

DRAINAGE & SuDS STRATEGY

for a

**PROPOSED RESIDENTIAL DEVELOPMENT AT
309 DICKENSON ROAD, LONGSIGHT**

for

ABBAYWAY COMMERCIAL LTD

Quality Management

Job No	12697		
Project	Proposed Residential Development at 309 Dickenson Road		
Location	Longsight, Manchester		
Title	Drainage & SuDS Strategy		
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Revision History

Rev	Date	Issue / Purpose/ Comment	Prepared	Checked
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1. Executive Summary

Figure 1 Flood Risk and Drainage Strategy Summary

Item	Brief Description
Development Proposed	Residential development of two Residential Properties on land off Dickenson Road, Longsight Manchester, M13 0NR. Existing site fully permeable.
Flood Zone Classification	Flood Zone 1 – Low Risk
Geology	According to British Geological Survey (BGS) borehole information next to the site, the ground encompasses very stiff silty and sandy clay to depth.
Infiltration Rate	Based on the cohesive ground conditions infiltration-based options will be discounted.
Nearest Watercourses	Gore Brook, some 500m to the south west.
Nearest Adopted Sewers	300 / 375mm dia combined sewer to the north in Honor Street. 750mm dia combined sewer in Birch Lane to the west / south west. No surface water sewer in close proximity.
Surface Water Drainage Outfall and SuDS Hierarchal Approach	Based on the poor ground conditions and watercourse / surface water sewer being too far from the site, it is proposed to drain the site to the local combined sewer.
Existing Discharge Rate	Greenfield (min 5l/s)
Proposed Discharge Rate	5 l/s
Allowance for Climate Change	40% - based on a residential > 50-year design life to 'the 2080's'.
Proposed Attenuation Method and Volume	Geocellular storage, 5m ³ for the 100yr + 40% CC.
SuDS features	Water butts, permeable paving, Geocellular Storage
Maintenance Responsibility	Owners
Foul Drainage Outfall	Free discharge to public combined sewer in Honor Street via a new connection.

2. Introduction

- 2.1 Marston and Grundy LLP (M&G) has been appointed by Abbeyway Commercial Ltd to prepare this Drainage & SuDS (Sustainable Drainage Systems) Strategy to support a full planning submission for a proposed residential development of two properties to the rear of 309 Dickenson Road, Longsight, Manchester, M13 0NR. The assessment has been undertaken in line with Section 10 of the 2019 'National Planning Policy Framework', plus the accompanying Technical Guidance on Flood Risk and any local policies.
- 2.2 This report has been commissioned by Abbeyway Commercial Ltd and is specific to his interest in the development proposals as described by the Architectural plan in Appendix A. This report may not be assigned.
- 2.3 The report has been commissioned to identify any drainage related issues associated with the proposed development and any likely constraints that could be imposed. The following issues have been addressed within this report;
- Determine the current surface water drainage regime and assess any potential increase in surface water runoff as a result of the proposed development.
 - Discuss Sustainable Drainage Systems (SuDS) as an option for reducing surface water flood risk and devise an outline Drainage layout.
 - Devise an appropriate outline surface water drainage strategy (including calculation where appropriate) to deal with any potential increase in surface water runoff and include for climate change.
 - Devise an appropriate outline foul water drainage strategy.

3. Development Description and Location

3.1 Site Location

3.1.1 The site is referenced in Figure 2, and a site location map is provided in Appendix A.

Item	Brief Description
Project name	Land off Dickenson Road
Site address and location	309 Dickenson Road, Longsight, Manchester, M13 0NR.
Council Area	Manchester City Council
Approximate Grid Reference	OS: 386504, 395439
General Locality	The site is located some 4km south east of central Manchester.

Figure 2 Site Referencing Information

3.2 Existing Site Description

3.2.1 The development site (Red Line Boundary) is irregular in plan shape, is situated within a residential area to the rear of 309 Dickenson Road. The site is currently unmade. The site can be classed for drainage purposes as 'Greenfield'.

3.2.2 Birch Lane to the west bounds the immediate proposed development site with 309 Dickenson Road bounding the development to the south and Honor Street bounding to the north. There are residential properties to the east of the proposed development.

3.2.3 Figure 3 overleaf identifies the overall site location. Further details of the existing layout can be seen on the Red Line Plans in Appendix A and the Topographical survey in Appendix B.



Figure 3 Site Location

3.3 Topography

- 3.3.1 A review of the topographical survey would indicate the land to be flat with the ground varying from 47.80m to 48.10m AOD.

