

McCarthy & Stone Retirement Lifestyles Limited

Proposed Retirement Apartments

at 38-44 London Road, Purbrook, Waterlooville, Hampshire PO7 5LJ

Detailed Drainage Design

Prepared by	Date	Checked by	Date
	11/10/17		

Graham Garner and Partners Ltd
Consulting civil and structural engineers





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Consulting civil and structural engineers

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**PROPOSED RETIREMENT APARTMENTS
AT
38-44 LONDON ROAD
PURBROOK
WATERLOOVILLE
HAMPSHIRE
PO7 5LJ**

DETAILED DRAINAGE DESIGN

FOR

McCARTHY & STONE RETIREMENT LIFESTYLES LIMITED

GRAHAM GARNER & PARTNERS LTD

OCTOBER 2017
8377/01/ACD/CH/DDD

*The Institution
of Structural
Engineers*



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APPENDICES

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1.0 INTRODUCTION

- 1.1 This drainage design has been prepared in connection with a proposed redevelopment of an existing commercial development at 38-44 London Road, Purbrook for McCarthy & Stone Retirement Lifestyles Ltd.

2.0 SITE DESCRIPTION

- 2.1 The site extends to approximately 0.4 hectares, with London Road to the west, Stakes Road to the north and largely residential type development to the south and east.
- 2.2 The topography of the site slopes from north west to south east at an average gradient of approximately 1 in 30. In addition the land to the south west, beyond the site boundary, is approximately one metre lower and thereafter falls away at approximately 1 in 25.
- 2.3 The site is presently occupied by a Builders Merchants and Car Sales and Repair/Service businesses. As such it is almost entirely hard paved or occupied by buildings.
- 2.4 A topographic survey and aerial photograph of the current site layout are included as Appendices A and B.

3.0 SEWER RECORDS

3.1 Public Sewer Records

Sewer records obtained from Southern Water confirm public foul sewers to the north and west of the site and within the site near the southern site boundary.

Surface water records are less clear but show a public surface water sewer in the western side of London Road and other surface water sewers to the north and south of the site.

The sewer record is included as Appendix C.

3.2 Site Drainage Survey

From the sewer record information and a groundscan utility search existing foul drainage connections were confirmed to public foul sewers within London Road and within the site at Southern Water chamber references 3901 and 3902.

Both lateral connections were recorded as being of 100mm diameter and the sewer leaving chamber 3901 in London Road being recorded as 225mm diameter.

For surface water a network of surface water drains, gullies and downpipes were recorded, and connected at an inspection chamber to a 150mm diameter pipe near the southern boundary.

Further CCTV investigation revealed this sewer increased to 225mm diameter at a change of direction approximately 12 metres from the boundary and connected to public sewer chamber reference 3854 within Parkside Close, south of the site.

Contributing impermeable areas derived from the site topography and identified surface water drains are indicated on drawing 8377-01-02A included as Appendix D. Other sewers were found draining the northern parts of the site to sewers in Stakes Road but as use of these sewers is not proposed they have not been included within the existing site discharge assessment.

The total area draining to the south is measured at 2585m², representing 65% of the total site area.

4.0 GROUND CONDITIONS

Site investigations have revealed that the site is underlain by made ground up to 1.2 metres thick above silty sandy clay and clayey sandy silt of the Wittering Formation, in turn above sandy silt and sandy clay of the London Clay Formation.

Due to the cohesive nature of the soils it is reported that soakaway drains are unlikely to be suitable for surface water drainage.

The site investigation report concludes that surface water drainage should be directed to existing public sewers.

5.0 FOUL WATER DRAINAGE

Two existing public foul sewers suitable for a gravity connection from the proposed development have been identified, one as a 100mm diameter lateral to London Road, the other as an inspection chamber, Southern Water reference 3902, on a 100mm diameter drain leaving the site to the south.

The lateral connection to London Road connects at Southern Water chamber 3901, the head of a 225mm diameter foul sewer. As the alternative route is via rear gardens of nearby properties and connection to chamber 3901 would allow the existing 100mm lateral connection to be increased to 150mm diameter the London Road chamber 3901 is the preferred point of connection.

A capacity check to Southern Water has confirmed adequate capacity exists within the public sewer system with connection for foul drainage to chamber 3902, this is included as Appendix E. Confirmation regarding the alternative connection to chamber 3901 is currently awaited.

6.0 SURFACE WATER DRAINAGE

The investigation has revealed the presence of the public surface water sewers surrounding the site and a surface water lateral connection and inspection chamber within the site near the southern site boundary.

A capacity check to Southern Water has confirmed that provided the development does not increase flows to the connection point there should be no detrimental impact to the existing sewer network.

7.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS (SUDS)

In accordance with National Planning Advice, the Local Planning Authority are required to ensure that sustainable drainage systems are incorporated in new developments unless demonstrated as inappropriate.

The aim is to make surface water discharges as high up the drainage hierarchy as is reasonably practicable.

The hierarchy is as follows:-

1. Into the ground (infiltration)
2. To a surface water body
3. To a surface water sewer
4. To a combined sewer

For this development the site investigations have revealed low permeability natural soils across the site and the presence of an extensive network of surface water sewers surrounding the site with most of the site drainage directed to the southern site boundary.

For development of land that has been previously occupied the run-off volume and the peak run-off rate must be constrained to not exceed the pre-development values and be as close as reasonably practicable to the greenfield run-off rates.

7.1 Volume Control

Analysis of the pre-development site layout, refer topographic survey and aerial photograph and drawing 8377-01-02, Appendices A, B & D indicates the current site is almost entirely hard paved.

Impermeable areas associated with the development are illustrated on drawing 8377-01-06, included as Appendix F, and show the combined area of roofs, measured 250mm beyond the building footprint, access road/parking areas and footpath paved areas likely to fall towards the access routes to total 2667m².

This total impermeable area is less than 68% of the total site area and represents a significant reduction in future run-off from the development.

7.2 Peak flow control

It is intended to drain future impermeable areas to the existing 150mm diameter pipe near the southern site boundary. CCTV drain survey and topography review have confirmed the existing contributing areas to this drain to be in excess of 2585m².

Based on a 50 mm/hour rainfall event historically used for design purposes the estimated design flow from the current development to the southern sewer is:-

$$Q = 50 \times 2585 \times 10,000/60 \times 60 = 35.9 \text{ litres/second}$$

The existing 150mm diameter pipe leaving the site has a gradient of approximately 1 in 20 with the 225mm diameter pipe beyond having a gradient of approximately 1 in 25.

Therefore the current capacity of the existing drainage system is as follows:-

150mm diameter pipe at 1 in 20, capacity = 39.95 litres/second

225mm diameter pipe at 1 in 25 capacity = 104.4 litres/second

Therefore there is adequate capacity in the existing drains for the historic design flows.

7.3 Climate Change

For new developments the expected impact of likely climate changes should be included within the drainage network.

This requires assessment of the site for the 100 year probability storm events with a 20% increase to be contained within the sewer network and 40% contained within the site boundaries.

As future rainfall events are expected to be more intense than previously used design flows attenuation is required to reduce the peak flows from the development to pre-development levels and lower where reasonably practicable.

Micro drainage calculations have been undertaken to calculate the volume of attenuation required for the development.

For the 100 year plan 20% scenario an attenuation volume of 52.1 cubic metres is required with the peak discharge rate limited to 21.6 litres/second. This peak discharge rate represents 60% of the pre-development peak flow and provides a significant reduction in peak flow to the sewer to the south.

For the 100 year plus 40% scenario the same attenuation tanks would overflow by 11 cubic metres. It is considered that the volume from this event would easily be contained within the parking area next to the southern boundary and therefore further below ground attenuation is not required.

The attenuation tank included in the microdrainage calculations is calculated as a 42 metre long 1.25m diameter pipe. Alternative means of equivalent storage could be provided by a tubosider or geocellular storage tank.

The microdrainage calculations are included as Appendix G.

7.4 Exceedance Flows

Exceedance flows are those flows that may result from blockage within a drainage system or storm intensity greater than those used within the design. Such flows would naturally follow the topography of the site and its surrounding area and the building layout permits such flows to pass around the building to off-site areas.

