

**RUSHBY BREWSTER**  
CONSULTING CIVIL & STRUCTURAL ENGINEERS

**REPORT ON PROPOSED FOUL AND SURFACE WATER DRAINAGE**

for

**Residential Development  
St George's Walk  
Waterlooville  
Hampshire**

**Client:**

PMC Construction and Development  
Services Ltd  
106 Queens Road  
Portsmouth  
Hampshire  
PO2 7NE

**Architect:**

Kenn Scaddan Associates  
Concept House  
35 Kingston Crescent  
North End  
Portsmouth  
PO2 8AA

| Issue       |              | A | B |
|-------------|--------------|---|---|
| Issued By   | Allen Rushby |   |   |
| Date        | Nov 2015     |   |   |
| Purpose     |              |   |   |
| Approved By |              |   |   |

**Project No: PMC 222**

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## **1. Introduction**

It is proposed to re-develop the site at St George's Walk, Waterloooville to provide new residential accommodation of 14 No flats and an office unit in a single 4 storey block.

This report outlines the proposed foul and surface water drainage strategy for the proposed development.

## **2. The Site**

The site is located off Hambledon Road, Waterloooville at the junction with Portland Road, and was previously occupied by two detached properties with associated access drive/hardstandings.

The total site area is 710m<sup>2</sup> (0.071ha), and existing impermeable areas measured from the topographical survey totalled 655m<sup>2</sup>.

Review of the Southern Water sewer asset plans confirms that adopted foul and surface water sewers are located within Portland Road to the south east and Hambledon Road to the north east.

A ground investigation report has been carried out by Geo-Environmental which confirms the soils to be predominantly London Clay.

## **3. Proposed Foul and Surface Water Drainage**

### **3.1 Foul Water**

It is proposed that all foul water from the proposed development be discharged to the existing foul sewer in Portland Road via an existing 150 diameter connection as shown on the drawings within the Appendix.

Based upon the 'Sewers for Adoption' requirements of 4000 litres/dwelling/day the design flow rate to the receiving sewer will be 0.65 litres/second.

### 3.2 Surface Water

It is proposed that surface water run-off from the roof of the new development will be discharged into the existing surface water sewer in Portland Road.

Surface water run-off rate to the existing sewer will be limited to the pre-development rate for a 1 in 1 year storm by incorporation of an attenuation facility and flow control device.

Attenuation will be provided for the 1 in 100 year storm event with additional 30% allowance for climate change (see calculations in the Appendix).

All external hard pavings will be constructed in permeable paving and calculations have been provided in the appendix to confirm the adequacy of the proposed system based upon infiltration tests carried out during the ground investigation.



A W Rushby I Eng. AMI StructE  
**For and on behalf of Rushby Brewster**

## APPENDICES

1. Southern Water Sewer Records
2. Calculations for Surface Water Drainage
3. Extracts from Ground Investigation
4. Drawings:
  - a) PMC 222-501 – External Works & Drainage Layout
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## APPENDIX 1

