

**Project:** Drainage and SUDS  
Design, 117 Station Road,  
Cradley Heath B64 6PL

**Project No:** 2081-C-R01

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## Executive Summary

This Drainage Assessment reviews the existing drainage arrangement at the application site and proposes a surface water drainage strategy in line with Sandwell Metropolitan Borough Council guidance.

The site is currently occupied by a warehouse and is located at 117 Station Road, Cradley Heath B64 6PL.

The proposed development comprises the conversion of the building into 9 self-contained flats and associated external works.

The site is less than 1 hectare in size and within flood zone 1, so no flood risk assessment is required.

### Surface Water Drainage

The proposed strategy presented in detail in this report aims to reduce the surface water discharge to greenfield rates. All post development run-off from the site will be limited to 5 litres/second in accordance with best practice. Attenuation and reduced discharge will be provided for all storm events up to and including the 1 in 100-year storm plus 40% allowance for climate change. Sustainable Drainage Systems (SuDS) shall be used, including an area of tanked permeable paving for surface water attenuation and silt traps.

It is proposed to reuse the existing sewer connection where possible. If this cannot be found, it is proposed to construct a new sewer connection to the surface water sewer in Station Road.

An additional 10% allowance for urban creep has been included in the sizing of attenuation.

Maintenance/management of all onsite drainage infrastructure has been considered within a separate maintenance plan appended to this report. This will be updated through the development process.

The proposed drainage strategy is entirely based on-site and therefore the only off-site works will be the foul and surface water outlets to the Severn Trent Water sewer.

Overall, the proposals provide a high level of water treatment, runoff reduction and flooding protection for the proposed development and are in accordance with all requirements of the Lead Local Flood Authority (LLFA).

### Foul Drainage

It is proposed to discharge the foul drainage from the site into the existing Severn Trent Water sewer in Station Road.

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## **1 1 Introduction**

- 1.1.1 Arcelle Consulting was commissioned to undertake a Drainage Assessment for the proposed development of land located at 117 Station Road, Cradley Heath.
- 1.1.2 This Drainage Assessment has been produced in support of a planning application and should be read in conjunction with the other planning documents.
- 1.1.3 The development proposal comprises the conversion of the existing warehouse into 9 self-contained flats and associated external works. Development proposals are provided in Appendix A.
- 1.1.4 The site is less than 1 hectare in size and within flood zone 1, so no flood risk assessment is required.
- 1.1.5 The total site area is 874 square metres. The existing development site contains an existing building and hardstanding.
- 1.1.6 Since April 2015, Lead Local Flood Authorities (LLFA's) have become a statutory consultee on surface water drainage for many planning applications. For this site, the following is considered to be the required level of details for planning approval.
  - SuDS: Designs, Maintenance Plans & Calculations - for SuDS proposed, the LLFA require product specifications or design drawings, all supporting calculations and a maintenance plan. This needs to include details of any SuDS structures, and the type of SuDS system in accordance with the CIRIA C753 SuDS Manual.

## **2 Site Description**

2.1.1 The total site area is 874 square metres. The existing development site contains an existing warehouse and hardstanding. The proposed development includes 9 new dwellings, associated hardstanding and a garden area.

2.1.2 The site location information is as follows:

- Nearest Postcode: B64 6PL

## **2.2 Topography**

### *Site Topography*

2.2.1 An onsite topographic survey has been carried out and is provided in Appendix B.

2.2.2 The site is irregular in shape and generally falls from northeast to southwest and the front of the site.

### **3 Design principles and policy requirements**

#### **3.1 *General Principles for Proposed Site Run-Off***

3.1.1 The DEFRA Sustainable Drainage Systems Non-Statutory Technical Standards for Sustainable Drainage Systems (March, 2015) states that the following options must be considered for disposal of surface water runoff in order of preference:

- Discharge to ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- Discharge to a combined sewer

##### ***Discharge to Ground***

3.1.2 The potential for surface water to discharge to ground has been assessed through a review of the likely ground conditions and possible infiltration structures.

3.1.3 The area in which this site is located is generally underlain by impermeable clays (Etruria Formation - Mudstone, Sandstone And Conglomerate). Based upon this information, it is unlikely that infiltration is possible on this site.

3.1.4 Soakaway tests will be carried out to confirm the permeability, however as well as the underlying ground conditions, the site and surrounds are urban in nature and have existing sewer connections. Hence it is considered that infiltration is unlikely to be possible on this site.

##### ***Discharge to Surface Water Body***

3.1.5 There are no suitable surface water bodies near to the site that can be used for surface water discharge.

##### ***Discharge to Surface Water Sewer/Combined Sewer***

3.1.6 Discharge to the public sewer network should only be considered once all other options for draining surface water from the site have been exhausted.

3.1.7 It is assumed that the existing site has a surface and foul water connection to the public sewer. It is proposed to reuse this existing connection if it can be located. If not a new surface water and foul connection will be constructed.

3.1.8 Attenuation will be provided in the form of a large area of tanked permeable paving. The proposed attenuation structure will discharge to the Severn Trent Water sewer in Station Road, with a discharge rate of 5 litres/second in accordance with best practice. Severn Trent Water will be contacted for approval of the discharge to their sewer. See Appendix C for design drawings and calculations.

## 3.2 ***Sustainable Drainage Systems (SuDS)***

- 3.2.1 To maximise the potential use of SuDS at the site, a review has been undertaken as shown in Table 1 in accordance with the SuDS Hierarchy. This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.

**Table 1: SuDS Selection Based on the SuDS Hierarchy**

<b>Component</b>	<b>Recommendation</b>
Green (living) roofs	<p>Whilst the use of green roofs provides additional environmental benefits such as enhanced aesthetics and ecology, its exposure to wind and orientation must be considered. Access to undertake the construction and maintenance easily and safely is also a high priority.</p> <p>If feasible, depending on the roof design, a green roof will provide water quality, biodiversity and aesthetic benefits to the site. Additionally, the green roof/s will offer some attenuation for run-off, reducing volumes of run-off and in higher frequency events (i.e. 1in2 year storms) will result in no run-off for the building.</p> <p>The roofs will remain as existing and so are not suitable for green roofs..</p>
Basins and Ponds	<p>Ponds and attenuation basins can provide overland storage of surface water whilst also providing additional biodiversity and aesthetic/amenity value.</p> <p>There are no open areas on the site which are suitable for basins or ponds.</p>
Filter Strips and Swales	<p>Swales are linear vegetated drainage features, which provide overland conveyance and storage of surface water whilst trapping sediments and hydrocarbons within run-off. They also create biodiverse areas for planting and habitat.</p> <p>Swales are not considered suitable for this site due to the urban setting restricting the availability of space and suitability of swales.</p>
Infiltration Devices	<p>Infiltration devices are not suitable for this site in accordance with the recommendations of the section above.</p>
Permeable Paving	<p>Whilst incorporating attenuation storage, permeable paving also provides treatment through filtration of silt (and attached pollutants), settlement and retention of solids, adsorption of pollutants and biodegradation of organic pollutants, including petrol and diesel.</p> <p>A large area of tanked permeable paving is proposed for the site.</p>
Tanked Systems	<p>This is the least sustainable option in terms of the SuDS Hierarchy. However, the use of tanked systems would still be of benefit compared to traditional drainage systems as it does allow run-off to be slowed down to</p>



Component	Recommendation
	an acceptable discharge rate. There are no tanks proposed for the site.

## 4 Surface Water Drainage Design

### 4.1 *Existing Site Runoff*

- 4.1.1 The development area currently comprises a building with an area of hardstanding and some overgrown planted areas. The existing and proposed areas are summarised below.

**Table 2: Site Areas**

Parameter	Existing (m2)	Existing (%)	Proposed (m2)	Proposed (%)
Impermeable area	794	90	794	90
Permeable area	80	70	80	10
Total area	874	100	874	100

### 4.2 *Design Considerations*

- 4.2.1 Consideration has been given to the following when calculating the proposed impermeable areas.
- The 2013 EA 'Rainfall Run-off Management for Developments' Report (SC030219) states that urban creep, the process of gradually increasing impermeable area within an urban area (through paving soft landscaped surfaces and constructed outbuildings etc), is an acknowledged issue. To include an allowance for urban creep, the impermeable area used in the drainage calculations has been increased by 10% in accordance with the recommendation made in SC030219.
- 4.2.2 Site discharge should be as close to greenfield rates as possible. However, as the greenfield rates from this site are low (See Appendix C), in accordance with best practice, outflow controls will be set to discharge at a rate of 5 litres/second.
- 4.2.3 The climate change allowance used in the Drainage Strategy is in line with updated EA guidance values published in February 2016 for increased rainfall intensities by 2115.

### 4.3 *Existing Greenfield Run-Off Rates*

- 4.3.1 The existing run-off rates for a variety of return periods have been calculated using the Wallingford method.
- 4.3.2 The greenfield run-off rates are based on the parameters provided below in Table 3.

**Table 3: Rural Run-off Calculator Parameters**

Parameter	Value
Area (ha)	0.0894
SAAR (mm)	749
Soil Type	4

- 4.3.3 The calculations are presented in Appendix C and summarised below in table 4 (Adjusted for 607m<sup>2</sup> site area).

**Table 4: Existing Greenfield Run-off Rates**

Parameter	Value for site (l/s)
QBAR	0.47
Q1	0.39
Q30	0.93
Q100	1.20

#### 4.4 **Existing Site Runoff Rates**

- 4.4.1 The total site area is 874 square metres and is 90% impermeable, resulting in an impermeable area of 794 square metres. Taking conservative peak 1 year, 30 year and 100 year rainfall rates of 50mm/hr, 125mm/hr and 185mm/hr respectively, the maximum existing peak discharge rates have been calculated as follows.

Contributing Area (ha) x 1 yr Rainfall (mm/hr) x 2.78

$$794/10000 \times 50 \times 2.78 = \mathbf{11.0 \text{ l/s}}$$

Contributing Area (ha) x 30 yr Rainfall (mm/hr) x 2.78

$$794/10000 \times 125 \times 2.78 = \mathbf{27.6 \text{ l/s}}$$

Contributing Area (ha) x 100yr Rainfall (mm/hr) x 2.78

$$794/10000 \times 185 \times 2.78 = \mathbf{40.8 \text{ l/s}}$$

#### 4.5 **Proposed Drainage Design**

- 4.5.1 Due to the urban nature of the site, the presence of surface water sewers and the highly vulnerable ground, the worst case is assumed and the design presented below assumes infiltration is not possible and surface water will discharge to sewers.
- 4.5.2 The discharge rates for the existing and proposed site are summarised below.

