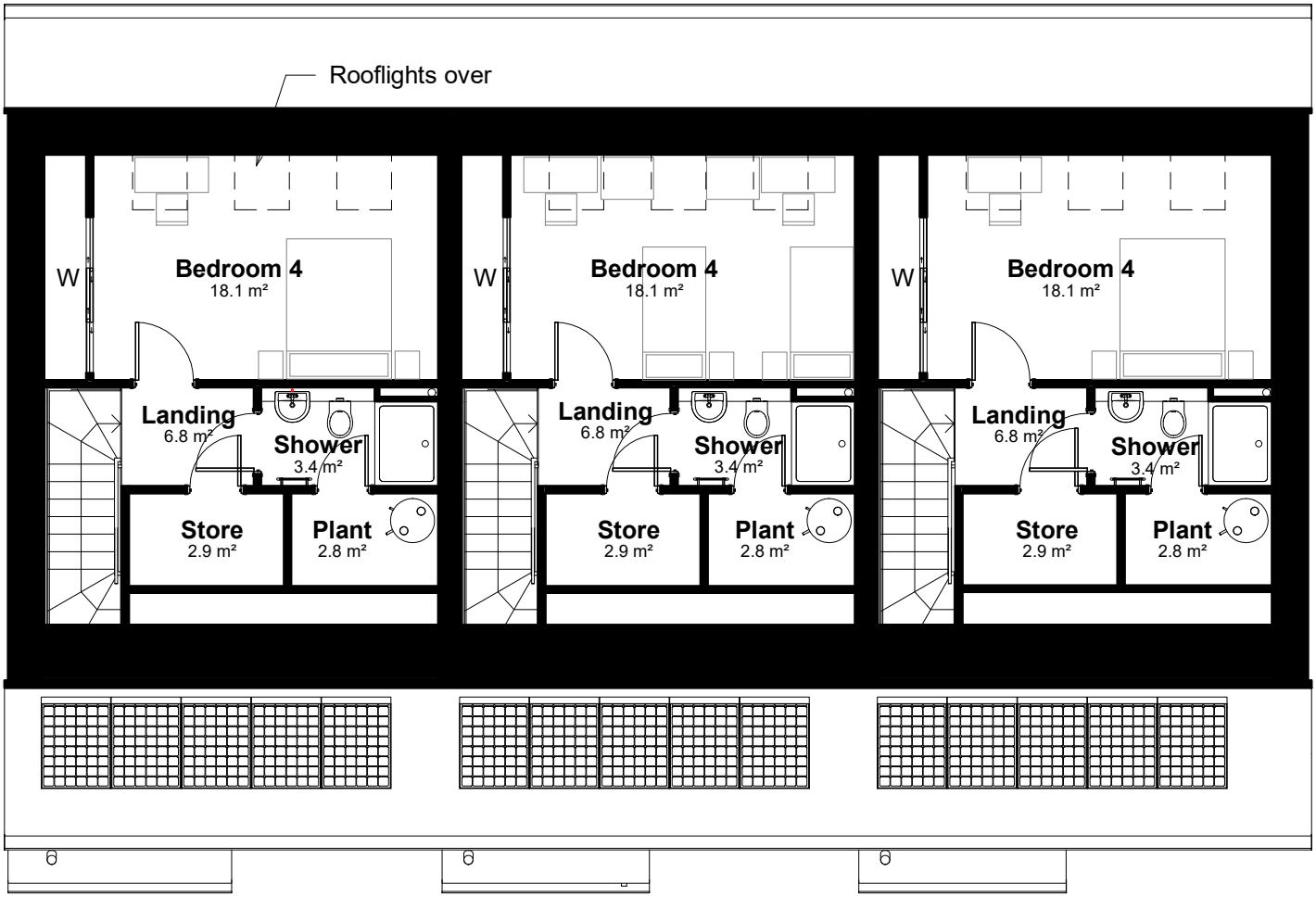
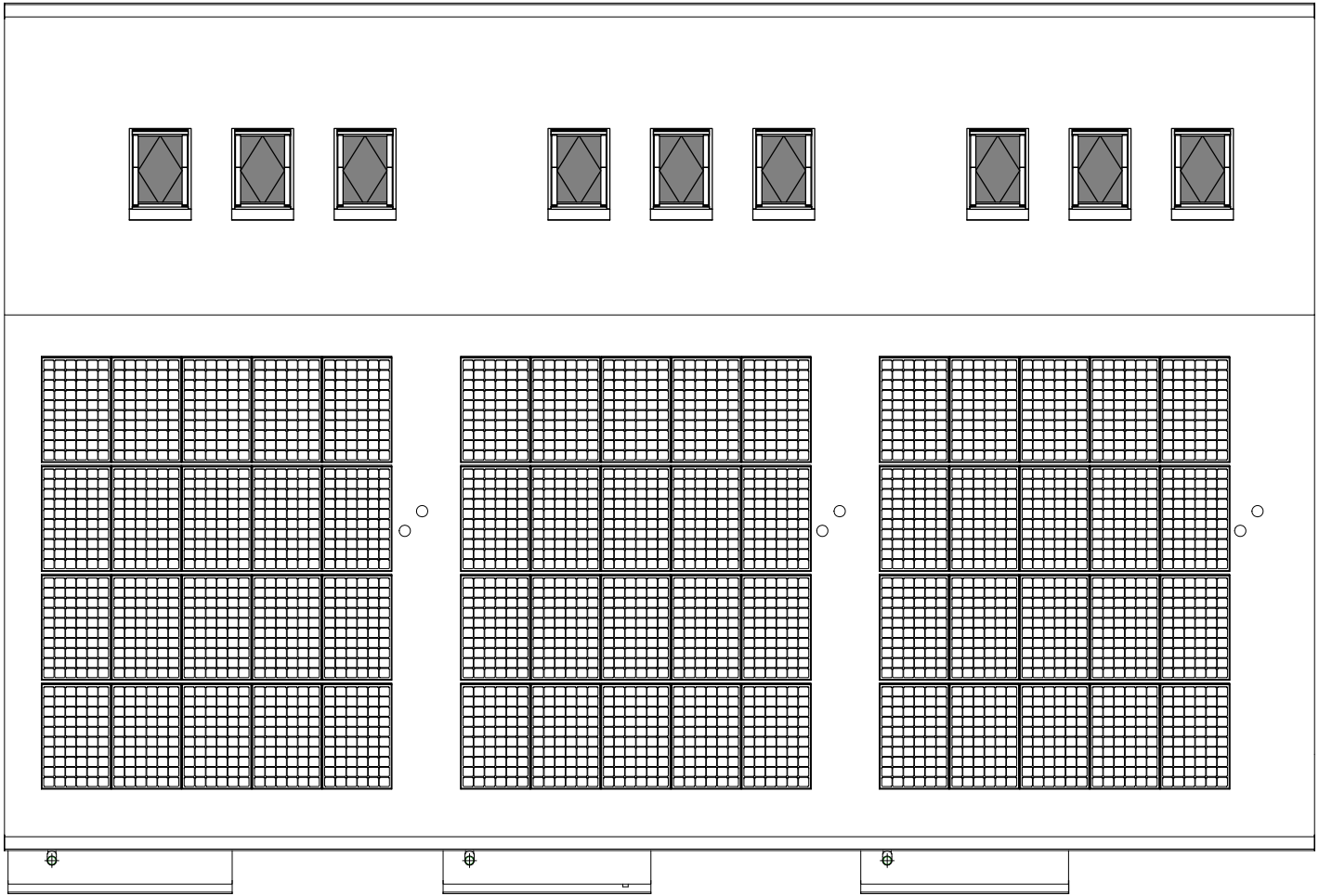
