

MERIDIAN

CIVIL ENGINEERING CONSULTANCY

IMPERIAL WHARF,
GRAVESEND,
DA11 0DY

SURFACE WATER DRAINAGE DISCHARGE OF CONDITIONS

MAY 2024

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Client : PDE Consulting

Rev	Date	Prepared by	Checked by	Approved by
-	20/05/2024	CL	MN	MN

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1.0 INTRODUCTION

- 1.1 Meridian Civil Engineering Consultancy LTD (MCEC) has been instructed by PDE Consulting to prepare a surface water design for the site at Imperial Wharf. This design follows the drainage hierarchy and the principles of the previously approved Ambiantal drainage strategy.
- 1.2 The proposals are for the construction of a hardstanding carpark, 2 bitumen tanks with a 4.5m high bund wall, a HGV parking area with a truck loading system and emulsion tanks and plant.
- 1.3 The drainage for the proposals has been split into three catchments, Catchment 1, 2 and 3.
- 1.4 Catchment 1 conveys storm water and discharges into the River Thames to the north of the site. As the River is tidal at this point no flow rate reduction is deemed necessary. An unrestricted gravity outfall is proposed with a supplemental pumped outfall for when tide levels are such that the gravity connection is no longer able to deal with flows from site.
- 1.5 Catchment 2 is an existing hard surfaced area that drains to the road drainage network. It is therefore proposed to have an attenuation tank and hydrobrake to limit runoff from the area in line with current best practice and local guidance. The attenuation tank will have a storage volume of 38.0m³. Runoff rate will be limited to 1.0l/s for all events up to and including the 1 in 100 year+40%CC event. Runoff is proposed to be discharged into nearby storm drainage network. The reduction in runoff is a betterment over the existing situation which drains at an unrestricted rate.
- 1.6 Catchment 2 includes a 4.5m high bund surrounding the proposed bitumen tanks. Water falling within the bund is proposed to be drained via the 'Bundguard' system (used for dewatering bunds) and would be pumped from at a rate of 0.7l/s.
- 1.7 Catchment 3 is currently a general storage area. Proposals for this area are for replacement car parking to compensate for the loss of the existing car park when the bitumen tanks are constructed. It is proposed to lay an impermeable asphalt surface on the car park area with permeable paving subbase with a French drain to provide attenuation. A hydrobrake will limit runoff from the subbase to a max rate of 1.0l/s for all events up to and including the 1 in 100 year+40%CC event.
- 1.8 MCEC have created a network model to assess the required storage capacities for the proposed development. The rainfall model used for detailed storage calculations is the FEH22 rainfall model. Storms have been modelled up to, and including, the 1in100yr rainfall event with 40% climate change allowance in accordance with best practice.
- 1.9 This discharge of condition report follows the principles of the Ambiantal Environmental Assessment Surface Water Drainage Strategy (SWDS) report submitted and approved at planning stage.

2.0 SURFACE WATER DRAINAGE STRATEGY

- 2.1 This detailed drainage submission has been produced in line with the CIRIA SuDS manual and follows the drainage hierarchy and the principles of the previously approved Ambiantal drainage strategy. The drainage for the proposals has been split into three catchments, Catchment 1, 2 and 3.
- 2.2 Catchment 1 is proposed to drain via a network of ACO QMAX 900 drains into the River Thames adjacent to the site. As the Thames is tidal at this point of the river, the runoff rate will be unrestricted. An oil interceptor is proposed prior to discharge to provide treatment for the surface water runoff. The discharge point into the river will have 2 components, a gravity discharge with a non-return valve for when tidal levels are low and a pumped discharge for when tidal levels are above the gravity connection.
- 2.3 The Catchment 2 strategy is based around attenuation and controlled discharge to nearby drainage. A geocellular crate system will provide attenuation storage. The crate will be 100m² in area and 0.4m in depth, giving a total storage volume of 38m³ with a half drain time of 795 minutes. A hydrobrake will limit discharge from the catchment to a maximum rate of 1.0l/s for all events up to and including the 1 in 100 year+40%CC event.
- 2.4 Catchment 2 also includes a 4.5m high bund surrounding 2 bitumen tanks. A Bundguard pump is proposed to provide treatment and pump from inside the bund to the rest of the catchment. The pumping will occur at a rate of 0.7l/s for the head of 4.5m. At this pumping rate the bund will not flood for all events up to and including the 1 in 100 year +40%CC event.
- 2.5 The Catchment 3 strategy is also based on attenuation and controlled discharge. The proposed development for Catchment 3 is for a carpark. Proposals are to formalise this parking and, as such, it is proposed to lay an impermeable asphalt surface on the car park area with permeable paving subbase. A French drain is shown proposed to run around the edge of the carpark which will drain into the permeable paving subbase.
- 2.6 The permeable pavement subbase will be approximately 900m² in area with a storage depth of 0.4m giving a storage volume of 108m³. The French drain running around the edge of the pavement will be approximately 112.5m² in area with an approximate storage volume of 15.2m³. A hydrobrake will control runoff from the subbase to a maximum rate of 1l/s for all events up to and including the 1 in 100 year+40% CC event. Surface water will be discharged to nearby drainage shown in the CCTV survey(Appendix IV).
- 2.7 The proposed drainage strategy is capable of coping with all events up to and including the 1 in 100 year+40%CC event with a 10% urban creep allowance factor. The critical storm duration is the 120 minute winter event.
- 2.8 The proposed drainage layout plan drawing is included in Appendix I and associated network calculations in appendix II.

3.0 MANAGEMENT AND MAINTENANCE

- 3.1 All onsite SuDS and drainage systems will be privately maintained by FM Conway.
- 3.2 In addition to a long term maintenance regime it is recommended that all drainage elements implemented on site should be inspected following the first rainfall event post construction and monthly for the first quarter following construction

PROPOSED SCHEDULE OF MAINTENANCE FOR BELOW GROUND DRAINAGE				
Item	Visual Inspection	Cleanse / De-sludge	CCTV Survey	Comments
Surface Water Drainage System (pipework, chambers etc.)	5 years	10 years	10 years	Cleansing to be carried as necessary
Gullies/Channels	1 year	1 year	N/A	Cleansing to be carried as necessary
Storm water catchpits	1 year		N/A	Cleansing to be carried as necessary
Pumps	1 year			Maintain as manufacturers guidance
Oil interceptors	1 year	As necessary		Maintain as manufacturers guidance
Geocellular Attenuation	0.5 year	1 year	-	See manufacturers guidelines

4.0 CONCLUSION

- 4.1 Meridian Civil Engineering Consultancy LTD (MCEC) has been instructed by PDE Consulting to prepare a surface water design for the site at Imperial Wharf. This design follows the drainage hierarchy and the principles of the previously approved Ambiantal drainage strategy.
- 4.2 The proposals are for the construction of a hardstanding carpark, 2 bitumen tanks with a 4.5m high bund wall, a HGV parking area with a truck loading system and emulsion tanks and plant.
- 4.3 The drainage for the proposals has been split into three catchments, Catchment 1, 2 and 3.
- 4.4 Catchment 1 conveys storm water and discharges into the River Thames to the north of the site. As the River is tidal at this point no flow rate reduction is deemed necessary. An unrestricted gravity outfall is proposed with a supplemental pumped outfall for when tide levels are such that the gravity connection is no longer able to deal with flows from site.
- 4.5 Catchment 2 is an existing hard surfaced area that drains to the road drainage network. It is therefore proposed to have an attenuation tank and hydrobrake to limit runoff from the area in line with current best practice and local guidance. The attenuation tank will have a storage volume of 38.0m³. Runoff rate will be limited to 1.0l/s for all events up to and including the 1 in 100 year+40%CC event. Runoff is proposed to be discharged into nearby storm drainage network. The reduction in runoff is a betterment over the existing situation which drains at an unrestricted rate.
- 4.6 Catchment 2 includes a 4.5m high bund surrounding the proposed bitumen tanks. Water falling within the bund is proposed to be drained via the 'Bundguard' system (used for dewatering bunds) and would be pumped from at a rate of 0.7l/s.
- 4.7 Catchment 3 is currently a general storage area. Proposals for this area are for replacement car parking to compensate for the loss of the existing car park when the bitumen tanks are constructed. It is proposed to lay an impermeable asphalt surface on the car park area with permeable paving subbase with a French drain to provide attenuation. A hydrobrake will limit runoff from the subbase to a max rate of 1.0l/s for all events up to and including the 1 in 100 year+40%CC event.
- 4.8 MCEC have created a network model to assess the required storage capacities for the proposed development. The rainfall model used for detailed storage calculations is the FEH22 rainfall model. Storms have been modelled up to, and including, the 1in100yr rainfall event with 40% climate change allowance in accordance with best practice.
- 4.9 This discharge of condition report follows the principles of the Ambiantal Environmental Assessment Surface Water Drainage Strategy (SWDS) report submitted and approved at planning stage.