### **Southern Water Sewer Records**

## 109551



SU6809SW



Southern  
Water

PMG 222

## SEWER RECORDS PAGE 2 OF 2

| Node  |       |       |     |     |      | Cover |        |        |     |     |      | Invert |        |        |     |     |      | Size  |        |        |     |     |      | Material |        |        |     |     |      | Shape |  |  |  |  |  |
|-------|-------|-------|-----|-----|------|-------|--------|--------|-----|-----|------|--------|--------|--------|-----|-----|------|-------|--------|--------|-----|-----|------|----------|--------|--------|-----|-----|------|-------|--|--|--|--|--|
| 0203X | 48.3  | 44.66 | 225 | VC  | CIRC | 2303X | 49.95  | 48.435 | 150 | VC  | CIRC | 2303X  | 49.95  | 48.435 | 150 | VC  | CIRC | 2303X | 49.95  | 48.435 | 150 | VC  | CIRC | 2303X    | 49.95  | 48.435 | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0204X | 48.37 |       | 225 | VC  | CIRC | 2304X | 49.73  | 48.11  | 150 | VC  | CIRC | 2304X  | 49.73  | 48.11  | 150 | VC  | CIRC | 2304X | 49.73  | 48.11  | 150 | VC  | CIRC | 2304X    | 49.73  | 48.11  | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0250X | 48.64 | 46.93 | 225 | VC  | CIRC | 2305X | 49.26  | 47.39  | 150 | VC  | CIRC | 2305X  | 49.26  | 47.39  | 150 | VC  | CIRC | 2305X | 49.26  | 47.39  | 150 | VC  | CIRC | 2305X    | 49.26  | 47.39  | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0301X | 48.17 | 45.98 | 150 | VC  | CIRC | 2306X |        |        | UNK | UNK | CIRC | 2306X  |        |        | UNK | UNK | CIRC | 2306X |        |        | UNK | UNK | CIRC | 2306X    |        |        | UNK | UNK | CIRC |       |  |  |  |  |  |
| 0302X | 47.65 | 44.75 | 225 | VC  | CIRC | 2307X |        |        | UNK | UNK | CIRC | 2307X  |        |        | UNK | UNK | CIRC | 2307X |        |        | UNK | UNK | CIRC | 2307X    |        |        | UNK | UNK | CIRC |       |  |  |  |  |  |
| 0303X | 47.41 | 44.79 | 225 | VC  | CIRC | 2350Y | 51.07  | 50.42  | 150 | VC  | CIRC | 2350Y  | 51.07  | 50.42  | 150 | VC  | CIRC | 2350Y | 51.07  | 50.42  | 150 | VC  | CIRC | 2350Y    | 51.07  | 50.42  | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0304Y | 46.71 | 45.1  | 225 | VC  | CIRC | 2350X | 51.07  | 50.4   | 150 | VC  | CIRC | 2350X  | 51.07  | 50.4   | 150 | VC  | CIRC | 2350X | 51.07  | 50.4   | 150 | VC  | CIRC | 2350X    | 51.07  | 50.4   | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0304X | 46.71 | 45.05 | 225 | VC  | CIRC | 2351X | 51.33  | 50.74  | 100 | VC  | CIRC | 2351X  | 51.33  | 50.74  | 100 | VC  | CIRC | 2351X | 51.33  | 50.74  | 100 | VC  | CIRC | 2351X    | 51.33  | 50.74  | 100 | VC  | CIRC |       |  |  |  |  |  |
| 0305X | 46.6  | 45.45 | 150 | VC  | CIRC | 2352X | 51.17  | 49.83  | 225 | CP  | CIRC | 2352X  | 51.17  | 49.83  | 225 | CP  | CIRC | 2352X | 51.17  | 49.83  | 225 | CP  | CIRC | 2352X    | 51.17  | 49.83  | 225 | CP  | CIRC |       |  |  |  |  |  |
| 0306X | 47.45 | 45.86 | 150 | VC  | CIRC | 2358X | 49.5   | 48.064 | 225 | VC  | CIRC | 2358X  | 49.5   | 48.064 | 225 | VC  | CIRC | 2358X | 49.5   | 48.064 | 225 | VC  | CIRC | 2358X    | 49.5   | 48.064 | 225 | VC  | CIRC |       |  |  |  |  |  |
| 0307X | 47.66 | 46.7  | 150 | VC  | CIRC | 2401X | 52.98  | 50.63  | 225 | VC  | CIRC | 2401X  | 52.98  | 50.63  | 225 | VC  | CIRC | 2401X | 52.98  | 50.63  | 225 | VC  | CIRC | 2401X    | 52.98  | 50.63  | 225 | VC  | CIRC |       |  |  |  |  |  |
| 0350X | 48.14 | 46.5  | 300 | CP  | CIRC | 2402X |        |        | UNK | UNK | CIRC | 2402X  |        |        | UNK | UNK | CIRC | 2402X |        |        | UNK | UNK | CIRC | 2402X    |        |        | UNK | UNK | CIRC |       |  |  |  |  |  |
| 0351X | 47.38 | 46.64 | 150 | VC  | CIRC | 2450X | 53.24  | 51.17  | 225 | CP  | CIRC | 2450X  | 53.24  | 51.17  | 225 | CP  | CIRC | 2450X | 53.24  | 51.17  | 225 | CP  | CIRC | 2450X    | 53.24  | 51.17  | 225 | CP  | CIRC |       |  |  |  |  |  |
| 0352X | 47.11 | 46    | 150 | VC  | CIRC | 2451X | 52.81  | 52.15  | 225 | CP  | CIRC | 2451X  | 52.81  | 52.15  | 225 | CP  | CIRC | 2451X | 52.81  | 52.15  | 225 | CP  | CIRC | 2451X    | 52.81  | 52.15  | 225 | CP  | CIRC |       |  |  |  |  |  |
| 0353X | 46.59 | 45.74 | 150 | VC  | CIRC | 2452X | 52.514 | 52.064 | UNK | UNK | CIRC | 2452X  | 52.514 | 52.064 | UNK | UNK | CIRC | 2452X | 52.514 | 52.064 | UNK | UNK | CIRC | 2452X    | 52.514 | 52.064 | UNK | UNK | CIRC |       |  |  |  |  |  |
| 0354X | 46.44 | 45.65 | 150 | VC  | CIRC | 2456X | 52.51  |        | 225 | CP  | CIRC | 2456X  | 52.51  |        | 225 | CP  | CIRC | 2456X | 52.51  |        | 225 | CP  | CIRC | 2456X    | 52.51  |        | 225 | CP  | CIRC |       |  |  |  |  |  |
| 0355X | 46.44 | 45.35 | 150 | VC  | CIRC | 3303X | 50.3   | 49.36  | 150 | VC  | CIRC | 3303X  | 50.3   | 49.36  | 150 | VC  | CIRC | 3303X | 50.3   | 49.36  | 150 | VC  | CIRC | 3303X    | 50.3   | 49.36  | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0356X | 46.41 | 44.89 | 150 | VC  | CIRC | 3305X | 50.715 | 49.2   | 150 | VC  | CIRC | 3305X  | 50.715 | 49.2   | 150 | VC  | CIRC | 3305X | 50.715 | 49.2   | 150 | VC  | CIRC | 3305X    | 50.715 | 49.2   | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0358X | 46.46 | 42.81 | 225 | VC  | CIRC | 3306X | 50.76  | 49.03  | 150 | VC  | CIRC | 3306X  | 50.76  | 49.03  | 150 | VC  | CIRC | 3306X | 50.76  | 49.03  | 150 | VC  | CIRC | 3306X    | 50.76  | 49.03  | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0359X | 41.56 | 40.56 | 225 | VC  | CIRC | 3307X | 50.535 | 48.978 | 150 | VC  | CIRC | 3307X  | 50.535 | 48.978 | 150 | VC  | CIRC | 3307X | 50.535 | 48.978 | 150 | VC  | CIRC | 3307X    | 50.535 | 48.978 | 150 | VC  | CIRC |       |  |  |  |  |  |
| 0360X | 47.06 | 45.75 | 300 | CP  | CIRC | 3356X | 50.55  | 48.635 | 225 | VC  | CIRC | 3356X  | 50.55  | 48.635 | 225 | VC  | CIRC | 3356X | 50.55  | 48.635 | 225 | VC  | CIRC | 3356X    | 50.55  | 48.635 | 225 | VC  | CIRC |       |  |  |  |  |  |
| 0361X | 46.72 | 45.84 | 300 | CP  | CIRC | 340DX |        |        | 225 | VC  | CIRC | 340DX  |        |        | 225 | VC  | CIRC | 340DX |        |        | 225 | VC  | CIRC | 340DX    |        |        | 225 | VC  | CIRC |       |  |  |  |  |  |
| 0401X | 44.83 | 42.63 | 225 | VC  | CIRC | 3450X | 53.52  | 51.93  | 225 | CP  | CIRC | 3450X  | 53.52  | 51.93  | 225 | CP  | CIRC | 3450X | 53.52  | 51.93  | 225 | CP  | CIRC | 3450X    | 53.52  | 51.93  | 225 | CP  | CIRC |       |  |  |  |  |  |
| 040DX |       |       | 225 | VC  | CIRC | 8301X | 40.64  | 39.46  | 225 | VC  | CIRC | 8301X  | 40.64  | 39.46  | 225 | VC  | CIRC | 8301X | 40.64  | 39.46  | 225 | VC  | CIRC | 8301X    | 40.64  | 39.46  | 225 | VC  | CIRC |       |  |  |  |  |  |
| 041DX |       |       | UNK | UNK | CIRC | 8401X | 38.88  | 36.49  | 225 | VC  | CIRC | 8401X  | 38.88  | 36.49  | 225 | VC  | CIRC | 8401X | 38.88  | 36.49  | 225 | VC  | CIRC | 8401X    | 38.88  | 36.49  | 225 | VC  | CIRC |       |  |  |  |  |  |
| 0451X | 41.73 | 40.03 | 300 | CP  | CIRC | 8451X | 38.68  | 36.73  | 600 | CP  | CIRC | 8451X  | 38.68  | 36.73  | 600 | CP  | CIRC | 8451X | 38.68  | 36.73  | 600 | CP  | CIRC | 8451X    | 38.68  | 36.73  | 600 | CP  | CIRC |       |  |  |  |  |  |
| 0452X | 44.62 | 43.75 | 300 | CP  | CIRC | 8452X | 39.1   | 36.66  | 525 | CP  | CIRC | 8452X  | 39.1   | 36.66  | 525 | CP  | CIRC | 8452X | 39.1   | 36.66  | 525 | CP  | CIRC | 8452X    | 39.1   | 36.66  | 525 | CP  | CIRC |       |  |  |  |  |  |
| 053X  | 40.78 | 39.78 | 225 | VC  | CIRC | 8501X | 36.36  | 35     | 225 | VC  | CIRC | 8501X  | 36.36  | 35     | 225 | VC  | CIRC | 8501X | 36.36  | 35     | 225 | VC  | CIRC | 8501X    | 36.36  | 35     | 225 | VC  | CIRC |       |  |  |  |  |  |
| 051X  | 38.63 | 37.51 | 150 | VC  | CIRC | 8551X | 36.38  | 34.99  | 450 | CP  | CIRC | 8551X  | 36.38  | 34.99  | 450 | CP  | CIRC | 8551X | 36.38  | 34.99  | 450 | CP  | CIRC | 8551X    | 36.38  | 34.99  | 450 | CP  | CIRC |       |  |  |  |  |  |
| 0550X | 40.26 | 39.35 | 375 | CP  | CIRC | 8552X | 37.91  | 36.15  | 450 | CP  | CIRC | 8552X  | 37.91  | 36.15  | 450 | CP  | CIRC | 8552X | 37.91  | 36.15  | 450 | CP  | CIRC | 8552X    | 37.91  | 36.15  | 450 | CP  | CIRC |       |  |  |  |  |  |
| 0551X | 38.2  | 37.22 | 375 | CP  | CIRC | 9451X | 40.5   | 39.45  | 225 | CP  | CIRC | 9451X  | 40.5   | 39.45  | 225 | CP  | CIRC | 9451X | 40.5   | 39.45  | 225 | CP  | CIRC | 9451X    | 40.5   | 39.45  | 225 | CP  | CIRC |       |  |  |  |  |  |
| 0553X | 38.77 | 38.11 | 225 | CP  | CIRC | 9452X | 39.49  | 38.12  | 300 | CP  | CIRC | 9452X  | 39.49  | 38.12  | 300 | CP  | CIRC | 9452X | 39.49  | 38.12  | 300 | CP  | CIRC | 9452X    | 39.49  | 38.12  | 300 | CP  | CIRC |       |  |  |  |  |  |
| 1251X | 49.24 | 47.86 | 300 | CP  | CIRC | 9453X | 39.06  | 37.23  | 600 | CP  | CIRC | 9453X  | 39.06  | 37.23  | 600 | CP  | CIRC | 9453X | 39.06  | 37.23  | 600 | CP  | CIRC | 9453X    | 39.06  | 37.23  | 600 | CP  | CIRC |       |  |  |  |  |  |
| 1301X | 49.89 | 48.32 | 150 | VC  | CIRC | 9501X | 36.63  | 35.29  | 225 | VC  | CIRC | 9501X  | 36.63  | 35.29  | 225 | VC  | CIRC | 9501X | 36.63  | 35.29  | 225 | VC  | CIRC | 9501X    | 36.63  | 35.29  | 225 | VC  | CIRC |       |  |  |  |  |  |
| 1302X | 49.75 | 47.23 | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1303X | 49.56 | 48.31 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1304X | 49.31 | 47.53 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1304Y | 49.31 | 47.59 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1305X | 49.2  | 47.07 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1306X | 49.76 | 47.77 | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 130DX |       |       | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 131DX |       |       | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1354X | 49.67 | 48.75 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1355X | 49.79 | 48.45 | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1356X | 49.73 | 48.2  | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1360X | 49.54 | 47.84 | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1401X | 46.72 | 45.81 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1402X | 47.66 | 46.44 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1403X | 49.01 | 46.48 | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 140DX |       |       | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1450X | 46.13 | 45.18 | 225 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1451X | 46.59 | 45.64 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1452X | 47.91 | 46.65 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1453X | 48.21 | 47.37 | 150 | CP  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1454X | 48.72 |       | 300 | CP  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 1455X | 48.44 |       | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 2201X | 48.64 | 47.17 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 2203X | 49.11 | 46.72 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 2204X | 48.3  | 45.1  | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 2207Y |       |       | 100 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 08X   |       |       | UNK | UNK |      |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |
| 09X   | 48.38 | 47.01 | 150 | VC  | CIRC |       |        |        |     |     |      |        |        |        |     |     |      |       |        |        |     |     |      |          |        |        |     |     |      |       |  |  |  |  |  |