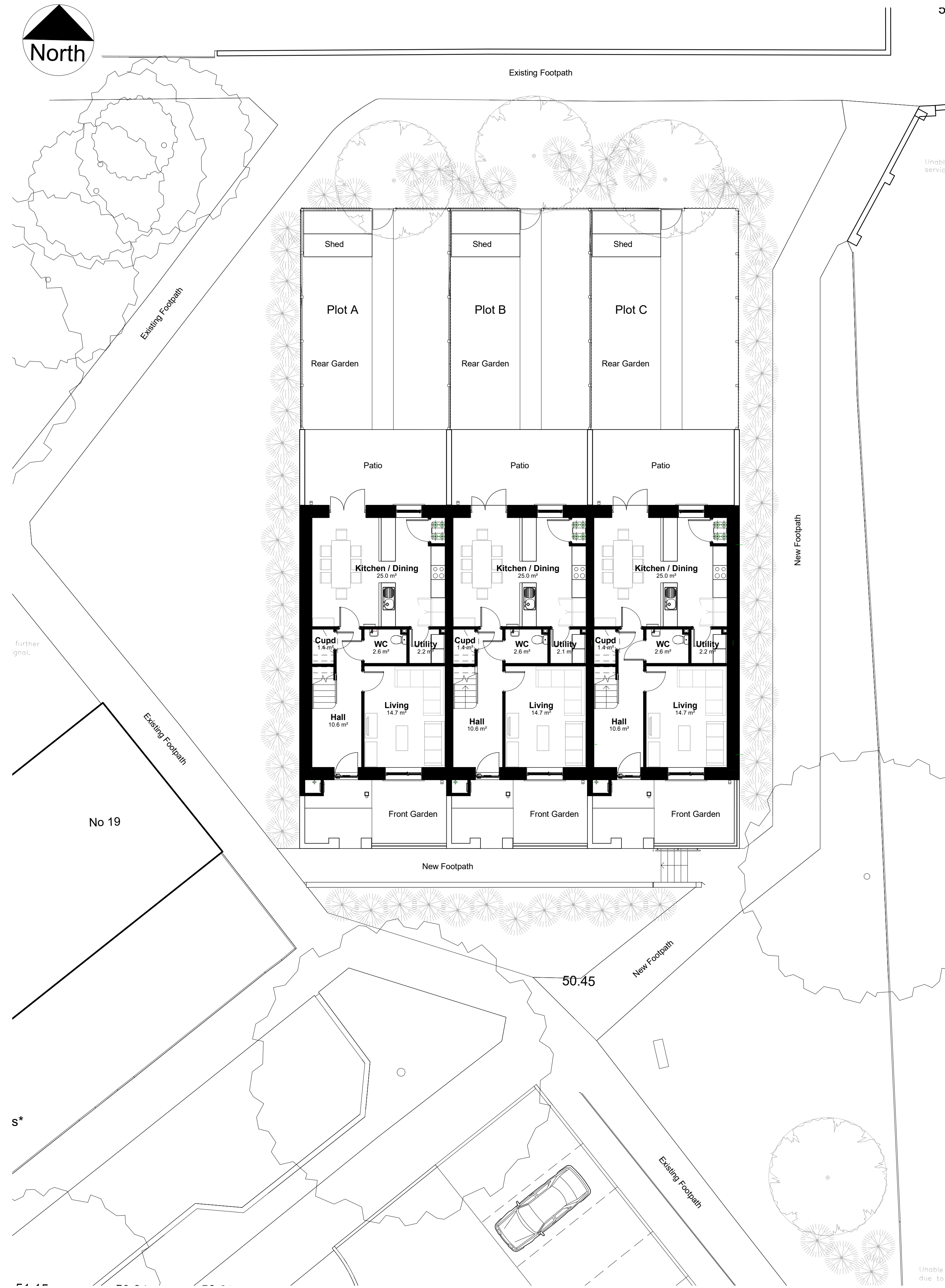