The location of the parking area next to the southern boundary bounded by a retaining wall to the lower land to the south provides also additional attenuation storage for more extreme storm events without placing the building at risk of flooding.

8.0 MAINTENANCE

The proposed drainage system incorporates conventional gravity foul and surface water sewers with associated inspection and access chambers. As such the system is expected to have a design life equal to or in excess of the building.

The storm water attenuation system proposed is an on-line Tubosider pipe type storage system which incorporates an in-built flow control device and access chambers to permit inspection and maintenance.

Other types of storage systems are available, such as geocellular crates which provide equivalent storage, should such a system be selected the flow control, silt trap and maintenance arrangement should be modified in accordance with the manufacturers recommendations.

9.0 CONCLUSIONS

9.1 Foul Water Drainage

Southern Water have confirmed that there is adequate capacity in the Public Foul Sewer Network to accommodate flows from the proposed development and a network of gravity sewers has been designed for the development.

9.2 Surface Water Drainage

Investigations have revealed that there is adequate capacity in the Public Surface Water Sewer Network to accommodate flows from the proposed development.

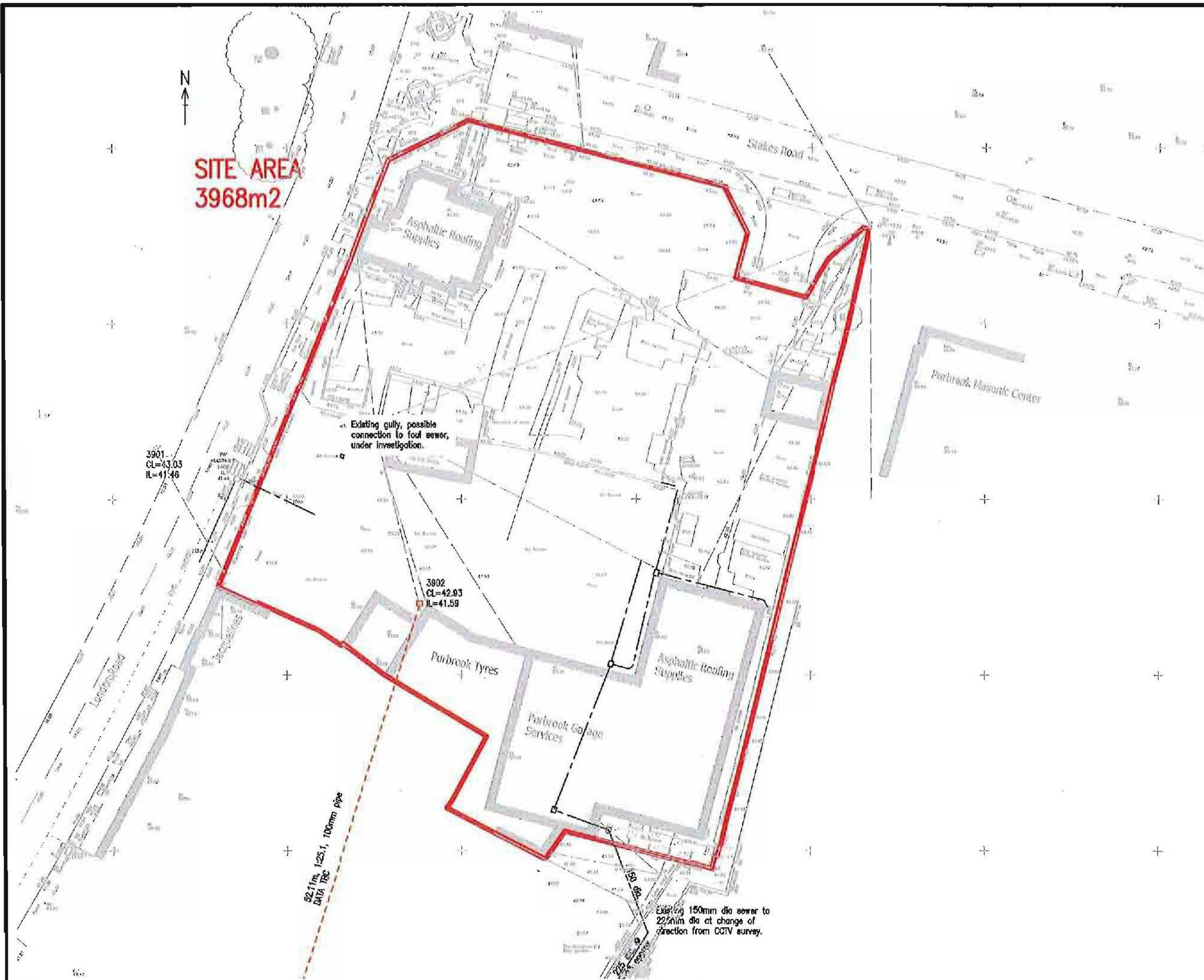
The proposed development, by reduction of impermeable area, reduces the total run-off from the site to less than 70% of the pre-development run-off.

Incorporation of peak flow control and attenuation within the drainage scheme will reduce the peak run-off to 60% of the existing flows into the sewer to the south. As the whole development will utilise this connection peak off-site flows from the whole site will be reduced to less than 40% of pre-development values providing a substantial reduction in flood risk to off-site areas.

The development drainage layout is included as Appendix H.

GGP

A Topographic Survey 8377-01-07



Notes:

THIS DRAWING IS NOT TO BE SCALED

1. Cross-references

This drawing is to be read in conjunction with all relevant architectural and engineering drawings and specifications. Any inconsistencies or errors should be referred to the engineer immediately and confirmed in writing.

revision	Revision details	Date

Client
McCarthy & Stone
Latter Ltd. Greater Ltd.

Architect
kenn scaddon associates

Job title
**38-44 London Road
Purbrook**

Drawing title
Topographic Survey

GGP

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CONSULTING CIVIL, STRUCTURAL AND GEOTECHNICAL ENGINEERS

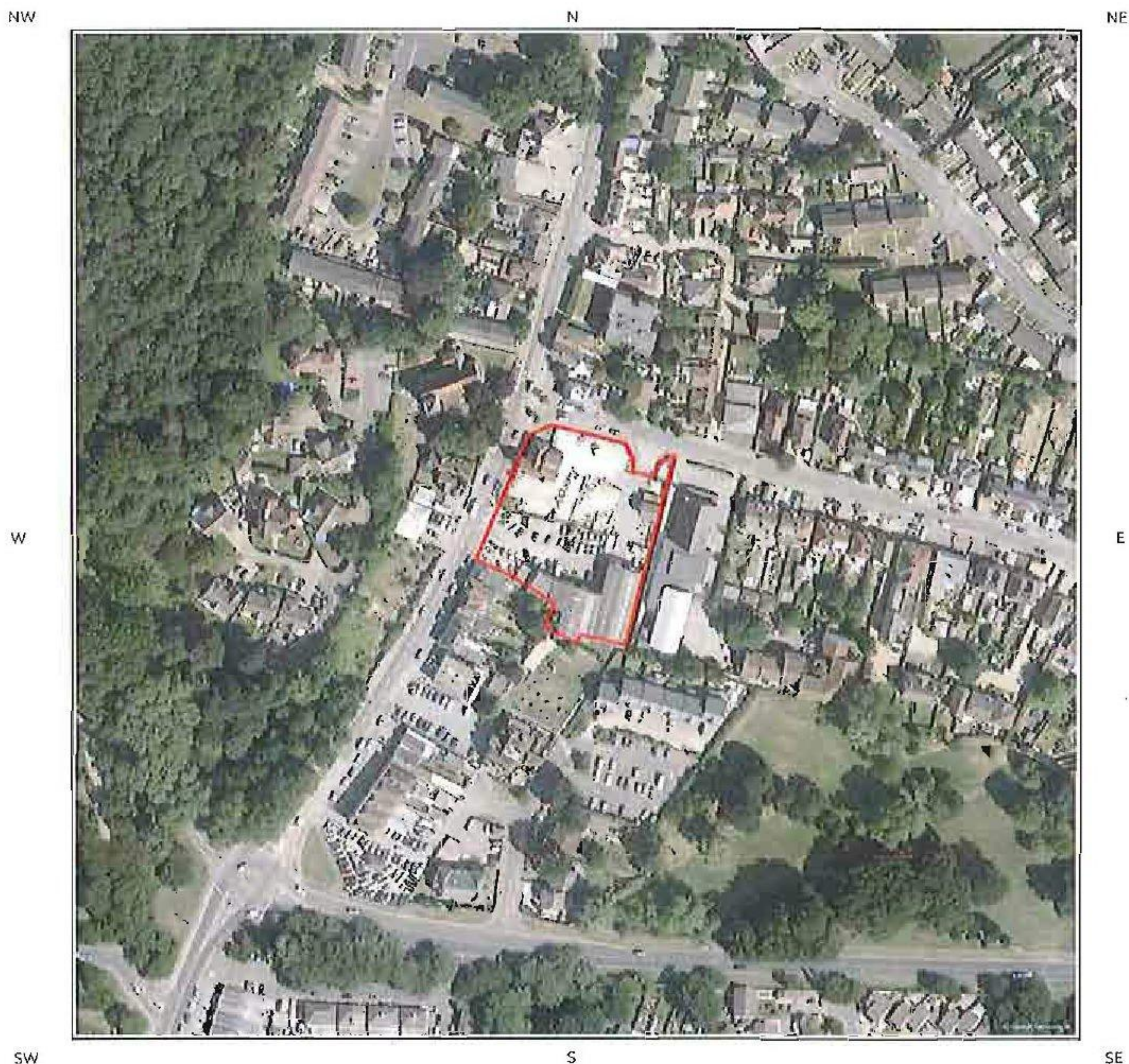
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DRAWING No			8377-01-07	A	