[illegible]

|           |              |
|-----------|--------------|
| Drawn by: | m            |
| Title:    | 11 St George |
| Date:     | 0            |

|         |                                                                                       |
|---------|---------------------------------------------------------------------------------------|
| ndaln   |  |
| s Walk  |                                                                                       |
| 05/2015 |                                                                                       |

Drawn by: mondaln

Title: 11 St Georges Walk

Date: 08/05/2015



## **APPENDIX 2**

### **Calculations for Surface Water Drainage**



# RUSHBY BREWSTER

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

The Town House  
St George's Square  
Bishops Waltham  
Southampton SO32 1AF  
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## CALCULATIONS

|           |                                    |          |         |          |        |
|-----------|------------------------------------|----------|---------|----------|--------|
| Job Title | ST GEORGE'S WALIC<br>WATERLOOVILLE | Job No.  | PMC 222 | Sht. No. | P1     |
| Element   | SURFACE WATER DRAINAGE             | Prepared | PR      | Date     | NOV'15 |

### SITE STATISTICS.

SITE AREA  $710 \text{ m}^2$

PRE-DEVELOPMENT SITE IMPERMEABLE AREA =  $655 \text{ m}^2$

POST-DEVELOPMENT SITE IMPERMEABLE AREA =  $389 \text{ m}^2$

CALCULATE SURFACE WATER RUN-OFF FOR POST-DEVELOPMENT SITE FOR 1 IN 100 YEAR STORM + 30% CLIMATE CHANGE

EFFECTIVE IMPERMEABLE AREA =  $389 \times 1.3 = 505 \text{ m}^2$

SEE SPREADSHEETS FOR RUN-OFF CALCULATIONS.

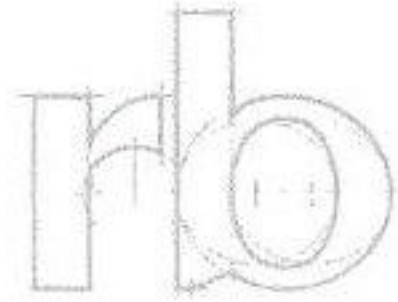
LIMIT OFF SITE FLOW FOR POST DEVELOPMENT SITE TO 1 IN 1 YEAR PRE-DEVELOPMENT RATE.

FROM SPREADSHEET  $= 9.6 \text{ L/s}$ .

LIMIT RUNOFF TO  $9.6 \text{ L/s}$ .

FROM SPREADSHEET ATTENUATION REQUIRED =  $4.29 \text{ m}^3$

PROVIDE  $4.5 \text{ m}^3$  STORAGE



# RUSHBY BREWSTER

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Bishops Waltham, Southampton  
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Telephone: 01489 890004  
Facsimile: 01489 890005

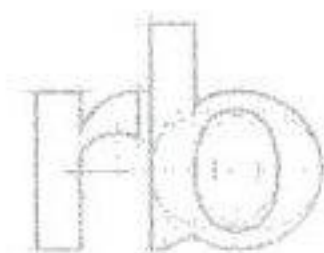
|           |                                 |          |        |          |    |
|-----------|---------------------------------|----------|--------|----------|----|
| Job Title | ST. GEORGE'S WALK WATERLOOVILLE | Job No.  | PMC229 | Sht. No. | D2 |
|           | PRE-DEVELOPMENT SITE            | Prepared | AWR    | Date     |    |
|           | DESIGN RAINFALL RATES           | Checked  |        | Date     |    |

Impermeable Area = 655 m<sup>2</sup>

| Storm Duration | M5 Rainfall<br>mm | 1 in 1 year |                |                    |                  |                               | 1 in 100 year |                |                    |                  |                               |
|----------------|-------------------|-------------|----------------|--------------------|------------------|-------------------------------|---------------|----------------|--------------------|------------------|-------------------------------|
|                |                   | Z2          | Rainfall<br>mm | Intensity<br>mm/hr | SW Runoff<br>l/s | Runoff vol.<br>m <sup>3</sup> | Z2            | Rainfall<br>mm | Intensity<br>mm/hr | SW Runoff<br>l/s | Runoff vol.<br>m <sup>3</sup> |
| 5 min          | 7.1               | 0.62        | 4.4            | 52.8               | 9.61             | 2.88                          | 1.84          | 13.1           | 156.8              | 28.52            | 8.56                          |
| 10 min         | 10.1              | 0.61        | 6.2            | 37.0               | 6.73             | 4.04                          | 1.91          | 19.3           | 115.7              | 21.06            | 12.64                         |
| 15 min         | 12.3              | 0.61        | 7.5            | 30.0               | 5.46             | 4.91                          | 1.95          | 24.0           | 95.9               | 17.46            | 15.71                         |
| 30 min         | 15.7              | 0.62        | 9.7            | 19.5               | 3.54             | 6.38                          | 2.00          | 31.4           | 62.8               | 11.43            | 20.57                         |
| 1 hr           | 20.0              | 0.64        | 12.8           | 12.8               | 2.33             | 8.38                          | 2.03          | 40.6           | 40.6               | 7.39             | 26.59                         |
| 2 hrs          | 24.5              | 0.66        | 16.2           | 8.1                | 1.47             | 10.59                         | 2.01          | 49.2           | 24.6               | 4.48             | 32.26                         |
| 4 hrs          | 29.9              | 0.68        | 20.3           | 5.1                | 0.92             | 13.32                         | 1.97          | 58.9           | 14.7               | 2.68             | 38.58                         |
| 6 hrs          | 33.8              | 0.69        | 23.3           | 3.9                | 0.71             | 15.28                         | 1.94          | 65.6           | 10.9               | 1.99             | 42.95                         |
| 10 hrs         | 38.9              | 0.70        | 27.2           | 2.7                | 0.50             | 17.84                         | 1.90          | 73.9           | 7.4                | 1.34             | 48.41                         |
| 24 hrs         | 49.6              | 0.72        | 35.7           | 1.5                | 0.27             | 23.39                         | 1.81          | 89.8           | 3.7                | 0.68             | 58.80                         |

Ratio of 60 minute to 2 day rainfalls for 5 year return period r = 0.35

M5 rainfalls are calculated from Table 1 BRE Digest 365 using Factor Z1



|           |                                 |          |        |          |       |
|-----------|---------------------------------|----------|--------|----------|-------|
| Job Title | ST GEORGE'S WALK, WATERLOOVILLE | Job No.  | PMC222 | Sht. No. | DS    |
|           | POST DEVELOPMENT SITE           | Prepared | AWR    | Date     | 11/15 |
|           | DESIGN RAINFALL RATES           | Checked  | CH     | Date     |       |

Impermeable Area = 505 m<sup>2</sup>      389 x 1.3 = 505 i.e. +30% for climate change