**Table 5: Existing and proposed Run-off Rates**

Parameter	Greenfield (l/s)	Existing (l/s)	Proposed (l/s)
Q1	0.39	11	5
Q30	0.93	27.6	5
Q100	1.2	40.8	5
Q100+40%CC	NA	NA	5

- 4.5.3 As infiltration is unlikely to be possible on this site, reducing post development run-off volumes to pre-development volumes is achieved through attenuation.
- 4.5.4 By controlling run-off rates to 5 litres/second and providing attenuation for all storm events up to and including a 1 in 100-year storm plus climate change allowance, the risk of downstream flooding will be minimised with site discharge restricted to less than 50% of the existing 1 year discharge.
- 4.5.5 Details of the drainage system and attenuation structures are presented in the design drawings and calculations in Appendix C.
- 4.5.6 The calculations include an assessment of the attenuation for the 100-year storm +40% climate change.
- 4.5.7 A total attenuation volume of approximately 30 cubic metres is proposed to cater for the 100 year +40% storm event.

#### **4.6 Exceedance Flooding**

- 4.6.1 As the general layout of the site is unchanged, the proposed flow routes will mimic existing, and fall toward the permeable paved area of the site and safely away from buildings.
- 4.6.2 It should be noted that the drainage system has been designed to cater for the 1 in 100 year + 40% climate change storm. ie in this storm event all surface water will be collected on site and slowly released. Thus, the flow route will only be in use in the event of drainage network failure or storms in excess of the 1 in 100 year + 40% climate change storm.

#### **4.7 Consents, Offsite Works and Diversions**

- 4.7.1 The proposed surface water drainage strategy is accommodated mostly on-site, with the only requirement for off-site works being the connection to the Severn Trent Water sewer should the existing sewer not be able to be reused.

## 4.8 ***Maintenance***

- 4.8.1 A SuDS maintenance plan has been prepared to outline the management of the potential SuDS features. The maintenance plan is provided in Appendix D.

## **5 Foul Run-off**

### **5.1 *Discharge to Public Sewer Network***

5.1.1 Severn Trent Water are the foul sewerage suppliers for the area.

5.1.2 The identified point of connection from the site is into the public foul sewer in Station Road. A Sewer connection application will be submitted to Severn Trent Water for approval.

## 6 Water Quality

### 6.1 *Post-Development Water Quality Treatment*

6.1.1 In line with the 2015 SuDS Manual (CIRIA C753), certain criteria should be applied to manage the quality of run-off to support and protect the natural environment effectively. Treatment design, wherever practicable, should be based on good practice, comprising the following principles:

- Manage surface water run-off close to source
- Treat surface water run-off on the surface
- Treat surface water run-off to remove a range of contaminants
- Minimise risk of sediment remobilisation
- Minimise impacts from accidental spills

6.1.2 Managing pollution close to the source can help keep pollutant levels and accumulation rates low, essentially allowing natural treatment processes to be effective. This in turn can help maximise the amenity and biodiversity value of downstream surface SuDS components and keep maintenance activities straightforward and cost-effective.

6.1.3 The proposed development comprises two types of land use; residential roofs and a car parks/low traffic driveway. These land uses are classified as having very low and low hazard pollution levels, respectively. This table is provided below in Table 6.

**Table 6: Pollution Hazard Indices from 2015 SuDS Manual (C753)**

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 <sup>1</sup>	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 <sup>1</sup>	High	0.8 <sup>2</sup>	0.8 <sup>2</sup>	0.9 <sup>2</sup>

6.1.4 The proposed drainage strategy utilises the following SuDS features:

- Permeable paving

6.1.5 The indicative SuDS mitigation indices, provided in Table 26.3 of the 2015 SuDS Manual (C753) have been reviewed for the paving. This table is provided below in Table 7.



**Table 7: Indicative SuDS Mitigation Indices from 2015 SuDS Manual (C753)**

<b>TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters</b>			
<b>Type of SuDS component</b>	<b>Mitigation indices<sup>1</sup></b>		
	<b>TSS</b>	<b>Metals</b>	<b>Hydrocarbons</b>
Filter strip	0.4	0.4	0.5
Filter drain	0.4 <sup>2</sup>	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 <sup>4</sup>	0.7 <sup>3</sup>	0.7	0.5
Wetland	0.8 <sup>3</sup>	0.8	0.8
Proprietary treatment systems <sup>5,6</sup>	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.		

- 6.1.6 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), as follows:

**Total SuDS mitigation index  $\geq$  pollution hazard index**  
**(for each contaminant type) (for each contaminant type)**

- 6.1.7 For each type of land-use, the pollution hazard indices, mitigation indices and concluding hazard have been outlined in Table 8 and **Error! Reference source not found.** below.

**Table 8: Roof Space Water Quality Mitigation Summary**

<b>Residential Roofs</b>				<b>SuDS Manual Reference</b>
	<b>TSS</b>	<b>Metals</b>	<b>Hydrocarbons</b>	
<b>Pollution Hazard Index</b>	0.2	0.2	0.05	Table 26.2
<b>Mitigation Index (permeable paving)</b>	0.7	0.6	0.7	Table 26.3
<b>Total Mitigation index</b>	0.7	0.6	0.7	Worst case only
<b>Result</b>	Total SuDS mitigation index $\geq$ pollution hazard index and therefore hazard is exceeded			

- 6.1.8 Therefore, it can be concluded that the provision of permeable exceeds the required pollution mitigation indices and provides sufficient treatment as part of the surface water management train, in accordance with the 2015 SuDS Manual (CIRIA C753).
- 6.1.9 Given that the site is not located in a Source Protection Zone, it is not considered necessary to apply a more cautionary approach.

## **7 Drainage during construction**

### **7.1 Construction Run-off Management**

7.1.1 Installing the surface water and foul drainage system, whilst managing temporary run-off, are key aspects of the construction works involved in any development. The information provided below is in accordance with the 'C698 Site handbook for the construction of SUDS' (CIRIA, 2007).

7.1.2 Please note that the measures recommended below are recommendations only and need to be confirmed at the construction stage by the client and the contractor.

### **7.2 Management of Construction (Including Drainage)**

7.2.1 Drainage is typically an early activity in the construction stage of a development, taking form during the earthworks phase. However, final construction i.e. piped drainage system connections to the SuDS devices, should not take place until the end of site development work, unless a robust strategy for silt-removal is implemented prior to occupation of the site.

7.2.2 A plan for the management of construction (including phasing of works, details of any offsite works etc.) cannot be provided at this early stage, as construction work plans are not yet known. However, the following key points are general construction issues associated with SuDS which will be addressed when these plans are complete:

- Silt-laden waters from construction sites represent a common form of waterborne pollution;
- These silt-laden waters cannot enter SUDS drainage systems unless specifically designed to accept this as it can clog the systems and pollute receiving waters. Therefore, piped drainage systems should not be connected to the attenuation SuDS devices until the late stages of construction.
- Any gullies and piped systems should be capped off during construction and fully jetted and cleaned prior to connection to the attenuation SuDS devices.

### **7.3 Temporary Drainage During Construction**

7.3.1 The three principal aspects of drainage control during construction are trapping sediment, conveying run-off, and controlling run-off.

7.3.2 Sediment traps and barriers can include basin traps and sediment fences (with any necessary boundary controls). The principal basins are to be installed after the construction site is accessed. Sediment fences and barriers will then be installed as needed during grading.

7.3.3 Conveyance of run-off can be achieved through small ditches/stream, storm drains, channels and sloped drains with sufficient inlet/outlet protection.

7.3.4 Slope stability needs to be considered when using any channels to convey run-off across the site into any basins etc.

7.3.5 Run-off control measures will need to be implemented in order not overwhelm the temporary system and cause flooding issues. Run-off rates

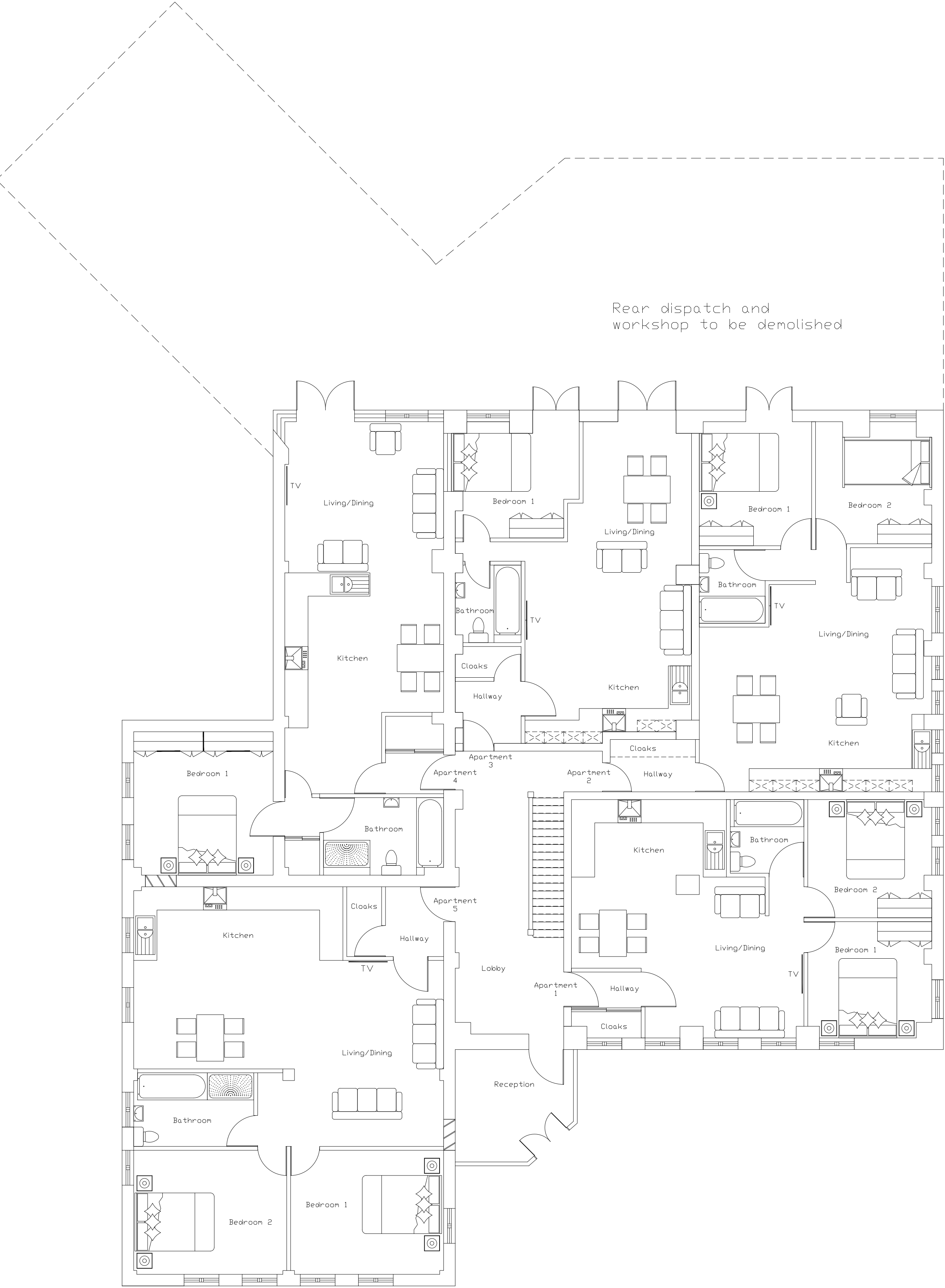
from the site will be managed so they are no greater than pre-development or in keeping with the best practice guidance to minimise risk of blockage. Any additional conveyance measures are to be installed as needed during grading.