3.4 Hydrology

- 3.4.1 A review of local maps has identified the closest watercourse to be Gore Brook, located some 500m to the south west.

3.5 Development Proposals

- 3.5.1 As discussed in the earlier sections, the report is prepared to support a planning application for the construction of 2 new residential properties with access road, parking and soft landscaping areas.
- 3.5.2 The outline Site Master Plan as indicated in Appendix A provides details of the proposed development intent. Access into the site would be off both Honor Street and Birch Lane.

4. Fluvial Flood Risk Review

- 4.1 Figure 4 below locates the site on the Environment Agency's indicative flood plain map. It is clear from this that the red line boundary sits outside of a fluvial generator of flood water from any identified water body or river. It is considered therefore that the site lays outside of the active 100-year and extreme event floodplains, thus lying within 'Flood Zone 1 Classification' in accordance with the 2019 National Planning Policy Framework (NPPF) Flood Risk Guidance Notes, i.e. probability of annual fluvial flooding significantly less than 1 in 1000 in any one year (<0.1%). The risk from fluvial flood water is diminished to acceptable levels, removing the requirement for further investigation and assessment of the fluvial flood regime.



Figure 4 EA Indicative Flood Maps

- 4.2 In addition, the development application boundary is less than 1ha in plan area. In line with criteria set within the NPPF a Flood Risk Assessment is not required to support a planning application if the development is less than 1ha and in Flood Zone 1.

5. Outline Drainage Strategy

5.1 Existing Drainage

- 5.1.1 The United Utilities sewer records have been reviewed (Figure 5 below) and confirms a 300 / 375mm dia combined sewer to the north in Honor Street plus a 750mm dia combined sewer in Birch Lane to the west / south west. No surface water sewer in close proximity.
- 5.1.2 As the land is currently undeveloped no existing drainage has been identified.

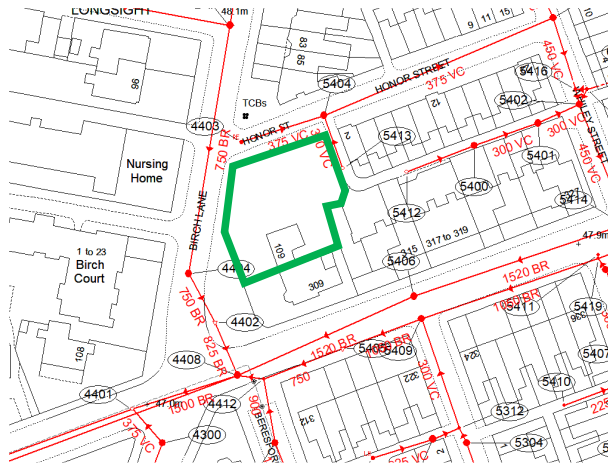


Figure 5 United Utilities Sewer Records

5.2 Existing Runoff

- 5.2.1 The existing site is fully permeable with no existing runoff to the combined sewer.

5.3 Geology

- 5.3.1 No site-specific intrusive Phase 2 Site Investigation has been carried out at the site. However, a review of the local borehole records (at the junction of Dickenson Road and Birch Lane) and an anecdotal review of desk-based information would indicate the ground to encompass stiff silty and sandy clay to depth. Refer to Figure 6 below for details. In light of this it is considered that the development will be unsuitable for infiltration based options.

CITY ENGINEER AND SURVEYORS DEPARTMENT

JRM 248 9542 680

SITE INVESTIGATION FOR		Rain Drainage		DATE COMMENCED		28.6.84	
LOCATION		Diddens Road		REF.			
BOREHOLE No.		10		BORING METHOD		Cable Percussive	
GRID REFERENCE				BORING DIAMETER		200mm	
				SCALE:			

DATE	CASING DEPTH (m)	WATER LEVEL (m) BORING & EVENING	DEPTH OF STRATA BELOW G.L.	Reduced Level	DESCRIPTION	No. and Type of Sample	SAMPLE DEPTH (m)		No. of Blows	Lap
							From	To		
28.6.84			0.50		Bituminous Surfacing					
			0.70		Crushed stone					
			0.95		Clay, stones, ashes etc.					
			1.20		Stiff/very stiff, mottled, silty & sandy CLAY with stone & coal inclusions					
					Very stiff and hard brown silty and sandy CLAY with stone and coal inclusions	U1	1.20	1.65		
28.6.84	1.70	Dry	3.50			D2	1.65			
						U3	2.35	2.80		
						D4	2.80			
28.6.84		Dry	6.10		Very stiff brown silty and sandy CLAY with stone and coal inclusions and grey fissures	U5	4.10	4.55		
						D6	4.55			
						U7	5.15	5.60		
						D8	5.60			
28.6.84			8.60		Very stiff brown sandy CLAY with stone and coal inclusions	U9	6.7	7.15		
						D10	7.15			
						U11	8.15	8.60		
						D12	8.60			