APPENDIX I Drainage Design Drawings

River Thames

PUMP STATION TO BE ACTIVATED WHEN TIDE LEVELS IMPEDE GRAVITY DRAINAGE TO THE THAMES
REQUIRED PUMP RATES BASED ON CALCULATIONS: 200 l/s TWIN PUMP REQUIRED.
PUMP TO BE PROVIDED WITH BATTERY BACKUP.
ARRANGEMENT TO BE AGREED WITH PUMP MANUFACTURER

HDPE PIPE SUITABLE FOR HIGH PRESSURE LOADING (RISING MAIN)
RISING MAIN TO PUMP TO EXISTING DRAINAGE OUTFALL WHERE VIALBE FOLLOWING SITE SURVEYS

MANHOLE WITH NON RETURN VALVE ON OUTLET

GRAVITY CONNECTION TO THE THAMES FOR DISCHARGE WHEN TIDAL LEVELS ARE LOW. FINAL OUTFALL LOCATION TO BE CONFIRMED.

DRAWING TO BE READ IN CONJUNCTION WITH CCTV SURVEY BY CONWAY

River Thames

Mean High Water

CATCHMENT 1
THIS CATCHMENT IS PROPOSED TO DISCHARGE DIRECTLY TO THE THAMES. AS THE THAMES IS TIDAL, ATTENUATION IS NOT REQUIRED FOR THE SITE. A PUMP IS REQUIRED TO PUMP WATER OUT OF THE SITE WHEN THE TIDE IS HIGH.

ACO QMAX 900 DRAIN PROPOSED TO DRAIN CATCHMENT 1 HARDSTANDING, MODELLED AS A 600mm DIAMETER PIPE

FULL RETENTION OIL INTERCEPTOR

ROOF RUNOFF TO DRAIN SEPARATELY TO EXTERNAL TRAFFICKED AREAS

AREA ASSUMED TO DRAIN AS EXISTING YET HAS STILL BEEN INCLUDED IN CALCULATIONS TO BE CONSERVATIVE

150mm ACO ROAD DRAIN OR SIMILAR HIGH LOAD CHANNEL DRAIN

CATCHPIT WITH SMARTSPONGE PASSIVE SKIMMERS TO OFFER TREATMENT TO HARD SURFACE RUNOFF

SURFACE WATER RUNOFF FROM CATCHMENT 2 TO BE DISCHARGED INTO EXISTING DRAINAGE ON SITE UPSTREAM MANHOLE IL: 3.32 DOWNSTREAM MANHOLE IL: 3.61 CONNECTION IL: 3.61

HYDROBRAKE AT 1.0 l/s DISCHARGING TO THE PUBLIC SURFACE WATER SEWER IN CLIFTON MARINE PARADE
RUNOFF RATE BASED ON MINIMUM APERTURE OPENING OF 50mm.
DESIGN HEAD: 1.2m
DESIGN FLOW: 1.3 l/s

HYDROBRAKE AT 1.0 l/s DISCHARGING TO THE PUBLIC SURFACE WATER SEWER IN CLIFTON MARINE PARADE
RUNOFF RATE BASED ON MINIMUM APERTURE OPENING OF 50mm.
DESIGN HEAD: 0.5m
DESIGN FLOW: 1.0 l/s

EXISTING mh DEPTH 1.2m CL: 5.69
RECONSTRUCT AS HYDROBRAKE MANHOLE

150mm SLOTTED DRAIN IN FILTER TRENCH AROUND CAR PARK TO CAPTURE AND DISPERSE RUNOFF FROM CAR PARK SURFACE TO PERMEABLE SUB-BASE AND OUTFALL TO HYDROBRAKE

150mm SLOTTED DRAIN IN SUB-BASE TO DISPERSE RUNOFF FROM CAR PARK SURFACE TO PERMEABLE SUB-BASE AND OUTFALL TO HYDROBRAKE

IMPERMEABLE ASPHALT SURFACED CAR PARKING. TO HAVE A PERMEABLE PAVING SUBBASE TO PROVIDE ATTENUATION (IMPERMEABLE LINED TO PREVENT INFILTRATION) PROPOSED TO HAVE FLAT SUB-BASE AT INVERT=5.45. MIN SUB-BASE DEPTH=300mm
CAPPING LAYER TO BE CONFIRMED FOLLOWING RECEIPT OF CBR VALUES OF FORMATION ALLOWING STRUCTURAL DESIGN OF PERMEABLE PAVEMENT

BUNDGUARD PUMP TO PROVIDE TREATMENT AND PUMP FROM INSIDE BUND TO SURFACE WATER DRAINAGE. TO BE DESIGNED BY SPECIALIST. PUMPING WILL OCCUR AT A RATE OF 0.7 l/s AT THE HEAD OF 4.5m AT THIS PUMPING RATE THE BUND WILL NOT FLOOD FOR ALL EVENTS UP TO AND INCLUDING THE 1 IN 100 YEAR + 40%CC EVENT

DUMMY PIPE RUN TO ALLOW MODelling QUALITY.

CATCHPIT WITH SMARTSPONGE PASSIVE SKIMMERS TO OFFER TREATMENT TO HARD SURFACE RUNOFF

4.5m HIGH BUND WALLS FOR THE CONTAINMENT OF ANY BITUMEN SPILLS
THE AREA CONFINED BY THE BUNDS IS APPROXIMATELY 900m² AND EXCLUDING THE BITUMEN TANKS AREA: 450m²
THE VOLUME CONFINED BY THE BUNDS (2000m³) IS LARGER THAN THE 6 HOUR 100-YEAR +40%CC RAINFALL EVENT VOLUME (85m³)
RUNOFF CONTAINED WITHIN THE BUND AREA WOULD BE PUMPED VIA A BUNDGUARD INTO SURFACE WATER DRAINAGE