- 7.3.6 Run-off control to include provision of perimeter ditches or appropriate levels grading to direct any water from the construction site to remain on site.
- 7.3.7 Any necessary surface stabilisation measures are to be applied immediately on all disturbed areas where construction work is either delayed or incomplete.
- 7.3.8 Maintenance inspections are to be performed weekly, and maintenance repairs to be made immediately after periods of rainfall.

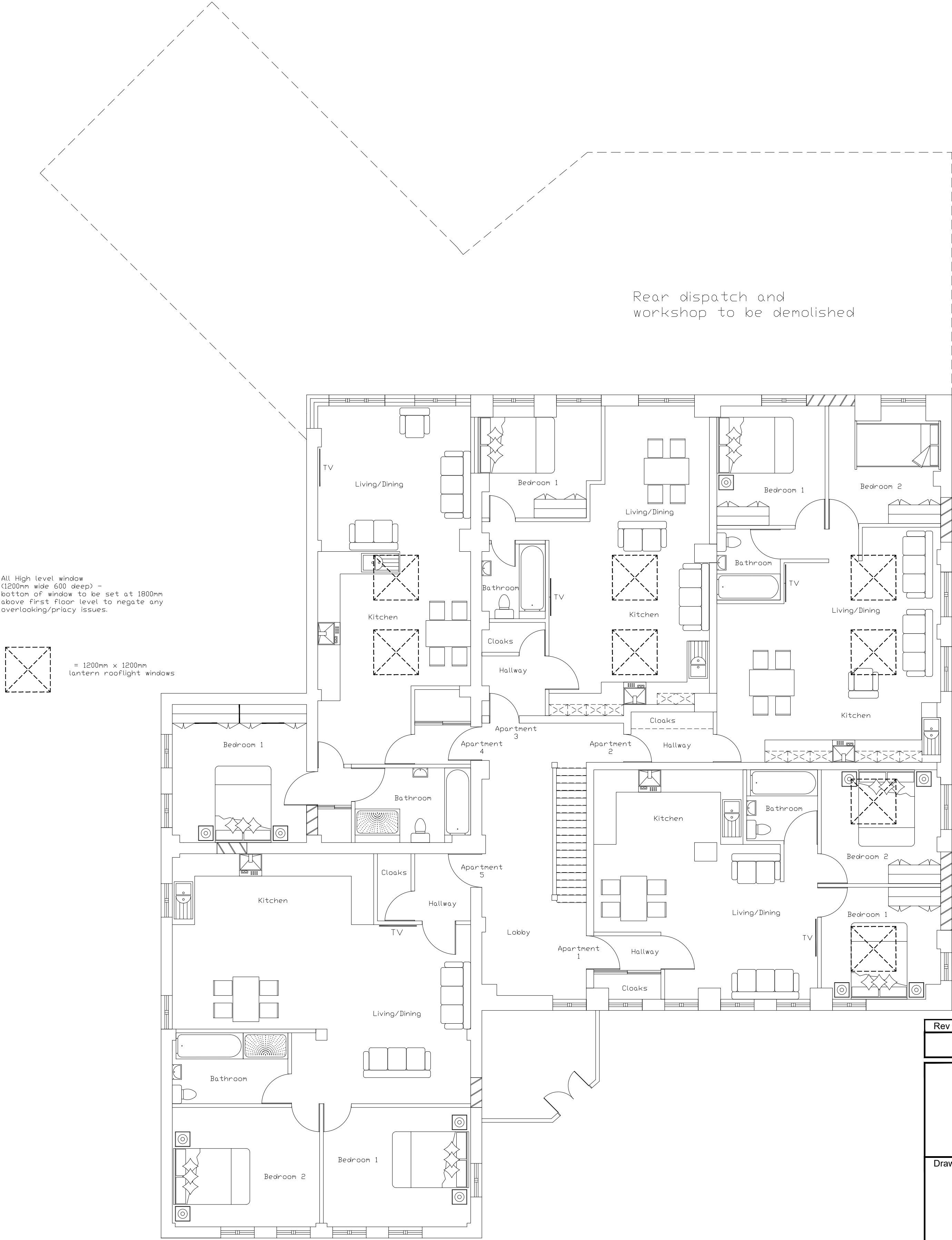
#### **7.4      *Protection of Drainage Infrastructure during Construction***

- 7.4.1 All drainage infrastructure should be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers, and storing construction materials away from the drainage infrastructure.

## **Appendix A: Proposed Development Details**



Proposed Ground Floor Plan



Proposed First Floor Plan

Rev	Revision details	Chkd	Appd	Date
117 Station Road B64 6PL				
Drawing Title				
Proposed Floor Layouts				
Scale : 1/100				
Original Drg Size : A3		Dimensions : M		
Drawn: SK		Date: 17/04/2020		
Drawing No 003				Rev -

## **Appendix B: Topographic Survey**

286000N

285975N

285950N

285925N

STATION	EASTINGS	NORTHINGS	LEVEL	DESCRIPTION
PS1	396260.001	285937.503	132.439	Hilti Nail
PS2	396214.337	285947.460	130.250	PK Nail
PS3	396262.101	285949.864	132.362	Hilti Nail
PS4	396172.838	285958.232	128.369	PK Nail
PS5	396224.650	285964.460	130.967	Hilti Nail
PS6	396278.284	285932.816	133.384	Hilti Nail

IN ORDER TO RE-ESTABLISH THE SITE GRID AND FOR ALL SETTING OUT WORKS BASED ON THIS DRAWING THEN THE EXISTING SURVEY CONTROL STATIONS SHOWN MUST BE USED.



SURVEY NOTES

1. THE SURVEY GRID (OSGB36) WAS ESTABLISHED WITH GPS AND THEN A ONE POINT SITE CENTRED TRANSFORMATION CARRIED OUT TO ELIMINATE SCALE FACTOR. IN ORDER TO RE-ESTABLISH THE SITE GRID THEN THE EXISTING SURVEY CONTROL STATIONS SHOWN MUST BE USED  
2. SURVEY LEVELS ESTABLISHED BY GPS TO OS DATUM

SURVEY KEY

House	Building		Survey Control Station
Wall	Wall	Hedge	Kerbline
R/Wall	Retaining Wall		Verge/Edge of Track etc
P/W	Fence (with description)		
Chestnut Pailing	C/P		Overhead Line
Close Boarded	C/B		
Corrugated Iron	C/I		Footpath
Chain Link	C/L		
Crash Barrier	CB		
Concrete Panel	Con/P		Sewer Line
Hit and Miss	H/M		
Interwoven	I/W		Water/Ditch etc
Pailing	Pol		
Post & Wire	P/W		
Post & Rail	P/R		
Post & Chain	P/C		
Overlap	O/L		
Iron Rollings	I/R		Gate
Post & Barbed Wire	P/Bw		Stile
Electric	Elc		
Hoarding	Hyd		Individual Tree
Post & Wire Mesh	P/M		
Picket (Wooden)	P/W		
Trip Rail	T/R	Unable To Raise	UTR
Trellis Fence	T/F	Fire Escape	P/Esc
Palisade Fence	P/F	Drop Kerb	DK
Floor Level	FL	Stone Surface	Stone
Eaves Level	EL	Gravel Surface	Gravel
Ridge Level	RL	Concrete Surface	Conc
Tarmac Surface	Tarmac	Rough Ground	R/Gnd
Grass/Lawn	Grass	Granite Setts/Cobbles	Cobbles
Paving Slabs	Paving	Tactile Paving	T/Pav
STREET FURNITURE			
Bellisha Beacon	BB O	Marker Post	Mir +
Borehole	BH O	Man Post	MP O
Bollard	BL O	Pillar Box	PB O
Bus Stop	BS O	Pipe	PI +
Drain	Dr O	Parking Meter	PM O
Electric Pole	EP O	Post	PO O
Flood Light	FL O	Rodding Eye	RE O
Flagstaff	FS O	Reflector Post	RP O
Gate Post	GP O	Road Sign	RS O
Gully	GU O	Stop Cock	SC O
Gas Valve	GV O	Sign	SI O
Inspection Cover	IC O	Stop Tap	ST O
Litter Bin	LB O	Stump	SU O
Lamp Post	LP O	Stop Valve	SV O
Traffic Light	TL O	Telegraph Pole	TP O
Manhole	MH O	Vent Pipe	VP O
Name Plate	NP	Telecommunication	TC
Fire Hydrant	FH	Water Tap	WT O
Vash Out	VO	Kerb Outlet	KO O
Water Meter	WM O	Air Valve	AV O
Cable Television	TV	Tel Call Box	TGB O
Earth Rod	ER O	Trial Pit	TP
Speed Camera	SP O	Closed Circuit TV	CCTV
Ceiling Light	CL	Multi Utility Pole (EP,LP,TP)	MUP

TECHNICAL NOTES

INFORMATION SHOWN ON THIS DRAWING IS SURVEYED TO THE ACCURACY OF THE BASE SCALE SHOWN IN THE LEGEND.  
MAN ENTRY TO SEWERS HAS NOT BEEN UNDERTAKEN. DEPTHS, PIPE SIZES ARE MEASURED/ESTIMATED FROM THE GROUND. ALL SEWER DETAILS TO BE CHECKED WITH LOCAL AUTHORITY RECORDS OR ON SITE PRIOR TO COMMENCEMENT OF WORKS.  
BOUNDARIES SHOWN ARE PHYSICAL FEATURES AND MAY NOT REPRESENT LEGALLY CONVEYED OWNERSHIP.  
ALL TREE HEIGHTS AND SPREADS ARE APPROXIMATE. TREE TYPES WHICH HAVE BEEN IDENTIFIED SHOULD BE CHECKED BY A TREE SPECIALIST.  
WHERE ADJACENT BUILDINGS HAVE BEEN SURVEYED REMOTELY NOT ALL EXTERNAL WALLS MAYBE SHOWN DUE TO OBSTRUCTIONS ALONG LINE OF SIGHT