B Aerial Photograph 20/8/2013



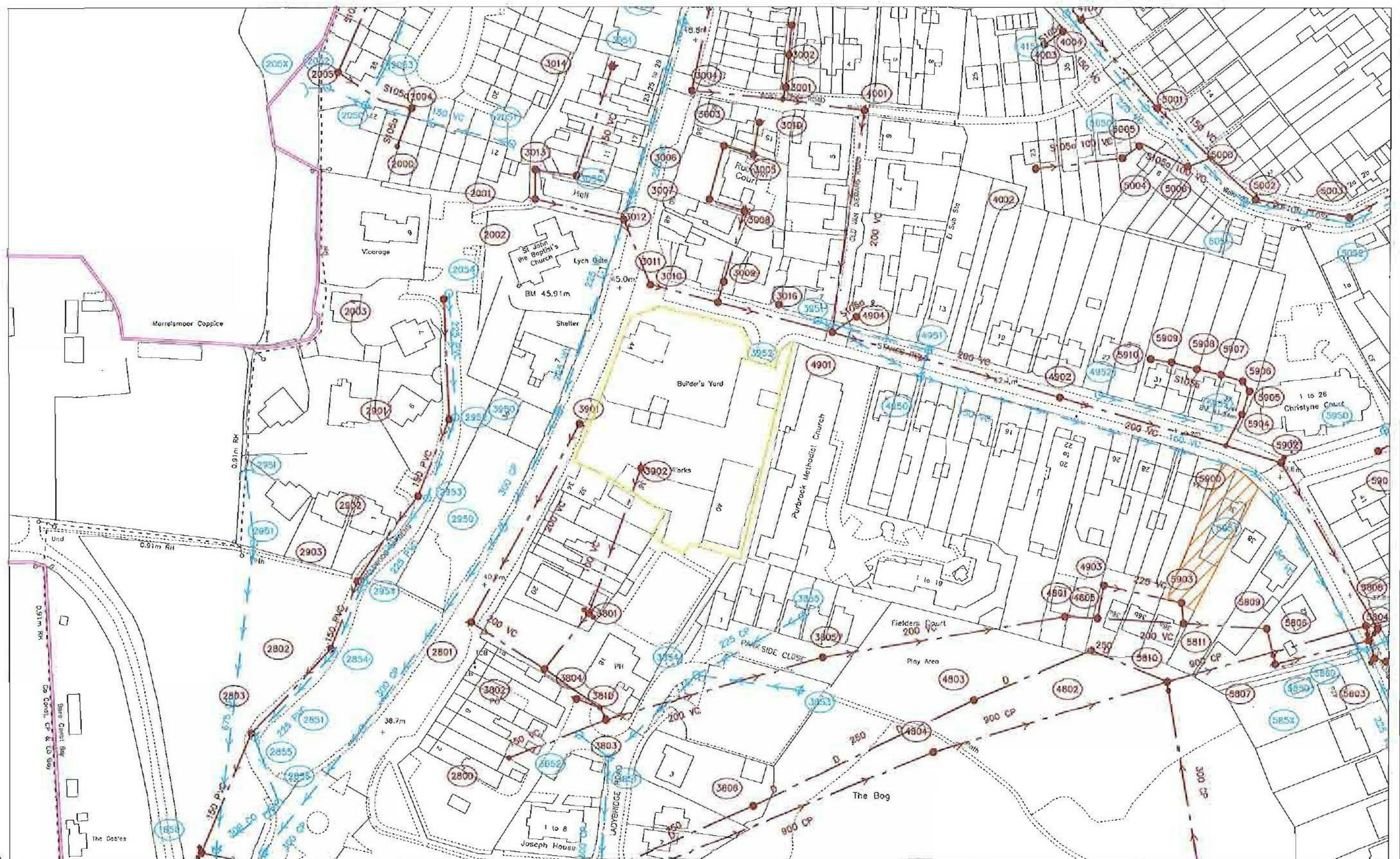
Groundsure Enviroinsight

Address: Purbrook, Waterlooville, 38-44 London Road, Purbrook, PO75LJ,
Date: 14 Apr 2015
Reference: EMS-298303_403257
Client: EmapSite



Aerial Photograph Capture date: 20-Aug-2013
Grid Reference: 467351,107962
Site Size: 0.40ha

C Southern Water Sewer Records



107816

467119

SU6707NW

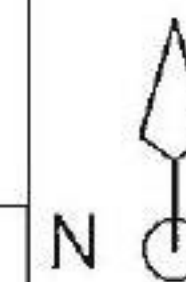
Title: 193252_38 44 London Road, Purb

Scale: 1:1250

Date: 17/04/2015

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.
WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