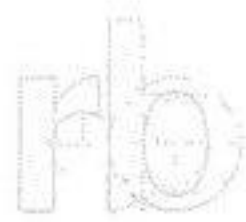
Runoff Limit  
9

| Storm Duration | M5 Rainfall<br>mm | 1 in 1 year |                |                    |                  |                               | 1 in 100 year |                |                    |                  |                               |
|----------------|-------------------|-------------|----------------|--------------------|------------------|-------------------------------|---------------|----------------|--------------------|------------------|-------------------------------|
|                |                   | Z2          | Rainfall<br>mm | Intensity<br>mm/hr | SW Runoff<br>l/s | Runoff vol.<br>m <sup>3</sup> | Z2            | Rainfall<br>mm | Intensity<br>mm/hr | SW Runoff<br>l/s | Runoff vol.<br>m <sup>3</sup> |
| 5 min          | 7.1               | 0.62        | 4.4            | 52.8               | 7.41             | 2.22                          | 1.83          | 13.0           | 155.9              | 21.87            | 6.56                          |
| 10 min         | 10.1              | 0.61        | 6.2            | 37.0               | 5.19             | 3.11                          | 1.90          | 19.2           | 115.1              | 16.15            | 9.69                          |
| 15 min         | 12.3              | 0.61        | 7.5            | 30.0               | 4.21             | 3.79                          | 1.94          | 23.9           | 95.4               | 13.39            | 12.05                         |
| 30 min         | 15.7              | 0.62        | 9.7            | 19.5               | 2.73             | 4.92                          | 1.99          | 31.2           | 62.5               | 8.77             | 15.78                         |
| 1 hr           | 20.0              | 0.64        | 12.8           | 12.8               | 1.80             | 6.46                          | 2.02          | 40.4           | 40.4               | 5.67             | 20.40                         |
| 2 hrs          | 24.5              | 0.65        | 15.9           | 8.0                | 1.12             | 8.04                          | 2.02          | 49.5           | 24.7               | 3.47             | 24.99                         |
| 4 hrs          | 29.9              | 0.67        | 20.0           | 5.0                | 0.70             | 10.12                         | 1.98          | 59.2           | 14.8               | 2.08             | 29.90                         |
| 6 hrs          | 33.8              | 0.68        | 23.0           | 3.8                | 0.54             | 11.61                         | 1.95          | 65.9           | 11.0               | 1.54             | 33.28                         |
| 10 hrs         | 38.9              | 0.70        | 27.2           | 2.7                | 0.38             | 13.75                         | 1.91          | 74.3           | 7.4                | 1.04             | 37.52                         |
| 24 hrs         | 49.6              | 0.71        | 35.2           | 1.5                | 0.21             | 17.78                         | 1.83          | 90.8           | 3.8                | 0.53             | 45.84                         |

| Attenuation               |                                |
|---------------------------|--------------------------------|
| Outflow<br>m <sup>3</sup> | Storage Rq'd<br>m <sup>3</sup> |
| 3                         | 3.86                           |
| 5                         | 4.29                           |
| 8                         | 3.95                           |
| 16                        | -0.42                          |
| 32                        | -12.00                         |
| 65                        | -39.81                         |
| 130                       | -99.70                         |
| 194                       | -161.12                        |
| 324                       | -286.48                        |
| 778                       | -731.76                        |

Ratio of 60 minute to 2 day rainfalls for 5 year return period r = 0.35

M5 rainfalls are calculated from Table 1 BRE Digest 365 using Factor Z1



# CALCULATIONS

## RUSHBY BREWSTER

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

|           |                           |          |         |          |        |
|-----------|---------------------------|----------|---------|----------|--------|
| Job Title | ST GEORGE'S WALL          | Job No.  | PMC 222 | Sht. No. | P4     |
| Element   | PERMEABLE PAVEMENT DESIGN | Prepared | NR      | Date     | NOV'15 |
|           |                           | Checked  |         | Date     |        |

DESIGN TO CIRIA REPORT 150.

FROM GROUND INVESTIGATION REPORT.

$$\begin{aligned} \text{INFILTRATION RATE} &= 5 \times 10^{-6} \text{ m/s} \\ &= 0.018 \text{ m/h.} \end{aligned}$$

FROM TABLE 6 FACTOR OF SAFETY = 3.00

EFFECTIVE INFILTRATION RATE  $q = 0.006 \text{ m/h}$ .

PEROSITY OF SUB BASE TO PAVING = 30%  $\therefore n = 0.3$ .

$$A_D = A_B \therefore R = 1.$$

$h_{\text{max}} = \text{DEPTH OF FILL MATERIAL REQUIRED}$   $h_{\text{max}} = \frac{D}{n}(i - q)$

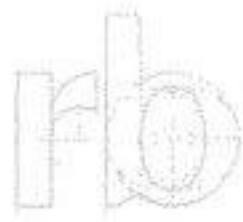
| DURATION<br>D(h) | INTENSITY<br>I (mm/h) | $h_{\text{max}}$ |
|------------------|-----------------------|------------------|
| 0.083            | 0.15                  | 0.04             |
| 0.167            | 0.11                  | 0.06             |
| 0.25             | 0.095                 | 0.08             |
| 0.50             | 0.063                 | 0.06             |
| 1.0              | 0.041                 | 0.12             |
| 2.0              | 0.025                 | 0.13             |
| 4.0              | 0.015                 | 0.13             |
| 6.0              | 0.011                 | 0.11             |
| 10.0             | 0.007                 | 0.06             |
| 24.0             | 0.003                 |                  |

MAX DEPTH OF FILL REQUIRED = 130 mm

ADD 30% FOR CLIMATE CHANGE  $130 \times 1.3 = 170 \text{ mm}$

DEPTH PROVIDED FOR STRUCTURAL PURPOSES = 350 mm

$$\text{ACTUAL FOS} = 3.0 \times \frac{350}{170} = \underline{\underline{6.0}}$$



## CALCULATIONS

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F: 01489 890005

|           |                         |          |         |          |         |
|-----------|-------------------------|----------|---------|----------|---------|
| Job Title | ST GEORGE'S WAY         | Job No.  | PMU 222 | Sht. No. | DS      |
| Element   | PERMEABLE PAVING DESIGN | Prepared | PN      | Date     | NOV '15 |
|           |                         | Checked  |         |          |         |
|           |                         | Date     |         |          |         |

TIME TAKEN TO HALF EMPTY

$$= \frac{n \cdot h \cdot m \cdot c}{q}$$

$$= \frac{0.3 \times 0.113}{2 \times 0.006} = 3.25 \text{ HRS} \quad \text{! OK}$$

USE 350 DEPTH OF SUB-BASE

## APPENDIX 3

### Extracts from Ground Investigation

#### 4.0 ENCOUNTERED CONDITIONS

A factual record of the conditions encountered during the physical investigation of the site is presented in the following sections.

For further details of the ground conditions, reference should be made to the exploratory hole logs presented in Appendix B, the ground gas assessment presented in Appendix C, the geotechnical testing results in Appendix D and geochemical testing results in Appendix E.

Unless stated otherwise, all depths are reported as metres below ground level (m bgl).

#### 4.1 Soils

The ground conditions encountered were broadly consistent with those anticipated from the desk study, i.e. with a succession of Made Ground overlying sandy silty clays of the London Clay. The ground conditions are summarised in Table 4.1.

| Top<br>(m bgl) | Base<br>(m bgl) | Description                                                                                                                                                                   |
|----------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0              | 0.45 – 0.55     | MADE GROUND: Tarmacadam over concrete with dark reddish brown very sandy fine to coarse angular to very angular gravel. Gravels are of brick, concrete, flint, chalk and ash. |
| 0.45 – 0.55    | 4.0             | LONDON CLAY: Soft to very stiff dark greyish brown silty CLAY with frequent pockets of orange fine sand and bands of very sandy silty CLAY.                                   |

Table 4.1 Summary of Ground Conditions

Whilst no organoleptic evidence of contamination was identified during the logging/description process, the recovered soils were sampled for laboratory analysis to clarify the PRA and site observations.

#### 4.2 Groundwater

Groundwater was encountered within several of the exploratory hole locations (WS1, WS2, WS4 and WS5) during the course of the intrusive investigation at depths ranging from 2.90m to 3.20m bgl.

On completion, one groundwater monitoring standpipe was installed within WS5. Groundwater levels were monitored on two subsequent occasions at fortnightly intervals during June 2015, with depths of between 3.0m and 3.1m bgl being recorded.