REV	DATE	DESCRIPTION	BY	APP.
 <b>Phoenix Survey Services Ltd.</b> 49 William Road, Long Buckby, Northampton NN6 7YS Tel 07876 658389 or 07810 752133 Email info@phoenixsurveyservices.co.uk				

Client

The Gate Fuels Ltd

Project Title

117 Station Road  
Cradley Heath

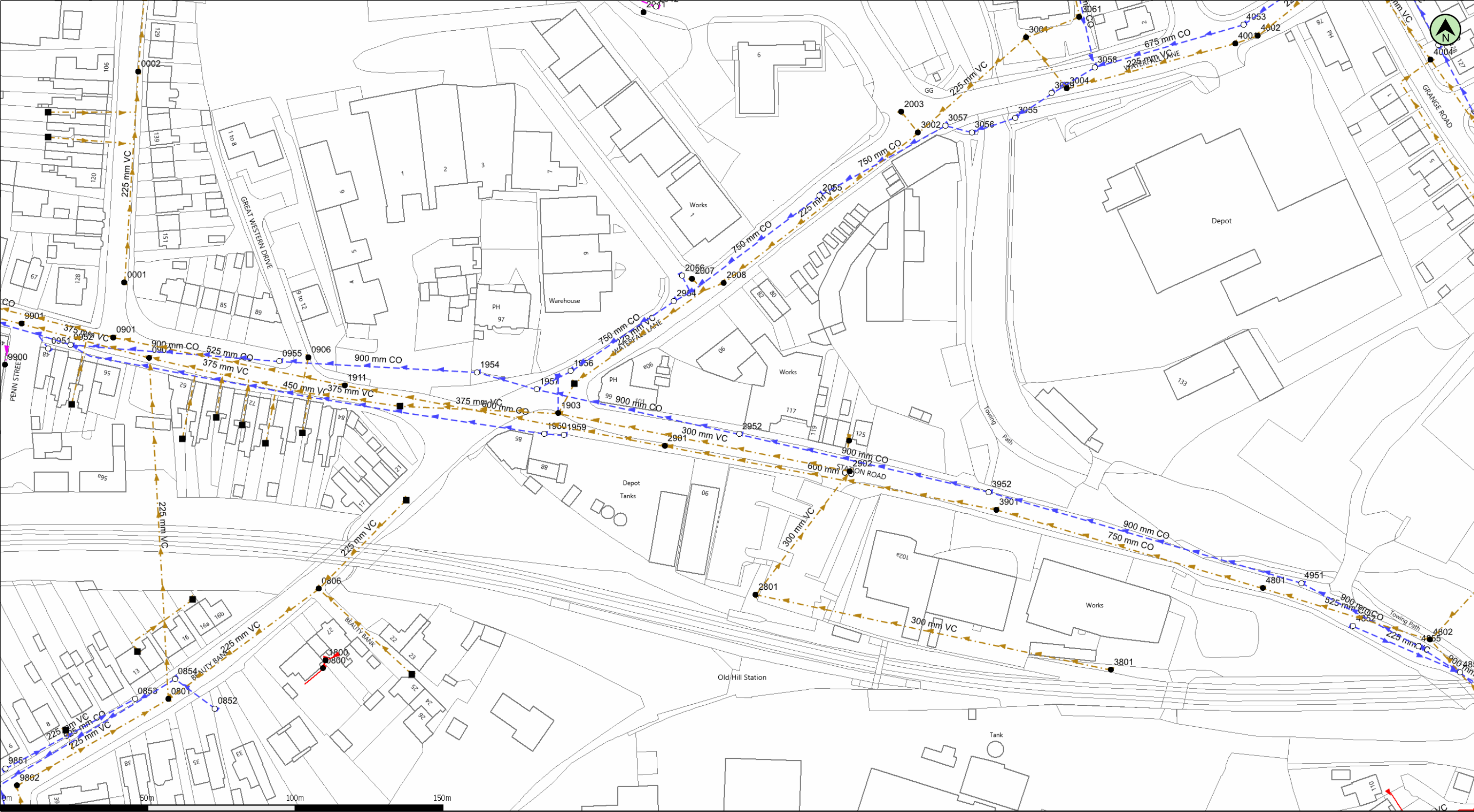
Drawing Title

Topographical Survey  
Sheet 1 of 1

Drawn	ALB	Checked	GRA	Approved	GRA
Date	22/01/2021	Scale	1/200	Sheet Size	A2
Drw. No.	S4764/01				Rev



## **Appendix C: Drainage Drawings and Calculations**



(c) Crown copyright and database rights 2021 Ordnance Survey 100031673

Date: 02/02/21

Scale: 1:1250

Map Centre: 396240,285960

Data updated: 14/12/20

Our Ref: 490220 - 1

Wastewater Plan A3

Do not scale off this Map. This plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. On 1 October 2011 most private sewers and private lateral drains in Severn Trent Water's sewerage area, which were connected to a public sewer as at 1 July 2011, Transferred to the ownership of Severn Trent Water and became public sewers and public lateral drains. A further transfer takes place on 1 October 2012. Private pumping stations, which form part of these sewers or lateral drains, will transfer to ownership of Severn Trent Water on or before 1 October 2016. Severn Trent Water does not assess complete records of these assets. These assets may not be displayed on the map. Reproduction by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and database right 2004. All rights reserved. Ordnance Survey licence number: 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

Public Foul Gravity/Lateral Drain		Highway Drain		Manhole Foul	
Public Combined Gravity/Lateral Drain		Overflow Pipe		Manhole Surface	
Public Surface Water Gravity/Lateral Drain		Disposal Pipe		Abandoned Pipe	
Pressure Foul		Culverted Water Course		Section 104 sewers are shown in green	
Pressure Combined		Pumping Station		Private sewers are shown in magenta	
Pressure Surface Water		Fitting			

andrew.wallaceengineering.co.uk

cradley



**GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS**

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on:

**0800 783 4444 (24 hours)**

- a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991 (a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as “STW Apparatus” in these general conditions and precautions.
- b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.
- c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.
- d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.
- e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).
- f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.
2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).
3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.
4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.
5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.
6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.
7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.
8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.
9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.
10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.
11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.
12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.
13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,

14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

#### **TREE PLANTING RESTRICTIONS**

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.

16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.

17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014

18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.

19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main or other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0800	C	-	0	0
1800	C	-	0	0
	F			
0001	F	125.11	123.15	1.96
0002	F	124.07	0	0
0801	F	124.93	122.69	2.24
0806	F	125.51	123.8	1.71
0901	F	124.82	118.5	0
0902	F	125.14	122.48	2.66
0906	F	126.07	123.87	2.2
1903	F	128.55	125.02	3.53
1911	F	126.25	120.22	0
2003	F	138.87	136.86	2.01
2007	F	131.88	129.57	2.31
2008	F	132.18	129.82	2.36
2041	F	-	0	0
2801	F	134.65	132.56	2.09
2901	F	130.2	124.31	5.89
2902	F	132.96	130.85	2.11
3001	F	138.77	0	0
3002	F	138.85	134.36	4.49
3004	F	140.25	135.66	4.59
3061	F	138.72	135.36	3.36
3801	F	138.1	134.84	3.26
3901	F	135.57	127.56	0
4001	F	139.25	136.91	2.34
4002	F	139.33	137.02	2.31
4004	F	143.4	141.17	2.23
4801	F	138.99	128.16	0
4802	F	138.51	133.41	5.1
9802	F	125.56	123.7	1.86
9900	F	-	0	0
9901	F	123.65	121.56	2.09
0852	S	125.55	124.92	0.63
0853	S	124.82	0	0
0854	S	124.9	123	1.9
0951	S	123.98	122.05	1.93
0952	S	124.28	119.85	4.43
0955	S	125.01	120.23	4.78
1950	S	128.34	124.83	3.51
1954	S	127.2	121.82	5.38
1956	S	128.61	126.86	1.75
1957	S	129.29	125.68	3.61
1959	S	128.54	127.16	1.38
2042	S	-	0	0
2055	S	135.57	133.23	2.34
2056	S	131.92	130.04	1.88
2952	S	131.29	126.01	5.28

[illegible][illegible]

2954	S	129.35	127.43	1.92
3055	S	141.24	135.36	5.88



Calculated by:	andrew wallace
Site name:	cradley heath
Site location:	Sandwell

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.

## Site Details

Latitude:	52.47154° N
Longitude:	2.05626° W
Reference:	1686212026
Date:	Feb 02 2021 11:26

## Runoff estimation approach

IH124

## Site characteristics

Total site area (ha):	.0894
-----------------------	-------

## Methodology

Q <sub>BAR</sub> estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

## Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

## Hydrological characteristics

	Default	Edited
SAAR (mm):	749	749
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 30 years:	2	2
Growth curve factor 100 years:	2.57	2.57
Growth curve factor 200 years:	3.04	3.04