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Southern Water

467591

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape	Node	Cover	Invert	Size	Material	Shape
1801X	37.71	29.89	800	CP	CIRC	4001X	45.77	44.16	200	VC	CIRC												
1850X	37.73	35.28	OTHER	CI	CIRC	4002X			100	VC	CIRC												
2001X	46.78	45.45	150	VC	CIRC	4003X			100	VC	CIRC												
2002X	46.48	44.95	150	VC	CIRC	4101X	46.35	44.07	150	VC	CIRC												
2003X	43.65	41.4	150	PVC	CIRC	4151X	46.62	44.67	225	VC	CIRC												
2004X			150	VC	CIRC	4801X	37.96	36.32	200	VC	CIRC												
2005X			150	VC	CIRC	4804X	38.16	29.2	900	CP	CIRC												
2050X	46.13	44.78	225	VC	CIRC	4805X	37.4	36.27	225	VC	CIRC												
2051X	47.09	46.23	150	VC	CIRC	4901X	42.91	41.28	200	VC	CIRC												
2052X	44.8	43.97	225	VC	CIRC	4902X	41.52	39.49	200	VC	CIRC												
2053X	46.38	45.86	150	VC	CIRC	4903X	37.8	36.23	225	VC	CIRC												
2054X	43.7	40.9	225	PVC	CIRC	4904X			150	VC	CIRC												
2801X	40.49	38.78	200	VC	CIRC	4950X	42.27	40.92	150	VC	CIRC												
2802X	39.35	37.55	150	PVC	CIRC	4951X	42.48	41.23	150	VC	CIRC												
2803X	38.18	36.84	150	PVC	CIRC	4952X			150	VC	CIRC												
2804X			150	VC	CIRC	5001X	44.64	42.74	150	VC	CIRC												
2850X	38.1	36.88	300	CP	CIRC	5002X	43.17	41.46	150	VC	CIRC												
2851X	38.64	37.54	300	CP	CIRC	5003X	42.52	40.92	150	VC	CIRC												
2854X	39.35	37.67	225	PVC	CIRC	5004X			100	VC	CIRC												
2855X	38.18	36.88	300	CO	CIRC	5005X			100	VC	CIRC												
2856X	37.94	36.73	300	CO	CIRC	5006X			100	VC	CIRC												
2901X	42.64	40.435	150	PVC	CIRC	5007X			150	VC	CIRC												
2902X	41.65	39.7	150	PVC	CIRC	5050X	44.75	43.15	225	VC	CIRC												
2903X	40.34	38.491	150	PVC	CIRC	5051X	43.21	41.62	225	VC	CIRC												
2950X	41.68	40.51	300	CP	CIRC	5052X	42.53	41.21	225	VC	CIRC												
2951X			675	CP	CIRC	5802X	37.33	35.67	250	VC	CIRC												
2952X	42.64	40.417	225	PVC	CIRC	5803X	37.43	34.79	225	VC	CIRC												
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2955X	39.27	37.5	375	PVC	CIRC	5806X	37.55	28.86	900	CP	CIRC												
3001X	47.01	46.21	150	VC	CIRC	5807X	36.86	34.1	250	VC	CIRC												
3002X	47.71	46.94	150	VC	CIRC	5809X	37.27	35.99	225	VC	CIRC												
3003X	47.01	46.03	150	VC	CIRC	5810X	36.87	29.03	900	CP	CIRC												
3004X	48	46.44	200	VC	CIRC	5811X	37.3	36.11	200	VC	CIRC												
3005X	48.38	45.8	150	PF	CIRC	5851X	37.59	35.5	OTHER	CP	RECT												
3006X	46.43	45.18	150	PF	CIRC	585DX			OTHER	CP	RECT												
3007X	46.4	44.69	150	PF	CIRC	585DX			OTHER	CP	RECT												
3008X	45.8	44.46	150	VC	CIRC	5901X	39.9	38.86	150	VC	CIRC												
3009X			150	VC	CIRC	5902X	39.77	37.88	200	VC	CIRC												
3010X	44.19	42.37	200	VC	CIRC	5903X	37.3	36.13	225	VC	CIRC												
3011X	45	43.11	200	VC	CIRC	5904X			150	VC	CIRC												
3012X	45.92	44.47	200	VC	CIRC	5905X			150	VC	CIRC												
3013X			150	VC	CIRC	5906X			150	VC	CIRC												
3014X	48.99	47.63	100	VC	CIRC	5907X			150	VC	CIRC												
3015X	48.13	47.63	100	VC	CIRC	5908X			150	VC	CIRC												
301DX			200	VC	CIRC	5909X			200	VC	CIRC												
3050X	46.4	45.52	225	VC	CIRC	590DX			200	VC	CIRC												
3051X	48.28	47.19	225	VC	CIRC	5910X			150	VC	CIRC												
3052X	49.09	48.15	225	VC	CIRC	5950X	40.02	39.25	225	VC	CIRC												
3801X	40.88	39.52	150	VC	CIRC	5951X	39.31	38.37	150	VC	CIRC												
3802X	40.87	37.83	200	VC	CIRC																		
3803X	38.32	36.94	200	VC	CIRC																		
3804X	38.7	37.65	100	VC	CIRC																		
3805X	39.63	36.67	200	VC	CIRC																		
381DX			200	VC	CIRC																		
3851X	37.67	35.81	300	CP	CIRC																		
3852X	38.14	36.53	225	CP	CIRC																		
3853X	39.2	37.28	225	CP	CIRC																		
3854X	38.88	36.89	225	CP	CIRC																		
3855X	40.05	37.67	225	CP	CIRC																		
3901X	43.03	41.46	200	VC	CIRC																		
3902X	42.93	41.59	100	VC	CIRC																		
3950X	43.21	42.04	300	CP	CIRC																		
3951X	43.2	42.06	225	VC	CIRC																		
3952X	43.13	42.46	150	VC	CIRC																		

LINE STYLES / COLOURS	MATERIALS	LEGEND - SEWERS	LEGEND - SEWERS
Red: Full Siphon/Sensor	AK: AS concrete	Manhole (S&C)	Manhole (S&C)
Red: Full Vacuum Main	BAC: BAC (concrete)	Upright hole (S&C)	Upright hole (S&C)
Red: Full Vacuum Main	CC: Concrete (S&C)	Lamp hole (S&C)	Lamp hole (S&C)
Red: Full Vacuum Main	CI: Cast Iron	Pumping Station (S&C)	Pumping Station (S&C)
Red: Full Vacuum Main	CO: Concrete (S&C)	Pumping Station (S&C)	Pumping Station (S&C)
Red: Full Vacuum Main	CP: Concrete (S&C)	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	CSE: Concrete (S&C)	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	CU: Concrete (S&C)	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	DI: Ductile Iron	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	GR: Glass Reinforced Concrete	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	GRP: Glass Reinforced Plastic	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	HDPE: High Density Polyethylene	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	PE: Polyethylene	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	PP: Polypropylene	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	PVC: Polyvinyl Chloride	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	RHD: Reinforced High Density Polyethylene	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	SI: Steel	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	VC: Virgin Clay	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	XX: Other	Slotted manhole (S&C)	Slotted manhole (S&C)
Red: Full Vacuum Main	ZZ: Unknown	Slotted manhole (S&C)	Slotted manhole (S&C)