WATER OBSERVATIONS DURING BORING				WATER LEVEL IN CASING/UNCASSED BOREHOLE ON COMPLETION		
DEPTH OF WATER ENTRY (m)	ESTIMATED SEEPAGE	STANDING WATER LEVEL (m)	DEPTH OF CASING WHEN SEALED (m)	DATE	WATER LEVEL	DEPTH OF CASING
None						
Observed						

REMARKS:-

SAMPLE TEST KEY: D - DISTURBED SAMPLE, F - SPT SAMPLE, B - BULK SAMPLE, U - UNDISTURBED SAMPLE, W - WATER SAMPLE

NOTE: WHERE FULL SPT PENETRATION HAS NOT BEEN ACHIEVED, THE NUMBER OF BLOWS FOR THE QUOTED PENETRATION IS GIVEN (NOT N - VALUE)

ALL DEPTHS AND REDUCED LEVELS IN (m) UNLESS OTHERWISE STATED

REMARKS: Trial hole excavated to 120m below ground level. Borehole backfilled with concrete on completion.

M/S 5831

Figure 6 Local Borehole Record

5.4 Hydrological Assessment

- 5.4.1 As discussed in previous sections, a review of the topographical survey, OS Maps and Environment Agency maps would indicate the closest surface water feature to be Gore Brook, located some 0.5km beyond the south western boundary.

5.5 Sustainable Drainage Systems (SuDS) Assessment

5.5.1 SuDS Objectives

- 5.5.1.1 Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

5.5.2 SuDS Design Themes

- 5.5.2.1 The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

- i. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
- ii. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
- iii. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
- iv. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

5.5.3 *SuDS Site Constraints*

5.5.3.1 SuDS techniques are suitable for all sites; therefore an assessment of the existing site is required so that SuDS limitations can be determined.

- *Land Use Characteristics:* The size and type of development enables the potential range of source control and site control SuDS devices to be considered below ground only.
- *Site Characteristics:* A site specific Phase 2 intrusive investigation has not been carried out to date at the site. However, initial findings from the desk-based study is that infiltration techniques would not be suitable.
- *Catchment Characteristics:* The site is currently classed for drainage purposes as 'Greenfield' and the discharge rate from the site will need to match the greenfield runoff rates.
- *Environmental and Amenity Performance:* The inclusion of SuDS within the overall development is a key driver in providing both amenity and habitat creation. All types of SUDs will be considered and blended into the landscaping zone, if possible. Safety to all future users is paramount and so best practice guidance will be incorporated so that these devices blend into the surrounding without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

5.5.4 *SuDS Methods*

5.5.4.1 Figure 7 and 8 on the following pages provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability and lifetime maintenance of the commercial development.

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	<u>Not suitable:</u> Not suitable due to the limited area of available roof.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect rainwater runoff from the roof areas.	<u>Suitable:</u> Water butts can be located at the base of the rear RWP's to be used by the residents.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site and reduces treated water consumption.	<u>Not Suitable:</u> - Additional costs of installation would have severe effect on viability of the development. - Running and maintenance costs would not be acceptable to our client and future occupiers. - The ability to restrict peak flow rates and short term peak volumes is non-existent where a critical storm event occurs.
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> Desk based information would indicate that the underlying soils would not be suitable for infiltration options.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Not Suitable:</u> Desk based information would indicate that the underlying soils would not be suitable for infiltration options.
Permeable Surfacing (Standard)	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>Suitable:</u> Permeable paving to parking areas to be incorporated in the design layout.

Swales, basins and ponds	• Provide areas for above ground surface runoff storage. • Swales also allow filtering of particulate matter, improving water quality	<u>Not suitable:</u> • No space available in the site for any of these features to be incorporated.
Bio-Retention	• Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not suitable:</u> • Space constraints on site do not permit large above ground areas for flood storage. • No scope to reduce development area due to site viability.