## Notes

### (1) Is Q<sub>BAR</sub> < 2.0 l/s/ha?

When Q<sub>BAR</sub> is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

### (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.

### (3) Is SPR/SPRHOST ≤ 0.3?

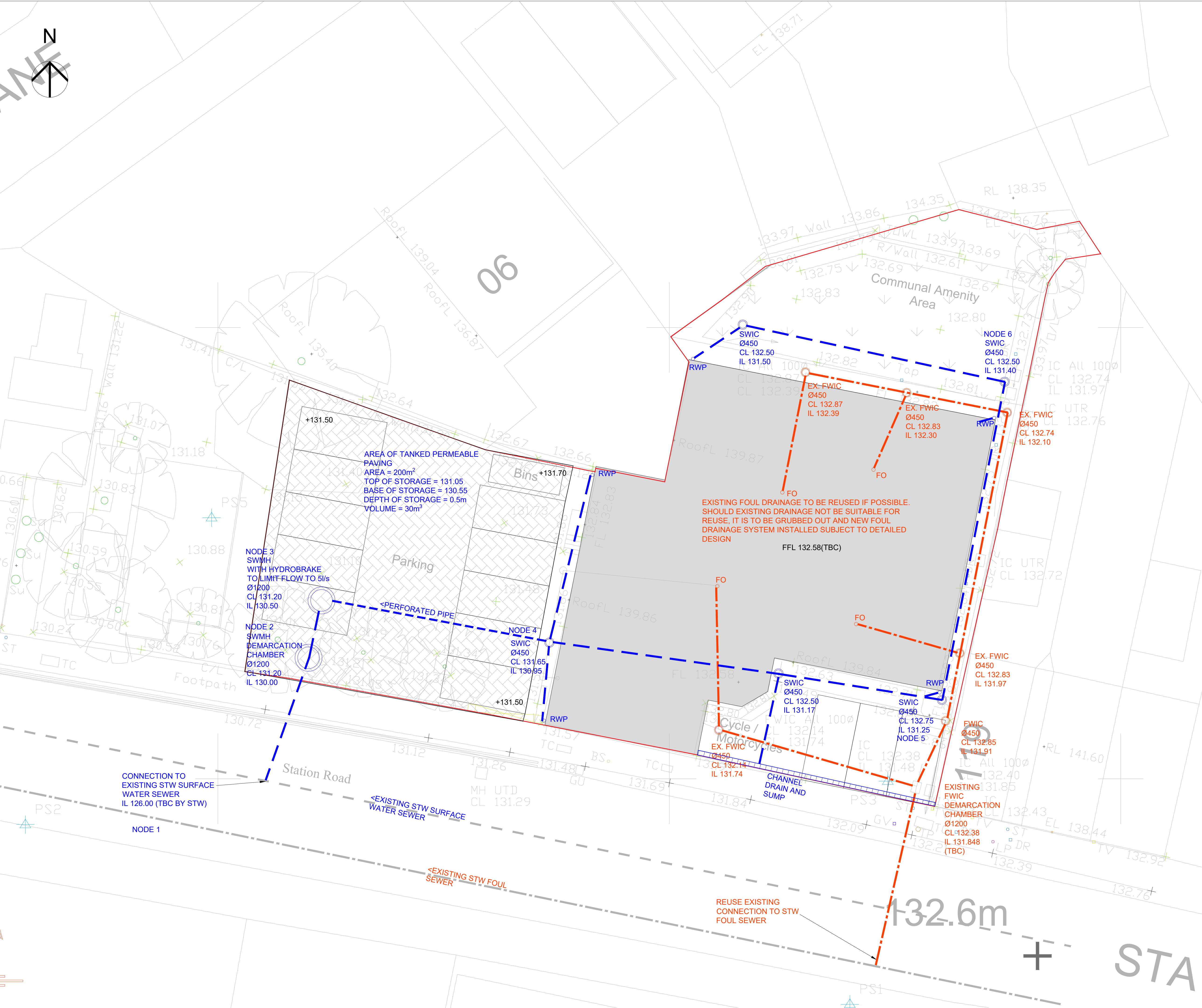
Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

## Greenfield runoff rates

	Default	Edited
Q <sub>BAR</sub> (l/s):	0.47	0.47
1 in 1 year (l/s):	0.39	0.39
1 in 30 years (l/s):	0.93	0.93
1 in 100 year (l/s):	1.2	1.2
1 in 200 years (l/s):	1.42	1.42

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at [www.uksuds.com](http://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](http://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.





- Notes
- This drawing is for planning only (NOT FOR CONSTRUCTION) and is to be read in conjunction with all relevant series design drawings, specifications and documentation.
  - Dimensions must not be scaled from this drawing.
  - The contractor shall be responsible for the setting out of the works and the accuracy of all dimensions. he shall satisfy himself that the information given is correct and notify the relevant parties immediately of any discrepancies.
  - The building contractor is responsible for the design and coordination of all temporary works required on this project.
  - All services are to be located by the contractor and clearly marked prior to commencing work on site.
  - Construction to be in accordance with all British and European standards and building regulations.
  - All dimensions are in millimetres and levels in metres above local datum.
  - Any discrepancies in the details shown are to be reported to the employer's representative/engineer prior to construction.
  - The general specification of materials and workmanships for the construction of the access road, footpaths and other areas of hardstanding shall be the manual of contract documents for highway works, volume 1, specification of highway works (shw) published by the stationary office.
  - Node numbers refer to drainage model in drainage report
  - All surface water drainage is subject to detailed design and all RWP and FO shown are indicative only and subject to approval and setting out by the architect.
  - Unless noted otherwise, pipes to be:  
foul pipes under building Ø100@1:40,  
foul pipes external Ø100@1:80,  
surface water pipes Ø100@1:100

DRAINAGE KEY

- Ø100@1:100>
- Ø100@1:100>
- SMH Ø1200 CL 80.90 IL 80.00
- SWIC Ø450
- RWP
- Ø150@1:100>
- FMH Ø1200 CL 80.90 IL 80.00
- FWIC Ø450
- FO
- Stormwater Pipe - Diameter and fall
- Perforated Pipe - Diameter and fall
- Manhole type - SMH Surface Water Diameter Cover Level Invert Level
- Polypropylene Inspection Chamber (PPIC)
- Rain Water Pipe
- Foul Pipe - Diameter and fall
- Manhole type - FMH Foul Water Diameter Cover Level Invert Level
- Polypropylene Inspection Chamber (PPIC)
- Sewer Vent Pipe/Sub Stack/Foul Outlet

EXTERNAL WORKS KEY

- 18.30+
- FFL 80.90
- Tanked Permeable Paving - See detail
- Proposed Level
- Finished floor level

—	Preliminary	XX DDDMMYY	XX DDDMMYY
Rev	Description	Drawn Date	Checked Date
Drawn By	AW	Checked By	AW
Date	03.02.21	Date	03.02.21
Date	03.02.21	Date	03.02.21

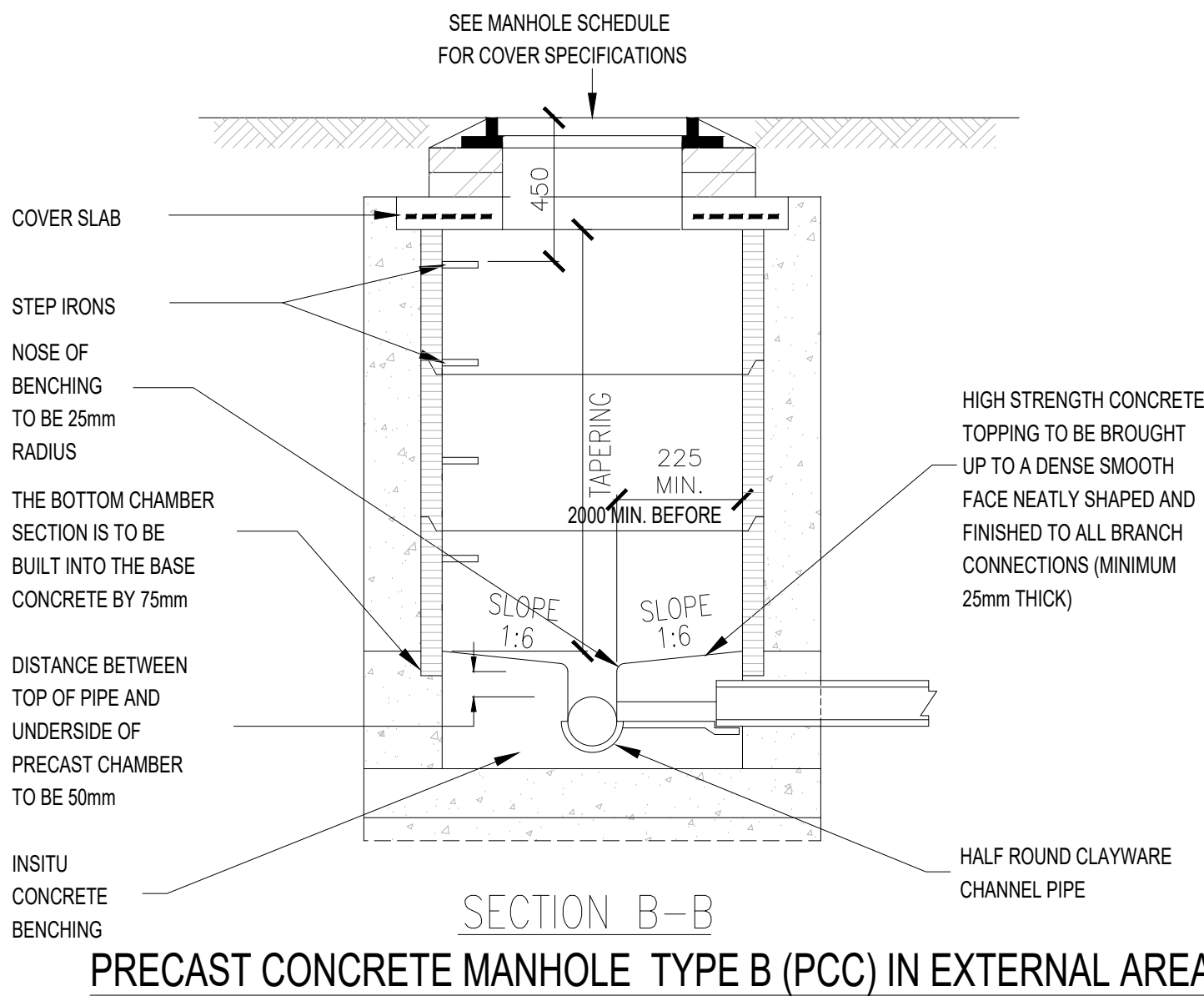
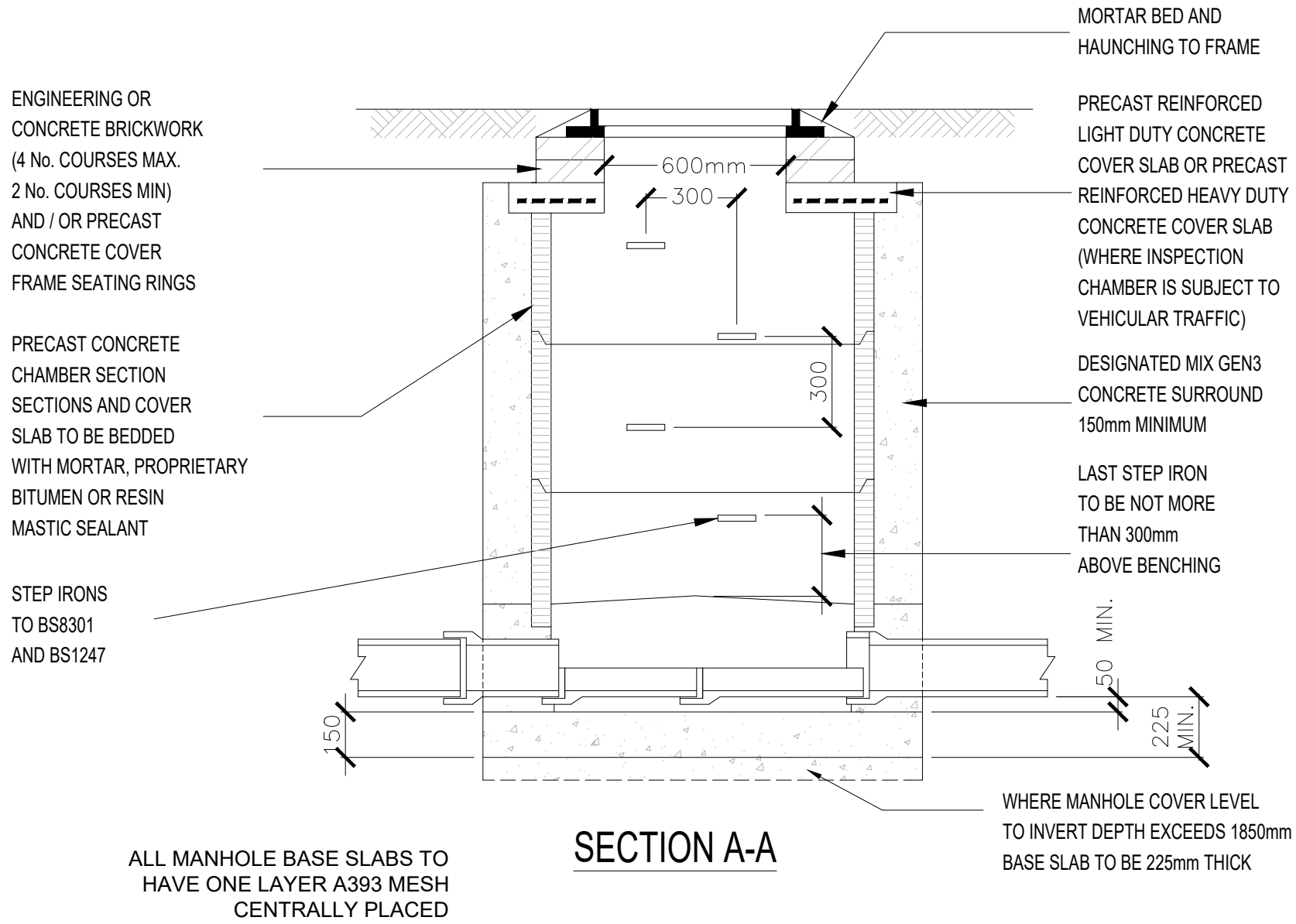
Client	M ADEEL THE GATE FUELS LTD
Project	117 STATION ROAD CRADLEY HEATH
Title	DRAINAGE PLAN