APPENDIX B – DEVELOPMENT PROPOSALS



NOTE: All dimensions to be checked on site prior to commencement of any work
*** DO NOT SCALE FROM THIS DRAWING EXCEPT FOR THE PURPOSES OF DETERMINING A PLANNING APPLICATION ***
Notify C.A of any discrepancies before ordering materials.
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P4	26/08/22	Bedroom floor areas adjusted to include areas of built in wardrobes. Panel heater locations adjusted		
P3	08/07/22	Built in wardrobes added to all bedrooms, kitchens replanned to suit stairgate, MVHR located on N wall		
P2	05/04/22	Updated following receipt of survey & general design development		
Rev	Date	Revision Details (Amended By)		Approved By
Project				
Bunting Gardens				
Drawing Title				
Plans as Proposed				
Date		18/01/22	Scale @ A1	1 : 100
Housing, Neighbourhood & Building Services				
		JAMES HILL Head of Service		
DEPARTMENTAL SECTION:				
ARCHITECTS GROUP - Susan Whitehouse Dip.L.A. M.L.I. Design Group Head			Tel No: 023 92 841518 Fax No: 023 92 834738	
Design/ Survey By		CG	Drawn By	CG
Checked By				
Drawing No				
2637 / 1200 / P4				
SURVEY	DESIGN	☒	WORKING DRAWING	
FEASIBILITY	TENDER		AS BUILT	
INFORMATION	CONTRACT		A.I.	



APPENDIX C – DRAINAGE LAYOUT AND CALCULATIONS



DRAINAGE LEGEND

EXISTING FEATURES

- EXISTING SURFACE WATER SEWER AND MANHOLE TO BE RETAINED
- EXISTING SURFACE WATER DRAIN AND MANHOLE TO BE RETAINED
- EXISTING FOUL WATER SEWER AND MANHOLE TO BE RETAINED
- EXISTING FOUL WATER DRAIN AND MANHOLE TO BE RETAINED