Figure 7 Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	• Suitable for sites with insufficient space for basins etc. • Suitable for sites where topography prevents the use of open basins etc.	<u>Suitable:</u> • Subject to detailed design and drainage layout.
Large Diameter Pipes, Culverts or Tanks	• Suitable for sites with insufficient space for basins etc. • Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. • Generally be suitable for adoption by the statutory water company (e.g. Severn Trent Water).	<u>Not Suitable:</u> • More suited for larger developments where the drainage is to be adopted by United Utilities.

Figure 8 Sub-Surface SuDS Methods

5.5.5 SuDS Hierarchal Approach

5.5.5.1 Based on the SuDS assessment in Figure 7 and 8, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below:

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Desk based information would indicate that the underlying soils would not be suitable for infiltration options.
Connection to Watercourse	No	Watercourse to far from the development boundary.
Connection to Surface Water Sewer	No	No surface water sewer in close proximity to the development site.
Connection to a Combined Sewer	Yes	New Connection to the combined sewer via a new connection.

Figure 9 SuDS Hierarchal Approach

5.5.6 SuDS Design Philosophy

5.5.6.1 SuDS assessment and hierarchal approach discussed in Figure 7, 8 and 9 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the development site is the promotion of Prevention, Source Control and Site Control techniques with discharge to the combined sewer.

5.5.6.2 The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance to the existing drainage infrastructure.
- Reduce the impermeable fraction of the post development area.
- Include Water butts at the base of the rear rainwater pipes.
- Include permeable paving to the parking areas.
- Geocellular crate attenuation tanks.

5.6 Outline Surface Water Drainage Strategy

- 5.6.1 The general principal of the surface water drainage strategy is to collect the runoff from the roof of the new residential properties and direct it to a new below ground surface water drainage network that will outfall to the combined public sewer via a new manhole connection. Due to the flow restriction attenuation will take the form of a geocellular crated tank. The parking areas will be constructed in permeable paving.
- 5.6.2 The proposed private drainage layout for the new development building will be designed in accordance with BS EN 752: 2017 and Building Regulations Part H guidance. This is to indicate no flooding for up to the 30-year storm event.
- 5.6.3 Figure 9 below defines the outline attenuation volumes based on the impermeable areas of the roof and a percentage of the permeable paving. It is noted that these rates and volumes are preliminary for this outline assessment and are likely to alter at detailed design stage when more site-specific information is made available. Further details on the Drainage Strategy Plan in Appendix C and the outline calculations in Appendix D.

Impermeable Area	Attenuation Volume for 30yr Event	Attenuation Volume for 100yr + 40% CC Event
0.024 ha	2.2m ³	5m ³

Figure 10 Outline Attenuation Volumes

- 5.6.4 Any future drainage calculations carried out as part of a site wide drainage strategy or for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future Climate change allowances.

5.7 Maintenance

The long-term maintenance of the new drainage and SuDS infrastructure will be with the owner / occupier of the development in line with best practice guidance. Annual inspections will need to be carried out and clearing of gullies, channel drains, catchpits and geocellular crates constructed.

Typically the maintenance regime will be in line with Figure 10 below.

<u>Future Maintenance of the Drainage System</u>			
Responsibility	Feature	Maintenance	Frequency
Owner / Occupier / Management Company	Drainage Channel.	Regular maintenance / removal of blockages and silts.	Ad-hoc flushing / jetting and emptying of silt traps required.
	Rainwater gutters, downpipes and above ground drainage.	Regular maintenance and inspections.	Ad-hoc sweeping and emptying of silt and debris required. Annual visual inspections to check for damage/leaks.
	Flow control chambers.	Regular maintenance / removal of blockages and debris.	Annual inspection and following significant rainfall events.
	Geocellular Attenuation / Attenuation Tanks	Regular maintenance / removal of blockages and debris.	Annual inspection and following significant rainfall events.
	Permeable Paving	Brushing and Vacuuming, removal of weeds	Annual inspection and following significant rainfall events.
	Pipes, sewers, manholes, outfall headwall.	Regular maintenance / removal of blockages and debris.	Annual inspection and removal of silts if required.

Figure 11 Outline Management and Maintenance Strategy

5.8 Foul Water Drainage

- 5.8.1 Foul drainage generated from the new development will discharge to the existing combined water public sewer in Honor Street via a new connection.
- 5.8.2 The proposed private drainage layout for the new development site will be designed in accordance with BS EN 752: 2017 and Building Regulations Part H guidance.
- 5.8.3 An indicative foul water drainage layout can be found on the drawing in Append C.

