

TRANSPORT AND INFRASTRUCTURE

DESIGN DEVELOPMENT

Rowlinson Construction Ltd
Axis, Stockport Road
Manchester
Condition 9 Discharge

TRANSPORT AND INFRASTRUCTURE

DESIGN DEVELOPMENT

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Rowlinson Construction Ltd
Axis, Stockport Road
Manchester
Condition 9 Discharge

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November 2022

DOCUMENT ISSUE RECORD

Document Number:	ASR-BWB-GEN-XX-RP-D-0002
Report Title:	Condition 9 Discharge
Date:	November 2022
Prepared by:	BWB Consulting
On behalf of:	Rowlinson Construction Ltd
BWB Reference:	MCS2460

Revision	Date of Issue	Status	Author:	Checked:	Approved:
P01	21.11.22	For Information	Matthew Murray Senior Technician	Joel Roberts Associate	Joel Roberts Associate

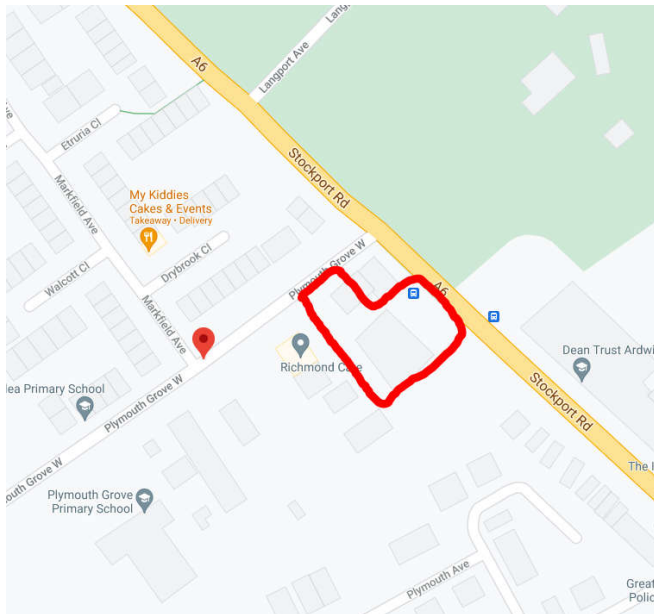
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INTRODUCTION

BWB Consulting Ltd has been commissioned by Rowlinson Construction Ltd to compile the information required to discharge Condition 9 of the Approved planning application number 122945/FO/2019.

Site location as per figure below;



PLANNING CONDITION 9 - 122945/FO/2019

Prior to the first occupation of the development, details of the implementation, maintenance and management of the sustainable drainage scheme shall be submitted for approval in writing by the City Council, as Local Planning Authority.

For the avoidance of doubt this shall include;

- *Verification reporting providing photographic evidence of construction.*
- *Management and maintenance plan for the lifetime of the development which shall include the arrangements adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme.*

SURFACE WATER DRAINAGE DESIGN

The surface water drainage design for this development has been carried out in accordance with the planning approved Drainage strategy produced by Curtins (Ref 070787-CUR-00-XX-RE-C-92001)

Surface water run off from the building is picked up via RWP's, the surrounding external works have slot drains installed. The underground surface water network has an offline attenuation tank to accommodate 115m³ of storage (1 in 100 year storm event plus

climate change). The surface water network has its flow reduced to 6l/s before it joins the foul network for the development before leaving the site via a combined sewer and connecting to an existing United Utilities combined sewer located within Plymouth Grove West via a new manhole. A S106 agreement was confirmed with United Utilities for this connection.

A copy of the as constructed drainage design drawings can be found in **Appendix A**.

SUDs ELEMENTS

Due to the nature of the site SUDs features are limited to attenuation storage tank, trapped gullies and catchpits.

CONSTRUCTION VERIFICATION

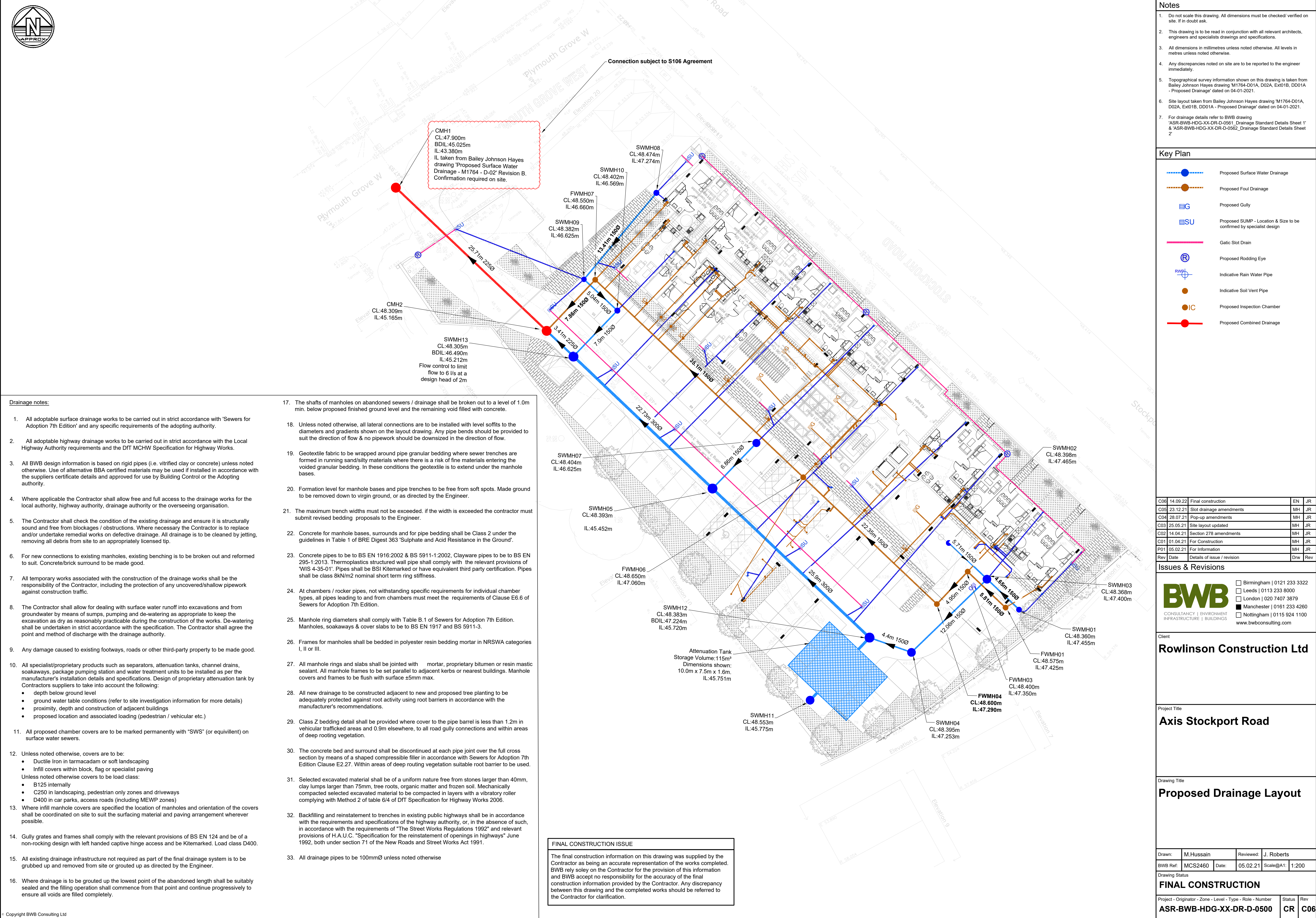
The drainage was constructed in accordance with the proposed drainage design. The site was visited during construction. Construction stage photos for the installation of the attenuation tank can be found in **Appendix B**.

MANAGEMENT AND MAINTENANCE

The development will be maintained and managed for its lifetime by the developers in house team. A maintenance schedule for the drainage elements can be found in **Appendix C**.

Manufacturer's information for products used on the development can be found in **Appendix D**.

APPENDIX A – AS BUILT DRAINAGE DESIGN



Structure Name	Easting	Northing	Cover Level	Connected Pipes	Manhole Type & Size
FWMH01	386193.596	396171.773	48.575	Inv. 47.425 150Ø	600Ø PPIC
FWMH03	386188.879	396176.258	48.400	Inv. 47.350 150Ø Inv. 47.350 150Ø	600Ø PPIC
FWMH04	386185.021	386172.186	48.600	Inv. 47.290 150Ø Inv. 47.290 150Ø	600Ø PPIC
FWMH06	386168.355	386188.014	48.650	Inv. 47.060 150Ø Inv. 47.060 150Ø	600Ø PPIC
FWMH07	386142.401	386212.657	48.550	Inv. 46.660 150Ø Inv. 46.660 150Ø	600Ø PPIC

Notes	
1.	Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2.	This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3.	All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4.	Any discrepancies noted on site are to be reported to the engineer immediately.
For drainage layout refer to BWB drawing 'ASR-BWB-HDG-XX-DR-D-0500_Proposed Drainage Layout'	

C03	14.09.22	Final construction	EN	JR
C02	16.04.21	For Construction	MH	JR
C01	01.04.21	For Construction	MH	JR
Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