PROPOSED FEATURES

- SURFACE WATER SEWER
- SURFACE WATER DRAIN
- RAINWATER PIPE - REFER TO PUBLIC HEALTH ENGINEERS/ARCHITECTS DRAWINGS FOR DETAILS
- STORM WATER MANHOLE TYPE B FOR INTERNAL DIAMETER REFER TO PLAN DEPTH FROM COVER TO SOFFIT OF PIPE 1.5m - 3m
- STORM WATER MANHOLE TYPE D INTERNAL DIMENSIONS 450mm MINIMUM DEPTH FROM COVER TO SOFFIT OF PIPE UP TO 3m RESTRICT ACCESS TO Ø350 IF DEPTH FROM COVER SOFFIT OF PIPE IS LESS THAN 1m (MAX PIPE DIAMETER 150mm)
- STORM WATER FILTER MANHOLE
- CHANNEL DRAIN SYSTEM WITH SUMP UNIT
- STORM WATER SOAKAWAY / ATTENUATION TANK GL = GROUND LEVEL TOTL = TOP OF TANK LEVEL BOTL = BOTTOM OF TANK LEVEL
- PIPE DETAIL: Ø, LENGTH, GRADIENT.
- MANHOLE REFERENCE: COVER LEVEL, INVERT LEVEL, SUMP INVERT LEVEL, MH TYPE, CATCHPIT MANHOLE (IF REQUIRED), COVER GRADE
- FOUL WATER SEWER
- FOUL WATER DRAIN
- FOUL WATER RISING MAIN
- ABOVE GROUND FOUL WATER CONNECTION - REFER TO PUBLIC HEALTH ENGINEERS/ARCHITECTS DRAWINGS FOR DETAILS
- FOUL WATER MANHOLE TYPE D INTERNAL DIMENSIONS 450mm MINIMUM DEPTH FROM COVER TO SOFFIT OF PIPE UP TO 3m RESTRICT ACCESS TO Ø350 IF DEPTH FROM COVER SOFFIT OF PIPE IS LESS THAN 1m (MAX PIPE DIAMETER 150mm)
- FOUL WATER PUMP CHAMBER
- PIPE DETAIL: Ø, LENGTH, GRADIENT.
- MANHOLE REFERENCE: COVER LEVEL, INVERT LEVEL, MH TYPE, COVER GRADE
- ARCHITECTURAL FINISHED FLOOR LEVEL

SPECIAL ATTENTION BY THE CONTRACTOR

NOTES:

- THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ARCHITECT AND ENGINEERING DETAILS, DRAWINGS AND SPECIFICATIONS.
- ANY DISCREPANCIES SHOULD BE REPORTED TO THE ARCHITECT AND/OR ENGINEER IMMEDIATELY, SO THAT CLARIFICATION CAN BE SOUGHT PRIOR TO THE COMMENCEMENT OF WORK.

DRAINAGE NOTES

- ALL PIPES TO BE ADOPTED, OR CONNECTING TO ADOPTED SEWERS, AND/OR SITUATED UNDER HIGHWAY TO BE VITRIFIED CLAY TO BS EN 295 & BS65 (SWS ONLY), OR CONCRETE PIPES TO BE EN 1916 & BS5911 PART 1, OR THERMOPLASTIC STRUCTURED WALL SEWER PIPES TO BS 4-35-01 (CLASS BKN/SQ/M) AND BE CAPABLE OF WITHSTANDING 4000 PSI JETTING PRESSURE. PRIVATE PIPES MAY BE VC OR PLASTIC.
- ADAPTABLE HIGHWAY WORKS ARE TO BE IN ACCORDANCE WITH LOCAL AUTHORITY DESIGN GUIDANCE.
- ANY WORKS ASSOCIATED WITH THE HIGHWAY/EXTERNAL WORKS INCLUDING HIGHWAY DRAINAGE, SHALL BE IN ACCORDANCE WITH THE HIGHWAYS AGENCY MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS, VOL 1 (MCHW), UNLESS OTHERWISE SPECIFIED.
- FOR CONSTRUCTION DETAILS REFER TO THE RELEVANT BAKER AND ASSOCIATES (BAK) DRAWING NUMBERS LISTED ON THE DRAWING ISSUE SHEET.
- ALL ADAPTABLE DRAINAGE WORKS TO BE CONSTRUCTED AS DETAILED IN "THE CODE" FOR ADOPTION DESIGN AND CONSTRUCTION GUIDANCE AND THE LOCAL WATER AUTHORITY'S LOCAL PRACTICE NOTE.
- ALL ADAPTABLE SEWERS WITH LESS THAN 1.20m OF COVER WHEN LAID BENEATH THE ROADS, OR 0.90m OF COVER IN OTHER AREAS, SHALL HAVE CONCRETE PROTECTION IN ACCORDANCE WITH EITHER OF THE DETAILS SHOWN ON THE STANDARD DRAWING PROVIDED.