arcelle Consulting		Status	
T: 0116 254 5058 E: info@arcelleconsulting.co.uk		Preliminary	●
Leicester Office 18 De Montfort Street Leicester LE1 7GL		Tender	
London Office 49 Constable House Adelaide Road London NW3 3QA		Construction	
Architect	-	As Built	
Drawing No.	2081/C01		
Revision	-		



- Notes
1. This drawing is to be read in conjunction with all relevant series design drawings, specifications and documentation.
  2. Construction to be in accordance with all British and European standards and building regulations.
  3. All dimensions are in millimetres and levels in metres above local datum.
  4. Any discrepancies in the details shown are to be reported to the employer's representative/engineer prior to construction
  5. all existing services are to be located prior to the commencement of any works. the contractor must notify the engineer immediately of any conflict with the proposed works.
  6. For gravity sewers, all drainage and fittings are to be flexibly jointed UPVC to BSEN 1401-1 or clayware to BSEN 295 or concrete to BS5911 part 100
  7. Chamber walls 225 thick to be constructed in class B engineering bricks to SHW series 2400 in designation (i) mortar or in-situ strength class C16/20 concrete to clause 2602
  8. Chamber walls and cover slab to be constructed in precast concrete to BSEN 1917 and BS 5911-3.
  9. Concrete mixes indicated on this drawing are designated mixes in accordance with BS8500-1:2006. all concrete to be sulphate resistant
  10. Backfill to all trenches under carriageways to be type 1 sub-base material, elsewhere backfill to be in accordance with the specification, free draining readily compactible material, free from rubbish and organic matter, frozen soil clay lumps and large stones. to be compacted in layers not exceeding 150mm thick.

11. A flexible joint shall be provided as close as is feasible to outside face of any structure into which a pipe is built, in accordance with the detail.
12. The general specification of materials and workmanships for the construction of the access road, footpaths and other areas of hardstanding shall be the manual of contract documents for highway works, volume 1. specification of highway works (SHW) published by the stationary office.
13. All pipes to be laid soffit to soffit unless noted otherwise.
14. Manhole covers and frames shall comply with BSEN124 and shall be of a non-rocking design which does not rely on the use of cushion inserts. class D covers shall be used in carriageways, hard shoulders and parking areas used by all type of road vehicles. class C shall be used in footways, pedestrian areas and all comparable locations.



PRECAST CONCRETE MANHOLE TYPE B (PCC) IN EXTERNAL AREAS DETAIL

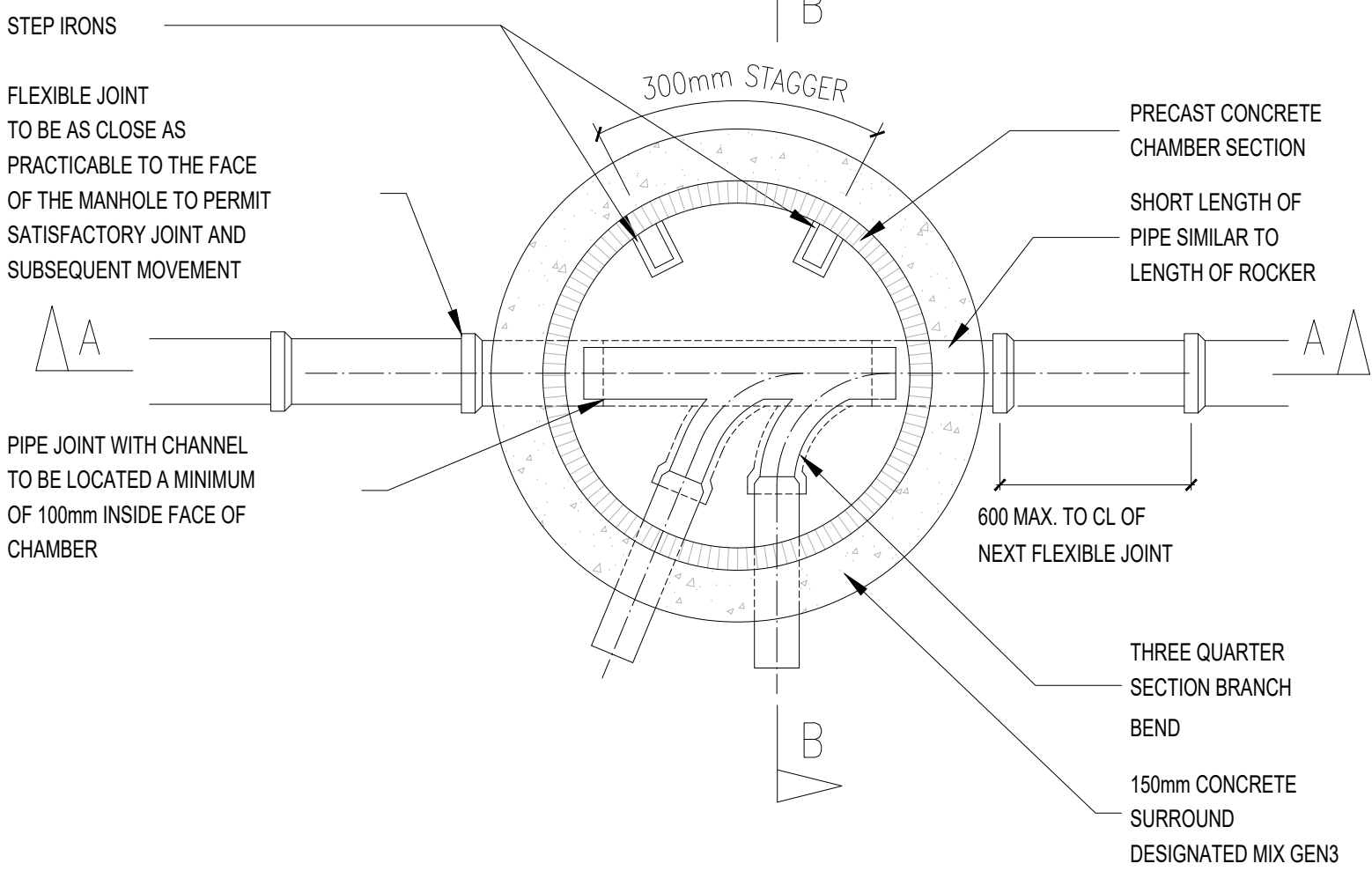
SCALE 1:20

MANHOLE TO DETAIL

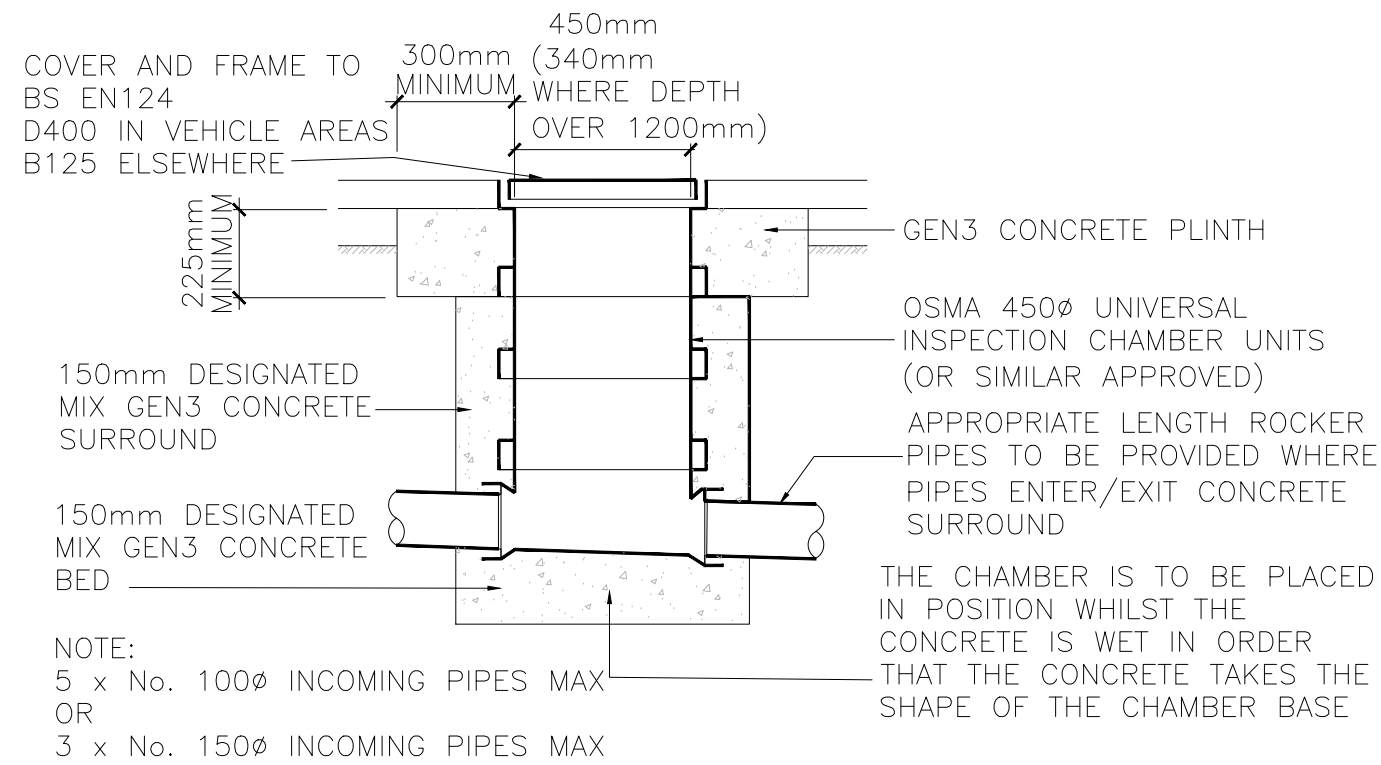
NOTES:  
CHAMBERS WITH OUTGOING PIPES GREATER THAN 500mm DIAMETER SHALL BE FITTED WITH GUARD BARS, SAFETY CHAINS OR OTHER SAFETY DEVICES. TOE HOLES TO BE PROVIDED IN BENCHING OF SEWERS GREATER THAN 450mm DIAMETER FOR ACCESS TO INVERT. WHERE INTERNAL HEIGHT EXCEEDS 1800mm MANHOLE MAY BE PROVIDED WITH REDUCING COVER AND SHAFT. SHAFT DIAMETER TO BE 600mm DIAMETER OR 900mm DIAMETER IF LONGER THAN 900mm.