- GENERAL
a. THIS DRAWING IS NOT TO BE SCALED, WORK TO FIGURED DIMENSIONS ONLY, CONFIRMED ON SITE.
b. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL DRAWINGS, DETAILED SPECIFICATIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
c. ANY DISCREPANCY ON THIS DRAWING IS TO BE REPORTED IMMEDIATELY TO THE PARTNERSHIP FOR CLARIFICATION.
d. THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
e. CDM REGULATIONS 2015. ALL CURRENT DRAWINGS AND SPECIFICATIONS MUST BE READ IN CONJUNCTION WITH THE DESIGNER'S HAZARD RISK AND ENVIRONMENT ASSESSMENT RECORD. DESIGN HAS BEEN PRODUCED BASED ON INFORMATION PROVIDED BY THE CLIENT/PRINCIPLE DESIGNER AVAILABLE AT TIME OF ISSUE. CONTRACTOR TO REVIEW DRAWING AND SPECIFICATION IN CONTEXT WITH THE WIDER SITE AND SPECIFIC SITE INVESTIGATION, CONTAMINATION ASSESSMENT, ASBESTOS SURVEY, ENVIRONMENTAL SURVEY, UXO SURVEY AND ANY OTHER RELEVANT INFORMATION AND MANAGE RISKS RELATING TO THE WORKS OUTLINED IN THE DRAWINGS AND SPECIFICATION. PRINCIPLE CONTRACTOR TO MAKE DESIGNER AND CLIENT AWARE OF SITE SPECIFIC RISKS THAT MAY AFFECT THE DRAWING AND SPECIFICATION.
f. CDM REGULATIONS 2015. FOR GENERIC MAINTENANCE AND MANAGEMENT RISKS REFER TO CHAPTER 36 OF CRIA 752 SUDS MANUAL. FOR PROPRIETARY SYSTEMS SEE MANUFACTURER'S MANAGEMENT AND MAINTENANCE DETAILS AND RISK ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.
- CONSTRUCTION NOTE
a. THE MAIN CONTRACTOR IS RESPONSIBLE FOR THE DESIGN OF ALL TEMPORARY WORKS, AND IS ALSO RESPONSIBLE FOR THE SAFE MAINTENANCE AND STABILITY OF EXISTING BUILDINGS AT ALL TIMES.
b. THE MAIN CONTRACTOR IS RESPONSIBLE FOR ALL OCCURRENCES OF GROUND WATER DURING THE CONSTRUCTION PERIOD.
c. ANY INFORMATION GIVEN REGARDING EXISTING UNDERGROUND SERVICES IS GIVEN IN GOOD FAITH AFTER CONSULTATION WITH THE RELEVANT AUTHORITY, HOWEVER ACCURACY IS NOT CERTAIN. THE MAIN CONTRACTOR IS RESPONSIBLE FOR CHECKING ALL INFORMATION ON SITE PRIOR TO WORK COMMENCING AND TAKING DUE CARE AND ATTENTION WHILST UNDERTAKING THE WORKS.
d. THE CONTRACTOR MUST COMPLY WITH ALL CURRENT LEGISLATION RELATING TO HEALTH & SAFETY.
e. ALL PRODUCTS SPECIFIED SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND INSTRUCTIONS. IF THERE ARE DISCREPANCIES BETWEEN THAT INFORMATION AND THE DETAILS ON ANY MERIDIAN DRAWINGS, THE MANUFACTURER'S INSTRUCTIONS MUST BE USED.
- BELOW GROUND DRAINAGE
a. UPVC-U PIPES TO BS 4660: 2000 AND PLASTIC INSPECTION CHAMBERS AND FITTINGS TO BS EN 13598-1:2020. CLAY PIPES TO BS EN 295-1:2013. CONCRETE MANHOLE AND INSPECTION CHAMBERS TO BS EN 1917:2002.
b. ALL ADAPTABLE DRAINAGE TO BE CONSTRUCTED IN ACCORDANCE WITH SEWERAGE SECTOR GUIDANCE App C - DESIGN AND CONSTRUCTION GUIDANCE AND THE RELEVANT COUNCIL DESIGN GUIDE.
c. 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.
d. ALL PRIVATE FOUL SEWER PIPES TO BE 100mm DIAMETER FROM SOIL STACKS UNLESS OTHERWISE STATED ON THE DRAWING AND 150mm WHERE SERVING MORE THAN 9 PROPERTIES.
e. ALL PRIVATE SURFACE WATER SEWERS TO BE LAID AT 1 IN 100 UNLESS OTHERWISE STATED ON THE DRAWING.
f. ALL PRIVATE SURFACE WATER SEWER PIPES TO BE 100mm DIAMETER FROM DOWNPIPES AND 150mm DIAMETER ELSEWHERE UNLESS OTHERWISE STATED ON THE DRAWING.
g. ALLOW FOR RODDING ACCESS ABOVE GROUND WHERE RAINWATER DOWNPIPES OR SOIL STACKS DO NOT HAVE A DIRECT CONNECTION TO AN INSPECTION CHAMBER.
h. EXISTING SEWER PIPE TO BE RE-USED TO BE SURVEYED AND LEVELED PRIOR TO COMMENCEMENT OF THE DRAINAGE WORKS AND REBURIED IF NECESSARY.
i. CONNECTIONS TO AN ADOPTED SEWER ONLY TO BE MADE FOLLOWING APPROVAL FROM THE RELEVANT ADOPTING AUTHORITY.
j. ALL DRAINS, SEWER PIPES AND MANHOLES TO BE CLEANED AND TESTED FOR WATER TIGHTNESS ON COMPLETION OF CONSTRUCTION.
- MANHOLE COVERS AND FRAMES
a. MANHOLE COVERS TO BE CLASS D400 IN HIGHWAYS, CLASS B125 IN FOOTWAYS AND VERGES, CLASS A15 IN NON-TRAFFICKED AREAS.
b. MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.

LEGEND

- PROPOSED SW PIPE RUN
- PROPOSED PERFORATED SW DRAIN
- PROPOSED TYPE 2 SW MANHOLE
- PROPOSED SW PUMP
- PROPOSED HYDROBRAKE MANHOLE
- SLOT/CHANNEL DRAIN
- PERMEABLE PAVING (ASSUMED TANKED) - SUB-BASE LAID FLAT WITH MINIMUM DEPTH REQUIRED FOR STORAGE
- RAINWATER PIPE
- EXISTING PRIVATE SW RUN - RETAINED
- PETROL INTERCEPTOR
- CATCHPIT CHAMBER/MANHOLE

REV: DESCRIPTION: BY: DATE:

STATUS: PRELIMINARY

MERIDIAN
CIVIL ENGINEERING CONSULTANCY

CLIENT: PDE CONSULTING

SITE: IMPERIAL WHARF
DA11 0DY

TITLE: SURFACE WATER DRAINAGE
OVERALL LAYOUT

SCALE AT A1: 1:250	DATE: 21/05/2024	DRAWN: CL / BB	CHECKED: MN
PROJECT NO: MC0367	DRAWING NO: CIV-01	REVISION:	P2

NOTE - WHERE THE ACCESS CHAMBER IS IN THE HIGHWAY (INCLUDING ANY FOOTWAY), THE HIGHWAY AUTHORITY CAN HAVE SPECIFIC REQUIREMENTS

TYPE D INSPECTION CHAMBER DETAIL - FLEXIBLE MATERIAL.

(FOR USE IN AREAS SUBJECT TO VEHICLE LOADING, DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE UP TO 3M)
(1:20)

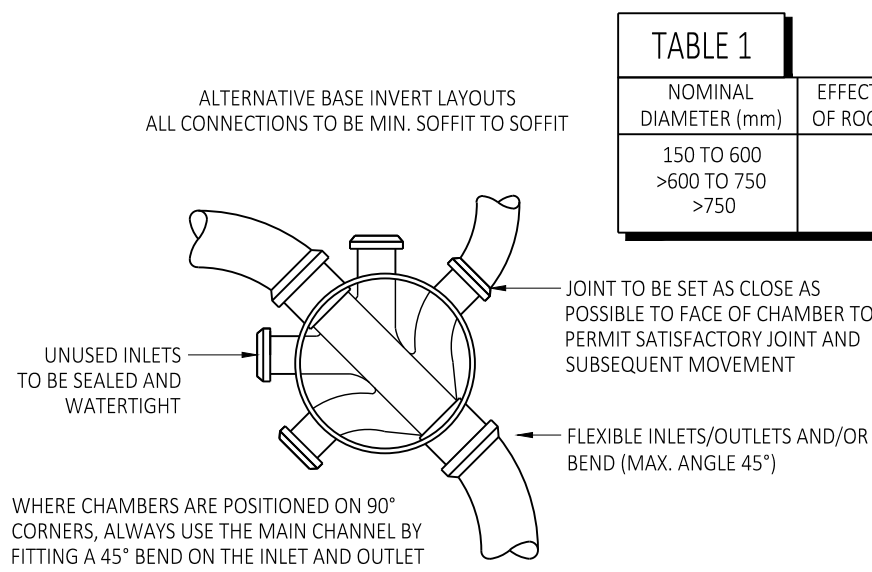
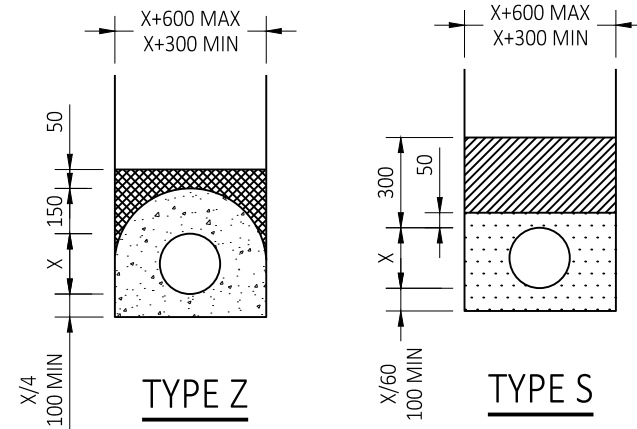
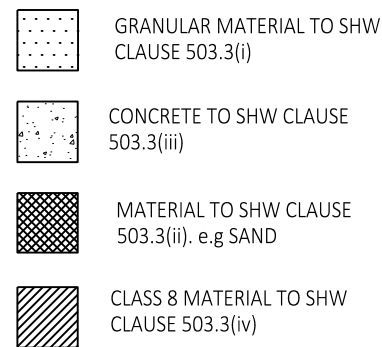