Appendix A – Architects Drawings



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All contractors must visit the site and be responsible for checking all setting out dimensions and notifying the architect of any discrepancies prior to any manufacture or construction work.

NOTES:



REV	DATE	NOTES	CHK
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Planning Purposes

Client

ABBEYWAY COMMERCIAL

Project

DICKENSON ROAD MANCHESTER

Drawing Title

PROPOSED SITE LAYOUT

Drawn	Checked	Paper Size	Scale	Date
JAS	LM	A3	1:100	17/02/2021
Project No.			Drawing No.	Revision
19584			0209	04

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Appendix B – Topographical Survey



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NOTES:



2 SITE LOCATION PLAN
SCALE 1:2500

00	24/03/20	ISSUE FOR PRE-APPLICATION	LM
REV	DATE	NOTES	CHK

PLANNING

Client
ABBNEYWAY COMMERCIAL

Project
DICKENSON ROAD MANCHESTER

Drawing Title
EXISTING SITE PLAN

Drawn	Checked	Paper Size	Scale	Date
JH	LM	A3	1:200/1:2500	09/04/20
Project No.	Drawing No.	Revision		
19584	0302	P00		

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1 EXISTING BLOCK SITE PLAN
SCALE 1:200



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Appendix C – Marston & Grundy Drawings

SURFACE WATER DRAINAGE STRATEGY

CONSIDERATION HAS BEEN GIVEN TO THE HIERARCHY OF DRAINAGE OPTIONS FOR THE SITE AS FOLLOWS:

- DISCHARGE INTO GROUND - UNDERLYING COHESIVE GROUND WOULD MAKE THE OPPORTUNITY FOR INFILTRATION BASED OPTIONS UNSUITABLE.
- DISCHARGE TO SURFACE WATER BODY - NO WATERCOURSE IN CLOSE PROXIMITY TO THE SITE.
- DISCHARGE TO SURFACE WATER SEWER, HIGHWAY DRAIN OR OTHER DRAINAGE SYSTEM - NO SURFACE WATER SEWER IN CLOSE PROXIMITY.
- DISCHARGE TO COMBINED SEWER - DUE TO THERE BEING NO OTHER VIABLE OPTIONS, CONNECTION WILL BE MADE TO THE COMBINED PUBLIC SEWER VIA A NEW CONNECTION.

THE PROPOSAL IS TO DISCHARGE SURFACE WATER FROM THE ROOF AND BASE OF THE PERMEABLE PAVING TO THE PUBLIC SEWER AT A CONTROLLED RATE WITH GEOCELLULAR CRATES USED AS ATTENUATION. WATER BUTTS ADDED TO BASE OF REAR RWPS

FOUL WATER DRAINAGE STRATEGY

FOUL WATER GENERATED BY THE SITE WILL DISCHARGE INTO THE EXISTING PUBLIC COMBINED WATER SEWER WITHIN HONOR STREET VIA A NEW CONNECTION

OFF LINE GEOCELLULAR STORAGE TANK TO RETAIN 5m³ FOR THE 100YR + 40% CC EVENT. DESIGNED BY MANUFACTURER TO SUIT GROUND CONDITIONS AND LOADING. MINIMUM COVER DEPTH TO BE APPLIED TO SUIT LOADINGS.

FLOW CONTROL ORIFICE PLATE PLACED IN CHAMBER TO LIMIT OUTFLOWS TO 5L/S

PERMEABLE PAVING 180m² (30% AREA (60m²) USED FOR OUTLINE CALCULATION PURPOSES)

PERMEABLE PAVING 120m² (30% AREA (40m²) USED FOR OUTLINE CALCULATION PURPOSES)

OUTFLOW FROM PERMEABLE PAVING

NEW MANHOLE CONSTRUCTED ON LINE OF EXISTING COMBINED SEWER SUBJECT TO APPROVAL FROM UU VIA S106 APPLICATION

EX UUMH 4404
CL:47.40
IL:41.74

EX UUMH 5404
CL:48.05
IL:44.78

EX 7500 COMBINED SEWER

EX 3000 COMBINED SEWER

EX 2250 COMBINED SEWER

BIRCH LANE

HONOR STREET

DICKENSON ROAD

309

315

317 to 319

Cycle Store

BRICK WALL

TARMAC

ROUGH GRASS

ROUGH GROUND

EXISTING BUILDING

CONCRETE

SEP1

SEP2

TACTILE PAVING

NOTE:- Unable to lift manhole due to volume of traffic at time of survey

NOTE:- Unable to lift manhole due to volume of traffic at time of survey

Boundary Wall realigned to give required visibility splay

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	EXISTING COMBINED WATER PUBLIC SEWER
	OUTLINE FOUL WATER DRAINAGE
	OUTLINE SURFACE WATER DRAINAGE
	OUTLINE COMBINED WATER DRAINAGE
	EXTENT OF PERMEABLE PAVING
	SITE BOUNDARY