- ALL DRAINAGE WORKS SHOULD COMMENCE AT THE PROPOSED DOWNSTREAM CONNECTION POINT, THE WORKS CONTINUING UPSTREAM FOLLOWING CONFIRMATION OF THE TIE-IN INVERT LEVELS TO THE ENGINEER. CONNECTIONS TO MANHOLES OR LARGER SIZED PIPES ETC. SHOULD BE SOFFIT TO SOFFIT UNLESS OTHERWISE INSTRUCTED BY THE ENGINEER. IF THIS IS NOT POSSIBLE INFORM THE ENGINEER IMMEDIATELY
- COVER LEVELS SHOWN ARE APPROXIMATE. COVERS AND FRAMES SHALL BE SET TO FINISHED GROUND LEVELS AND FALLS.
- ROAD GULLY PIPES ARE TO BE 150mm DIA. WITH CONCRETE SURROUND AND FLEXIBLE JOINTS. ALL OTHER UN-REFERENCED PIPES ARE ASSUMED TO BE 100mm DIA.
- FW MIN GRADIENT - 1 IN 40 (100 DIA) NO WC'S CONNECTED
- FW MIN GRADIENT - 1 IN 80 (100 DIA) MIN 1 WC CONNECTED
- FW MIN GRADIENT - 1 IN 150 (150 DIA) MIN 5 WCs CONNECTED
- SW MIN GRADIENT - 1 IN 100 (100 DIA)
- SW MIN GRADIENT - 1 IN 150 (150 DIA)

- WHERE DRAINAGE RUNS PASS CLOSE TO BUILDINGS OR THEIR INVERT LEVELS ARE BELOW FOUNDATION LEVEL, THEN THE TRENCHES ARE TO BE BACK FILLED IN ACCORDANCE WITH THE STANDARD DETAIL PROVIDED.
- REFERENCE SHOULD BE MADE TO THE STRUCTURAL ENGINEERS DETAILS FOR ALL ASPECTS OF FOUNDATION DESIGN AND CONSTRUCTION.
- THE CONTRACTOR IS TO KEEP A RECORD OF ANY VARIATIONS MADE ON SITE, INCLUDING THE RELOCATION OF SEWERS OR DRAINS, SO THAT AN AS CONSTRUCTED DRAWING CAN BE PREPARED UPON COMPLETION OF THE PROJECT.
- THE CONTRACTOR SHOULD CHECK ALL DIMENSIONS ON SITE. NO DIMENSIONS ARE TO BE SCALED FROM THESE DRAWINGS.
- IT IS THE CONTRACTOR'S/SUBCONTRACTORS RESPONSIBILITY TO ENSURE COMPLIANCE WITH THE CURRENT BUILDING REGULATIONS AND CODES OF PRACTICE.
- STUB CONNECTIONS TO ADAPTABLE MANHOLES SHALL BE MADE FROM VITRIFIED CLAY AND CONSIST OF TWO ROCKER PIPES LAID AT THE SAME GRADIENT AS THE UP OR DOWNSTREAM PIPE.
- ALL DOWNPIPES ARE TO BE SEALED, IE CONNECTED DIRECTLY TO THE STORMWATER DRAIN. ACCESS POINTS TO BE PROVIDED 1m ABOVE GROUND LEVEL FOR EXTERNAL RWPS AND 1m ABOVE FFL FOR INTERNAL RWPS.
- ALL DOWNPIPES ARE TO BE CONNECTED TO DOWN PIPE GULLIES PRIOR TO CONNECTING TO THE STORMWATER DRAIN. ACCESS POINTS TO BE PROVIDED 1m ABOVE FFL FOR INTERNAL RWPS.
- UNLESS OTHERWISE NOTED OR SIMILAR APPROVED CHANNEL DRAINS TO BE ACO MULTI DRAIN WITH A15 GRATING IN PEDESTRIAN AREAS, C250 IN CAR PARKS AND D400 IN CARRIAGEWAYS. SLOTTED CHANNEL TO BE USED FOR AREAS WITH FALLS <1:15 MESH GRATING TO BE USED WHERE FALLS >1:15
- GULLY AND CHANNEL DRAIN POSITIONS ARE LIABLE TO AMENDMENT WHEN THE DESIGN LEVELS HAVE BEEN DETERMINED.