TABLE 1	
NOMINAL DIAMETER (mm)	EFFECTIVE LENGTH OF ROCKER PIPE (m)
150 TO 600	0.6
>600 TO 750	1.0
>750	1.2

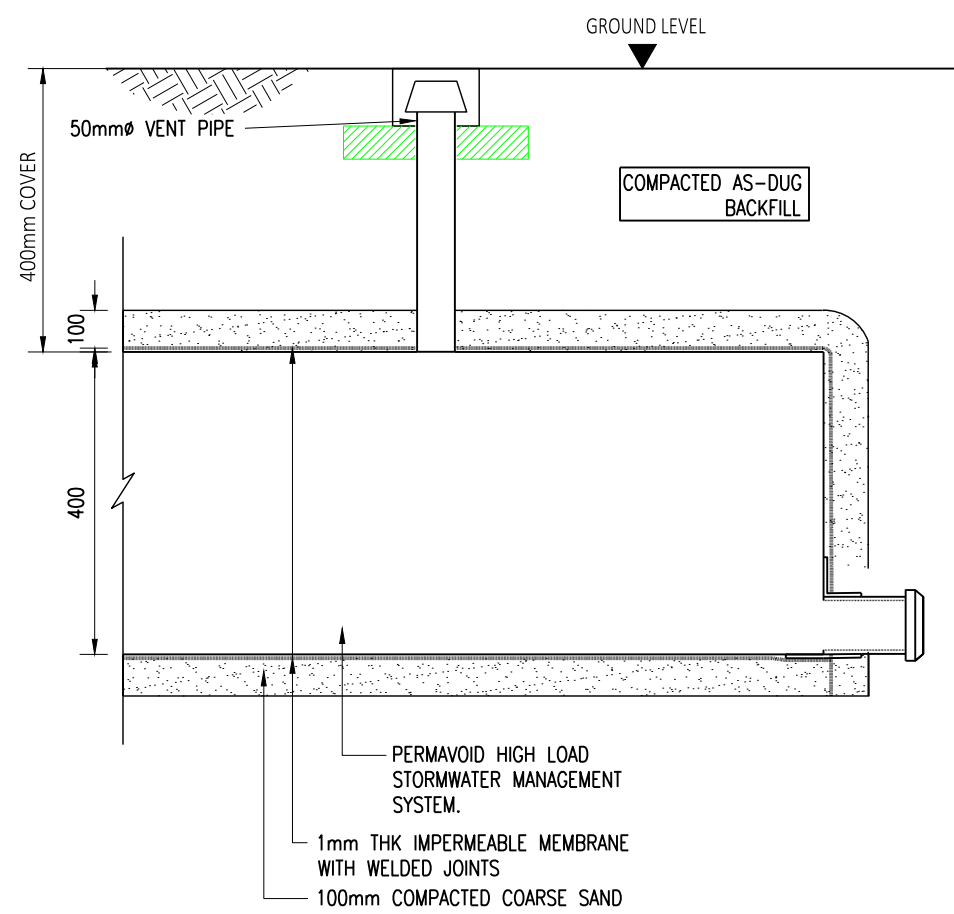
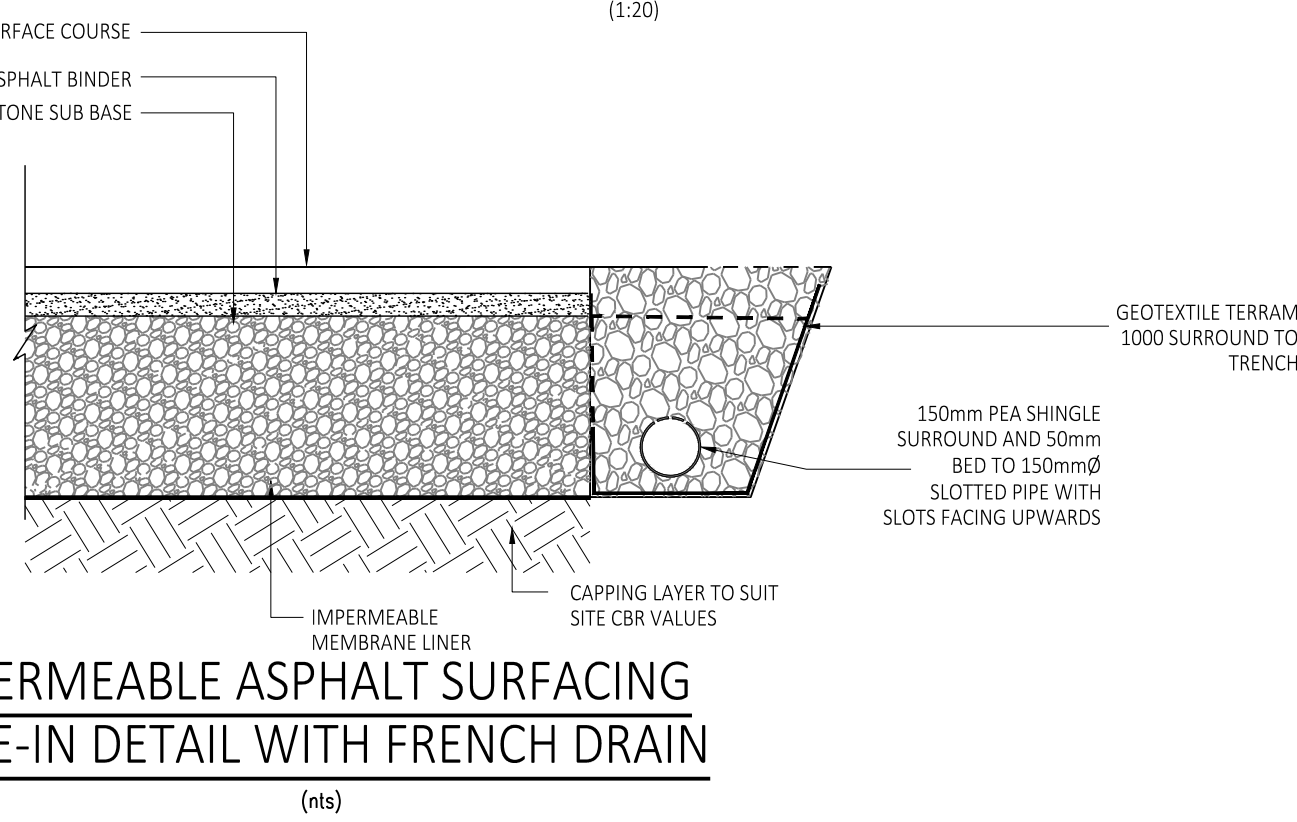