Drawn by: mondalb

Title: 193252_38 44 London Road, Purb

Date: 17/04/2015



D Existing Surface Water Drains and Impermeable Areas
8377-01-02 A



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CONSULTING CML, STRUCTURAL AND GEOTECHNICAL ENGINEERS

Project

38-44 London Road, Purbrook

Sub-Section

Impermeable areas

Existing site

Scale 1:500

Job ref 8377-01

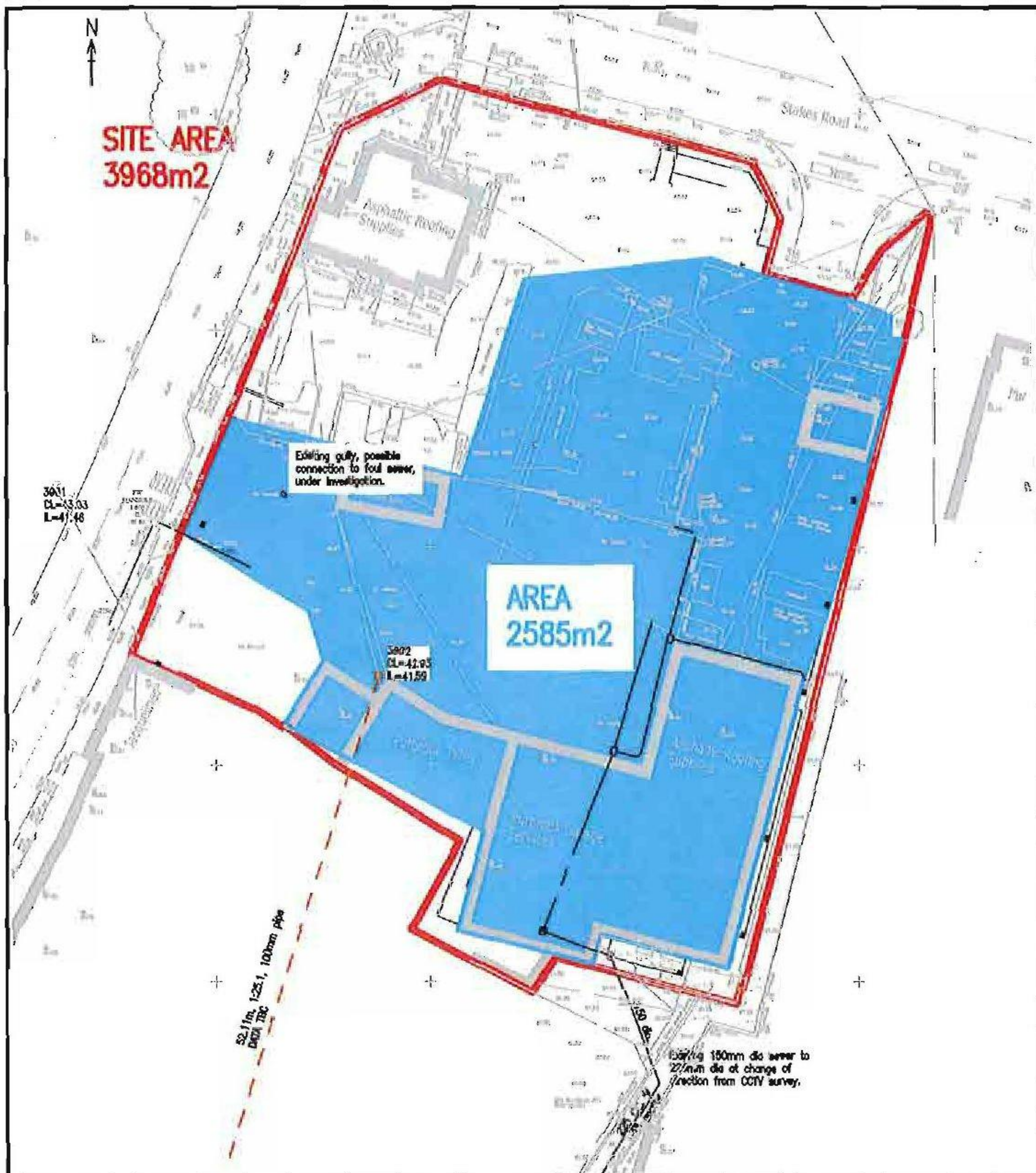
Sheet No.02 A

Prepared AD

Date 05/06/17

Checked

Date



E Southern Water Capacity Check



STUDY INTO THE OPTIONS FOR
FOUL DRAINAGE PROVISION AT
38-44 LONDON ROAD,
PURBROOK
WATERLOOVILLE
PO7 5LJ

17 June 2015

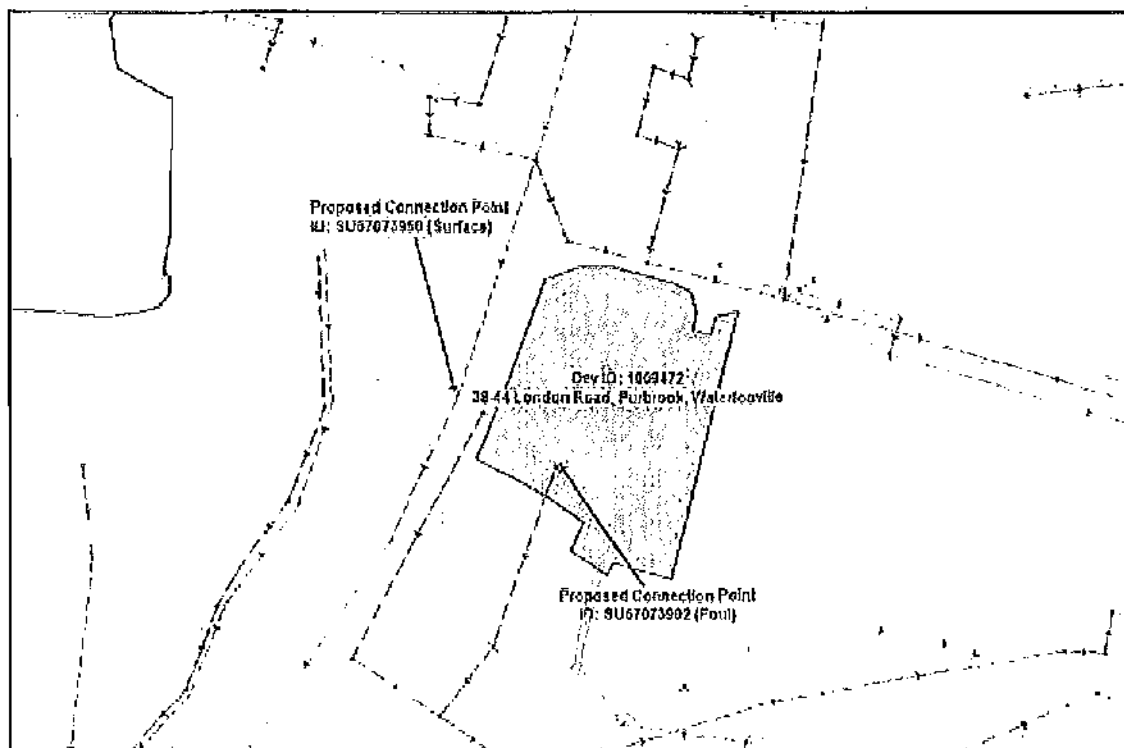
REQUESTED:
OPUS INTERNATIONAL CONSULTANTS LTD

Study into the Options for Foul Water Drainage Provision at London Road, Purbrook, Waterlooville

I. Development Details:

The proposal is to discharge 0.50 l/s of foul flow to the local foul sewerage systems at manhole reference SU67073902 which is located within the development boundary adjacent to London Road.

Figure 1 - Proposed Development



II. Results and Conclusions:

Foul Water:

There is currently adequate capacity within the foul sewerage network to accommodate the 0.50 l/s foul flow from proposed development site. The proposed development does not significantly increase local flow to the connection manhole SU67073902, to cause additional surcharge or flooding to the existing system. Therefore no remedial work required to accommodate the proposed development.

Study into the Options for Foul Water Drainage Provision at London Road, Purbrook, Waterlooville

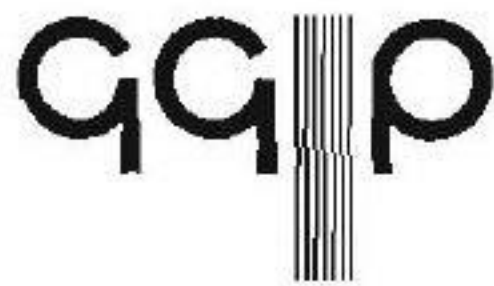
Surface Water:

This is a brown field site. The application for the level 2 check indicated that there would be no increase of net impermeable area to contribute to the existing surface water flows. Therefore the proposed development does not increase flow to the connection point SU67073950. There should be no detrimental impact on the existing surface water network assuming it can be proved that the existing site drains into that system.

Before any connections are made, an application form needs to be completed and approved by Southern Water Services.

PUBLIC SEWER RECORD

F Impermeable Areas – Proposed Development
8377-01-06 A



Graham Garner and Partners Limited
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CONSULTING CIVIL, STRUCTURAL AND GEOTECHNICAL ENGINEERS