PIPE DIAMETER	ROCKER PIPE * LENGTH
150mm-450mm	500mm-750mm
475mm-750mm	750mm-1000mm
OVER 750mm	1200mm

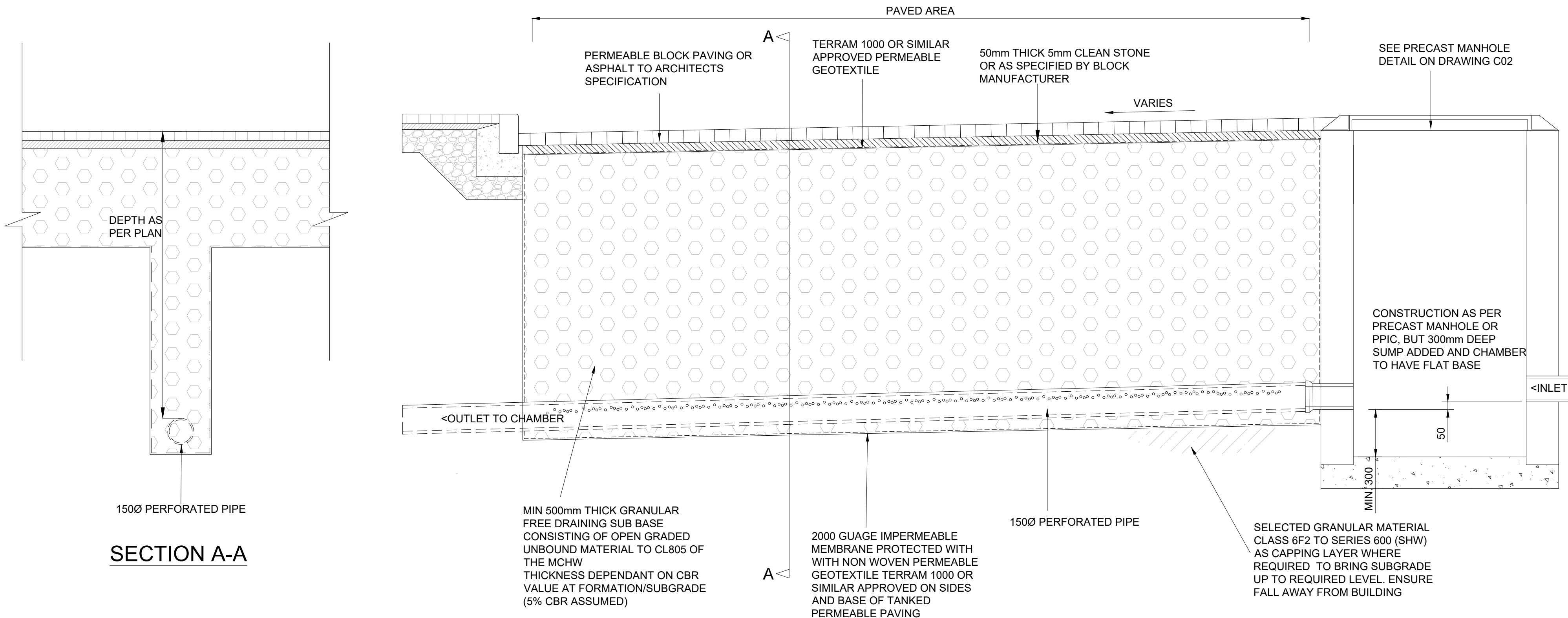
\* OR LINTEL AND COMPRESSIBLE SEALANT IN ACCORDANCE WITH CLAUSE 689 OF THE SPECIFICATION.



PLAN



EXTERNAL POLYPROPYLENE INSPECTION CHAMBER (PPIC)  
MAXIMUM DEPTH TO INVERT OF CHAMBER TO BE 1200mm (3000mm FOR REDUCED ACCESS)  
CUT TO INTERMEDIATE SIZES  
SCALE 1:20



TANKED PERMEABLE PAVING DETAIL WITH SILT TRAP MANHOLE

SCALE 1:20

-	Preliminary	XX DDMMYY	XX DDMMYY		
Rev	Description	Drawn Date	Checked Date	Approved Date	
Drawn By	AW	Checked By	AW	Approved By	AW
Date	03.02.21	Date	03.02.21	Date	03.02.21

Base drawing scale as noted at A1

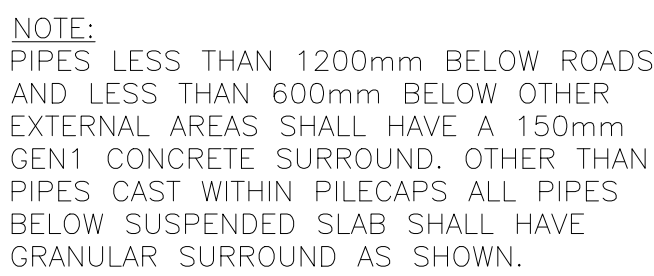
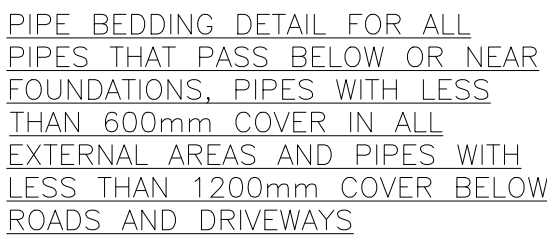
Client  
**M ADEEL  
THE GATE FUELS LIMITED**

Project  
**117 STATION ROAD  
CRADLEY HEATH**

Title  
**DRAINAGE CONSTRUCTION  
DETAILS 1**

<b>arcelle Consulting</b> T: 0116 254 5058 E: info@arcelleconsulting.co.uk Leicester Office 18 De Montfort Street Leicester LE1 7GL London Office 49 Constable House Adelaide Road London NW3 3QA	
Architect	Status
-	Preliminary ●
Drawing No.	Tender
2081/C02	
Revision	Construction
-	As Built





Notes

1. This drawing is to be read in conjunction with all relevant series design drawings, specifications and documentation.
2. Construction to be in accordance with all British and European standards and building regulations.
3. All dimensions are in millimetres and levels in metres above local datum.
4. Any discrepancies in the details shown are to be reported to the employer's representative/engineer prior to construction
5. all existing services are to be located prior to the commencement of any works. the contractor must notify the engineer immediately of any conflict with the proposed works.
6. For gravity sewers, all drainage and fittings are to be flexibly jointed UPVC to BS EN 1401-1 or clayware to BS EN 295 or concrete to BS5911 part 100
7. Chamber walls 225 thick to be constructed in class B engineering bricks to SHW series 2400 in designation (i) mortar or in-situ strength class C16/20 concrete to clause 2602
8. Chamber walls and cover slab to be constructed in precast concrete to BS EN 1917 and BS 5911-3.
9. Concrete mixes indicated on this drawing are designated mixes in accordance with BS8500-1:2006. all concrete to be sulphate resistant
10. Backfill to all trenches under carriageways to be type 1 sub-base material, elsewhere backfill to be in accordance with the specification, free draining readily compactable material, free from rubbish and organic matter, frozen soil clay lumps and large stones, to be compacted in layers not exceeding 150mm thick.
11. A flexible joint shall be provided as close as is feasible to outside face of any structure into which a pipe is built, in accordance with the detail.
12. The general specification of materials and workmanships for the construction of the access road, footpaths and other areas of handstanding shall be the manual of contract documents for highway works, volume 1. specification of highway works (SHW) published by the stationary office.
13. All pipes to be laid soffit to soffit unless noted otherwise.
14. Manhole covers and frames shall comply with BS EN124 and shall be of a non-rocking design which does not rely on the use of cushion inserts. class D covers shall be used in carriageways, hard shoulders and parking areas used by all type of road vehicles. class C shall be used in footways, pedestrian areas and all comparable locations.