TRENCH AND BEDDING DETAILS

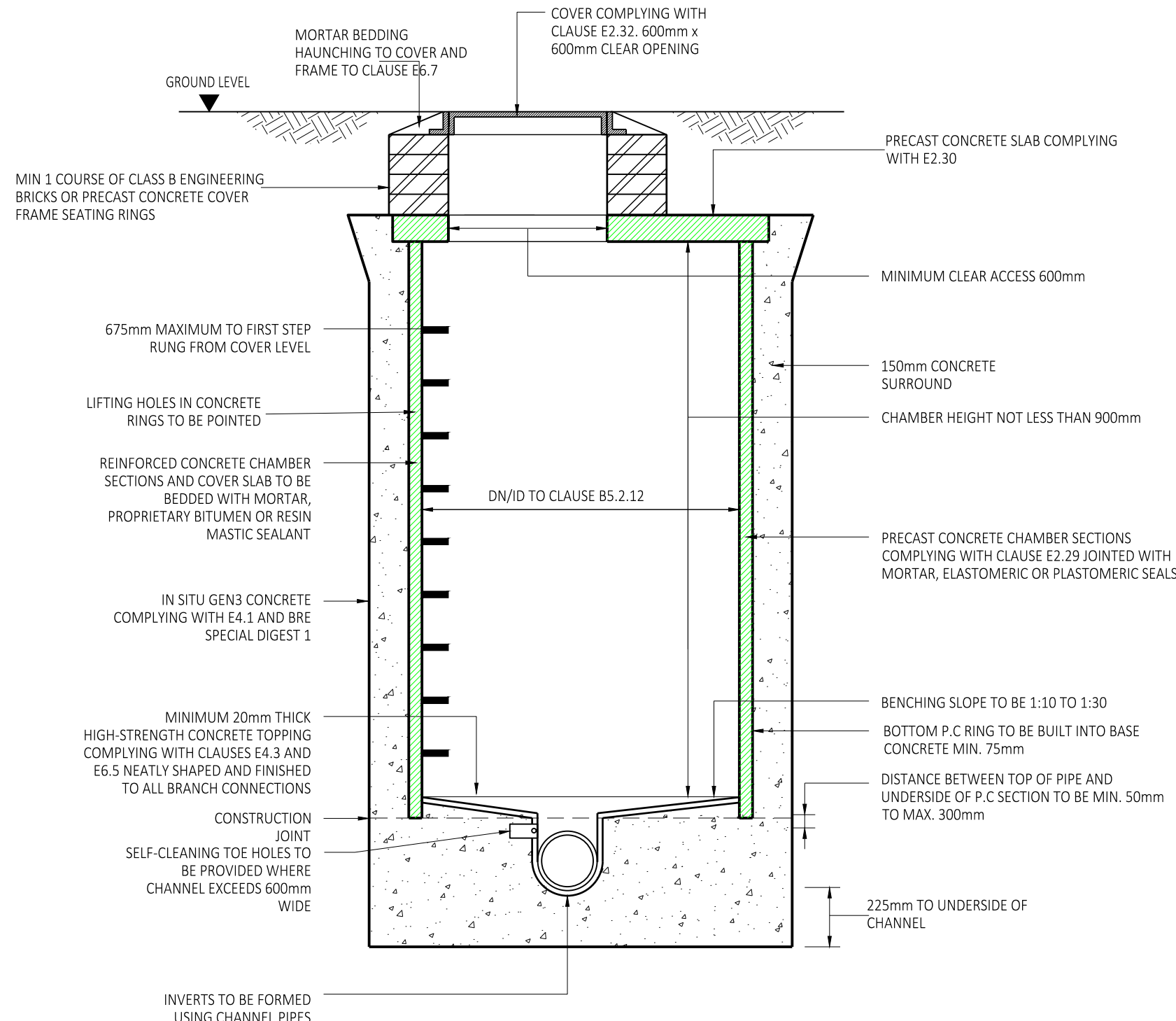
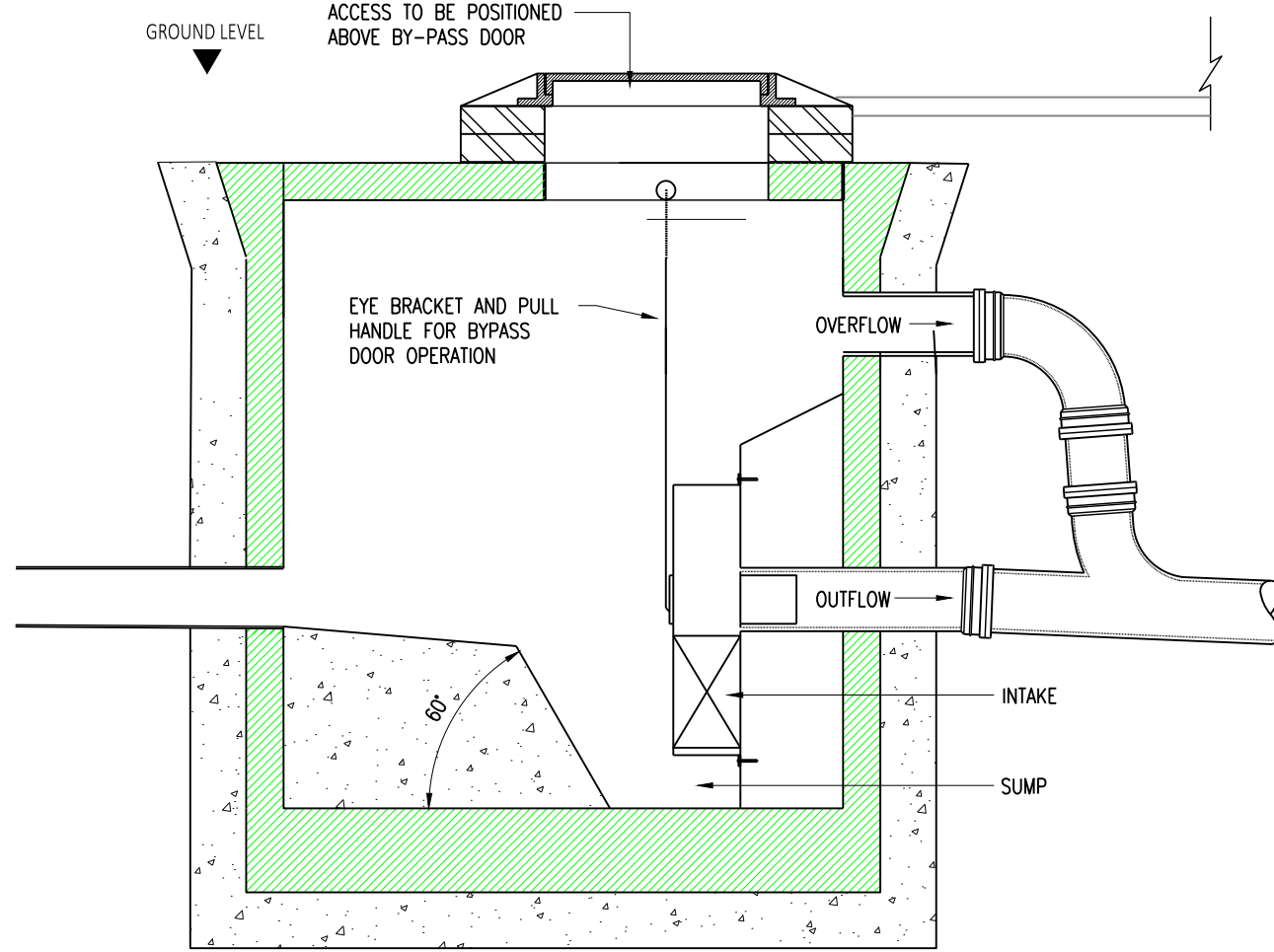


- BEDDING NOTES 3.
- ALL DIMENSIONS ARE IN MILLIMETRES.
 - THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAINAGE DRAWINGS.
 - DIMENSION 'X' IS THE EXTERNAL DIAMETER OF THE PIPE.
 - THE MINIMUM OR MAXIMUM TRENCH WIDTH APPLIES ON AND BELOW A LINE 300mm ABOVE THE OUTSIDE TOP OF THE PIPE. ABOVE 300mm LINE THE TRENCH BACKFILL MATERIAL SHALL BE AS DESCRIBED IN CLAUSE 505 OF SHW.
 - THE CONCRETE BED OR SURROUND MAY EXTEND TO THE SIDES OF THE TRENCH OR BE OF MINIMUM WIDTH. CLASS B MATERIAL IS TO BE SUED TO FILL ANY VOIDS SO FORMED.
 - FOR TYPE Z TRENCH THE CONCRETE COVER MAY BE FORMED TO A RADIUS BATTER OF HORIZONTAL SURFACE. MIN COVER OF CONCRETE SHALL BE 150mm.

PERMEABLE ASPHALT SURFACING TIE-IN DETAIL WITH FRENCH DRAIN



OIL INTERCEPTOR TO BE INSTALLED AS PER MANUFACTURERS DETAILS



TYPE B MANHOLE WITH CONCRETE SURROUND.

(DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE LESS 1.5m TO 3m ALTERNATE RIGID MATERIAL CONSTRUCTION WITH CONCRETE SURROUND)
(1:20)