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Client

Rowlinson Construction Ltd

Project Title

Axis Stockport Road

Drawing Title

Foul Water Manhole Schedule

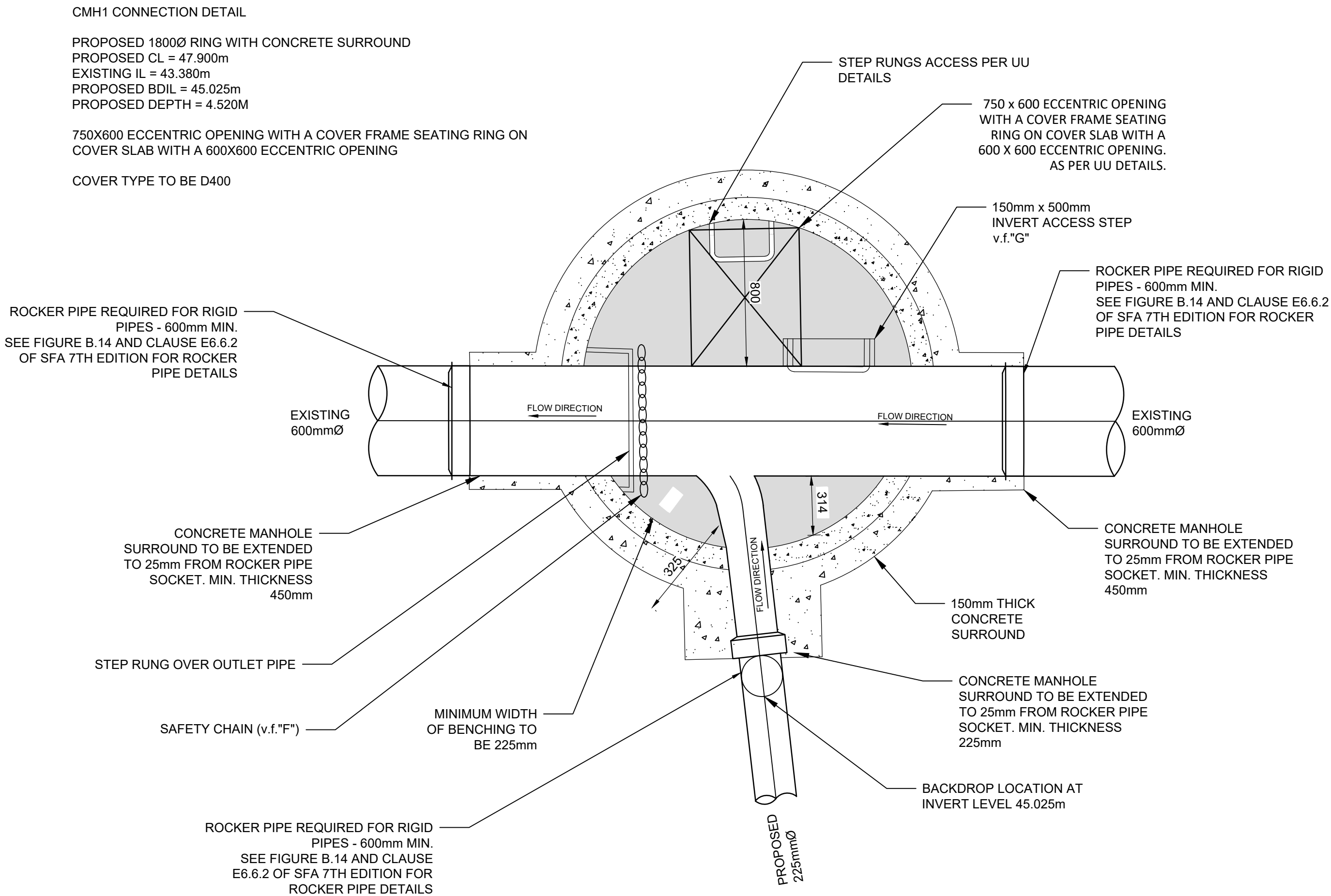
Drawn:	M.Hussain	Reviewed:	J. Roberts
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Drawing Status

FINAL CONSTRUCTION

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
ASR-BWB-HDG-XX-DR-D-0511	CR	C03

FINAL CONSTRUCTION ISSUE
The final construction information on this drawing was supplied by the Contractor as being an accurate representation of the works completed. BWB rely solely on the Contractor for the provision of this information and BWB accept no responsibility for the accuracy of the final construction information provided by the Contractor. Any discrepancy between this drawing and the completed works should be referred to the Contractor for clarification.



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2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
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CO2	14.09.22	Final construction	EN	JR
CO1	02.07.21	For Construction	MH	JR
Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

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Client

Rowlinson Construction Ltd

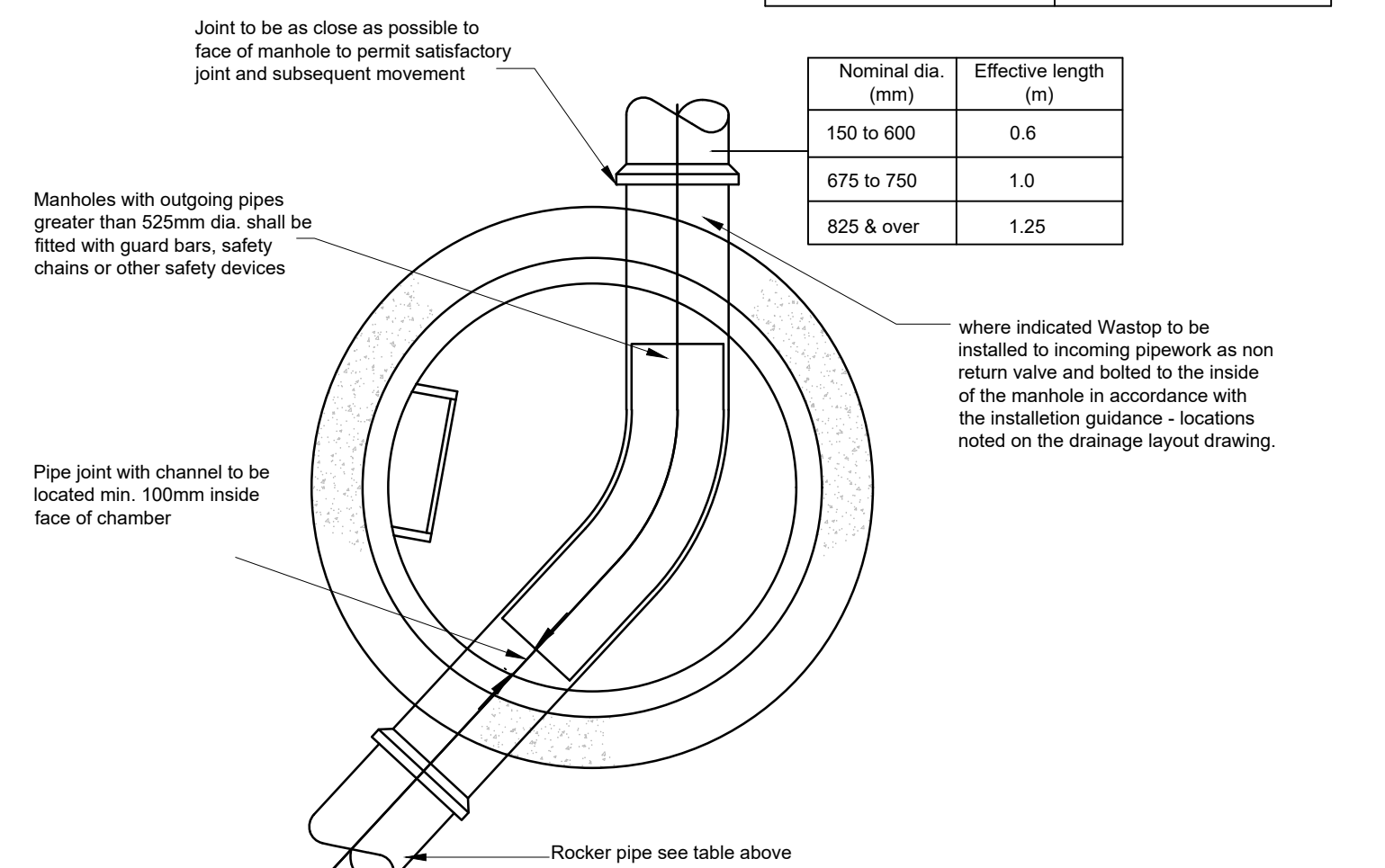
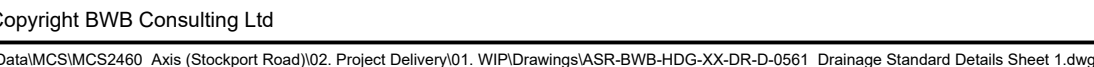
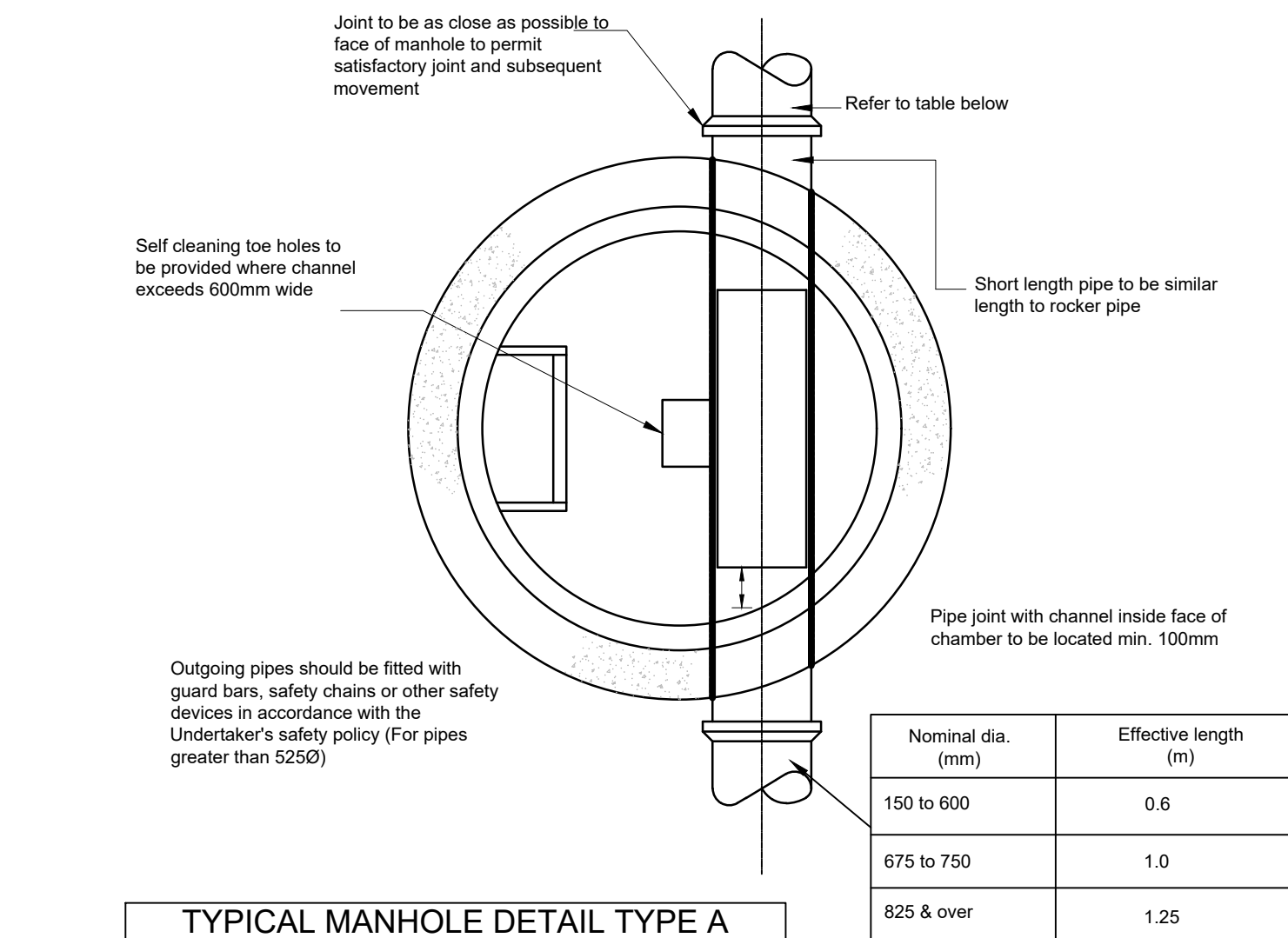
Project Title