It should also be noted that changes in groundwater levels do occur for a number of reasons including seasonal effects and variations in drainage. Such fluctuations may only be recorded by the measurement of the groundwater level within a series of standpipes or piezometers installed within appropriate response zones.

### 4.3 Obstructions

No further progress was possible with the window sampler within WS3 due to a thick concrete layer obstruction at 0.55m which prevented further drilling. As a result, a second hole (WS3A) was drilled adjacent to WS3, although the same obstruction was noted at a depth of 0.55m. Consequently no further drilling was possible at this location.

### 4.4 Ground Gases and Vapours

Ground gas monitoring was undertaken on two separate occasions as part of the investigation works within the monitoring standpipe installed within WS5.

During the monitoring, methane and carbon dioxide were not found to be present. Oxygen was present in the range of 19.1 – 20.6% v/v. A flow rate of 0.0 l/hr was detected during the monitoring. Atmospheric pressure was recorded at 1012mb on both occasions.

On the basis of the ground gas assessment and supported by the data presented in Appendix D, it is considered that the site's gassing regime is representative of Characteristic Situation 1 (BS8485 and CIRIA) and Green (NHBC) for which no gas protection measures would be required.

### 4.5 Chemical Analysis

In order to assess the general chemical quality of the strata encountered, samples of soils recovered from the exploratory holes were submitted for analysis for a range of potential contaminants selected on the basis of the findings of the desk study and supported by CLR publication CLR8 and Environment Agency R&D66 publication.

The testing rationale included sampling and analysis to provide a general coverage from the exploratory hole locations. Testing was undertaken for a broad range of commonly occurring contaminants including metals, metalloids, inorganic compounds, speciated TPH, PAH and asbestos.

### 4.6 Geotechnical Testing

Geotechnical laboratory tests were undertaken on selected samples encountered within the exploratory holes. The results are summarised in Table 4.2 and test results are presented in Appendix D.

| Parameter                     | Stratum     |
|-------------------------------|-------------|
|                               | London Clay |
| Moisture Content (%)          | 24 – 29     |
| Liquid Limit (%)              | 52 – 64     |
| Plastic Limit (%)             | 20 – 25     |
| Plasticity Index (%)          | 29 – 40     |
| Modified Plasticity Index (%) | 28.5 – 40   |
| pH                            | 7.51 – 7.67 |
| Water soluble sulphate (g/l)  | 0.07 – 0.25 |

NOTE: Modified plasticity index is defined in NHBC Standards Chapter 4.2

**Table 4.2 Summary of Geotechnical Laboratory Test Results**

Seven Atterberg Limits and an additional three moisture content tests were undertaken on samples of



the London Clay. The results indicated Plasticity Indices of 29 to 40, with a corresponding Moisture Content of 24% to 29% and calculated Modified Plasticity Indices of 28.5 to 40. The results shown on the Plasticity Chart suggest clays of high plasticity and of Medium volume change as defined by the NHBC Standards Chapter 4.2.

A laboratory CBR test was undertaken on a bulk sample of soil taken from shallow depth from WS3. The results indicated the sample tested to have an average CBR value of 4.2%.

Two pH and water soluble sulphate determinations were undertaken on samples recovered from the intrusive locations. The results indicate pH values of between pH7.5 and pH7.6 with corresponding water soluble sulphate concentrations ranging from 0.07g/l to 0.25g/l.

## 5.0 ENGINEERING CONSIDERATIONS

Subsequent to intrusive investigation of the site and receipt of the laboratory test results, the following geotechnical assessments have been made.

### 5.1 Foundations

The ground and groundwater conditions encountered within the boreholes are considered suitable for the use of conventional trench fill, isolated pad or strip footings. All foundations should be taken through any Made Ground or Disturbed Ground and bear wholly into or onto the London Clay Formation.

The results of the geotechnical tests indicate the more cohesive parts of the London Clay to be classified *en masse* as Medium Volume Change potential in accordance with the NHBC Standards, Chapter 4.2. Any new foundations should be taken to a minimum founding depth of 0.90m below existing or proposed final ground level and deepening will be required in the vicinity of trees, in accordance with the requirements of the NHBC Standards Chapter 4.2.

An allowable bearing value of 125kPa is considered appropriate for conventional trench fill, strip or pad foundations taken down through any Made Ground or Disturbed Ground and bear wholly into or onto the London Clay Formation. Under the above loadings, settlements should remain within tolerable limits for the proposed construction.

The London Clay Formation will soften rapidly if exposed to free water and foundation bases should be concreted or blinded as soon as possible after excavation.

### 5.2 Floor Slabs

Suspended floor slabs are recommended for this development due to the presence of shrinkable soils at shallow depth and the thickness of Made Ground across the site.

### 5.3 Excavations

Shallow excavations within the Made Ground should remain stable in the short term. Deeper excavations into the Made Ground may prove unstable in the short term especially where loose granular pockets and any perched water seepages are encountered. Some form of trench support and dewatering may be required in such circumstances.

Both shallower and deeper excavations within the London Clay Formation should remain relatively stable in the short to medium term. However, in the case of deeper excavations, some localised instability may be encountered, particularly where excavations are left open for prolonged periods, or where water seepages within sandy partings are intercepted.

Where man entry is required into excavations, this should only be permitted where the appropriate risk assessments have been undertaken and the appropriate health and safety protection measures employed.

### 5.5 Sub-Surface Concrete

The results of the water soluble sulphate and pH analyses indicate that buried concrete should be designed in accordance with Class DS-1 of BRE Special Digest 1, with an ACEC class of AC-1s. The advice of this publication should be taken for the design and specification of all sub surface concrete.

### 5.6 Soakaways

Falling head soakage tests were undertaken within WS1 and WS4. Based on the relatively poor result, it is unlikely that conventional soakaways would perform satisfactorily on site, though full scale testing in accordance with BRE365 is recommended to confirm this assessment. The following infiltration rate was calculated from the results of the test:

- WS1  $5 \times 10^{-6}$  m/s
- WS4  $5 \times 10^{-6}$  m/s

### 5.7 Pavements

The Made Ground encountered across the site was noted to be of mixed composition. The engineering characteristics of such soils are variable and unpredictable and the CBR value of Made Ground does not predict the overall settlements that may occur in such materials. Due to the variability of the Made Ground it would be prudent to assume the material to be deemed frost susceptible throughout thus a minimum pavement thickness of 450mm would be appropriate.