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Client

ABBNEYWAY COMMERCIAL

Project

LAND AT DICKENSON ROAD
MANCHESTER

DRAINAGE STRATEGY PLAN

Purpose of Issue

PRELIMINARY

Scale @ A1	Date	Drawn	Checked
1:125	08.06.21	PG	DG
Project No.	Drawing No.		Revision
12697	100		P1

Appendix D – Hydraulic Calculations

		Dickenson Road 30yr Event					Page 1	
Date 10/06/2021 File Dickenson Road 30yr Eve...		Designed by paulg Checked by						
Innovyze		Source Control 2017.1.2						
<u>Summary of Results for 30 year Return Period</u> Half Drain Time : 10 minutes.								
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	
15 min Summer	46.751	0.151	0.0	2.0	2.0	1.7	O K	
30 min Summer	46.774	0.174	0.0	2.2	2.2	2.0	O K	
60 min Summer	46.773	0.173	0.0	2.2	2.2	2.0	O K	
120 min Summer	46.745	0.145	0.0	1.9	1.9	1.6	O K	
180 min Summer	46.720	0.120	0.0	1.7	1.7	1.4	O K	
240 min Summer	46.702	0.102	0.0	1.6	1.6	1.2	O K	
360 min Summer	46.680	0.080	0.0	1.3	1.3	0.9	O K	
480 min Summer	46.669	0.069	0.0	1.1	1.1	0.8	O K	
600 min Summer	46.662	0.062	0.0	1.0	1.0	0.7	O K	
720 min Summer	46.657	0.057	0.0	0.8	0.8	0.7	O K	
960 min Summer	46.650	0.050	0.0	0.7	0.7	0.6	O K	
1440 min Summer	46.642	0.042	0.0	0.5	0.5	0.5	O K	
2160 min Summer	46.634	0.034	0.0	0.4	0.4	0.4	O K	
2880 min Summer	46.630	0.030	0.0	0.3	0.3	0.3	O K	
4320 min Summer	46.626	0.026	0.0	0.2	0.2	0.3	O K	
5760 min Summer	46.624	0.024	0.0	0.2	0.2	0.3	O K	
7200 min Summer	46.621	0.021	0.0	0.2	0.2	0.2	O K	
8640 min Summer	46.620	0.020	0.0	0.1	0.1	0.2	O K	
10080 min Summer	46.619	0.019	0.0	0.1	0.1	0.2	O K	
15 min Winter	46.771	0.171	0.0	2.1	2.1	1.9	O K	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)				
15 min Summer	65.808	0.0	3.0	18				
30 min Summer	43.570	0.0	3.9	26				
60 min Summer	27.653	0.0	5.0	42				
120 min Summer	17.064	0.0	6.1	74				
180 min Summer	12.735	0.0	6.9	104				
240 min Summer	10.303	0.0	7.4	134				
360 min Summer	7.597	0.0	8.2	192				
480 min Summer	6.121	0.0	8.8	252				
600 min Summer	5.173	0.0	9.3	312				
720 min Summer	4.507	0.0	9.7	372				
960 min Summer	3.624	0.0	10.4	492				
1440 min Summer	2.661	0.0	11.5	736				
2160 min Summer	1.952	0.0	12.6	1092				
2880 min Summer	1.565	0.0	13.5	1468				
4320 min Summer	1.145	0.0	14.8	2188				
5760 min Summer	0.917	0.0	15.8	2864				
7200 min Summer	0.772	0.0	16.7	3672				
8640 min Summer	0.670	0.0	17.4	4336				
10080 min Summer	0.594	0.0	18.0	5040				
15 min Winter	65.808	0.0	3.3	18				
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Innovyze Source Control 2017.1.2																																												
<u>Rainfall Details</u> <table> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Winter Storms</td> <td>Yes</td> </tr> <tr> <td>Return Period (years)</td> <td>30</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>18.000</td> <td>Shortest Storm (mins)</td> <td>15</td> </tr> <tr> <td>Ratio R</td> <td>0.363</td> <td>Longest Storm (mins)</td> <td>10080</td> </tr> <tr> <td>Summer Storms</td> <td>Yes</td> <td>Climate Change %</td> <td>+0</td> </tr> </table> <u>Time Area Diagram</u> Total Area (ha) 0.024 <table> <thead> <tr> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> <th>Time (mins)</th> <th>Area</th> </tr> <tr> <th>From: To: (ha)</th> <th></th> <th>From: To: (ha)</th> <th></th> <th>From: To: (ha)</th> <th></th> </tr> </thead> <tbody> <tr> <td>0 4 0.010</td> <td></td> <td>4 8 0.010</td> <td></td> <td>8 12 0.004</td> <td></td> </tr> </tbody> </table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	30	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	18.000	Shortest Storm (mins)	15	Ratio R	0.363	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+0	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	From: To: (ha)		From: To: (ha)		From: To: (ha)		0 4 0.010		4 8 0.010		8 12 0.004	
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Model Details