Axis Stockport Road

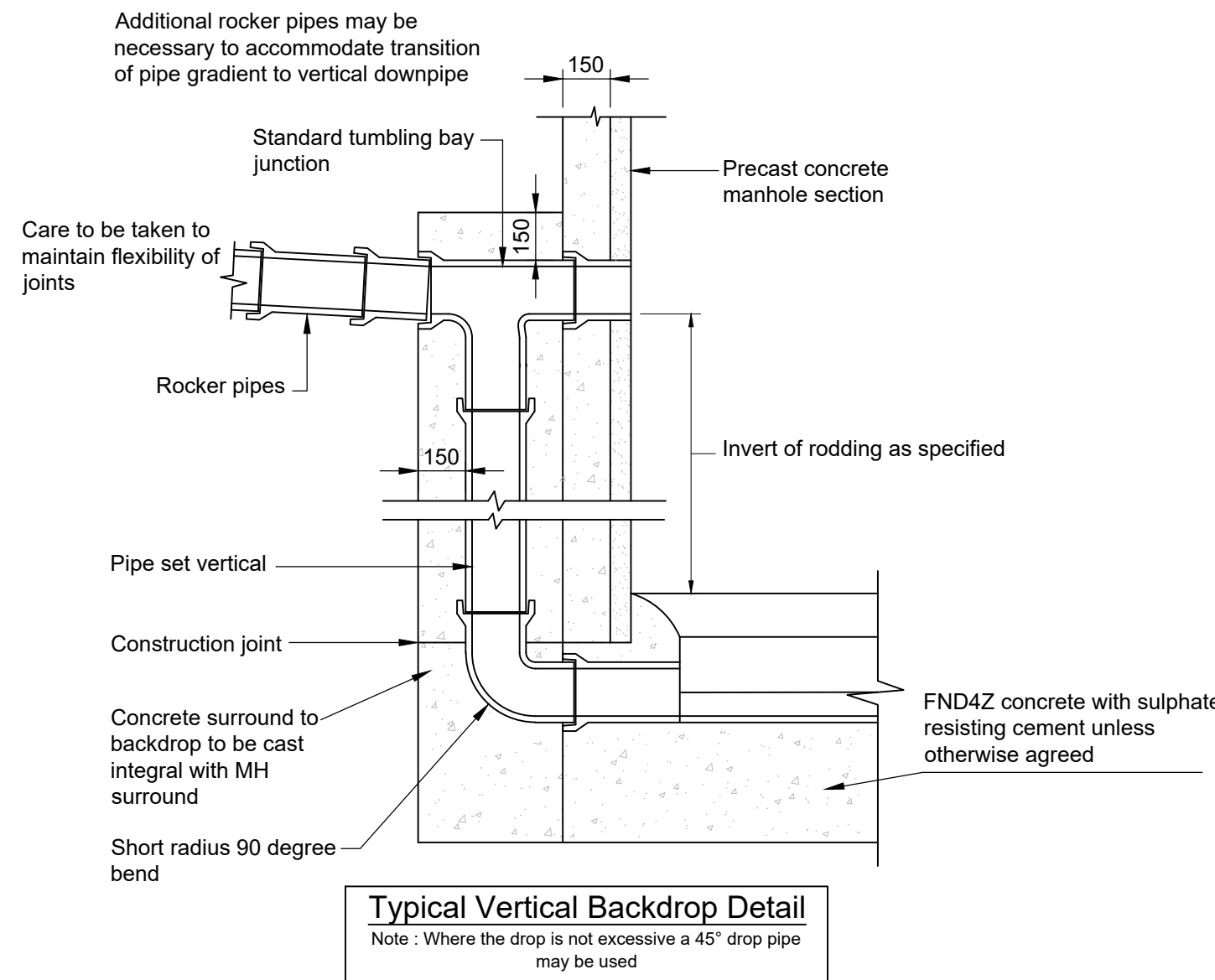
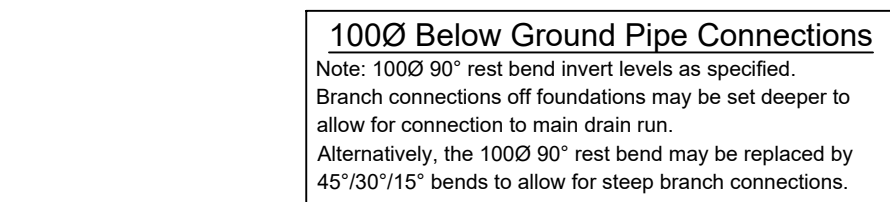
Drawing Title

1:20 Combined Manhole Detail

Drawn:	M.Hussain	Reviewed:	J. Roberts
BWB Ref:	MCS2460	Date:	02.07.21
Scale@A1:	1:20	Status	Rev
Drawing Status			
FINAL CONSTRUCTION			
Project - Originator - Zone - Level - Type - Role - Number			
ASR-BWB-HDG-XX-DR-D-0512			C02



Nominal dia. (mm)	Effective length (m)
150 to 600	0.6
675 to 750	1.0
825 & over	1.25



- | | | | | |
|-----|----------|-----------------------------|-----|-----|
| C02 | 14.09.22 | Final construction | EN | JR |
| C01 | 01.04.21 | For Construction | MH | JR |
| P01 | 05.02.21 | For Information | JT | JR |
| Rev | Date | Details of issue / revision | Drw | Rev |

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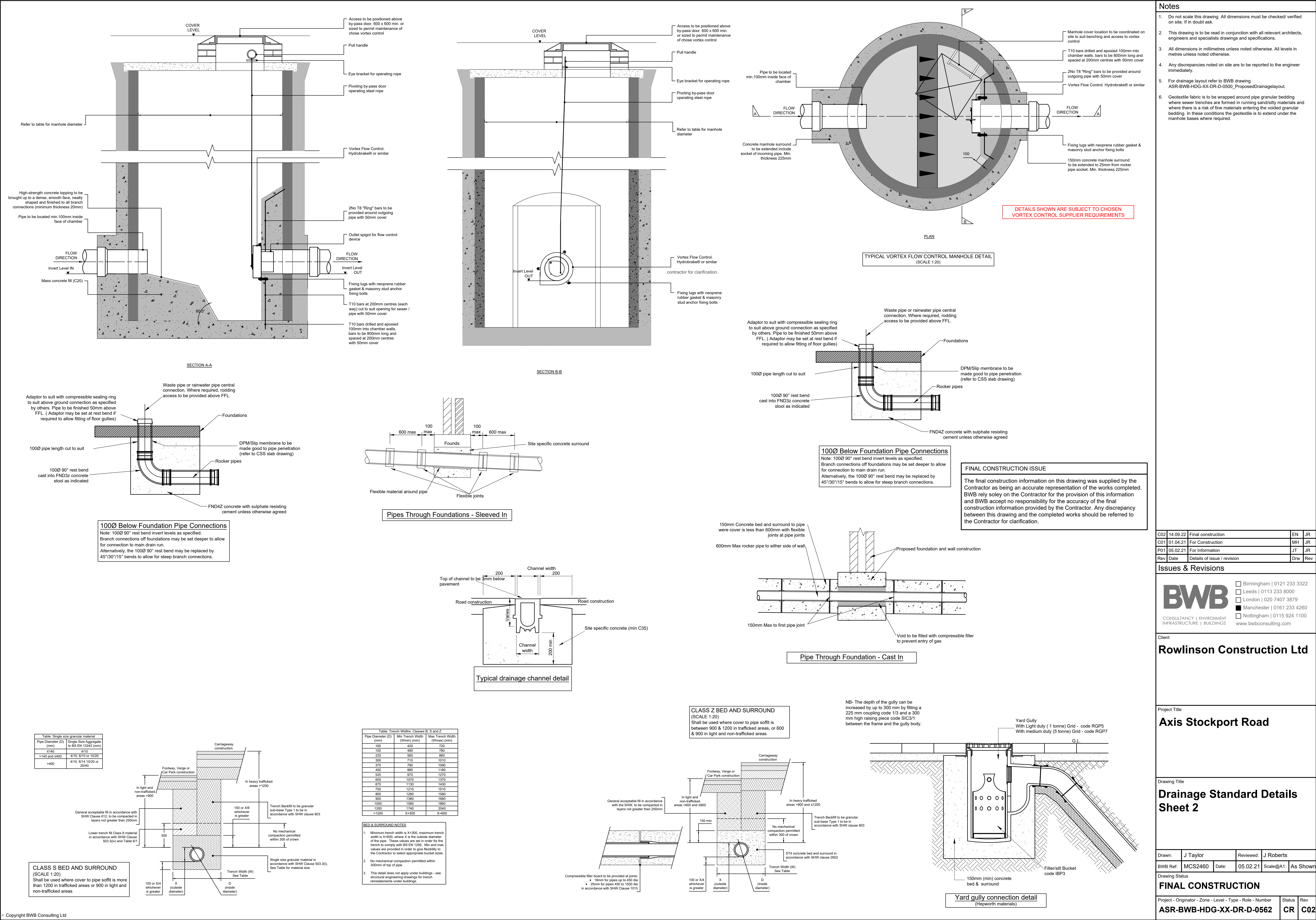
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Project Title
Axis Stockport Road

Drawn:	J Taylor		Reviewed:	J Roberts	
BWB Ref:	MCS2460	Date:	05.02.21	Scale@A1:	As Shown

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
ASR-BWB-HDG-XX-DR-D-0561	CR	C02



APPENDIX B – CONSTRUCTION PHOTOS











APPENDIX C – MAINTENANCE SCHEDULE

Drainage Item	Scheme Specific General Requirements
Channel Drains	Annual visual check for blockages and remove as necessary.
Gullies	Annual removal of any deposits from sump. Check outlets for blockages.
Drainage pipework	Clean and jet as required.
Inspection Chambers / Catch pits / Manholes / Rodding Eyes	Remove cover annually to check for any sign of blockage and clear as required. Empty sumps as required.
Attenuation Tank System	Annual check of all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.
Flow Control Chambers, penstocks, flap valves	Annual removal of any deposits from sump. Check outlets for blockages. Check flow control valve for blockage and remove as necessary.

APPENDIX D – SUPPLIER PRODUCT INFORMATION

ESS Systems

HEALTH AND SAFETY INFORMATION

March 2007

PRODUCT NAME: GEOCELL MODULES

USES: Void forming in ground for storage and passage of water from Ground

COMPOSITION: Injection-moulded polypropylene

GENERAL HANDLING: No specific handling precautions are required. The use of appropriate gloves is suggested.

STORAGE: No special requirements are needed for storage

FIRE HAZARDS: PP is combustible, but burns slowly. In a fire it will melt and burning droplets may fall and propagate the fire. **Avoid use of water jets in the early stages of a fire, use water spray.**

MELTING POINT: 125o to 135oC**DECOMPOSITION:**330oC

FIRE FIGHTING: Use waterspray, CO2, Foam, or dry powder. If immediate action fails to extinguish, evacuate the building.
With large fires self contained breathing apparatus must be worn. Where practicable, remove the plastic from the site of the fire. When heating above 300oC, soot will be released. In flaming conditions the main combustion product is carbon dioxide. When the flame is extinguished it will contain quantities of carbon monoxide, acrolan, and other aldehydes. This is similar to that of wood or other cellulose products.