- GENERAL
- (i) WORK TO FIGURED DIMENSIONS ONLY.
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- (iv) THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
- (v) CDM REGULATIONS 2015. ALL CURRENT DRAWINGS AND SPECIFICATIONS MUST BE READ IN CONJUNCTION WITH THE DESIGNER'S HAZARD RISK AND ENVIRONMENT ASSESSMENT RECORD. DESIGN HAS BEEN PRODUCED BASED ON INFORMATION PROVIDED BY THE CLIENT/PRINCIPLE DESIGNER AVAILABLE AT TIME OF ISSUE. CONTRACTOR TO REVIEW DRAWING AND SPECIFICATION IN CONTEXT WITH THE WIDER SITE AND SPECIFIC SITE INVESTIGATION, CONTAMINATION ASSESSMENT, ASBESTOS SURVEY, ENVIRONMENTAL SURVEY, UXO SURVEY AND ANY OTHER RELEVANT INFORMATION AND MANAGE RISKS RELATING TO THE WORKS OUTLINED IN THE DRAWINGS AND SPECIFICATION. PRINCIPLE CONTRACTOR TO MAKE DESIGNER AND CLIENT AWARE OF SITE SPECIFIC RISKS THAT MAY AFFECT THE DRAWING AND SPECIFICATION.
- (v) CDM REGULATIONS 2015. FOR GENERIC MAINTENANCE AND MANAGEMENT SYSTEMS SEE MANUFACTURER'S MANAGEMENT AND MAINTENANCE DETAILS AND RISK ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.
2. DRAINAGE GENERAL
- (i) ALL FOUL AND STORM WATER DRAINS WHICH ARE NOT TO BE ADOPTED AS PUBLIC SEWERS UNDER A SECTION 104 AGREEMENT MUST BE CONSTRUCTED IN ACCORDANCE WITH THE BUILDING REGULATIONS, BS EN 752 AND WHERE APPROPRIATE THE RELEVANT AGREEMENT CERTIFICATES.
- (ii) MANHOLES, GULLIES, GULLY CONNECTIONS, SEWERS AND OTHER SEWERAGE STRUCTURES INTENDED TO CONVEY SURFACE WATER ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE WATER AUTHORITIES ASSOCIATION SPECIFICATION 'SEWERS FOR ADOPTION' 6TH EDITION AND RELEVANT COUNCIL DESIGN GUIDE.
- (iii) ALL CONCRETE USED IN DRAINAGE WORKS TO COMPLY WITH BRE DIGEST 363 FOR CLASS 2 SULPHATE CONDITIONS.
3. MANHOLE COVERS AND FRAMES
- (i) MANHOLE COVERS TO BE CLASS D400 IN HIGHWAYS, CLASS B125 IN FOOTWAYS AND VERGES, CLASS A15 IN NON-TRAFFICKED AREAS.
- (ii) MANHOLE COVER AND FRAME TO BE BEDDED AND SURROUNDED IN 1:3 MORTAR.
4. MANHOLE RINGS, COVER SLABS & TAPERS
- (i) PRECAST CONCRETE MANHOLE UNITS SHALL COMPLY WITH THE REQUIREMENTS OF BS 5911. THE RELEVANT ABSORPTION TESTS REQUIRED SHALL BE CARRIED OUT ON A SAMPLE OF THOSE RINGS AND SLABS USED UNLESS A CERTIFICATE OF TESTING IS SUPPLIED BY THE MANUFACTURER. COVER SLABS SITUATED UNDER CARRIAGEWAYS OR TRAFFICKED AREAS SHALL BE HEAVY DUTY AND THOSE ELSEWHERE SHALL BE LIGHT DUTY. MANHOLE UNITS SHALL BE COMPLETE WITH STEP IRONS IF REQUIRED.
5. PIPES
- (i) PLASTIC PIPES SHALL BE OF UNPLASTICISED POLYVINYL CHLORIDE (UPVC) COMPLYING WITH THE REQUIREMENTS OF BS EN 1401.
- (ii) CONCRETE PIPES SHALL BE SPUN BY A CENTRIFUGAL PROCESS, OR BE VERTICALLY PRESSED. THEY SHALL POSSESS SELF INVERTING SOCKETS AND SHALL COMPLY WITH THE REQUIREMENTS OF AND BE TESTED IN ACCORDANCE WITH BS 5911.
- (iii) SOLID WALL CONCENTRIC EXTERNAL RIB-REINFORCED UNPLASTICISED PVC PIPE SHALL COMPLY WITH ASTM A978.
- (iv) ALL VITRIFIED CLAY PIPES TO BE IN ACCORDANCE WITH BS EN 295.
- (v) ALL PIPE CONNECTIONS TO MHs AND CATCH PITS TO HAVE MIN 600MM ROCKER PIPE AS CLOSE AS PRACTICABLE TO CHAMBER WALL.
6. GULLY GRATES & FRAMES
- (i) GULLY GRATES AND FRAMES FOR CARRIAGEWAY GULLIES SHALL COMPLY WITH BS EN 142. GULLIES SHALL BE PATTERN G84-325 FOR ROADS BELOW 50 DV AND PATTERN GA2-450 FOR ROADS ABOVE 50 DV. GULLY GRATES AND FRAMES FOR KERB SIDE GULLIES SHALL BE PATTERN GK-115 FOR ROADS BELOW 50 DV AND GK-165 FOR ROADS ABOVE 50 DV. CURVED BAR GULLY GRATES SHALL BE USED IN ROADS WHERE THE GRADIENT EXCEEDS 4%.

-	-	-	-
REV:	DESCRIPTION:	BY:	DATE:
STATUS: PRELIMINARY			
MERIDIAN CIVIL ENGINEERING CONSULTANCY			
CLIENT: PDE CONSULTING			
SITE: IMPERIAL WHARF DA11 0DY			
TITLE: Construction Details SHEET 1 OF 2			
SCALE AT A1: 1:20	DATE: 21/05/2024	DRAWN: CL	CHECKED: MN
PROJECT NO: MC0367	DRAWING NO: CIV-02	REVISION: PO	

1:20 @ A1
0 200 400 600 800 1000mm

SECTION A-A

SECTION B-B

PLAN

ACO QMAX ACCESS
CHAMBER WITH
CONCRETE SURROUND

ACO QMAX 900 WITH
CONCRETE SURROUND

CHANNEL DRAIN OUTLET

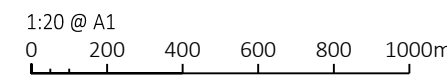
RWP CONNECTION
WORKSHOP BUILDING

ACO ROAD DRAIN

OIL INTERCEPTOR TO BE INSTALLED AS PER MANUFACTURERS DETAILS

1. GENERAL
- (i) WORK TO FIGURED DIMENSIONS ONLY.
- (ii) THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, DRAWING SCHEDULES, DRAWING CONDITIONS WHERE APPLICABLE AND ALL ASSOCIATED DRAWINGS IN THIS SERIES.
- (iii) ANY DISCREPANCY ON THIS DRAWING IS TO BE REPORTED IMMEDIATELY TO THE PARTNERSHIP FOR CLARIFICATION.
- (iv) THE CONTRACTOR IS RESPONSIBLE FOR ALL TEMPORARY WORKS AND FOR THE STABILITY OF THE WORKS IN PROGRESS.
- (v) COM REGULATIONS 2015. ALL CURRENT DRAWINGS AND SPECIFICATIONS MUST BE READ IN CONJUNCTION WITH THE DESIGNER'S HAZARD RISK AND ENVIRONMENTAL ASSESSMENT REPORT. DESIGN HAZARD RISK PRODUCED BASED ON INFORMATION PROVIDED BY THE DESIGNER AND INFORMATION AVAILABLE AT TIME OF ISSUE. CONTRACTOR TO REVIEW DRAWING AND SPECIFICATION IN CONTEXT WITH THE WIDER SITE AND SPECIFIC SITE INVESTIGATION, PRELIMINARY ASSESSMENT, ASBESTOS SURVEY, SURVEY INFORMATION, SOILS, LUVE SURVEY AND ANY OTHER RELEVANT INFORMATION AND MANAGE RISKS RELATING TO THE WORKS OUTLINED IN THE DRAWINGS AND SPECIFICATION. PRINCIPLE CONTRACTOR TO MAKE DESIGNER AND CLIENT AWARE OF SITE SPECIFIC RISKS THAT MAY BE ENCOUNTERED DURING THE WORKS.
- (vi) COM REGULATIONS 2015. FOR GENERIC MAINTENANCE AND MAINTENANCE RISKS REFER TO CHAPTER 36 OF CIRA 752 SUDS MANUAL. FOR PROPRIETARY SYSTEMS SEE MANUFACTURER'S MAINTENANCE AND MAINTENANCE DETAILS AND ASSESSMENT WITH REGARDS TO MAINTENANCE OF PROPRIETARY SYSTEMS.
2. DRAINAGE GENERAL
- (i) ALL FOUL AND STORM WATER DRAINS WHICH ARE NOT TO BE ADOPTED AS PUBLIC SEWER DRAINS MUST BE TO BE ADOPTED AS AGREEMENT MUST BE CONSTRUCTED IN ACCORDANCE WITH THE BUILDING REGULATIONS, BS EN 752 AND WHERE APPROPRIATE THE RELEVANT AGREEMENT CERTIFICATES.
- (ii) MANHOLES, GULLIES, GULLY CONNECTIONS, SEWERS AND OTHER SEWERAGE DRAINAGE INTENDED TO BE CONSTRUCTED IN NON-TRAFFIC AREAS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH THE WATER AUTHORITIES ASSOCIATION SPECIFICATION 'SEWERS FOR ADOPTION' 6TH EDITION AND RELEVANT CONCEPT DESIGN GUIDE.
- (iii) ALL SEWER DRAINS MUST COMPLY WITH BS 6813 PART 3 FOR CLASS 2 SULPHATE CONDITIONS.
- (iv) MANHOLE COVERS AND FRAMES
- (i) MANHOLE COVERS TO BE CLASS 400 IN HIGHWAYS, CLASS B125 IN PAVED AREAS, CLASS B8 FOR NON-TRAFFIC AREAS.
- (ii) MANHOLE COVER AND FRAME TO BE CURVED OR SURROUNDED IN 1.3 MORTAR.
- (v) MANHOLE RINGS, COVER SLABS & TAPERS
- (i) ALL SEWER MANHOLE RINGS SHALL COMPLY WITH THE REQUIREMENTS OF BS 5911. THE RELEVANT ABSORPTION TESTS REQUIRED SHALL BE CARRIED OUT ON A SAMPLE OF THOSE RINGS AND SLABS USED UNLESS A CERTIFICATE OF TESTING IS SUPPLIED BY THE MANUFACTURER.
- (ii) MANHOLE RINGS SITUATED IN NON-TRAFFIC AREAS SHALL BE HEAVY DUTY AND THOSE ELSEWHERE SHALL BE LIGHT DUTY. MANHOLE UNITS SHALL BE COMPLETE WITH STEP IRONS IF REQUIRED.
3. PIPES
- (i) ALL PIPES SHALL BE OF UNPLASTICISED POLYVINYL CHLORIDE (UPVC) COMPLYING WITH THE REQUIREMENTS OF BS EN 1401.
- (ii) CONCRETE PIPES SHALL BE SPUN BY A CENTRIFUGAL PROCESS AND BE VERTICALLY PRESSED. THEY SHALL POSSESS SELF-INVERTING SLOPES AND SHALL COMPLY WITH THE REQUIREMENTS OF AND BE TESTED IN ACCORDANCE WITH BS 5911.
- (iii) SOILD WALL CONCRECENTIAL RIB-REINFORCED UNPLASTICISED PVC PIPE SHALL COMPLY WITH ASTM A578.
- (iv) ALL PIPES TO BE LAYED IN ACCORDANCE WITH BS EN 295.
- (v) ALL PIPE CONNECTIONS TO MHS AND CATCH PITS TO HAVE MIN 600MM ROCKER PIPE AS CLOSE AS PRACTICABLE TO CHAMBER WALL.
- (vi) GULLY GRATES & FRAMES
- (i) GULLY GRATES AND FRAMES FOR CARRIAGEWAY GULLIES SHALL COMPLY WITH BS EN 142. GULLIES SHALL BE PATTERN 684-S23 FOR ROADS BELOW 50 M AND PATTERN GA2-450 FOR ROADS ABOVE 50 M. GULLY GRATES AND FRAMES FOR KERB SIDE GULLIES SHALL BE PATTERN GA-115 FOR ROADS BELOW 50 M AND PATTERN GA-115 FOR ROADS ABOVE 50 M.
- (ii) ALL GULLY GRATES SHALL BE USED IN ROADS WHERE THE GRADIENT EXCEEDS 4%.