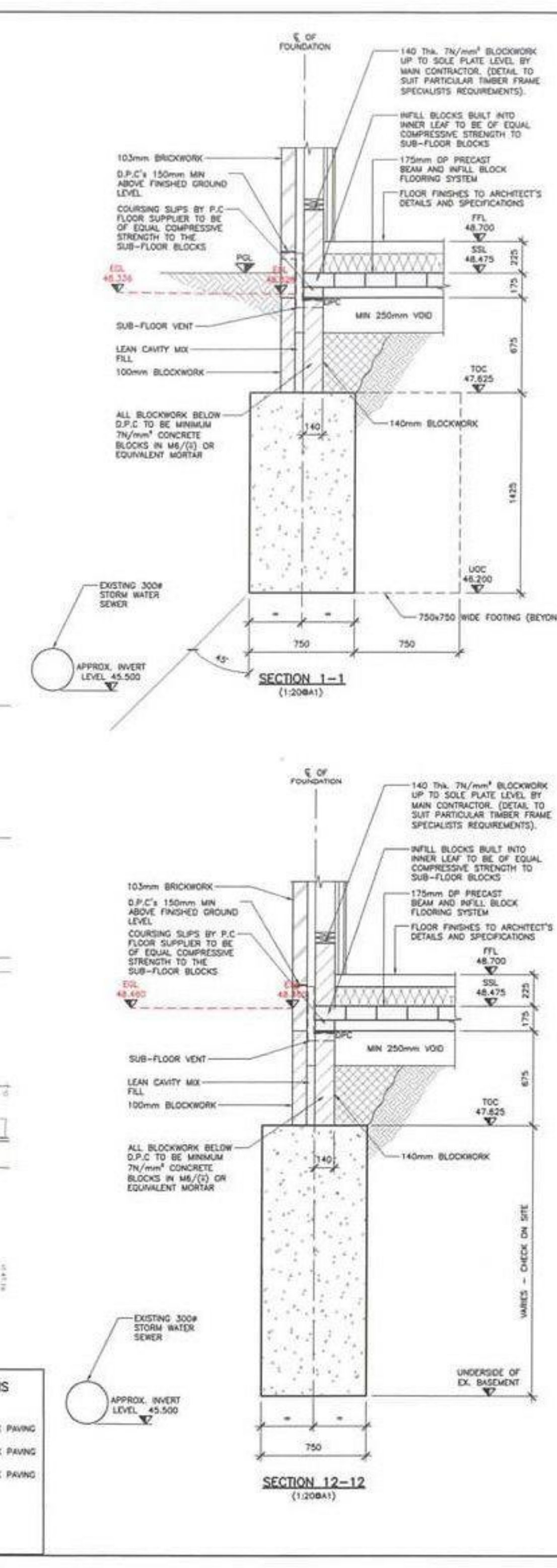
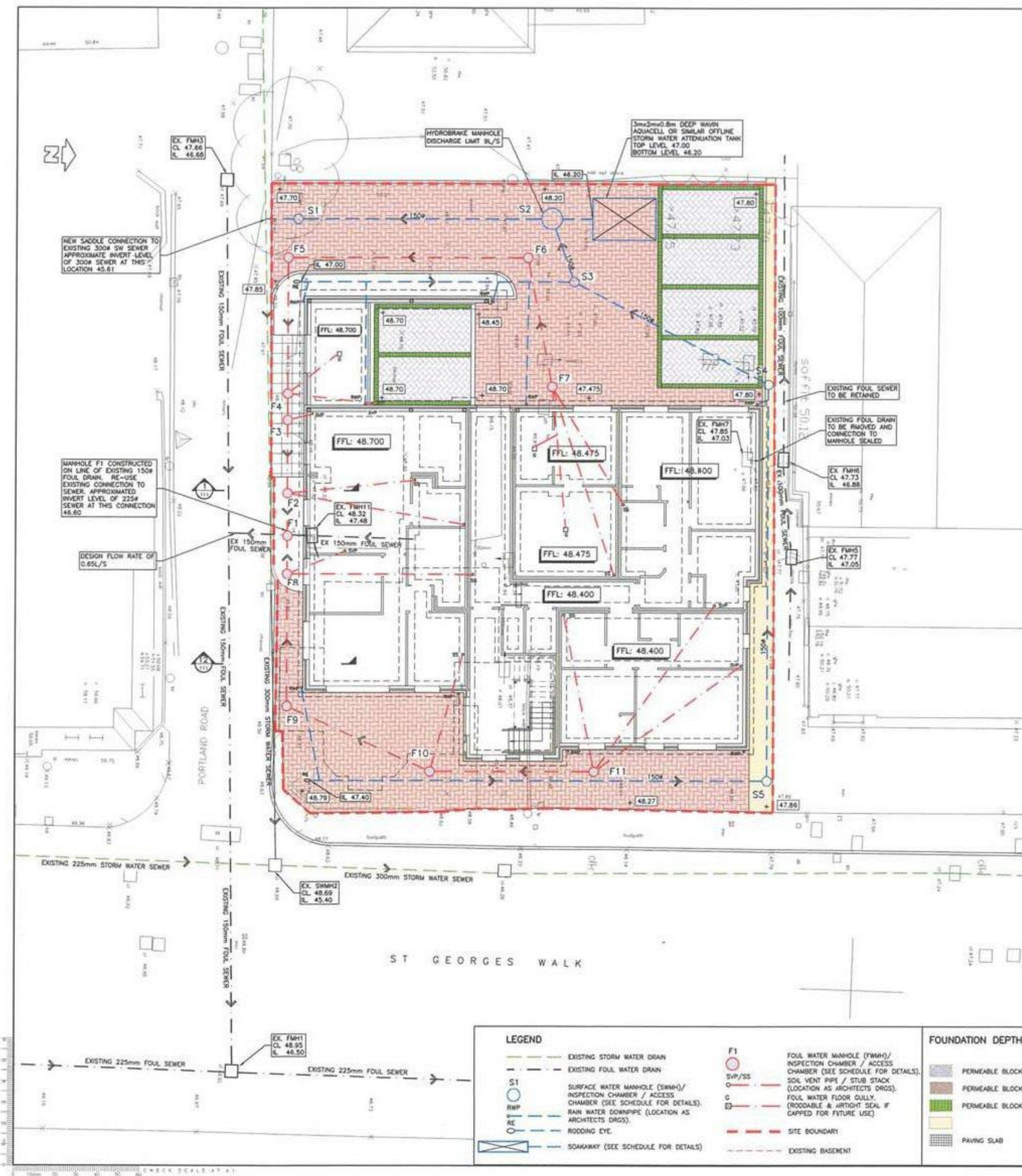
A laboratory CBR test was undertaken on a bulk sample of soil taken from shallow depth from WS3. The results indicated the sample tested to have an average CBR value of 4.2%.

Any hard or soft spots in the formation level may induce reflective cracking in the pavement and allowance should be made for removing hard spots that may be present. In addition, an allowance should be made for proof rolling coupled with excavation and replacement of soft spots.

## APPENDIX 4

### Drawings :

- a) PMC 222 - 501
- b) PMC 222 – 551
- c) PMC 222 – 552
- d) Topographical Survey
- e) Architect's Proposed Site Layout



**NOTES**

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND DETAILS.

2. ALL DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED DIMENSIONS.

3. ANY DISCREPANCIES BETWEEN THIS DRAWING AND OTHER INFORMATION IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF THE WORKS ON SITE.

4. THE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR THE SETTING OUT AND ACCURACY OF ALL DIMENSIONS. THE CONTRACTOR IS TO ENSURE THE STABILITY AND STRUCTURAL INTEGRITY OF THE EXISTING PROPERTY AT ALL TIMES DURING WORKS AND IS TO BE RESPONSIBLE FOR ALL PROPPING AND SHORING AS REQUIRED.

5. MAIN CONTRACTOR TO PROVIDE AND FIX SUITABLE BRACING AND PROPPING FOR ALL ELEMENTS IN THE TEMPORARY CONDITION DURING CONSTRUCTION STAGE, SUCH AS TO ENSURE STRUCTURE STABILITY AT ALL TIMES.

6. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY FOR ASCERTAINING SAFE DISPOSAL OF ANY OFF-SITE EXCAVATED SPOIL. NO CLAIM RESULTING FROM ABNORMAL TOP REQUIREMENTS WILL BE ENTERTAINED.

**CDM REGULATIONS 2015**

RUSHBY BREWSTER ASSOCIATES HAVE CONSIDERED AND, WHERE REASONABLY PRACTICABLE, ADDED FORESEEABLE RISKS IN THE PREPARATION OF THE DESIGN SHOWN ON THIS AND RELATED DRAWINGS. SIGNIFICANT RISKS WHICH REMAIN AND ASSOCIATED CONTROL MEASURES ARE IDENTIFIED BELOW AND SHOULD BE GIVEN PARTICULAR ATTENTION BY THE MAIN CONTRACTOR ON SITE.

| ACTIVITY | HAZARD | CONTROL |
|----------|--------|---------|
|          |        |         |

NOTE: THE ABOVE ASSESSMENT RECORDS ONLY THOSE ELEMENTS CONSIDERED UNUSUAL, DIFFICULT TO MANAGE OR OUTSIDE OF THE ANTICIPATED EXPERIENCE OF A COMPETENT CONTRACTOR.