–	Preliminary			XX DDMMYY	XX DDMMYY
Rev	Description			Drawn Date	Checked Date
Drawn By Date	AW 03.02.20	Checked By Date	AW 03.02.21	Approved By Date	AW 03.02.21

Client **M ADEEL**  
**THE GATE FUELS LIMITED**

Project 117 STATION ROAD  
CRADLEY HEATH

Title DRAINAGE CONSTRUCTION  
DETAILS 2

arcelle Consulting

Leicester Office

**London Office**

Architect										Status	
-										Preliminary	<input checked="" type="checkbox"/>
Drawing No. 2081/C03										Tender	
										Construction	
Revision -										As Built	

### Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	0.900
Time of Entry (mins)	2.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

### Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1			130.600	1200	10.000	10.000	4.600
2			131.200	1200	10.000	15.000	1.200
3	0.030	2.00	131.250	1200	10.000	19.000	0.750
4	0.020	2.00	131.650	1200	25.000	20.000	0.700
5	0.020	2.00	132.750	1200	45.000	20.000	1.500
6	0.020	2.00	132.500	1200	45.000	40.000	1.100

### Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.004	2	1	5.000	0.600	130.000	126.000	4.000	1.3	150	2.83	50.0
1.003	3	2	4.000	0.600	130.500	130.000	0.500	8.0	150	2.82	50.0
1.002	4	3	15.033	0.600	130.950	130.500	0.450	33.4	150	2.80	50.0
1.001	5	4	20.000	0.600	131.250	130.950	0.300	66.7	150	2.65	50.0
1.000	6	5	20.000	0.600	131.400	131.250	0.150	133.3	150	2.38	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.004	9.088	160.6	12.2	1.050	4.450	0.090	0.0
1.003	3.584	63.3	12.2	0.600	1.050	0.090	0.0
1.002	1.747	30.9	8.1	0.550	0.600	0.060	0.0
1.001	1.233	21.8	5.4	1.350	0.550	0.040	0.0
1.000	0.868	15.3	2.7	0.950	1.350	0.020	0.0

### Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	✓
Winter CV	0.840	Drain Down Time (mins)	240	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
10	0	0	0
30	0	0	0
100	0	0	0
100	40	0	0

#### Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

#### Node 3 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	130.500	Product Number	CTL-SHE-0106-5000-1000-5000
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

#### Node 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	130.550
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	60

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	200.0	0.0	0.500	200.0	0.0	0.501	1.0	0.0	0.550	1.0	0.0

**Results for 2 year Critical Storm Duration. Lowest mass balance: 99.30%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	23	126.014	0.014	3.9	0.0000	0.0000	OK
30 minute winter	2	23	130.017	0.017	3.9	0.0193	0.0000	OK
30 minute winter	3	23	130.608	0.108	10.2	3.7181	0.0000	OK
15 minute summer	4	9	131.013	0.063	11.3	0.1076	0.0000	OK
15 minute summer	5	9	131.313	0.063	7.6	0.0875	0.0000	OK
15 minute summer	6	9	131.451	0.051	3.8	0.0759	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)
30 minute winter	2	1.004	1	3.9	3.977	0.024	0.0049	7.6
30 minute winter	3	Hydro-Brake®	2	3.9				
15 minute summer	4	1.002	3	11.3	1.365	0.364	0.1287	
15 minute summer	5	1.001	4	7.5	1.077	0.346	0.1400	
15 minute summer	6	1.000	5	3.8	0.626	0.248	0.1220	

**Results for 10 year Critical Storm Duration. Lowest mass balance: 99.30%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	24	126.016	0.016	4.8	0.0000	0.0000	OK
30 minute winter	2	24	130.019	0.019	4.8	0.0214	0.0000	OK
30 minute winter	3	24	130.682	0.182	19.0	8.3061	0.0000	SURCHARGED
15 minute summer	4	9	131.045	0.095	20.9	0.1615	0.0000	OK
15 minute summer	5	9	131.341	0.091	14.0	0.1273	0.0000	OK
15 minute summer	6	9	131.471	0.071	7.0	0.1066	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)
30 minute winter	2	1.004	1	4.8	4.226	0.030	0.0057	14.0
30 minute winter	3	Hydro-Brake®	2	4.8				
15 minute summer	4	1.002	3	21.0	1.619	0.679	0.1942	
15 minute summer	5	1.001	4	14.0	1.221	0.642	0.2293	
15 minute summer	6	1.000	5	7.0	0.723	0.458	0.1944	

**Results for 30 year Critical Storm Duration. Lowest mass balance: 99.30%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	1	26	126.016	0.016	4.9	0.0000	0.0000	OK
30 minute winter	2	26	130.019	0.019	4.9	0.0217	0.0000	OK
30 minute winter	3	26	130.741	0.241	25.0	11.9515	0.0000	SURCHARGED
15 minute summer	4	9	131.068	0.118	27.2	0.2011	0.0000	OK
15 minute summer	5	9	131.361	0.111	18.2	0.1550	0.0000	OK
15 minute summer	6	9	131.483	0.083	9.0	0.1243	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)
30 minute winter	2	1.004	1	4.9	4.263	0.031	0.0058	18.4
30 minute winter	3	Hydro-Brake®	2	4.9				
15 minute summer	4	1.002	3	27.0	1.713	0.876	0.2365	
15 minute summer	5	1.001	4	18.2	1.260	0.835	0.2884	
15 minute summer	6	1.000	5	9.2	0.760	0.597	0.2398	

**Results for 100 year Critical Storm Duration. Lowest mass balance: 99.30%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	16	126.016	0.016	5.0	0.0000	0.0000	OK
15 minute winter	2	16	130.019	0.019	5.0	0.0218	0.0000	OK
60 minute winter	3	48	130.841	0.341	21.4	18.1220	0.0000	SURCHARGED
15 minute summer	4	10	131.164	0.214	31.7	0.3645	0.0000	SURCHARGED
15 minute summer	5	9	131.458	0.208	22.6	0.2914	0.0000	SURCHARGED
15 minute summer	6	10	131.505	0.105	12.0	0.1576	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	2	1.004	1	5.0	4.272	0.031	0.0058	18.8
60 minute winter	3	Hydro-Brake®	2	5.0				
15 minute summer	4	1.002	3	29.1	1.780	0.942	0.2647	
15 minute summer	5	1.001	4	19.7	1.240	0.903	0.3521	
15 minute summer	6	1.000	5	10.7	0.783	0.696	0.3082	



**Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.30%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	1	31	126.016	0.016	5.0	0.0000	0.0000	OK
15 minute summer	2	31	130.019	0.019	5.0	0.0218	0.0000	OK
60 minute winter	3	58	131.016	0.516	29.8	28.9655	0.0000	FLOOD RISK
15 minute summer	4	10	131.429	0.479	38.2	0.8159	0.0000	FLOOD RISK
15 minute summer	5	10	131.820	0.570	27.9	0.7967	0.0000	SURCHARGED
15 minute summer	6	10	131.919	0.519	16.7	0.7752	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)
15 minute summer	2	1.004	1	5.0	4.272	0.031	0.0058	23.5
60 minute winter	3	Hydro-Brake®	2	5.0				
15 minute summer	4	1.002	3	33.9	1.924	1.097	0.2647	
15 minute summer	5	1.001	4	22.6	1.285	1.038	0.3521	
15 minute summer	6	1.000	5	11.3	0.751	0.737	0.3521	

## **Appendix D: SuDS Maintenance Report**

**Project:** Drainage Maintenance  
Report, 117 Station Road,  
Cradley Heath B64 6PL

**Project No:** 2081-C-R02

**Date:** Feb 2021

Revision	Date	Author	Checker
-	03.02.21	AW	CA



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## **1.0 General**

- 1.1** Sustainable Drainage Systems (SuDS) are an environmentally friendly approach to managing rainfall. SuDS techniques use landscape features to deal with surface water with the aim to:
- 1.1.1 Control the flow, volume and frequency of water leaving a development.
  - 1.1.2 Prevent pollution by intercepting silt and cleaning runoff from hard surfaces.
  - 1.1.3 Provide attractive surroundings for the community.
- 1.2** The surface water drainage strategy for this development utilises tanked permeable paving as the main SUDS feature as well as a number of minor features (silt traps). The following sections provides a brief description of these features and outlines the maintenance programme that should be adopted.

## **2.0 Cleaning of the Drainage System**

- 2.1** Drainage systems should be inspected at regular intervals and where necessary, thoroughly cleaned out at the same time. Any defects discovered should be made good.
- 2.2** The following operations should be carried out during the periodic cleaning of a drainage system:-

<b>Product Type</b>	<b>Period</b>	<b>Responsibility</b>	<b>Maintenance Methods</b>
<b>Silt Trap</b>	As necessary and before wet season	Owner/ Maintenance Company	<ul style="list-style-type: none"> <li>• Sediment and debris that accumulated during summer needs to be removed before the wet season.</li> <li>• Inspect and clean out routinely prior to inlet pipework to minimise debris reaching the tank.</li> <li>• Conduct inspections more frequently during the wet season for the area where sediment or trash accumulates more often. Clean and repair as needed.</li> </ul>
<b>Standard Manholes/ Inspection Chambers</b>	As necessary	Owner/ Maintenance Company	<ul style="list-style-type: none"> <li>• Remove and clean any soil and vegetation that covers the manhole cover to prevent blockage of the drainage system at the manhole.</li> <li>• Renew/replace any damaged/missing bolts and damaged/missing manhole covers.</li> </ul>

Product Type	Period	Responsibility	Maintenance Methods
<b>Drainage Pipes</b>	Six monthly interval	Owner/ Maintenance Company	<ul style="list-style-type: none"> <li>Inspect underground drainage pipes to ensure that the distribution pipework arrangement is operational and free from blockages. If required, take remedial action.</li> </ul>
<b>Hydrobrake</b>	Monthly for 3 months	Owner/ Maintenance Company	<ul style="list-style-type: none"> <li>Inspect and identify any areas that are not operating correctly. If required, take remedial action.</li> </ul>
	Monthly	Owner/ Maintenance Company	<ul style="list-style-type: none"> <li>Debris removal from catchment surface (where may cause risks to performance).</li> </ul>
	Annually	Owner/ Maintenance Company	<ul style="list-style-type: none"> <li>Remove sediment from pre-treatment structures.</li> </ul>
	Annually and after large storms	Owner/ Maintenance Company	<ul style="list-style-type: none"> <li>Inspection/check all inlets and outlets to ensure that they are in good condition and operating as designed.</li> </ul>
<b>Permeable Paving</b>	As required	Site Owner for private areas. Maintenance Company for communal areas	<ul style="list-style-type: none"> <li>Inspect the paving after any precipitation to ensure no displacement of any organic matter onto the surface of the pavement.</li> </ul>
	Six monthly (Ideally, this activity to be carried out in spring and autumn seasons)	Site Owner for private areas. Maintenance Company for communal areas	<ul style="list-style-type: none"> <li>Agitate (e.g. brush, vacuum, etc.) the block paving to ensure no vegetation of any sort is allowed to grow and develop in the joints (where may affect performance).</li> </ul>
	Winter season	Site Owner for private areas. Maintenance Company for communal areas	<ul style="list-style-type: none"> <li>De-icing may be used without causing significant detrimental effects towards the permeable pavement's performance. When used carefully, the use of these chlorides will not result in an increase in the chloride levels in</li> </ul>

Product Type	Period	Responsibility	Maintenance Methods
			the local ground.

### **3.0** *Sketches and Plans*

- 3.1** The locations of the above features can be found by examining Drawing 2081/C01