Project

38-44 London Road, Purbrook

Sub-Section

Impermeable Areas
Proposed Development
Scale 1:500

Job ref 8377-01

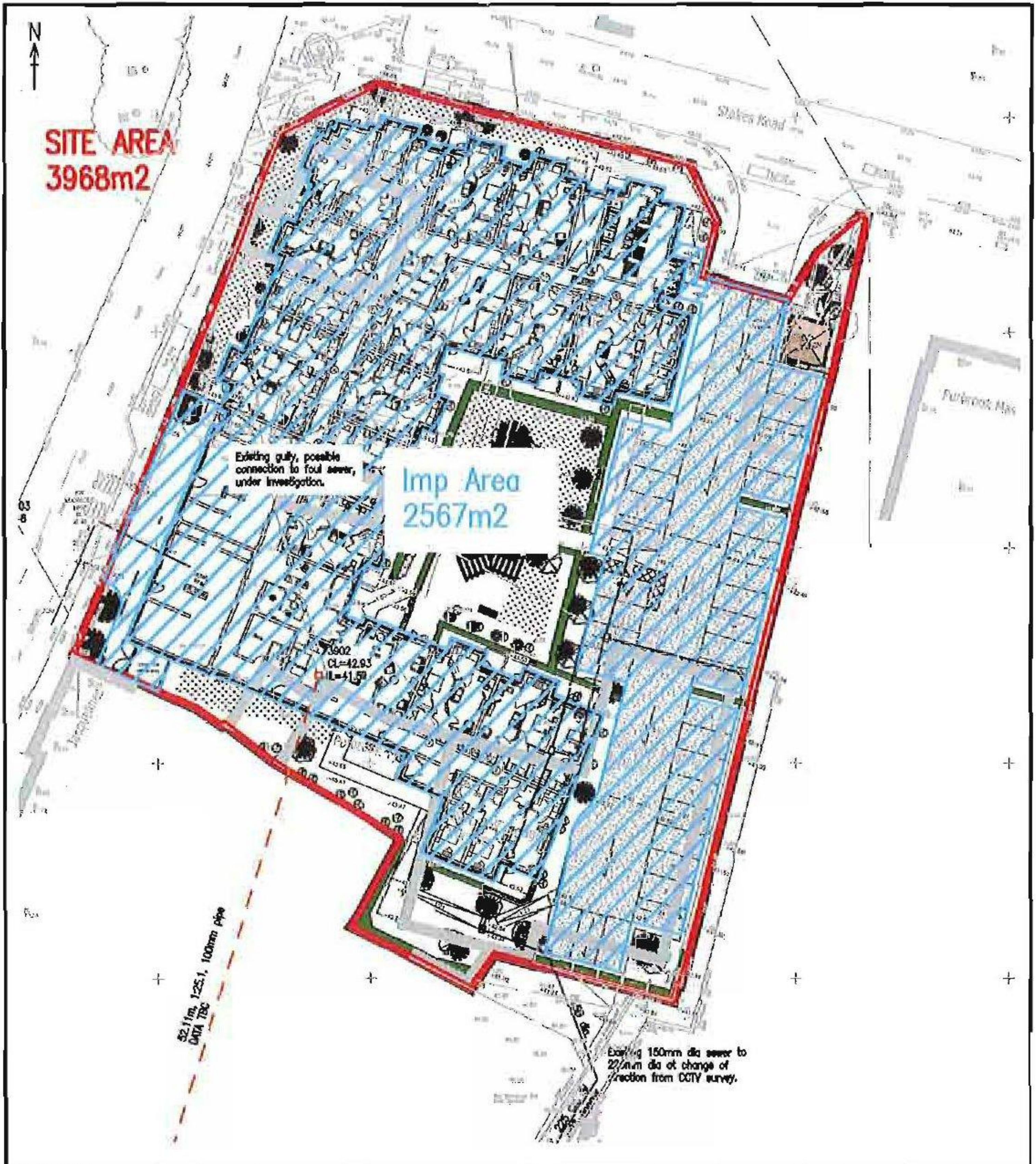
Sheet No.06A

Prepared AD

Date 05/10/17

Checked

Date



G Microdrainage Analysis
 100 year + 20% pages 1-4
 100 year + 40% pages 1-4

Graham Garner And Partners		Page 1
10 Station Approach	38-44 London Road	
Broadstone	Purbrook	
Dorset BH18 8AX	100 yr + 20%	
Date 05/06/17	Designed By AD	
File 8377 purbrook 100+20%....	Checked By	
CADS	Storage Design W.11.2	

Summary of Results for 100 year Return Period

Storm Duration (mins)	Maximum Control (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	21.2	0.0	21.2	41.7288	0.9288	0.0	39.5	O K
30 Summer	21.2	0.0	21.2	41.8448	1.0448	0.0	44.9	O K
60 Summer	21.2	0.0	21.2	41.8383	1.0383	0.0	44.6	O K
120 Summer	21.3	0.0	21.3	41.6773	0.8773	0.0	36.9	O K
180 Summer	21.2	0.0	21.2	41.5163	0.7163	0.0	28.5	O K
240 Summer	21.2	0.0	21.2	41.3728	0.5727	0.0	20.9	O K
360 Summer	21.1	0.0	21.1	41.1763	0.3762	0.0	11.0	O K
480 Summer	19.6	0.0	19.6	41.0843	0.2842	0.0	6.9	O K
600 Summer	17.1	0.0	17.1	41.0383	0.2382	0.0	5.1	O K
720 Summer	15.3	0.0	15.3	41.0048	0.2047	0.0	3.8	O K
960 Summer	12.5	0.0	12.5	40.9713	0.1712	0.0	2.7	O K
1440 Summer	9.2	0.0	9.2	40.9343	0.1343	0.0	1.6	O K
2160 Summer	6.6	0.0	6.6	40.9063	0.1063	0.0	1.0	O K
2880 Summer	5.3	0.0	5.3	40.8873	0.0873	0.0	0.6	O K
4320 Summer	3.8	0.0	3.8	40.8633	0.0633	0.0	0.3	O K
5760 Summer	3.1	0.0	3.1	40.8508	0.0508	0.0	0.2	O K
7200 Summer	2.6	0.0	2.6	40.8423	0.0422	0.0	0.1	O K
8640 Summer	2.2	0.0	2.2	40.8368	0.0367	0.0	0.1	O K
10080 Summer	2.0	0.0	2.0	40.8328	0.0327	0.0	0.1	O K
15 Winter	21.3	0.0	21.3	41.8638	1.0638	0.0	45.7	O K
30 Winter	21.6	0.0	21.6	42.0563	1.2563	0.0	52.1	FLOOD RISK
60 Winter	21.2	0.0	21.2	42.0068	1.2068	0.0	50.9	FLOOD RISK
120 Winter	21.2	0.0	21.2	41.7098	0.9098	0.0	38.6	O K
180 Winter	21.3	0.0	21.3	41.4513	0.6513	0.0	25.0	O K
240 Winter	21.3	0.0	21.3	41.2408	0.4407	0.0	14.1	O K
360 Winter	18.7	0.0	18.7	41.0678	0.2677	0.0	6.2	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	114.95	16
30 Summer	76.78	25
60 Summer	48.56	42
120 Summer	29.33	76
180 Summer	21.66	110
240 Summer	17.43	138
360 Summer	12.79	194
480 Summer	10.25	250
600 Summer	8.63	308
720 Summer	7.49	368
960 Summer	5.98	490
1440 Summer	4.35	734
2160 Summer	3.16	1076
2880 Summer	2.51	1444
4320 Summer	1.82	2136
5760 Summer	1.45	2840
7200 Summer	1.22	3664
8640 Summer	1.06	4248
10080 Summer	0.93	5096
15 Winter	114.95	16
30 Winter	76.78	27
60 Winter	48.56	46
120 Winter	29.33	82
180 Winter	21.66	116
240 Winter	17.43	142
360 Winter	12.79	192

10 Station Approach
Broadstone
Dorset BH18 8AX

38-40 London Road
Purbrook
100 yr + 20%



Date 05/06/17

Designed By AD

File 8377 purbrook 100+20%....

Checked By

CADS

Storage Design W.11.2

Summary of Results for 100 year Return Period

Storm Duration (mins)	Maximum Control (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
480 Winter	15.3	0.0	15.3	41.0048	0.2047	0.0	3.8	O K
600 Winter	13.0	0.0	13.0	40.9773	0.1772	0.0	2.9	O K
720 Winter	11.3	0.0	11.3	40.9583	0.1583	0.0	2.3	O K
960 Winter	9.1	0.0	9.1	40.9333	0.1333	0.0	1.6	O K
1440 Winter	6.6	0.0	6.6	40.9063	0.1063	0.0	1.0	O K
2160 Winter	4.8	0.0	4.8	40.8793	0.0793	0.0	0.5	O K
2880 Winter	3.8	0.0	3.8	40.8633	0.0633	0.0	0.3	O K
4320 Winter	2.8	0.0	2.8	40.8458	0.0457	0.0	0.2	O K
5760 Winter	2.2	0.0	2.2	40.8368	0.0367	0.0	0.1	O K
7200 Winter	1.9	0.0	1.9	40.8308	0.0307	0.0	0.1	O K
8640 Winter	1.6	0.0	1.6	40.8268	0.0267	0.0	0.1	O K
10080 Winter	1.5	0.0	1.5	40.8243	0.0243	0.0	0.0	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
480 Winter	10.25	250
600 Winter	8.63	308
720 Winter	7.49	368
960 Winter	5.98	490
1440 Winter	4.35	730
2160 Winter	3.16	1096
2880 Winter	2.51	1432
4320 Winter	1.82	2176
5760 Winter	1.45	2864
7200 Winter	1.22	3592
8640 Winter	1.06	4288
10080 Winter	0.93	5128