**THIS DRAWING IS TO BE READ IN CONJUNCTION WITH DRAWING No. PMC222-551 & 552**

**COLOURED DRAWING**  
REQUEST A COLOURED COPY IF THIS STAMP IS NOT RED

| PI | Date     | Revision                      | By  |
|----|----------|-------------------------------|-----|
| P1 | 20/11/15 | PRELIMINARY ISSUE FOR COMMENT | PJM |

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**ace**  
PROJECT MANAGER

**PMC CONSTRUCTION**  
ARCHITECT

**KENN SCADDEN ASSOCIATES**  
PROJECT TEAM

**9-11 ST GEORGES WALK WATERLOOVILLE**

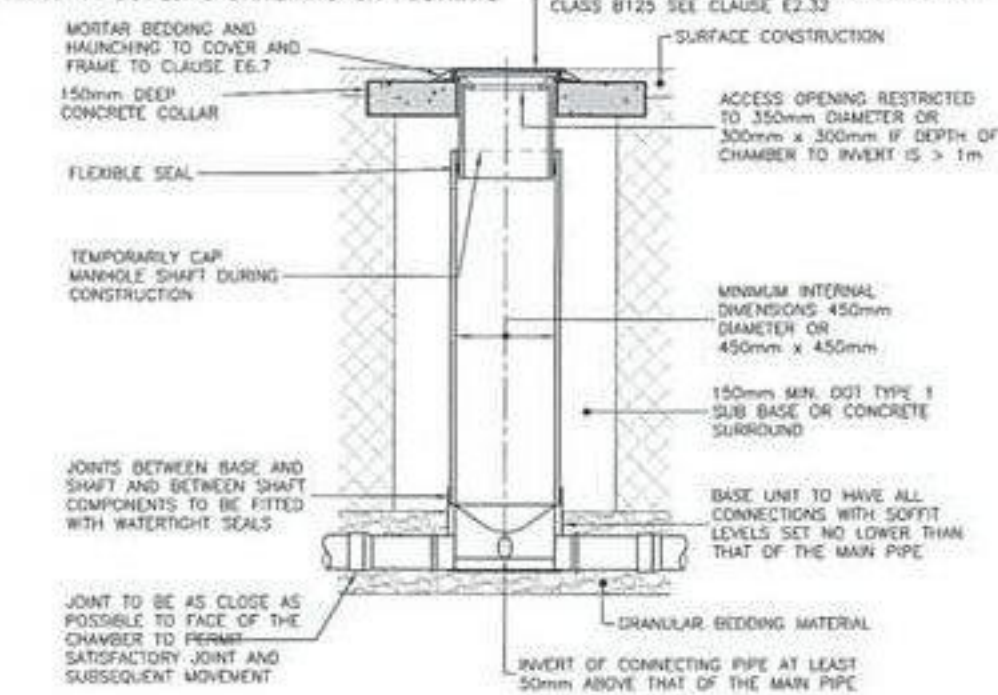
**DRAINAGE LAYOUT**

| Scale | Project No | Date      | Drawn By | Checked By |
|-------|------------|-----------|----------|------------|
| 1:100 | A1         | NOV. 2015 | PJM      | ARW        |

**PMC222 501**

PLASTIC CHAMBERS AND RINGS SHALL COMPLY WITH BS EN 1228-1 AND BS EN 1228-2 OR HAVE EQUIVALENT INDEPENDENT APPROVAL

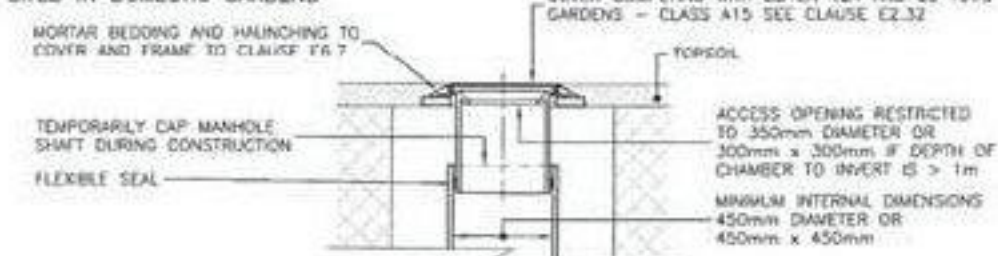
SITED IN DOMESTIC DRIVEWAYS OR FOOTWAYS



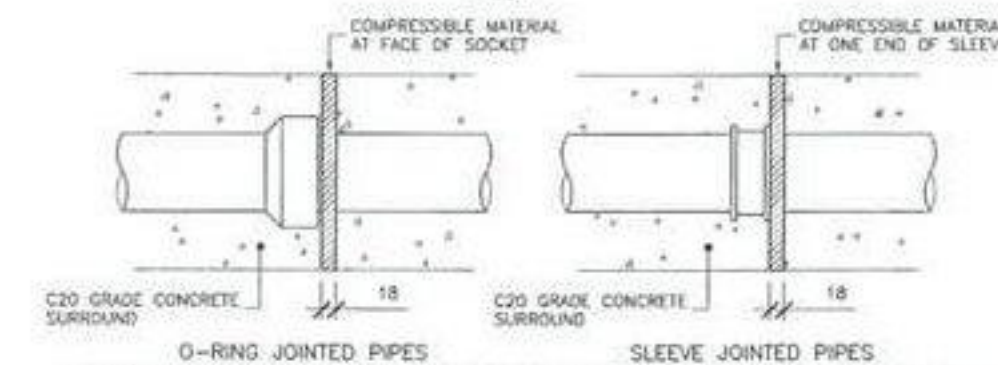
**TYPICAL ACCESS CHAMBER DETAIL - TYPE 3 (FLEXIBLE MATERIAL DETAIL)**

MAXIMUM DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE IN AREAS SUBJECT TO VEHICLE LOADING 3m, NON-ENTRY (1:25)