FIRST AID

Inhalation: No special requirements
In the case of fire or smoke inhalation, remove to fresh air and obtain medical attention

Eyes: Rinse with clean water to remove any particles.
Skin: No special requirements
Ingestion: No special requirements

SPILLAGE: Not applicable

DISPOSAL: Uncontaminated waste can be recycled into lower grade products. Can be disposed of by landfill, will not degrade to produce voids, and does not emit dangerous gases or contribute to ground water pollution.

IN AN EMERGENCY

CONTACT: Alderburgh Ltd Telephone: 01706 374416

The information given in this data sheet is true and accurate to the best of the Company's knowledge and belief. It is provided for guidance only.

GEOTEX 300 PP

DESCRIPTION

A needle punched non woven geotextile made from 100% virgin polypropylene staple fibres, UV resistant, produced without the addition of chemical binders and without thermal bonding of the filaments.

PRIMARY FUNCTIONS

Fabric used for ground stabilisation and membrane protection.
Enclosing granular layers in formed drainage systems.

TECHNICAL DATA

Roll Size:	Width	6 m	
	Length	50m, 100m	
Weight:	300g/m ²		
Fabric Thickness:	4.0mm nom.		BS 2544 AS
Tensile strength:	MD	13KN/M	BSEN ISO 10319
	CD	21KN/M	BSEN ISO 1996
Extension:	MD	103%	BSEN ISO 1996
	CD	80%	BSEN ISO 1996
Water Transmittivity	@ 100mm head	140 lt/m/sec	BSEN ISO 10319
Apparent Opening size	90% finer	90 microns	BS6906 PE2 1989
CBR (Puncture):	Part 4	2400N	
Displacement (mm)		70	
Cone PropTest (mm)		17mm	

The above are typical mean values of 5 samples taken at random for test purposes, as defined in BSEN ISO standard.

SPECIFICATION

The Geotex 300PP filter fabric should be specified by name with specific reference to the technical requirements of its use

ALDERPRUFE GEO-MEMBRANES

HEALTH AND SAFETY INFORMATION

March 2006

PRODUCT NAME: GEO-TEX MEMBRANES

USES: As a protective layer to Alderprufe membranes from pressures caused by horizontal multi-level slabs, as a filter medium, and for ground stabilisation.

COMPOSITION: Needle punched polypropylene fibres

GENERAL HANDLING: No specific handling precautions are required

STORAGE: No special requirements are needed for storage.

HEALTH HAZARDS: This product presents no hazard to health under normal working conditions.

FIRE HAZARDS: This product is combustible at high temperatures. When burning it releases black smoke.

FIRE FIGHTING: Use foam vaporizing liquid, CO2 or dry powder. NB carbon dioxide is rarely effective in the open air. Do not use water. If immediate action fails to extinguish, evacuate the building.
Wear protective clothing and self contained breathing apparatus to prevent contact with molten polypropylene and inhalation of smoke and fumes.

FIRST AID Inhalation: No special requirements **In the case of fire or smoke or fumes inhalation, remove to fresh air, and keep warm. If symptoms persist obtain medical attention.**

Eyes: No significant risk under normal conditions.

Skin: No significant risk under normal conditions.

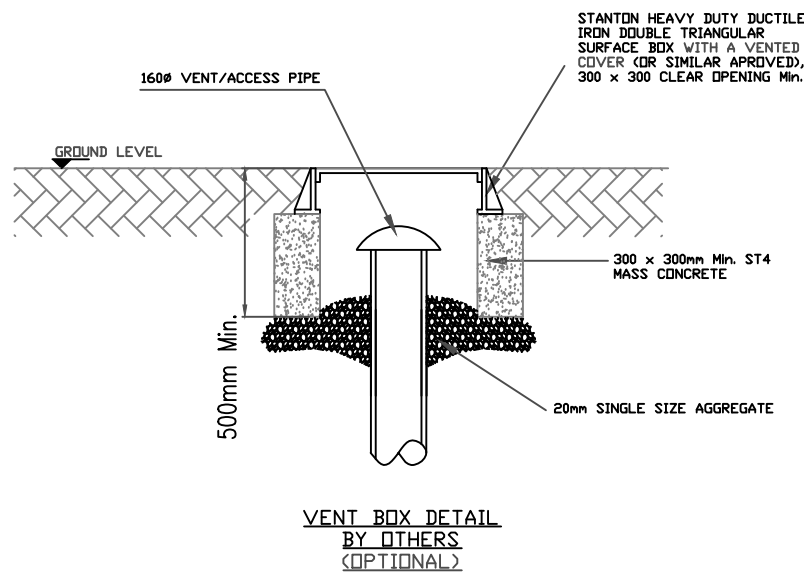
Ingestion: Unlikely to occur under normal working conditions.

SPILLAGE: Not applicable

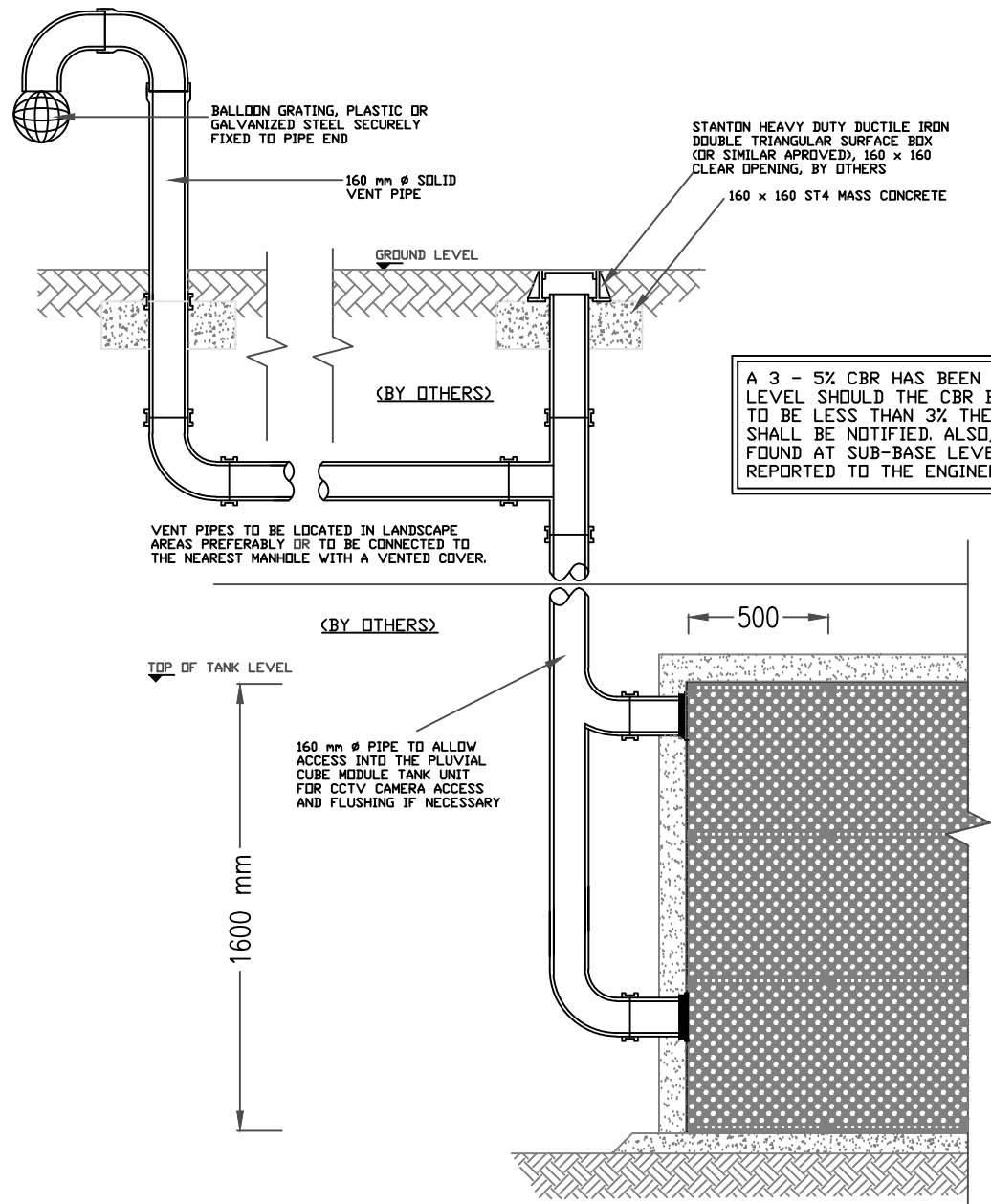
IN AN EMERGENCY

CONTACT: Alderburgh Ltd Tel: 01706 374416

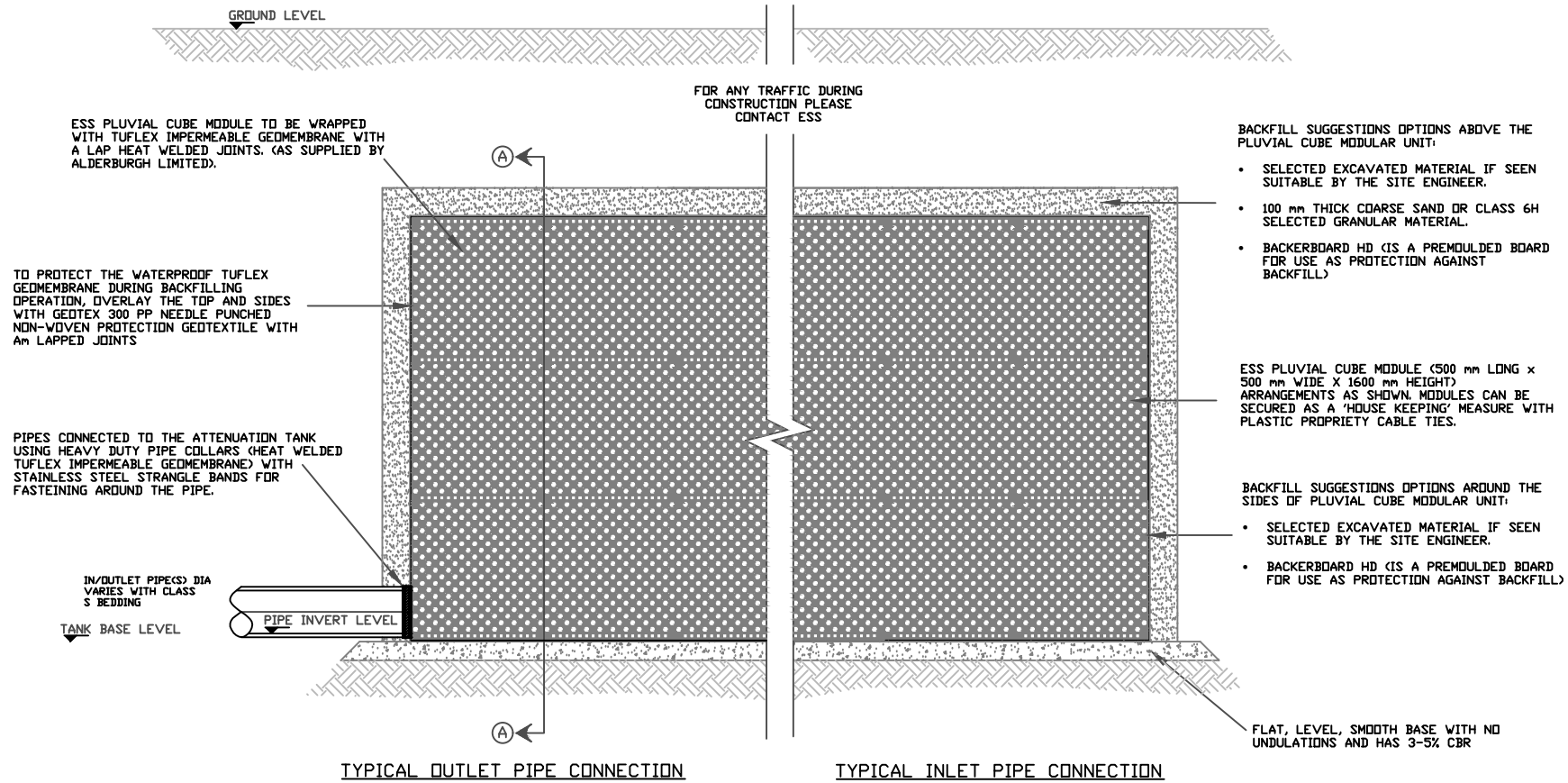
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VENT/ACCESS TERMINATION DETAILS OPTIONS TO SUIT SITE AND ENGINEER REQUIREMENTS.