REV:		DESCRIPTION:		BY:		DATE:	
STATUS:							
PRELIMINARY							
MERIDIAN							
CIVIL ENGINEERING CONSULTANCY							
CLIENT: PDE CONSULTING							
SITE: IMPERIAL WHARF DA11 0DY							
TITLE: Construction Details							
SCALE AT A1:		DATE:		DRAWN:		CHECKED:	
1:20		21/05/2024		CL		MN	
PROJECT NO:		DRAWING NO:		REVISION:			
MC0367		CIV-03		P0			



APPENDIX II Hydraulic Calculations

Calculated by:	Chrisopher Lee
Site name:	MC0367
Site location:	Imperial Wharf 3

Site Details

Latitude:	51.44499° N
Longitude:	0.35698° E
Reference:	2325383720
Date:	Apr 18 2024 11:48

This is an estimation of the greenfield runoff rates that are used 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). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):	0.1163
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Methodology

Q _{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

Soil characteristics

	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

Hydrological characteristics

	Default	Edited
SAAR (mm):	551	551
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):	0.25	0.25
1 in 1 year (l/s):	0.21	0.21
1 in 30 years (l/s):	0.58	0.58
1 in 100 year (l/s):	0.81	0.81
1 in 200 years (l/s):	0.94	0.94

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at 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 www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. 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, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.



Nodes

	Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓	French Drain	0.091	4.00	5.980	Junction			563884.317	174415.781	0.530
✓	1			5.950	Junction			563880.006	174418.508	0.625
✓	2			5.690	Manhole	SW_Junction	100	563871.994	174424.140	1.200

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node 1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.001	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0054-1000-0500-1000
Invert Level (m)	5.325	Min Outlet Diameter (m)	0.075
Design Depth (m)	0.500	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.0		

Node French Drain Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	4

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	112.5	0.0	0.450	112.5	0.0	0.451	0.0	0.0

Node 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.400	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	460	Depth (m)	0.400
Safety Factor	2.0	Width (m)	30.000	Inf Depth (m)	
Porosity	0.30	Length (m)	30.000		

Results for 2 year Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	French Drain	11	5.531	0.081	18.0	2.7270	0.0000	OK
180 minute summer	1	144	5.440	0.115	6.4	10.3988	0.0000	OK
15 minute summer	2	1	4.490	0.000	1.0	0.0000	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 summer	French Drain	1.000	1	14.4	1.122	0.279	0.0653	
180 minute summer	1	Hydro-Brake®	2	1.0				19.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	French Drain	11	5.598	0.148	45.9	4.9929	0.0000	OK
180 minute winter	1	176	5.513	0.188	9.6	30.2070	0.0000	OK
15 minute summer	2	1	4.490	0.000	1.0	0.0000	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 summer	French Drain	1.000	1	40.3	1.454	0.783	0.1413	
180 minute winter	1	Hydro-Brake®	2	1.0				41.6

Results for 100 year Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	French Drain	11	5.624	0.174	56.7	5.8693	0.0000	OK
240 minute winter	1	228	5.543	0.218	10.1	38.0730	0.0000	OK
15 minute summer	2	1	4.490	0.000	1.0	0.0000	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 summer	French Drain	1.000	1	49.4	1.498	0.960	0.1681	
240 minute winter	1	Hydro-Brake®	2	1.0				54.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 98.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	French Drain	11	5.690	0.240	79.4	8.0925	0.0000	FLOOD RISK
240 minute winter	1	236	5.613	0.288	19.1	56.9766	0.0000	SURCHARGED
15 minute summer	2	1	4.490	0.000	1.0	0.0000	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 summer	French Drain	1.000	1	65.8	1.657	1.278	0.1986	
240 minute winter	1	Hydro-Brake®	2	1.0				75.6



Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓ 5	0.094	4.00	5.300	Junction			563933.919	174443.205	1.300
✓ 4	0.028	4.00	5.300	Junction			563932.601	174445.829	1.443
✓ 3			4.500	Junction			563959.171	174453.693	0.800
✓ 2			4.500	Manhole	SW_HB	1200	563959.239	174455.278	0.832
✓ 1			4.400	Junction			563959.071	174464.189	0.785
✓ 6			4.500	Manhole	SW_Standard	450	563979.877	174455.525	0.320
✓ 7	0.015	4.00	4.500	Junction			563979.729	174456.658	0.300
✓ 8			5.000	Manhole	SW_Standard	450	563926.062	174454.343	0.718
✓ 9		4.00	5.000	Junction			563924.544	174455.272	0.700

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	1440	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

Node 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.002	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0051-1300-1200-1300
Invert Level (m)	3.668	Min Outlet Diameter (m)	0.075
Design Depth (m)	1.200	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.3		

Node 5 Online Depth/Flow Control

Flap Valve	x	Replaces Downstream Link	✓
Downstream Link	2.000	Invert Level (m)	4.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.700	4.000	0.700

Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.700
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	795

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	100.0	0.0	0.400	100.0	0.0	0.401	0.0	0.0

Node 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	4.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	2000.0	0.0	1.000	2000.0	0.0	1.001	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute summer	5	192	4.007	0.007	5.8	14.2763	0.0000	OK
15 minute summer	4	10	3.924	0.067	6.2	0.0000	0.0000	OK
360 minute winter	3	328	3.788	0.088	2.5	8.3868	0.0000	OK
480 minute summer	2	336	3.791	0.123	3.5	0.1391	0.0000	OK
15 minute summer	1	1	3.615	0.000	0.9	0.0000	0.0000	OK
15 minute summer	6	10	4.227	0.047	3.0	0.0074	0.0000	OK
15 minute summer	7	10	4.243	0.043	3.0	0.0000	0.0000	OK
15 minute summer	8	1	4.282	0.000	0.0	0.0000	0.0000	OK
15 minute summer	9	1	4.300	0.000	0.0	0.0000	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)
240 minute summer	5	Depth/Flow	4	0.7				
15 minute summer	4	2.001	3	6.3	1.320	0.161	0.1534	
360 minute winter	3	2.002	2	3.8	0.402	0.051	0.0288	
480 minute summer	2	Hydro-Brake®	1	1.0				38.9
15 minute summer	6	3.001	2	2.9	0.637	0.203	0.0949	
15 minute summer	7	3.000	6	3.0	0.722	0.127	0.0050	
15 minute summer	8	1.001	2	0.0	0.000	0.000	0.0000	
15 minute summer	9	1.000	8	0.0	0.000	0.000	0.0000	