Graham Garner And Partners		Page 3
10 Station Approach Broadstone Dorset BH18 8AX	38-4 4 London Road Purbrook 100 yr + 20%	
Date 05/06/17 File 8377 purbrook 100+20%....	Designed By AD Checked By	
CADS	Storage Design W.11.2	

Rainfall Details

Region	ENG+WAL	Cv (Winter)	0.840
Return Period (years)	100	Shortest Storm (mins)	15
M5-60 (mm)	24.000	Longest Storm (mins)	10080
Ratio-R	0.350	Summer Storms	Yes
Cv (Summer)	0.750	Winter Storms	Yes

Time / Area Diagram

Total Area (ha) = 0.257

Time	(mins)	Area
from:	to:	(ha)
0	4	0.257

Graham Garner And Partners		Page 4
10 Station Approach Broadstone Dorset BH18 8AX	38-40 London Road Purbrook 100 yr + 20%	
Date 05/06/17 File 8377 purbrook 100+20%....	Designed By AD Checked By	
CADS	Storage Design W.11.2	

Circular Pipe Details

Diameter (m) 1.250 Length (m) 42.000 Cover Level (m) 42.200
 Slope (1:x) 400.0 Invert Level (m) 40.800

Hydro-Brake Outflow Control

Design Head (m) 1.000 Hydro-Brake Type MD6 Invert Level (m) 40.800
 Design Flow (l/s) 20.0 Diameter (mm) 182

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	6.1	0.60	20.2	1.60	24.0	2.60	30.4	5.00	42.2	7.50	51.7
0.20	15.1	0.80	19.5	1.80	25.4	3.00	32.7	5.50	44.3	8.00	53.4
0.30	20.4	1.00	20.1	2.00	26.7	3.50	35.3	6.00	46.2	8.50	55.0
0.40	21.3	1.20	21.2	2.20	28.0	4.00	37.8	6.50	48.1	9.00	56.6
0.50	20.9	1.40	22.6	2.40	29.2	4.50	40.0	7.00	49.9	9.50	58.2

Weir / Flume Overflow Control

Discharge Coef 0.544 Width (m) 0.500 Crest Level (m) 42.200

Graham Garner And Partners		Page 1
10 Station Approach	38-44 London Road	
Broadstone	Purbrook	
Dorset BH18 8AX	100yr + 40%	
Date 05/06/17	Designed By AD	
File 8377 purbrook 100+40%....	Checked By	
CADS	Storage Design W.11.2	

Summary of Results for 100 year Return Period

Storm Duration (mins)	Maximum Control (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
15 Summer	21.2	0.0	21.2	41.9388	1.1388	0.0	48.7	O K
30 Summer	23.2	25.4	48.7	42.2962	1.4962	1.9	53.0	FLOOD
60 Summer	22.9	9.7	32.6	42.2507	1.4507	1.7	53.0	FLOOD
120 Summer	21.2	0.0	21.2	41.8853	1.0853	0.0	46.6	O K
180 Summer	21.2	0.0	21.2	41.7008	0.9008	0.0	38.1	O K
240 Summer	21.2	0.0	21.2	41.5398	0.7398	0.0	29.8	O K
360 Summer	21.3	0.0	21.3	41.2837	0.4837	0.0	16.3	O K
480 Summer	20.8	0.0	20.8	41.1403	0.3402	0.0	9.3	O K
600 Summer	19.1	0.0	19.1	41.0753	0.2752	0.0	6.5	O K
720 Summer	17.0	0.0	17.0	41.0358	0.2357	0.0	5.0	O K
960 Summer	14.1	0.0	14.1	40.9888	0.1887	0.0	3.3	O K
1440 Summer	10.3	0.0	10.3	40.9468	0.1468	0.0	2.0	O K
2160 Summer	7.4	0.0	7.4	40.9153	0.1153	0.0	1.2	O K
2880 Summer	5.9	0.0	5.9	40.8978	0.0978	0.0	0.8	O K
4320 Summer	4.3	0.0	4.3	40.8713	0.0713	0.0	0.4	O K
5760 Summer	3.5	0.0	3.5	40.8573	0.0573	0.0	0.2	O K
7200 Summer	2.9	0.0	2.9	40.8483	0.0483	0.0	0.2	O K
8640 Summer	2.5	0.0	2.5	40.8418	0.0417	0.0	0.1	O K
10080 Summer	2.2	0.0	2.2	40.8368	0.0367	0.0	0.1	O K
15 Winter	23.5	40.5	64.0	42.3312	1.5312	3.1	53.1	FLOOD
30 Winter	24.1	88.3	112.5	42.4207	1.6207	11.0	53.2	FLOOD
60 Winter	23.7	55.4	79.1	42.3617	1.5617	9.6	53.1	FLOOD
120 Winter	21.3	0.0	21.3	41.9828	1.1828	0.0	50.1	O K
180 Winter	21.2	0.0	21.2	41.6763	0.8763	0.0	36.9	O K
240 Winter	21.2	0.0	21.2	41.4243	0.6243	0.0	23.6	O K
360 Winter	20.6	0.0	20.6	41.1188	0.3187	0.0	8.4	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
15 Summer	135.74	16
30 Summer	89.85	23
60 Summer	55.85	42
120 Summer	33.47	78
180 Summer	24.66	112
240 Summer	19.81	142
360 Summer	14.51	198
480 Summer	11.61	252
600 Summer	9.75	310
720 Summer	8.45	370
960 Summer	6.74	490
1440 Summer	4.89	734
2160 Summer	3.55	1076
2880 Summer	2.83	1464
4320 Summer	2.05	2164
5760 Summer	1.64	2904
7200 Summer	1.37	3544
8640 Summer	1.19	4280
10080 Summer	1.06	5104
15 Winter	135.74	14
30 Winter	89.85	21
60 Winter	55.85	40
120 Winter	33.47	84
180 Winter	24.66	120
240 Winter	19.81	150
360 Winter	14.51	196

Graham Garner And Partners		Page 2
10 Station Approach Broadstone Dorset BH18 8AX	38-44 London Road Purbrook 100yr + 40%	
Date 05/06/17 File 8377 purbrook 100+40%....	Designed By AD Checked By	
CADS	Storage Design W.11.2	

Summary of Results for 100 year Return Period

Storm Duration (mins)	Maximum Control (l/s)	Maximum Overflow (l/s)	Maximum Outflow (l/s)	Maximum Water Level (m OD)	Maximum Depth (m)	Overflow Volume (m³)	Maximum Volume (m³)	Status
480 Winter	17.2	0.0	17.2	41.0403	0.2402	0.0	5.1	O K
600 Winter	14.7	0.0	14.7	40.9958	0.1957	0.0	3.5	O K
720 Winter	12.8	0.0	12.8	40.9748	0.1747	0.0	2.8	O K
960 Winter	10.2	0.0	10.2	40.9463	0.1463	0.0	2.0	O K
1440 Winter	7.4	0.0	7.4	40.9153	0.1153	0.0	1.2	O K
2160 Winter	5.4	0.0	5.4	40.8888	0.0888	0.0	0.6	O K
2880 Winter	4.3	0.0	4.3	40.8708	0.0708	0.0	0.4	O K
4320 Winter	3.1	0.0	3.1	40.8513	0.0512	0.0	0.2	O K
5760 Winter	2.5	0.0	2.5	40.8413	0.0412	0.0	0.1	O K
7200 Winter	2.1	0.0	2.1	40.8348	0.0347	0.0	0.1	O K
8640 Winter	1.8	0.0	1.8	40.8303	0.0302	0.0	0.1	O K
10080 Winter	1.6	0.0	1.6	40.8268	0.0268	0.0	0.1	O K