- MODULAR GEOCELLULAR STORAGE/SOAKAWAY SYSTEM TO CONFORM TO CIRIA C793 THE SUDS MANUAL, C880 STRUCTURAL DESIGN OF MODULAR GEOCELLULAR DRAINAGE TANKS & C269 SITE HANDBOOK FOR THE CONSTRUCTION OF SUDS. THE MANUFACTURER SHOULD PROVIDE A COMPLETE SET OF INDEPENDENT TEST RESULTS FOR A PROPOSED SYSTEM INCLUDING, AS A MINIMUM, STRESS/STRAIN CURVES FOR VERTICAL AND LATERAL COMPRESSION, AND CREEP TESTS UNDER SUSTAINED LONG-TERM LOADS. A BBA CERTIFICATE IS NOT INDEPENDENT TEST DATA.
- ALL REDUNDANT DRAINAGE TO BE ABANDONED ONCE THE CONTRACTOR HAS SATISFIED HIMSELF THAT NO CONNECTIONS REMAIN LIVE. REDUNDANT DRAINAGE TO BE GRUBBED OUT.
- ALL BELOW GROUND CONCRETE TO ACCORD WITH BS5328:1997/SULPHATE CLASS TBA.
- IF ANY SUB SOIL DRAINAGE SYSTEMS ARE UNCOVERED DURING THE WORKS CONTACT THE ENGINEER FOR INSTRUCTIONS. GENERALLY SUB SOIL DRAINS AFFECTED ARE TO BE DIVERTED AROUND NEW WORKS AND CONNECTED INTO THE SURFACE WATER DRAINAGE SYSTEM. PIPE DIAMETERS AND GRADIENTS ARE TO BE MAINTAINED.
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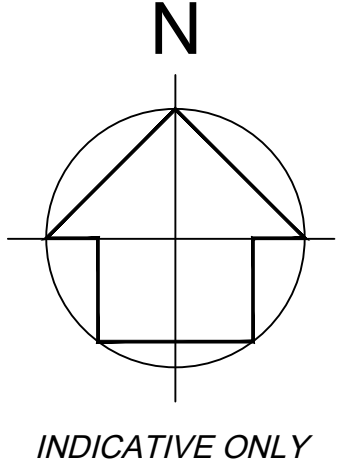
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IMPORTANT NOTE: CAUTION
ALL INFORMATION SHOWN ON THIS DRAWING FOR UNDERGROUND SERVICES/STATUTORY UNDERTAKERS' PLANT IS APPROXIMATE AND IS PROVIDED FOR THE CONTRACTOR'S INFORMATION ONLY. IT SHOULD NOT BE RELIED ON FOR EXCAVATION OR ANY OTHER WORKS PURPOSES AND CONTRACTORS MUST SATISFY THEMSELVES OF THEIR LOCATIONS PRIOR TO THE COMMENCEMENT OF WORKS.



P01		03/10/22		FIRST ISSUE		JFB	
REV		DATE		DESCRIPTION		ISSUED	
CLIENT PORTSMOUTH CITY COUNCIL							
ARCHITECT -							
PROJECT TITLE BUNTING GARDENS WATERLOOVILLE PO8 9UN							
DATE OF FIRST ISSUE SEP 2022				SCALE @ A1 1:100		SCALE @ A3 1:200	
PROJECT TECHNICIAN / ENGINEER J.MARSH				PROJECT LEAD ENGINEER S.BAKER			
DRAWING TITLE PROPOSED DRAINAGE LAYOUT SHEET 2 OF 2							
				Wessex House Upper Market Street Eastleigh Hampshire SO50 9FD			
DRAWING NUMBER P1893-BAK-XX-XX-DR-C-501							
PROJECT STATUS PRELIMINARY				REVISION P01			

Node SW TANK Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	50.550
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	41