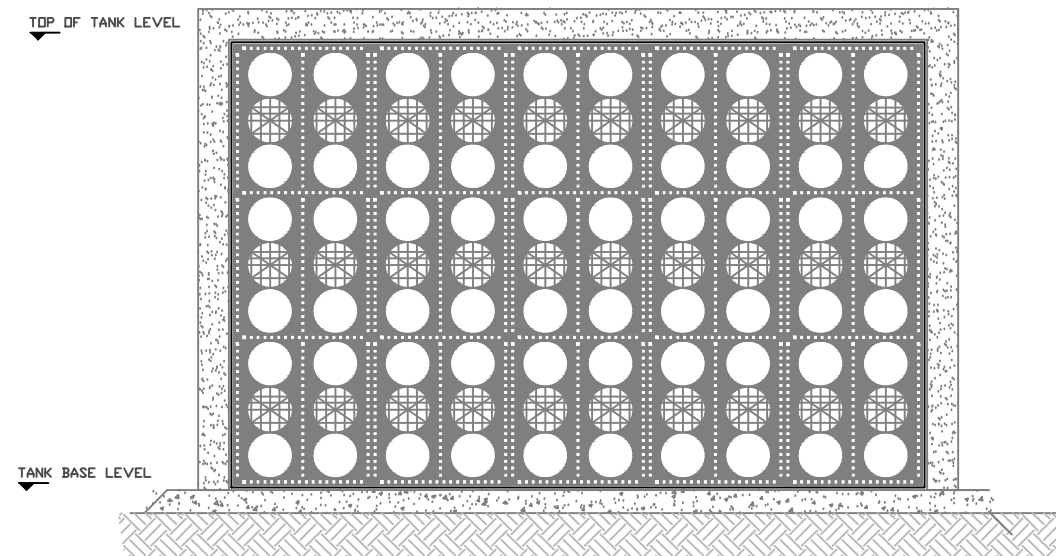
TYPICAL 160 $\varnothing$ VENT/ACCESS PIPE CONNECTION



TYPICAL DETAILS OF ATTENUATION TANK USING PLUVIAL CUBE MODULAR UNITS

THE CONTRACTOR SHALL PROHIBIT THE MOVEMENT OF CONSTRUCTION PLANT ACROSS THE STORAGE TANK AND WHERE NECESSARY PROVIDE ADDITIONAL SUPPORT AND PROTECTION TO THE STRUCTURE. PARTICULARLY POST CONSTRUCTION. TEMPORARY FENCING CAN BE USED TO PROHIBIT TRADE STOCKS, PILING MATERIALS, HEAVY PLANTS ETC.,

INLET/OUTLET PIPES MUST BE SUPPORTED WITH CONCRETE TO PROTECT IT DURING BACKFILLING



TYPICAL DETAILS OF ATTENUATION TANK USING PLUVIAL CUBE MODULAR UNITS

(SECTION A-A)

Notes :-

- ALL STORAGE TANK DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS, METHOD STATEMENTS AND RECOMMENDATIONS OF ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED, ROCHDALE.
- THE LOCATION, SIZE AND DEPTH OF ALL EXISTING DRAINS / SEWERS AND SERVICES SHALL BE ESTABLISHED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORKS ON SITE. ANY DISCREPANCIES FROM THE INFORMATION INDICATED ON THESE DRAWINGS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
- THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT AND DIVERSION WORKS AS NECESSARY, TO ALL EXISTING SERVICES TO THE SATISFACTION OF THE PUBLIC UTILITIES.
- THE CONTRACTOR SHALL ALLOW FOR DEALING WITH SURFACE WATER RUN-OFF INTO EXCAVATIONS AND FROM GROUNDWATER BY MEANS OF SUMPS, PUMPING AND DE-WATERING AS APPROPRIATE, IN ORDER TO KEEP THE EXCAVATION AS REASONABLY DRY AS POSSIBLE DURING THE CONSTRUCTION OF THE WORKS.
- ALL LEVELS AND DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS. ANY DISCREPANCIES SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
- THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY PRECAUTIONS IN LINE WITH CURRENT LEGISLATION WHEN WORKING IN / NEAR CONFINED SPACES, DEEP EXCAVATIONS AND MACHINERY.
- THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY TO PROTECT PEDESTRIANS AND VEHICLES FROM THE WORKING AREAS.
- TO PROTECT THE ESS PLUVIAL CUBE MODULAR ATTENUATION / STORAGE TANK FROM CONSTRUCTION SITE DEBRIS, THE CONTRACTOR SHALL ENSURE THAT STOPPERS ARE SECURELY PLACED IN ALL CONNECTIONS IMMEDIATELY UPSTREAM OF THE TANK UNITS, ONLY TO BE REMOVED ONCE THE FINAL CLEANING OF THE ROADS / DRAINAGE HAS BEEN COMPLETED.
- UPON COMPLETION OF THE WORKS THE CONTRACTOR SHALL CLEAN ALL DRAINAGE BY JETTING, REMOVING ALL DEBRIS FROM SITE, NO DEBRIS SHALL BE PERMITTED TO ENTER THE TANK STORAGE SYSTEM.
- NUMBER OF VENT UNITS DEPENDS ON THE SIZE OF THE TANK (REFER LAYOUT DRAWING)
- REFER SEQUENCE OF WORK DOCUMENT FOR DETAILED INSTALLATION METHODOLOGY (CONTACT ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED)

Notes :- All the Dimensions by Millimeters

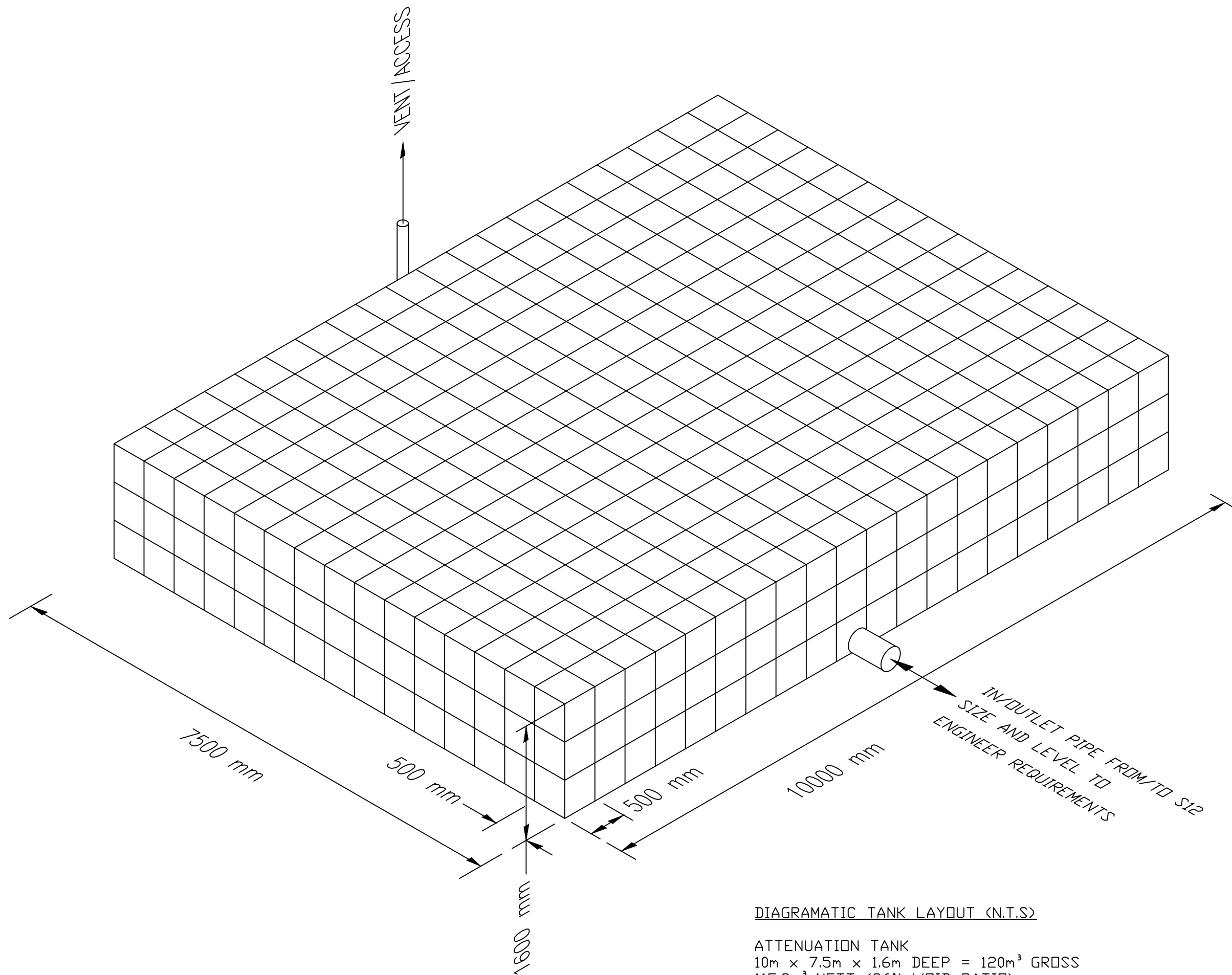


ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED
SOLUTION HOUSE
DANE STREET
ROCHDALE
OL11 4EZ
TEL: 01706 374416
FAX 01706 376785
EMAIL: TECHNICAL@Y-ESS.COM

PROJECT
328 TO 336 STOCKPORT ROAD AXIS, MANCHESTER
ATTENUATION TANK - DETAILS

TITLE
ATTENUATION STORAGE TANK LAYOUT USING PLUVIAL CUBE MODULE UNITS.