Storm Duration (mins)	Rain (mm/hr)	Time-Peak (mins)
480 Winter	11.61	252
600 Winter	9.75	308
720 Winter	8.45	368
960 Winter	6.74	486
1440 Winter	4.89	720
2160 Winter	3.55	1080
2880 Winter	2.83	1460
4320 Winter	2.05	2200
5760 Winter	1.64	2840
7200 Winter	1.37	3656
8640 Winter	1.19	4272
10080 Winter	1.06	5016

Graham Garner And Partners		Page 3
10 Station Approach Broadstone Dorset BH18 8AX	38-44 London Road Purbrook 100yr + 40%	
Date 05/06/17 File 8377 purbrook 100+40%....	Designed By AD Checked By	
CADS	Storage Design W.11.2	

Rainfall Details

Region	ENG+WAL	Cv (Winter)	0.840
Return Period (years)	100	Shortest Storm (mins)	15
M5-60 (mm)	28.000	Longest Storm (mins)	10080
Ratio-R	0.350	Summer Storms	Yes
Cv (Summer)	0.750	Winter Storms	Yes

Time / Area Diagram

Total Area (ha) = 0.257

Time	(mins)	Area
from:	to:	(ha)
0	4	0.257

10 Station Approach
Broadstone
Dorset BH18 8AX

38-44 London Road
Purbrook
100yr + 40%

Date 05/06/17

Designed By AD

File 8377 purbrook 100+40%....

Checked By

CADS

Storage Design W.11.2



Circular Pipe Details

Diameter (m) 1.250 Length (m) 42.000 Cover Level (m) 42.200
Slope (1:x) 400.0 Invert Level (m) 40.800

Hydro-Brake Outflow Control

Design Head (m) 1.000 Hydro-Brake Type MD6 Invert Level (m) 40.800
Design Flow (l/s) 20.0 Diameter (mm) 182

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.10	6.1	0.60	20.2	1.60	24.0	2.60	30.4	5.00	42.2	7.50	51.7
0.20	15.1	0.80	19.5	1.80	25.4	3.00	32.7	5.50	44.3	8.00	53.4
0.30	20.4	1.00	20.1	2.00	26.7	3.50	35.3	6.00	46.2	8.50	55.0
0.40	21.3	1.20	21.2	2.20	28.0	4.00	37.8	6.50	48.1	9.00	56.6
0.50	20.9	1.40	22.6	2.40	29.2	4.50	40.0	7.00	49.9	9.50	58.2

Weir / Flume Overflow Control

Discharge Coef 0.544 Width (m) 0.500 Crest Level (m) 42.200

H Drainage Layout
8377-01-20



FOUL MANHOLE SCHEDULE

MH No.	COVER	INVERT LEVEL		DEPTH	MAX PIPE	MH	COVER TYPE
		IN	OUT				
F1	43.20	41.525	41.525	1.68	150	2	B125
F2	43.20	41.73	41.73	1.47	150	3	B125
F3	43.50	42.23	42.23	1.27	100	3	B125
F4	43.50	42.34	42.34	1.16	100	3	B125
F5	43.50	42.64	42.64	0.86	100	3	B125
F6	43.50	42.70	42.70	0.80	100	3	B125
F7	43.2	41.62	41.62	1.58	150	2	B125
F8	43.60	41.83	41.83	1.77	150	3	B125
F9	43.3	41.91	41.91	1.39	150	3	B125
F10	43.32	41.99	41.99	1.33	150	3	B125
F11	43.50	42.220	42.170	1.33	150	3	D400
F12	43.50	42.55	42.55	0.95	100	3	B125
F13	43.50	42.60	42.60	0.90	100	3	B125
F14	43.50	42.70	42.70	0.80	100	3	B125
F15	43.43	42.50	42.50	0.93	100	3	B125
F16	43.5	42.575	42.575	0.93	100	3	B125
F17	43.5	42.65	42.65	0.85	100	3	B125
F18	43.5	42.70	42.70	0.80	100	3	B125

Foul inspection chambers/manholes scheduled for main runs only. All inspection chambers connecting lateral drains to have invert levels at 42.750m unless noted otherwise.

SURFACE WATER MANHOLE SCHEDULE

MH No.	COVER	INVERT LEVEL		DEPTH	MAX PIPE	MH	COVER TYPE
		IN	OUT				
S1	42.50	40.65	40.65	1.85	150	2	D400
S2	43.60	41.7	41.7	1.90	150	2	B125
S3	43.40	42.03	42.03	1.37	150	3	B125
S4	43.40	42.08	42.08	1.32	150	3	B125
S5	43.20	42.40	42.40	0.80	150	3	B125
S6	43.25	42.57	42.52	0.73	150	3	B125
S7	43.5	42.78	42.78	0.72	100	3	B125
S8	43.5	42.95	42.95	0.55	100	3	B125
S9	43.5	43.00	43.00	0.50	100	3	B125
S10	43.0	41.9	41.9	1.10	100	3	B125
S11	43.55	42.50	42.50	1.05	100	3	B125
S12	43.55	42.84	42.84	0.71	100	3	B125
S13	43.55	42.90	42.90	0.65	100	3	B125
S14	43.55	42.95	42.95	0.60	100	3	B125
S15	43.55	43.00	43.00	0.55	100	3	B125
S16	43.55	42.90	42.90	0.65	100	3	B125
S17	43.55	42.95	42.95	0.60	100	3	B125
S18	43.3	42.03	42.03	1.27	150	3	D400
S19	43.4	42.15	42.15	1.25	150	3	B125
S20	43.55	42.25	42.25	1.30	100	3	B125
S21	43.50	42.93	42.93	0.57	100	3	B125
S22	43.50	43.00	43.00	0.50	100	3	B125
S23	43.55	42.95	42.95	0.60	100	3	B125
S24	43.50	42.6	42.6	0.90	100	3	B125

Surface water inspection chambers/manholes scheduled for main runs only. All inspection chambers connecting lateral drains to main runs to have invert levels at 43.00m unless noted otherwise.

Notes:

- THIS DRAWING IS NOT TO BE SCALED
1. Cross-references
 2. Minimum gradient for surface water pipes to be 1 in 100.
 3. Minimum gradient for foul pipes to be as follows:
100mm dia, 1 in 80
150mm dia, 1 in 150.
 4. Concrete protection to be provided to all pipes where cover to the crown of the pipe is less than:
-gardens/parks/no vehicles 350mm
-private driveways vehicles < 7.5t 500mm
-drives/parking areas with limited access for vehicles with a gross weight > 7.5t 900mm
-highways 1200mm
 5. For proposed levels of all paths, footways and soft landscape areas refer to Landscape Architects details.
 6. In-situ existing drains, all drains within the site to be abandoned to be grubbed out and backfilled with min C20 concrete and the foundations adopted in accordance with the Structural Engineers details.

HEALTH AND SAFETY
The construction of drainage and external paving shown on this drawing is considered to be a routine nature to a suitably experienced Contractor. However the Contractor's attention is drawn to the potential instability of excavations particularly in existing drainage trenches. It is also to be noted that as the site has had a previous use there may be unrecorded buried services, etc. Appropriate risk assessment/method statement/working practices should be developed and followed in accordance with the requirements of the Construction (Design and Management) regulations 2015.
In relation to existing sewers, there may be asbestos cement or fibre reinforced concrete pipes within the site or Public Sewerage network and the Contractor is to ensure that any persons carrying out the works are competent and adequately trained, safe systems of work are in place and disposal of any pipework/affected material is carried out in accordance with current legislation. Attention is drawn to:
The Control of Asbestos at Work Regulations 1987 and amendment 1992 and all other legislation relating to health and safety of work.

Rev	Revision details	Date
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Client
McCarthy Stone
Luton Ltd, Greater Luton

Architect
kenn scadden associates

Job title
38-44 London Road
Purbrook
Hampshire

Drawing title
Drainage Layout

GGP
Graham Garner and Partners Limited
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CONSULTING CIVIL, STRUCTURAL AND GEOTECHNICAL ENGINEERS

DATE	07/06/17	SCALE	1:200	DRAWN	AD
DRAWING No	SS-2168-03-DE-20 GGP ref: 8377-01-20				