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	15.0	0.0	0.400	15.0	0.0	0.401	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	109.521	30.991	30 year 720 minute winter	11.754	4.687
1 year 15 minute winter	76.857	30.991	30 year 960 minute summer	14.215	3.743
1 year 30 minute summer	71.439	20.215	30 year 960 minute winter	9.416	3.743
1 year 30 minute winter	50.133	20.215	30 year 1440 minute summer	10.161	2.723
1 year 60 minute summer	48.435	12.800	30 year 1440 minute winter	6.829	2.723
1 year 60 minute winter	32.179	12.800	30 year 2160 minute summer	7.160	1.979
1 year 120 minute summer	30.053	7.942	30 year 2160 minute winter	4.933	1.979
1 year 120 minute winter	19.966	7.942	30 year 2880 minute summer	5.883	1.577
1 year 180 minute summer	23.233	5.979	30 year 2880 minute winter	3.953	1.577
1 year 180 minute winter	15.102	5.979	30 year 4320 minute summer	4.374	1.143
1 year 240 minute summer	18.475	4.882	30 year 4320 minute winter	2.880	1.143
1 year 240 minute winter	12.274	4.882	30 year 5760 minute summer	3.554	0.910
1 year 360 minute summer	14.169	3.646	30 year 5760 minute winter	2.301	0.910
1 year 360 minute winter	9.210	3.646	30 year 7200 minute summer	2.987	0.762
1 year 480 minute summer	11.185	2.956	30 year 7200 minute winter	1.928	0.762
1 year 480 minute winter	7.431	2.956	30 year 8640 minute summer	2.583	0.659
1 year 600 minute summer	9.182	2.511	30 year 8640 minute winter	1.667	0.659
1 year 600 minute winter	6.274	2.511	30 year 10080 minute summer	2.284	0.583
1 year 720 minute summer	8.203	2.199	30 year 10080 minute winter	1.474	0.583
1 year 720 minute winter	5.513	2.199	100 year +40% CC 15 minute summer	488.233	138.153
1 year 960 minute summer	6.768	1.782	100 year +40% CC 15 minute winter	342.620	138.153
1 year 960 minute winter	4.483	1.782	100 year +40% CC 30 minute summer	320.551	90.705
1 year 1440 minute summer	4.949	1.326	100 year +40% CC 30 minute winter	224.948	90.705
1 year 1440 minute winter	3.326	1.326	100 year +40% CC 60 minute summer	214.603	56.713
1 year 2160 minute summer	3.574	0.988	100 year +40% CC 60 minute winter	142.577	56.713
1 year 2160 minute winter	2.462	0.988	100 year +40% CC 120 minute summer	129.587	34.246
1 year 2880 minute summer	2.986	0.800	100 year +40% CC 120 minute winter	86.094	34.246
1 year 2880 minute winter	2.007	0.800	100 year +40% CC 180 minute summer	97.729	25.149
1 year 4320 minute summer	2.276	0.595	100 year +40% CC 180 minute winter	63.526	25.149
1 year 4320 minute winter	1.499	0.595	100 year +40% CC 240 minute summer	75.977	20.078
1 year 5760 minute summer	1.885	0.483	100 year +40% CC 240 minute winter	50.477	20.078
1 year 5760 minute winter	1.220	0.483	100 year +40% CC 360 minute summer	56.677	14.585
1 year 7200 minute summer	1.609	0.410	100 year +40% CC 360 minute winter	36.841	14.585
1 year 7200 minute winter	1.038	0.410	100 year +40% CC 480 minute summer	43.979	11.622
1 year 8640 minute summer	1.409	0.359	100 year +40% CC 480 minute winter	29.219	11.622
1 year 8640 minute winter	0.910	0.359	100 year +40% CC 600 minute summer	35.604	9.738
1 year 10080 minute summer	1.260	0.322	100 year +40% CC 600 minute winter	24.327	9.738
1 year 10080 minute winter	0.813	0.322	100 year +40% CC 720 minute summer	31.433	8.424
30 year 15 minute summer	268.706	76.035	100 year +40% CC 720 minute winter	21.125	8.424
30 year 15 minute winter	188.566	76.035	100 year +40% CC 960 minute summer	25.432	6.697
30 year 30 minute summer	174.929	49.499	100 year +40% CC 960 minute winter	16.847	6.697
30 year 30 minute winter	122.757	49.499	100 year +40% CC 1440 minute summer	18.055	4.839
30 year 60 minute summer	116.589	30.811	100 year +40% CC 1440 minute winter	12.134	4.839
30 year 60 minute winter	77.459	30.811	100 year +40% CC 2160 minute summer	12.630	3.490
30 year 120 minute summer	70.438	18.615	100 year +40% CC 2160 minute winter	8.702	3.490
30 year 120 minute winter	46.797	18.615	100 year +40% CC 2880 minute summer	10.319	2.766
30 year 180 minute summer	53.298	13.715	100 year +40% CC 2880 minute winter	6.935	2.766
30 year 180 minute winter	34.645	13.715	100 year +40% CC 4320 minute summer	7.609	1.989
30 year 240 minute summer	41.604	10.995	100 year +40% CC 4320 minute winter	5.011	1.989
30 year 240 minute winter	27.641	10.995	100 year +40% CC 5760 minute summer	6.145	1.573
30 year 360 minute summer	31.221	8.034	100 year +40% CC 5760 minute winter	3.978	1.573
30 year 360 minute winter	20.295	8.034	100 year +40% CC 7200 minute summer	5.137	1.311
30 year 480 minute summer	24.324	6.428	100 year +40% CC 7200 minute winter	3.316	1.311
30 year 480 minute winter	16.160	6.428	100 year +40% CC 8640 minute summer	4.424	1.129
30 year 600 minute summer	19.756	5.404	100 year +40% CC 8640 minute winter	2.855	1.129
30 year 600 minute winter	13.498	5.404	100 year +40% CC 10080 minute summer	3.897	0.994
30 year 720 minute summer	17.490	4.687	100 year +40% CC 10080 minute winter	2.515	0.994

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.29%

	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
	SW MH 1.0	1	49.000	0.000	2.3	0.0000	0.0000	OK
	SW MH 2.0	14	50.599	0.099	2.6	0.1116	0.0000	OK
	SW MH 3.0	10	50.885	0.039	4.1	0.0225	0.0000	OK
	SW MH 4.0	10	51.021	0.041	2.1	0.0206	0.0000	OK
	SW MH 6.0	11	51.123	0.023	0.7	0.0087	0.0000	OK
	SW TANK	14	50.610	0.060	4.1	0.8598	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW MH 2.0	Hydro-Brake®	SW MH 1.0	2.4				1.9
15 minute winter	SW MH 3.0		SW TANK	4.1	1.562	0.301	0.0208	
15 minute winter	SW MH 4.0		SW MH 3.0	2.0	0.708	0.336	0.0393	
15 minute winter	SW MH 6.0	1.000	SW MH 4.0	0.7	0.326	0.116	0.0264	
15 minute winter	SW TANK	1.003	SW MH 2.0	2.6	0.465	0.545	0.0523	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.29%