Scale N.T.S.	Drawn AY	Checked KD
Date 18/03/2021	Drawing No. PCST - 3.0 Job Ref. (RP/17093)	Revision R0



DIAGRAMATIC TANK LAYOUT (N.T.S)

ATTENUATION TANK
 10m x 7.5m x 1.6m DEEP = 120m³ GROSS
 115.2m³ NETT (96% VOID RATIO)
 (LEVELS TO THE ENGINEER REQUIREMENTS
 PLEASE REFER TO THE LATEST DRAINAGE
 LAYOUT PRIOR TO INSTALLATION)

- Notes :-
1. ALL STORAGE TANK DRAINAGE WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH THE SPECIFICATIONS, METHOD STATEMENTS AND RECOMMENDATIONS OF ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED, ROCHDALE.
 2. THE LOCATION, SIZE AND DEPTH OF ALL EXISTING DRAINS / SEWERS AND SERVICES SHALL BE ESTABLISHED BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF WORKS ON SITE. ANY DISCREPANCIES FROM THE INFORMATION INDICATED ON THESE DRAWINGS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
 3. THE CONTRACTOR SHALL ALLOW FOR THE PROTECTION, TEMPORARY AND PERMANENT SUPPORT AND DIVERSION WORKS AS NECESSARY, TO ALL EXISTING SERVICES TO THE SATISFACTION OF THE PUBLIC UTILITIES.
 4. THE CONTRACTOR SHALL ALLOW FOR DEALING WITH SURFACE WATER RUN-OFF INTO EXCAVATIONS AND FROM GROUNDWATER BY MEANS OF PUMPS, PUMPING AND DE-WATERING AS APPROPRIATE, IN ORDER TO KEEP THE EXCAVATION AS REASONABLY DRY AS POSSIBLE DURING THE CONSTRUCTION OF THE WORKS.
 5. ALL LEVELS AND DIMENSIONS SHALL BE VERIFIED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORKS. ANY DISCREPANCIES SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER.
 6. THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY PRECAUTIONS IN LINE WITH CURRENT LEGISLATION WHEN WORKING IN / NEAR CONFINED SPACES, DEEP EXCAVATIONS AND MACHINERY.
 7. THE CONTRACTOR SHALL TAKE ALL NECESSARY SAFETY TO PROTECT PEDESTRIANS AND VEHICLES FROM THE WORKING AREAS.
 8. TO PROTECT THE ESS PLUVIAL CUBE MODULAR ATTENUATION / STORAGE TANK FROM CONSTRUCTION SITE DEBRIS, THE CONTRACTOR SHALL ENSURE THAT STOPPERS ARE SECURELY PLACED IN ALL CONNECTIONS IMMEDIATELY UPSTREAM OF THE TANK UNITS, ONLY TO BE REMOVED ONCE THE FINAL CLEANING OF THE ROADS / DRAINAGE HAS BEEN COMPLETED.
 9. UPON COMPLETION OF THE WORKS THE CONTRACTOR SHALL CLEAN ALL DRAINAGE BY JETTING, REMOVING ALL DEBRIS FROM SITE, NO DEBRIS SHALL BE PERMITTED TO ENTER THE TANK STORAGE SYSTEM.
 10. NUMBER OF VENT UNITS DEPENDS ON THE SIZE OF THE TANK (REFER LAYOUT DRAWING)
 11. REFER SEQUENCE OF WORK DOCUMENT FOR DETAILED INSTALLATION METHODOLOGY (CONTACT ENVIRONMENTAL SUSTAINABLE SOLUTIONS (ESS) LIMITED)

Notes :- All the Dimensions by Millimeters



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 FAX 01706 376785
 EMAIL: TECHNICAL@Y-ESS.COM

PROJECT
 328 TO 336 STOCKPORT ROAD AXIS,
 MANCHESTER
 ATTENUATION TANK - LAYOUT

TITLE
 ATTENUATION STORAGE TANK
 LAYOUT USING PLUVIAL CUBE
 MODULE UNITS.

Scale N.T.S.	Drawn AY	Checked KD
Date 18/03/2021	Drawing No. PCST - 31 Job Ref. (RP/17093)	Revision R0

PLUVIAL CUBE HEAVY DUTY MODULE – DATA SHEET

Pluvial Cube Module Dimensions* (mm)	Module Configuration	Units per m ³	Module Volume (m ³)	Storage Volume (m ³)
500 (L) x 500 (W) x 550 (D)	Single	7.27	0.1375	0.132
500 (L) x 500 (W) x 1075 (D)	Double	3.72	0.2688	0.258
500 (L) x 500 (W) x 1600 (D)	Triple	2.5	0.4	0.384

* Bespoke modules with different configuration available



Single Module



Double Module



Triple Module

Product Data	Heavy Duty Pluvial Cube Module
Application	Stormwater Management
Average Weight (kg) – single module	8
Compressive Strength* (kN/m ²)	400
Lateral Strength* (kN/m ²)	225
Creep Rupture Strength (kN/m ²)	317
Creep Rupture Lateral Strength (kN/m ²)	201
Long Term Creep Testing** (kN/m ²)	200
Void Ratio (%)	96
Surface Void Ratio (%)	Greater than 90
Minimum Backfill Cover Landscaped areas# (mm)	450
Material	Polypropylene
Chemical resistance	Good
Bacterial Resistance	Good
UV Resistance	Good

Note: Other Modules with Compressive Strength more than 1500 kN/m² available

* Modules tested using UKAS calibrated test machine, range 0 – 60 Tons, UDL, loading rate 0.2 kN/m²

** Modules tested for long term creep testing for 90, 180 and 208 days / 5000 hours = 50 years design life.

Any cover less than 450 mm and for Min. backfill cover for trafficked areas – contact ESS design department

Maximum depth to invert based on soil type dense sand and gravel for different soil type–contact ESS design department

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Solutions House, Dane St.
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Tel: 01706 374416
Fax: 01706 376785
Email: sales@alderburgh.com



ALDERPRUFE GEO-MEMBRANES

HEALTH AND SAFETY INFORMATION

March 2007

PRODUCT NAME: TUFLEX

USES: A single layer cold applied Geo-membrane suitable for environmental protection to structures, containments and cut off trenches.

COMPOSITION: The product consists of a copolymer of ethylene and polypropylene rubber which is a polymerised matrix.

GENERAL HANDLING: No specific handling precautions are required. Do not use petroleum based solvents.

STORAGE: No special requirements are needed for storage.

FIRE HAZARDS: Combustible at high temperatures. When burning it releases black smoke.

FIRE FIGHTING: Use waterspray, CO₂, Foam, or dry powder. NB carbon dioxide is rarely effective in open air.
Wear protective clothing and self contained breathing apparatus to prevent inhalation of smoke and fumes.

FIRST AID

Inhalation:	No special requirements <u>In the case of fire or smoke inhalation, remove to fresh air and obtain medical attention.</u>
Eyes:	No significant risk under normal conditions
Skin:	No significant risk under normal condition
Ingestion:	Unlikely to occur under normal working conditions

**IN AN
EMERGENCY
CONTACT:**

Alderburgh Ltd Tel 01706 374416

The information given in this data sheet is true and accurate to the best of the Company's knowledge and belief. It is provided for guidance only.

GEOMEMBRANES

ALDERPRUFE TUFLEX



Features

Excellent Barrier Properties

High Puncture Resistance

**Exceptional Multiaxial Stress
and Strain Properties**

Good Tear Resistance

High Surface Friction

**Good Low Temperature
Behaviour**

**Low Coefficient of Thermal
Expansion**

Very Good Chemical Resistance

Very Good UV Resistance

**Excellent Environmental Stress
Crack Resistance (ESCR)**

**Excellent Welding Properties -
Wide Seaming Temperature
Window**

General Description

Alderprufe Tuflex is a single layer cold applied geomembrane suitable for environmental protection to structures, containments and cut-off trenches.

Alderprufe Tuflex combines excellent chemical resistance with low flexural modulus to provide a malleable, flexible membrane suitable for non-smooth surfaces and factory prefabrication to optimise on-site installation.

Alderprufe Tuflex is the ideal membrane for building protection systems and cut-off trench containment particularly on contaminated sites which would otherwise prove too difficult or costly to develop.

Building Protection Membrane

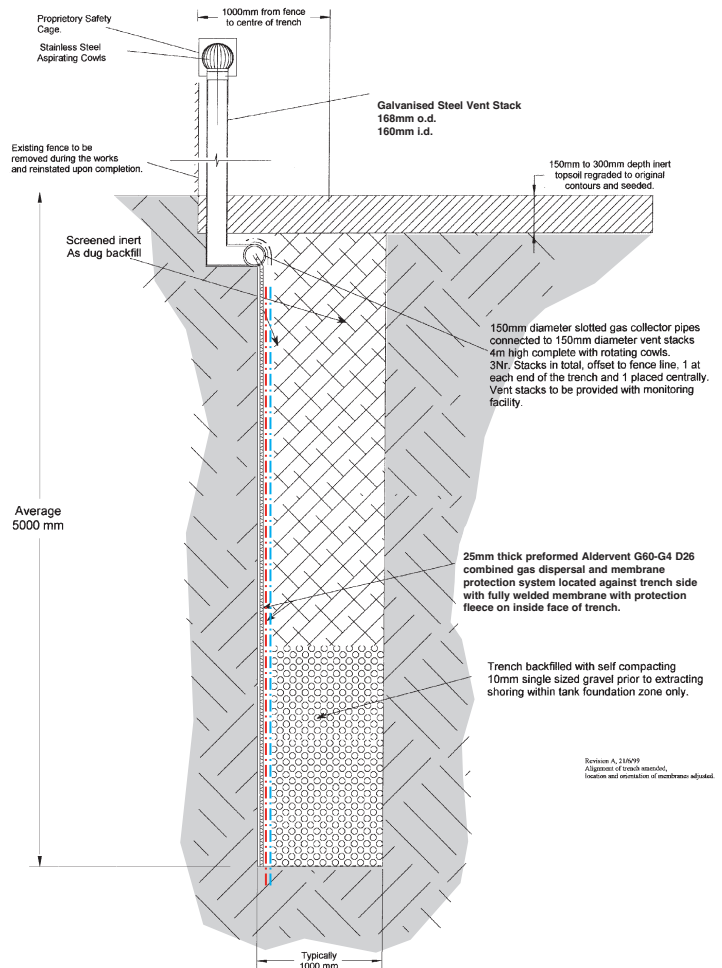
Applied as a Gas Barrier Membrane to protect the building against the ingress of all land borne gases - Methane, Carbon Dioxide and Radon. Tuflex is laid in a single layer over a prepared site. Due to its inherent weldability and on site quality assurance monitoring, the membrane is recommended to be laid by trained operatives certified for the purpose. On smaller sites factory fabricated panels can be supplied for application by others. Applied to cover the whole of the slab area above Aldervent gas ventilation system if required.