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	5	236	4.018	0.018	8.0	36.9490	0.0000	OK
15 minute summer	4	9	3.957	0.100	14.8	0.0000	0.0000	OK
360 minute winter	3	344	3.888	0.188	2.4	17.8442	0.0000	OK
360 minute winter	2	360	3.887	0.219	3.5	0.2478	0.0000	OK
15 minute summer	1	1	3.615	0.000	1.0	0.0000	0.0000	OK
15 minute summer	6	10	4.259	0.079	7.6	0.0126	0.0000	OK
15 minute summer	7	10	4.276	0.076	7.6	0.0000	0.0000	OK
15 minute summer	8	1	4.282	0.000	0.0	0.0000	0.0000	OK
15 minute summer	9	1	4.300	0.000	0.0	0.0000	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)
240 minute winter	5	Depth/Flow	4	0.7				
15 minute summer	4	2.001	3	14.9	1.524	0.383	0.3071	
360 minute winter	3	2.002	2	3.5	0.372	0.047	0.0594	
360 minute winter	2	Hydro-Brake®	1	1.0				72.6
15 minute summer	6	3.001	2	7.5	0.815	0.521	0.1907	
15 minute summer	7	3.000	6	7.6	0.864	0.322	0.0105	
15 minute summer	8	1.001	2	0.0	0.000	0.000	0.0000	
15 minute summer	9	1.000	8	0.0	0.000	0.000	0.0000	

Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	5	352	4.023	0.023	7.1	46.7506	0.0000	OK
15 minute summer	4	9	3.968	0.111	18.1	0.0000	0.0000	OK
360 minute winter	3	352	3.933	0.233	2.8	22.0997	0.0000	SURCHARGED
360 minute winter	2	360	3.932	0.264	3.5	0.2983	0.0000	SURCHARGED
15 minute summer	1	1	3.615	0.000	1.0	0.0000	0.0000	OK
15 minute summer	6	10	4.271	0.091	9.4	0.0145	0.0000	OK
15 minute summer	7	10	4.288	0.088	9.4	0.0000	0.0000	OK
15 minute summer	8	1	4.282	0.000	0.0	0.0000	0.0000	OK
15 minute summer	9	1	4.300	0.000	0.0	0.0000	0.0000	OK

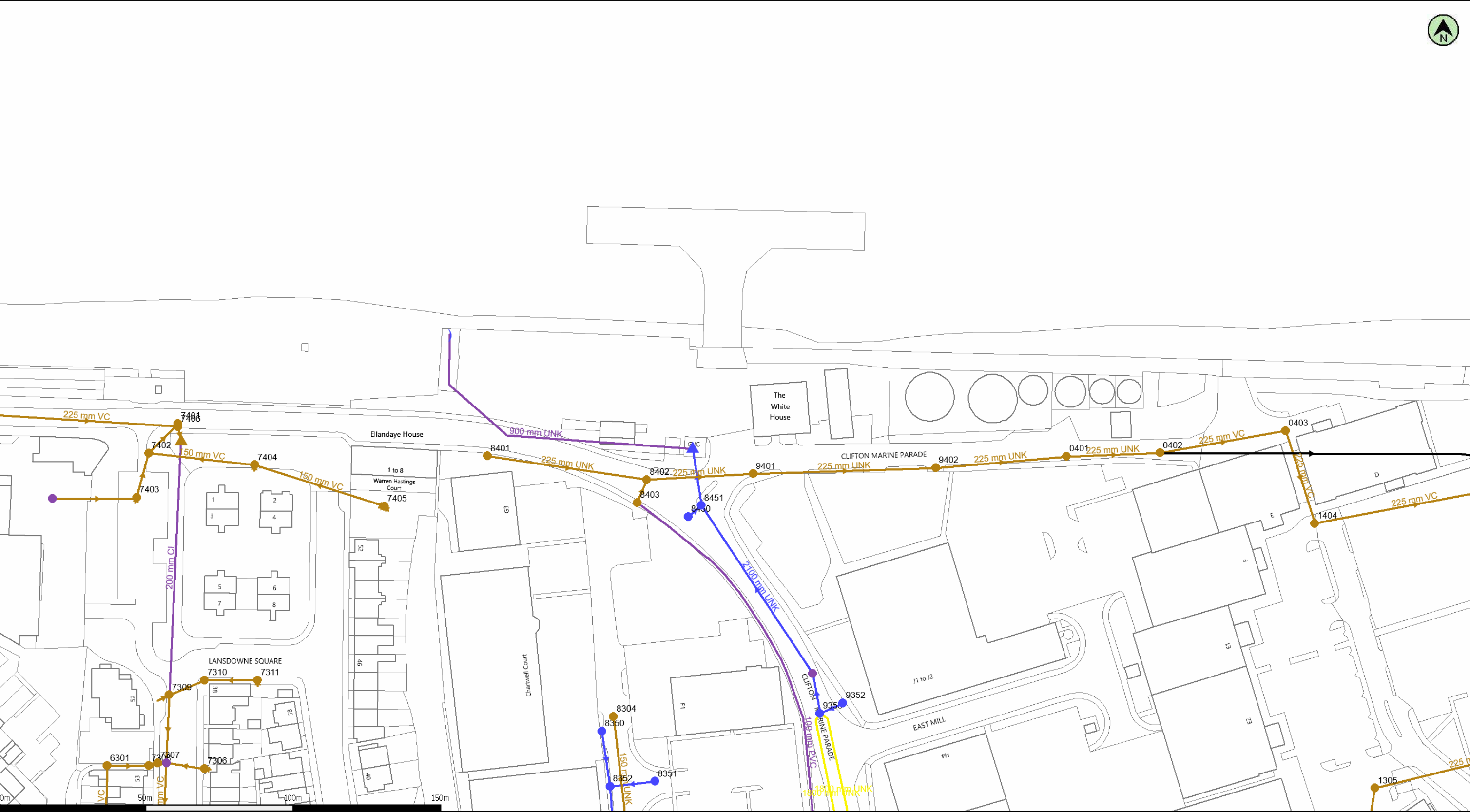
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	5	Depth/Flow	4	0.7				
15 minute summer	4	2.001	3	18.2	1.566	0.468	0.3721	
360 minute winter	3	2.002	2	3.5	0.399	0.048	0.0631	
360 minute winter	2	Hydro-Brake®	1	1.0				87.7
15 minute summer	6	3.001	2	9.3	0.855	0.644	0.2249	
15 minute summer	7	3.000	6	9.4	0.899	0.398	0.0125	
15 minute summer	8	1.001	2	0.0	0.000	0.000	0.0000	
15 minute summer	9	1.000	8	0.0	0.000	0.000	0.0000	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	5	352	4.035	0.035	9.9	70.3367	0.0000	OK
600 minute summer	4	600	4.044	0.187	3.5	0.0000	0.0000	OK
600 minute summer	3	600	4.044	0.344	3.9	32.7151	0.0000	SURCHARGED
600 minute summer	2	600	4.044	0.376	2.6	0.4257	0.0000	SURCHARGED
15 minute summer	1	1	3.615	0.000	1.0	0.0000	0.0000	OK
15 minute summer	6	10	4.298	0.118	13.2	0.0188	0.0000	OK
15 minute summer	7	10	4.315	0.115	13.2	0.0000	0.0000	OK
15 minute summer	8	1	4.282	0.000	0.0	0.0000	0.0000	OK
15 minute summer	9	1	4.300	0.000	0.0	0.0000	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)
360 minute winter	5	Depth/Flow	4	0.7				
600 minute summer	4	2.001	3	3.5	0.622	0.089	1.0408	
600 minute summer	3	2.002	2	2.6	-0.192	0.035	0.0631	
600 minute summer	2	Hydro-Brake®	1	1.0				118.2
15 minute summer	6	3.001	2	13.0	0.922	0.900	0.2906	
15 minute summer	7	3.000	6	13.2	0.954	0.559	0.0167	
15 minute summer	8	1.001	2	0.0	0.000	0.000	0.0000	
15 minute summer	9	1.000	8	0.0	0.000	0.000	0.0000	

APPENDIX III Sewer records



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The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2021 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

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APPENDIX IV CCTV Survey

Project Name	Project Number	Project Date
FMC1134 FMC IMPERIAL WHARF GRAVESEND DA11 0DY CZD LW	-	11/03/2024