	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
	SW MH 1.0	1	49.000	0.000	2.5	0.0000	0.0000	OK
	SW MH 2.0	26	50.749	0.249	2.9	0.2813	0.0000	SURCHARGED
	SW MH 3.0	11	50.917	0.071	10.2	0.0408	0.0000	OK
	SW MH 4.0	10	51.054	0.074	5.2	0.0368	0.0000	OK
	SW MH 6.0	10	51.136	0.036	1.7	0.0135	0.0000	OK
	SW TANK	26	50.765	0.215	7.9	3.0633	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	SW MH 2.0	Hydro-Brake®	SW MH 1.0	2.5				6.2
15 minute winter	SW MH 3.0		SW TANK	10.1	1.686	0.738	0.0404	
15 minute winter	SW MH 4.0		SW MH 3.0	5.0	0.840	0.832	0.0807	
15 minute winter	SW MH 6.0	1.000	SW MH 4.0	1.7	0.381	0.276	0.0522	
30 minute winter	SW TANK	1.003	SW MH 2.0	2.9	0.447	0.618	0.0642	

CAUSEWAY 	Baker & Associates	File: Flow Network P01.pfd Network: Storm Network Simon Baker 03/10/2022						Page 5	
Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.29%									



APPENDIX D – EXCEEDANCE ROUTING





APPENDIX E – MAINTENANCE REQUIREMENTS



BUNTING GARDENS
WATERLOOVILLE
HAMPSHIRE
PO8 9UN

DRAINAGE SYSTEM MAINTENANCE REQUIREMENTS.

October 2022

Consulting Civil Engineers

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1. INTRODUCTION

2. COMPONENTS OF THE SYSTEM

3. MAINTENANCE SCHEDULES

3.1 Pipes, foul and surface water system. Clay or Plastic

3.2 Inspection Chambers, manholes, channel drains & Gullies

3.3 Attenuation Tank

3.4 Proprietary Water Quality Systems.





1 INTRODUCTION

The purpose of this document is to set out the maintenance requirements for the private drainage system.

The foul drainage system has been designed such that foul water flows from the building drain into an adopted foul water sewer system.

The surface water drainage system has been designed such that surface water flows falling on roofs and hard paved surfaces drain into an attenuation tank, designed to cater for the 1:100 +40% storm return period prior to discharging to a surface water sewer at a restricted rate.

The implications of not meeting the requirements set out within this document is the potential for flooding the building and open areas on the site.

2 COMPONENTS OF THE SYSTEM

The following components form part of the drainage system and need to be maintained as indicated within this document.

- Pipes, foul and surface water system. Clay or Plastic
- Inspection Chambers, manholes, channel drain & road gullies
- Attenuation Tank
- Proprietary Water Quality Systems.
- Pumping Station

3 MAINTENANCE SCHEDULES

The below sets out the requirements for maintenance of the drainage system.

The maintenance requirements are based on durations and the occurrence of severe storms. However should water be found ponding on any hard surface around channel drains, road gullies, or foul drains become blocked then this visual identifier will trigger the requirements for investigation and maintenance.

A severe storm is defined as any aspect of weather that poses risk to life, property or requires the intervention of authorities. Severe weather warnings will be issued by the Met Office.

3.1 PIPES, FOUL AND SURFACE WATER SYSTEM. CLAY OR PLASTIC

To be checked annually by CCTV survey and debris removed by high pressure jetting. A list of defects should be compiled with high, medium and low risk of failure. High risk defects should be fixed immediately, medium risk should be fixed within 6 months and low risk to be monitored annually.





3.2 INSPECTION CHAMBERS, MANHOLES, CHANNEL DRAINS AND ROAD GULLIES

To be checked annually and after a severe storm by visual survey and debris removed. A list of defects should be compiled and with high, medium and low risk of failure. High risk defects should be fixed immediately, medium risk should be fixed within 6 months and low risk to be monitored annually.

3.3 ATTENUATION TANK

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into 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
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

3.4 PROPRIETARY WATER QUALITY SYSTEMS

An ACO QuadraCeptor has been specified and the manufacturers recommendation for maintenance are below; the maintenance frequency of the system should follow that of the attenuation tank.

There are no moving parts in the ACO QuadraCeptor, meaning the only maintenance required is occasional emptying of the silt chamber (an ACO silt level alarm can be fitted) and cleaning or replacing of the filters when required.

3.5 PUMPING STATION

Maintenance contract to be put in place for Pumping Station.