All membrane penetrations (i.e. steel stanchions and service entry points) to be sealed with factory formed units welded to the membrane on site.

At all points where the membrane passes through load bearing walls, Aldercourse Tuflex DPC or GRA DPC is installed and welded to the overlaying Tuflex membrane.



Pressure testing of welded joints
(part of standard CQA procedures)



Membrane Protection

Protect finished membrane with Geotex or Alderway protection mats if following trades are erecting steel fabrication for slab reinforcement.

All punctures to be repaired by a minimum overlap of 150mm.

Cut-off Trench Containment

Alderprufe Tuflex has been successfully installed up to 8 metres deep as a vertical barrier to contain contaminants and gases on brown fields sites and around landfill.

Installed by accredited contractors.

Bespoke systems have been designed to suit site specific parameters.

Trilaminate membranes with exceptionally high puncture resistance are available.

Cut-off trenches for contaminant control, with large volume gas and liquid dispersal properties, are possible, utilising Aldervent Geogrid, Geovoid, or Geocell systems. (see separate data sheets.)



This product satisfies the criteria set out in BS 6920: Part 1: 1996 "Specification" and thus complies with the requirements of the Water Bylaws Scheme Tests of Effect on Water Quality (BS 6920: 1996). It is suitable for use with cold but not hot water.

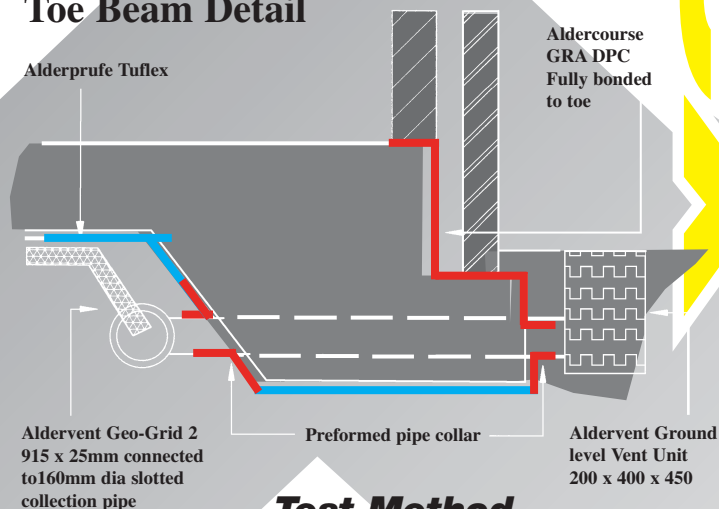
In-service performance

The demands made on Alderprufe Tuflex in landfill, water containment or pollution control are considerable. The flexibility of Alderprufe Tuflex is due to the polymeric structure of the resin. There are no plasticisers in the Alderprufe Tuflex formulation that can be leached out by exposure to chemicals or sunlight causing the membrane to become brittle.

Design and Specification

All Alderprufe Tuflex systems carry Product Guarantee Insurance including efficacy cover. Bespoke system designs with third party accreditation including P.I. cover are available to the developer to offer full security and warranties.

Toe Beam Detail



Test Method

Thickness mm +/- 10%	0.75	1.0	1.5	ASTM D - 751
Density g/cm ³	0.9	0.9	0.9	ASTM D - 792
Tensile Stress @ break Min N/mm ²	13	18	26	ASTM D - 638
Elongation @ Break %	>700	>700	>750	ASTM D - 638
Puncture Resistance Min N	120	150	200	FTMS 101C Method 2065
Tear Resistance Min N	45	60	90	ASTM D - 1004
Dimensional Stability	+/-2%	+/- 2.0	+/-2%	ASTM D - 1204
% Change Max				1 Hr @ 1000C
Stress Crack Resistance	100%	100%	100%	ASTM 5397
Volatile Loss 5%	0.2	0.2	0.2	ASTM D - 1203
Loss Max				Method A
Ozone Resistance	No cracks	No Cracks	No Cracks	ASTM D - 1149
Carbon Black Content	2-3%	2 - 3%	2-3%	ASTM 1063
Moisture Vapour g/m ² /day	<0.01	< 0.1	<0.01	ASTM E96
Friction Angle (Non Woven Geotextile)		21°		Shear Box
Methane Permeability	0.14	0.11	0.007	European standard g/m ² /day/atm
Methane Transmission Rate		1.8 x 10 ⁻⁹ m ³ /m ² /s/atm		BRE
Permeability Coefficient		1,8 x 10 ⁻¹²		



Alderprufe Tuflex possess exceptional flexibility, tear and puncture resistance qualities for all water containment projects, even at very low temperatures.

Ornamental ponds and water storage lakes used in landscaping and irrigation projects utilise the special attributes of the Alderprufe Tuflex geomembrane.



Alderprufe Tuflex geomembranes are used as liners and capping to contain both the gas and liquids produced by a landfill operation. The multiaxial strain qualities of Alderprufe Tuflex are so good that the geomembrane will resist out of plane forces caused by subsidence which occurs with differential waste consolidation and unstable site substrates





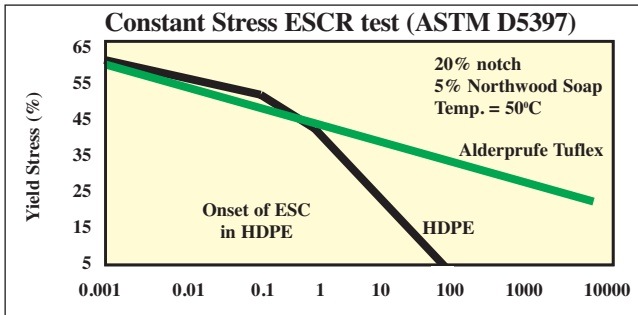
The flexibility of Alderprufe Tuflex geomembranes ensures that most ponds, ditches, lagoons, lakes and dams can be lined including those with inherently complex shapes.



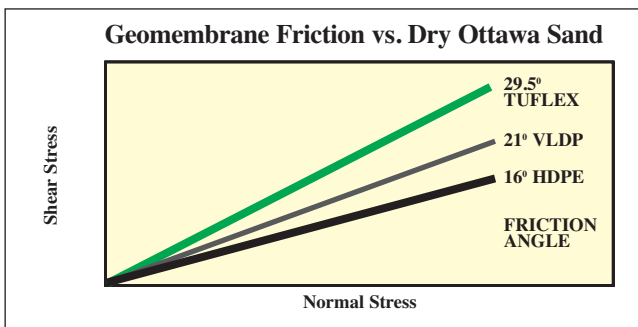
The exceptionally wide seaming temperature window ensures a reliable weld is achieved in most weather conditions. Fluctuations in temperature are not as critical as they are with other geomembranes.

Tuflex

Environmental Stress Crack Resistance (NCTL)



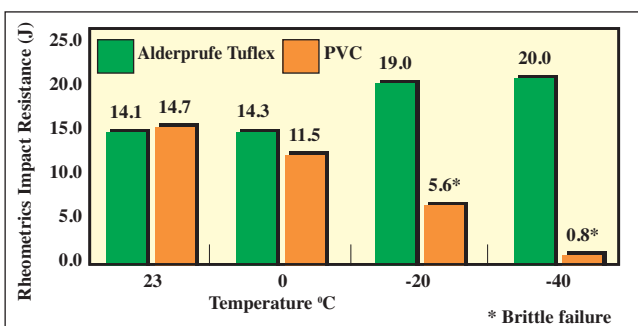
Comparative Friction Angles



Alderprufe Tuflex possesses outstanding environmental stress crack resistance compared to other materials. Alderprufe Tuflex also retains its flexibility at low temperatures and does not become brittle even at temperatures as low as -40°C. This feature is particularly important as it enables the Geomembrane to be handled or installed during severe weather conditions or at high altitude.

The friction angle of Alderprufe Tuflex measured by this method is higher than that of all the commonly used smooth geomembrane materials. This allows the construction of steeper side slopes, increasing the capacity and, in the case of landfills, speeding up waste settlement.

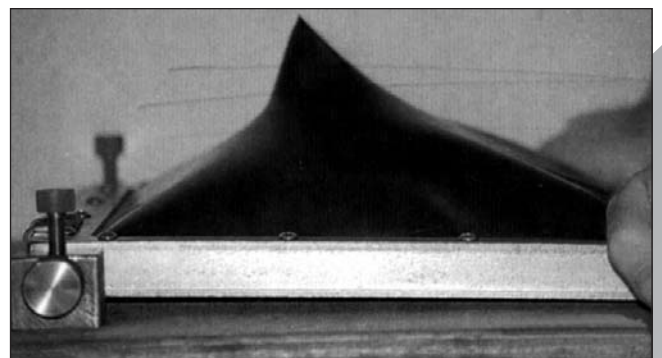
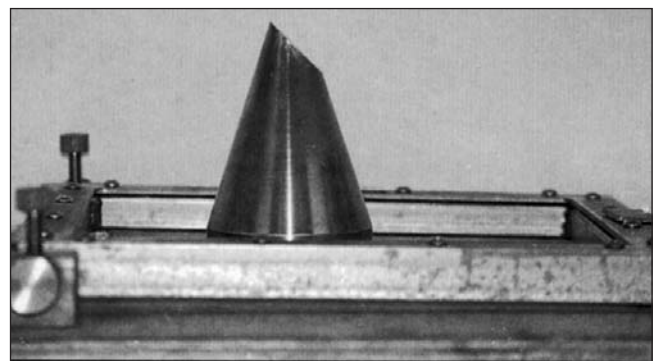
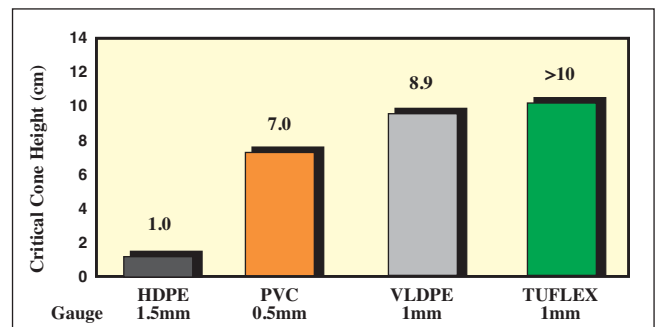
Low Temperature Impact Resistance



Puncture Resistance Truncated Cone

Alderprufe Tuflex, when placed under load on uneven or rocky substrates, has an exceptionally high puncture resistance. It even exceeds the specifications of GRI test method GM - 3 and possesses the highest puncture resistance of all geomembrane materials measured by this test.