Storage is Online Cover Level (m) 48.000

Cellular Storage Structure

Invert Level (m) 46.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	12.0	12.0	2.600	0.0	17.5
0.200	12.0	14.8	2.800	0.0	17.5
0.400	12.0	17.5	3.000	0.0	17.5
0.401	0.0	17.5	3.200	0.0	17.5
0.600	0.0	17.5	3.400	0.0	17.5
1.000	0.0	17.5	3.600	0.0	17.5
1.200	0.0	17.5	3.800	0.0	17.5
1.400	0.0	17.5	4.000	0.0	17.5
1.600	0.0	17.5	4.200	0.0	17.5
1.800	0.0	17.5	4.400	0.0	17.5
2.000	0.0	17.5	4.600	0.0	17.5
2.200	0.0	17.5	4.800	0.0	17.5
2.400	0.0	17.5	5.000	0.0	17.5

Orifice Outflow Control

Diameter (m) 0.052 Discharge Coefficient 0.600 Invert Level (m) 46.600

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Summary of Results for 100 year Return Period (+40%)							
Half Drain Time : 15 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	46.897	0.297	0.0	2.9	2.9	3.4	O K
30 min Summer	46.951	0.351	0.0	3.2	3.2	4.0	O K
60 min Summer	46.956	0.356	0.0	3.2	3.2	4.1	O K
120 min Summer	46.910	0.310	0.0	3.0	3.0	3.5	O K
180 min Summer	46.862	0.262	0.0	2.7	2.7	3.0	O K
240 min Summer	46.823	0.223	0.0	2.5	2.5	2.5	O K
360 min Summer	46.767	0.167	0.0	2.1	2.1	1.9	O K
480 min Summer	46.733	0.133	0.0	1.8	1.8	1.5	O K
600 min Summer	46.710	0.110	0.0	1.6	1.6	1.3	O K
720 min Summer	46.694	0.094	0.0	1.5	1.5	1.1	O K
960 min Summer	46.675	0.075	0.0	1.2	1.2	0.9	O K
1440 min Summer	46.660	0.060	0.0	0.9	0.9	0.7	O K
2160 min Summer	46.650	0.050	0.0	0.7	0.7	0.6	O K
2880 min Summer	46.643	0.043	0.0	0.5	0.5	0.5	O K
4320 min Summer	46.635	0.035	0.0	0.4	0.4	0.4	O K
5760 min Summer	46.630	0.030	0.0	0.3	0.3	0.3	O K
7200 min Summer	46.628	0.028	0.0	0.3	0.3	0.3	O K
8640 min Summer	46.626	0.026	0.0	0.2	0.2	0.3	O K
10080 min Summer	46.625	0.025	0.0	0.2	0.2	0.3	O K
15 min Winter	46.936	0.336	0.0	3.1	3.1	3.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	118.958	0.0	5.3	19
30 min Summer	79.532	0.0	7.2	27
60 min Summer	50.812	0.0	9.1	44
120 min Summer	31.423	0.0	11.3	76
180 min Summer	23.415	0.0	12.6	106
240 min Summer	18.891	0.0	13.6	136
360 min Summer	13.837	0.0	14.9	196
480 min Summer	11.101	0.0	16.0	256
600 min Summer	9.350	0.0	16.8	316
720 min Summer	8.122	0.0	17.5	376
960 min Summer	6.498	0.0	18.7	492
1440 min Summer	4.738	0.0	20.5	736
2160 min Summer	3.447	0.0	22.3	1100
2880 min Summer	2.748	0.0	23.7	1468
4320 min Summer	1.992	0.0	25.8	2148
5760 min Summer	1.584	0.0	27.4	2880
7200 min Summer	1.325	0.0	28.6	3616
8640 min Summer	1.145	0.0	29.7	4360
10080 min Summer	1.012	0.0	30.6	4976
15 min Winter	118.958	0.0	6.0	19