Alderprufe Tuflex readily conforms to projections and deforms easily when under static load. Stresses are evenly distributed throughout the material's structure as it deforms thus allowing the membrane to maintain its "barrier" properties when subjected to both short and long term static loads.



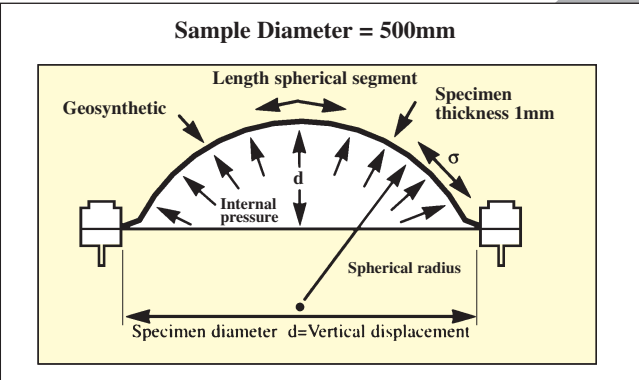
Large Scale Multiaxial Stress-Strain Test



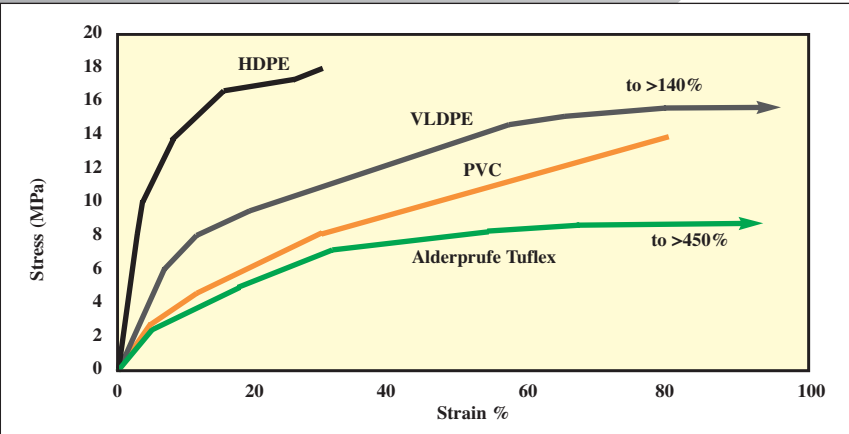
One of the most noteworthy features of Alderprufe Tuflex is the inherent ability to elongate when subjected to out of plane stresses. Localised deformation typically occurs in a landfill capping as the solid waste subsides or under slabs as piled sites are subject to ground subsidence.

The outstanding multiaxial performance of Alderprufe Tuflex is most beneficial in these applications where a high degree of subsidence is anticipated.

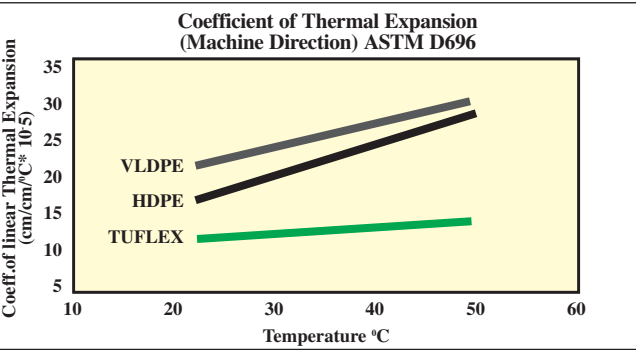
the excellent multiaxial elongation demonstrated by Alderprufe Tuflex indicates that it can accommodate more differential settlement than other membranes.



Geomembrane Multiaxial Stress-Strain Behaviour

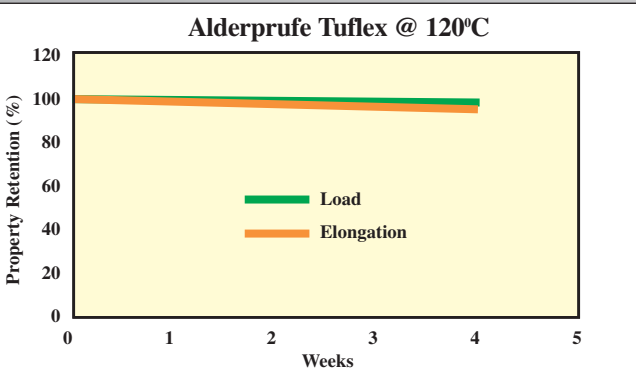


Coefficient of Thermal Expansion



Alderprufe Tuflex has an unusually low coefficient of thermal expansion (CLTE), as little as half that of some other geomembranes. During installation, Alderprufe Tuflex geomembrane does not expand or contract as much and therefore forms fewer and smaller wrinkles. Also, placement of cover material may be simplified since the liner has a better tendency to lay flat. These factors lead to easier and higher quality installations.

Thermal Ageing tests of Alderprufe Tuflex Geomembranes



The high melting point of Alderprufe Tuflex makes it particularly suitable for environments such as black liquor effluent ponds with operating temperatures of 70°C and solar ponds where liners must withstand temperatures fluctuating from 10° - 80°C. Alderprufe tuflex maintains its mechanical properties across an unusually broad range of temperatures.

TUFLEX-P CHEMICAL RESISTANCE

The following chemical resistance values are provided only as a guide

Chemical	Concentration	Temperature °C	Resistant
A			
Acetic acid	100%	50	S
Acetic anhydride	100%	50	S
Acetone	100%	50	S
Acrylonitrile	100%	50	S
Aluminium hydroxide		23	S
Aluminium sulphate	38%	23	S
Ammonia water (conc)	100%	30	S
Ammonium chloride	30%	50	S
Ammonium hydroxide	100%	23	S
Ammonium nitrate	50%	50	S
Ammonium phosphate(monobasic)	20%	50	S
Ammonium phosphate (di-basic)	24%	30	S
Ammonium sulphate	43%	30	S
Amyl acetate	100%	30	U
Amyl alcohol		30	S
Aniline		30	S
B			
Barium Chloride	27%	30	S
Barium Hydroxide	20%	30	S
Barium Sulphate	sat	30	S
Benzene		23	U
Benzyl alcohol			S
Boric acid	5%	30	S
N-butanol	100%	30	U
Butyraldehyde			
C			
Calcium carbonate	sat	50	S
Calcium chloride	50%	30	S
Calcium hydroxide	100%	23	S
Chloroacetic	25%	30	S
Chloroform	100%	23	U
Chlorosulphonic acid	98%	30	U
Chromic acid	50%	30	U
Citric acid	33%	30	S
Cresol (Meta)			U
Cupric chloride	sat	30	S
Cupric sulphate	sat	50	S
Cychlorohexane	100%	30	U
Cyclohexanol			
D			
Decalin		30	U
Di-butyl phthalate		30	S
Di-ethyl ether			U
Di-octyl phthalate		30	S
Dimethylamine	40%	23	S
E			
Ethanediol	40%	23	S

Chemical	Concentration	Temperature °C	Resistant
Ethanol	100%	23	S
Ethyl acetate	50%	23	S
Ethyl alcohol (denatured)		30	S
Ethylene glycol	100%	23	S
F			
Ferric chloride	15%	30	S
Ferric sulphate	17%	30	S
Formaldehyde	37%	23	S
Formic acid	99%		U
Furfural		30	S
G			
Gasoline	35%	23	U
Glycerine		30	S
H			
Hexane	100%	23	U
Hydrochloric acid		30	S
Hydrofluoric acid	40%	30	S
I			
Indolene			U
Iso-butyaldehyde			
Isoctane			U
Isopropanol	30%	23	U
Iso-propyl ether			U
K			
Kerosene	100%		U
L			
Lactic acid	pure	50	S
Linseed oil			U
M			
Magnesium chloride	sat	30	S
Methanol	50%	23	S
Methylene chloride	100%	23	U
Methyl acetate			U
Methyl alcohol			S
Methyl ethyl ketone			U
Methylisobutylketone	60%	23	S
Methyl methacrylate			U
N-methylmorpholine oxide	60%	23	S
N			
Nickel chloride	33%	30	S
Nickel sulphate	50%	30	S
Nitric acid	38%	30	S
Nitric acid	65%		U

The following chemical resistance values are provided only as a guide

Chemical	Concentration	Temperature °C	Resistant	Chemical	Concentration	Temperature °C	Resistant
Nitrobenzene			U	Sodium hydroxide	50%	23	S
N-n-di-methyl formamide				Sodium hydroxide	100%	50	S
O				Sodium hyperchloride	20%	30	S
Oil ASTM 1	pure		U	Sodium hyperchlorite	20%	30	S
Oil ASRM 2	pure		U	Sodium nitrate	43%	30	S
Oil ASTM 3	pure		U	Sodium phosphate (monobasic)	43%	30	S
Oil OB/22-AT	35%		U	Sodium sulphate	40%	30	S
Oil of Linseed	pure	30	U	Sodium thiosulphate	45%	30	S
Oil of olive	pure	23	U	Solna 100	30%	23	U
Oil of chicken	pure	23	U	Stearic acid	100%	50	S
Oil of beef	pure	23	U	Sulphuric acid	35%	23	S
Oil of pork	pure	23	U	Sulphuric acid	50%	50	S
Oleum			U	Sulphuric acid	96%		U
Oxalic acid	10%	30	S	T			
P				Tannic acid	10%	30	S
Pentane	pure	23	U	Tartaric acid	20%	30	S
Phenol	sol.	30	S	Tetralin	100%	23	U
Phophoric acid	85%	30	S	Tin chloride	62%	30	S
Potassium bi-chromate	20%	30	S	Toluene	pure	50	U
Potassium bromide	sat.	23	S	Tri-butyl phosphate			U
Potassium chloride	27%	30	S	Trichloroethylene	pure	50	U
Potassium hydroxide	50%	30	S	Triethanolamine		30	S
Potassium iodide	57%	30	S	V			
Potassium phosphate	17%	30	S	Vaseline oil	pure	30	U
Potassium sulphate	11%	30	S	W			
N-propanol	pure	23	S	Wine	pure	30	S
Propionic acid	100%	23	S	X			
Propyl ether			U	Xylene	pure	30	U
N-propyl nitrate			U				
Pyridine			U				
S							
Sodium chloride	sat.	23	S				

CODE:			
S	=	Satisfactory	
L	=	Limited application possible	
U	=	UNSATISFACTORY	
-	=	Not tested	
CONCENTRATION:			
Sat. sol.	=	Saturated aqueous solution	
prepared at 20°C (68°F)			
sol = aqueous solution with concentration above 10% but below saturation level			
dil. sol = diluted aqueous solution with concentration below 10%			
cust. conc = customary service concentration			



All Alderburgh products are manufactured to the highest quality, being subject to rigid quality control. However, the company cannot control conditions of application and use of its products, thus any warranty, written or implied, is given in good faith for materials only. Alderburgh Ltd will not accept any responsibility for damage or injury arising from storage handling, misapplication or misuse of its products. All transactions are subject to our standard condition of sale, copies of which are available on request.



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