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Dickenson Road
100yr + 40% CC Event



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Date 10/06/2021
File Dickenson Road 100yr + ...
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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	46.994	0.394	0.0	3.4	3.4	4.5	O K
60 min Winter	46.983	0.383	0.0	3.4	3.4	4.4	O K
120 min Winter	46.904	0.304	0.0	3.0	3.0	3.5	O K
180 min Winter	46.837	0.237	0.0	2.6	2.6	2.7	O K
240 min Winter	46.789	0.189	0.0	2.3	2.3	2.2	O K
360 min Winter	46.730	0.130	0.0	1.8	1.8	1.5	O K
480 min Winter	46.698	0.098	0.0	1.5	1.5	1.1	O K
600 min Winter	46.679	0.079	0.0	1.3	1.3	0.9	O K
720 min Winter	46.670	0.070	0.0	1.1	1.1	0.8	O K
960 min Winter	46.660	0.060	0.0	0.9	0.9	0.7	O K
1440 min Winter	46.649	0.049	0.0	0.7	0.7	0.6	O K
2160 min Winter	46.641	0.041	0.0	0.5	0.5	0.5	O K
2880 min Winter	46.635	0.035	0.0	0.4	0.4	0.4	O K
4320 min Winter	46.629	0.029	0.0	0.3	0.3	0.3	O K
5760 min Winter	46.626	0.026	0.0	0.2	0.2	0.3	O K
7200 min Winter	46.624	0.024	0.0	0.2	0.2	0.3	O K
8640 min Winter	46.622	0.022	0.0	0.2	0.2	0.3	O K
10080 min Winter	46.621	0.021	0.0	0.1	0.1	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
30 min Winter	79.532	0.0	8.0	28
60 min Winter	50.812	0.0	10.2	46
120 min Winter	31.423	0.0	12.7	78
180 min Winter	23.415	0.0	14.2	110
240 min Winter	18.891	0.0	15.2	140
360 min Winter	13.837	0.0	16.7	200
480 min Winter	11.101	0.0	17.9	258
600 min Winter	9.350	0.0	18.8	316
720 min Winter	8.122	0.0	19.6	370
960 min Winter	6.498	0.0	21.0	492
1440 min Winter	4.738	0.0	22.9	736
2160 min Winter	3.447	0.0	25.0	1104
2880 min Winter	2.748	0.0	26.6	1448
4320 min Winter	1.992	0.0	28.9	2144
5760 min Winter	1.584	0.0	30.7	2952
7200 min Winter	1.325	0.0	32.1	3560
8640 min Winter	1.145	0.0	33.2	4376
10080 min Winter	1.012	0.0	34.3	5016

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.363	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.024

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.010	4 8	0.010	8 12	0.004

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	Dickenson Road 100yr + 40% CC Event	
Date 10/06/2021 File Dickenson Road 100yr + ...	Designed by paulg Checked by	
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Model Details

Storage is Online Cover Level (m) 48.000

Cellular Storage Structure

Invert Level (m) 46.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	12.0	12.0	2.600	0.0	17.5
0.200	12.0	14.8	2.800	0.0	17.5
0.400	12.0	17.5	3.000	0.0	17.5
0.401	0.0	17.5	3.200	0.0	17.5
0.600	0.0	17.5	3.400	0.0	17.5
1.000	0.0	17.5	3.600	0.0	17.5
1.200	0.0	17.5	3.800	0.0	17.5
1.400	0.0	17.5	4.000	0.0	17.5
1.600	0.0	17.5	4.200	0.0	17.5
1.800	0.0	17.5	4.400	0.0	17.5
2.000	0.0	17.5	4.600	0.0	17.5
2.200	0.0	17.5	4.800	0.0	17.5
2.400	0.0	17.5	5.000	0.0	17.5

Orifice Outflow Control

Diameter (m) 0.052 Discharge Coefficient 0.600 Invert Level (m) 46.600

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