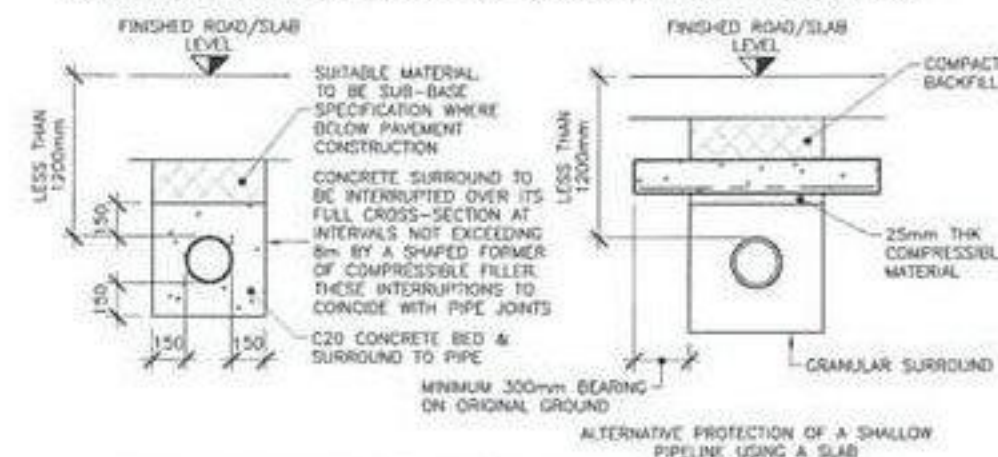
SITED IN DOMESTIC GARDENS



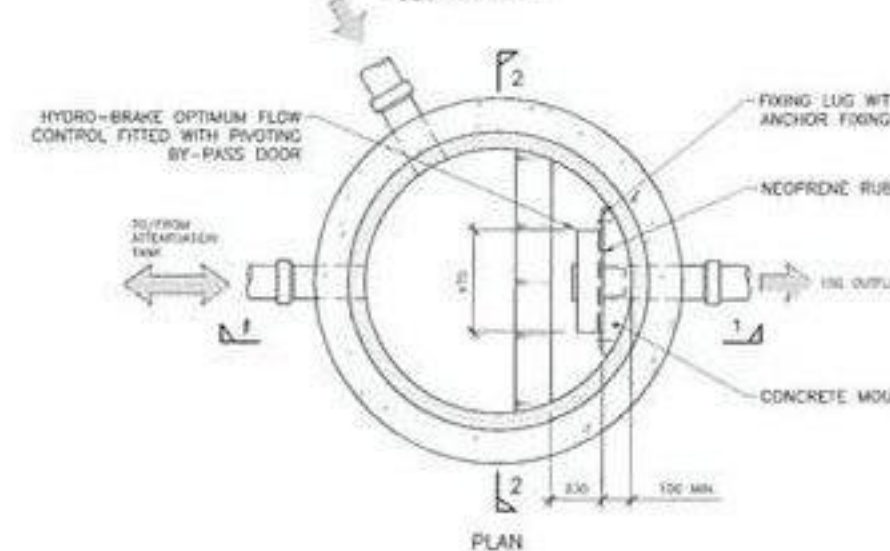
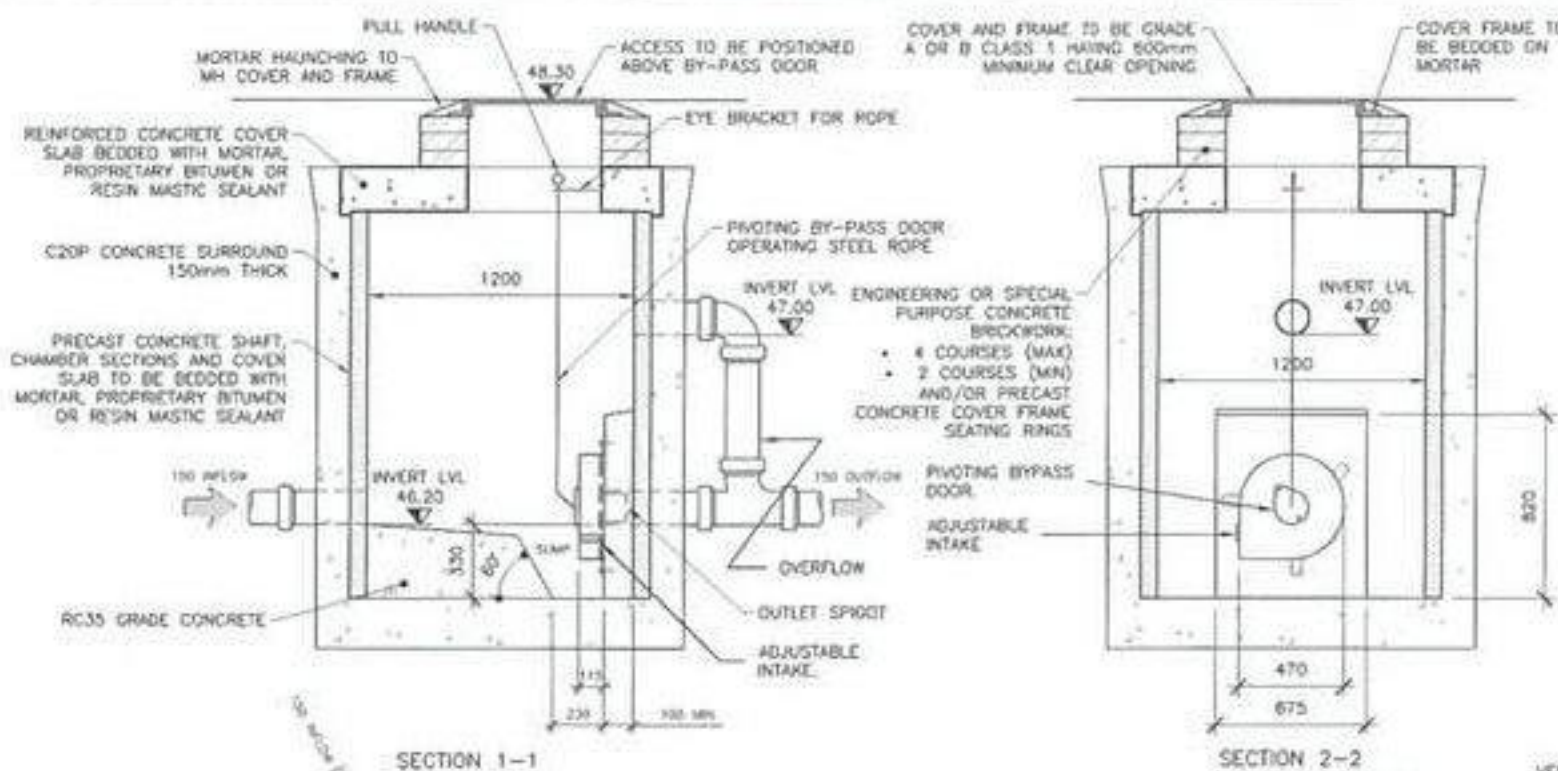
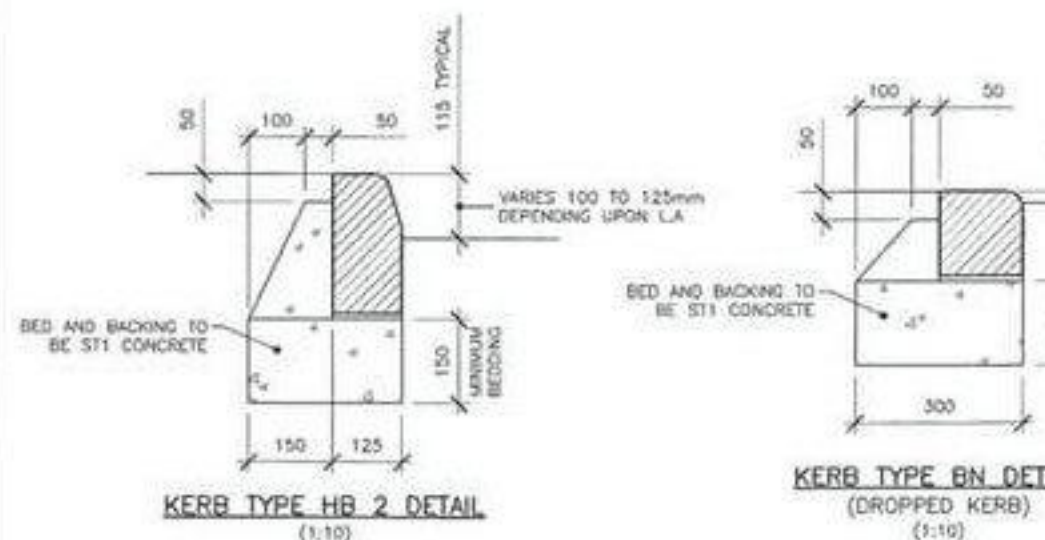
**ALTERNATIVE COVER DETAIL FOR LANDSCAPED AREAS - TYPE 3 (1:25)**



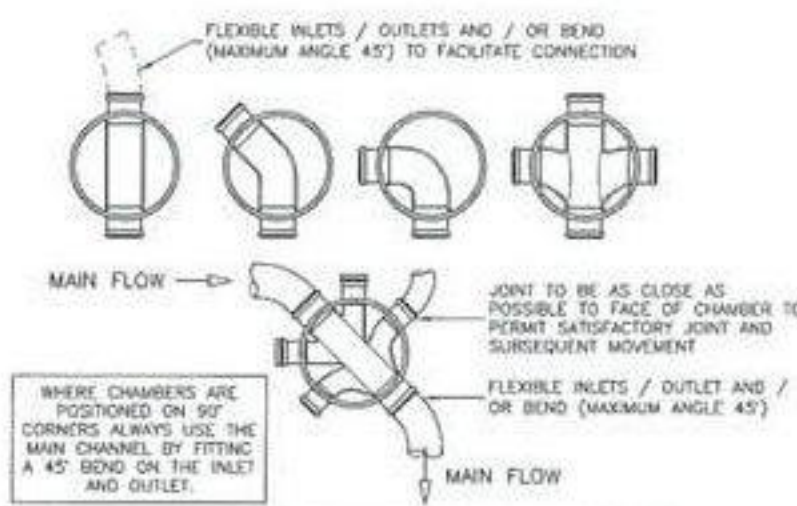
THE FLEXIBILITY OF A PIPELINE BEDDED ON, OR SURROUNDED WITH, CONCRETE SHOULD NORMALLY BE MAINTAINED BY THE PROVISION OF FLEXIBLE CONSTRUCTION JOINTS THROUGH THE CONCRETE AT PIPE JOINTS. THESE SHOULD BE MADE FROM BITUMEN IMPREGATED INSULATING BOARD COMPLYING WITH B.S. 1142 PART 3, OR OTHER EQUALLY COMPRESSIBLE FILLER MATERIAL SUCH AS EXPANDED POLYSTYRENE. THE BOARD SHOULD BE CUT TO FIT THE PIPES & PLACED AT THE FACE OF THE PIPE SOCKETS OR AT ONE END OF SLEEVE JOINTS. THE JOINT MATERIAL SHOULD BE AT LEAST 18mm THICK PLACED AT 50mm CENTRES MAX.



**PROTECTION TO PIPELINES WITH LESS THAN 1200mm COVER (1:25)**



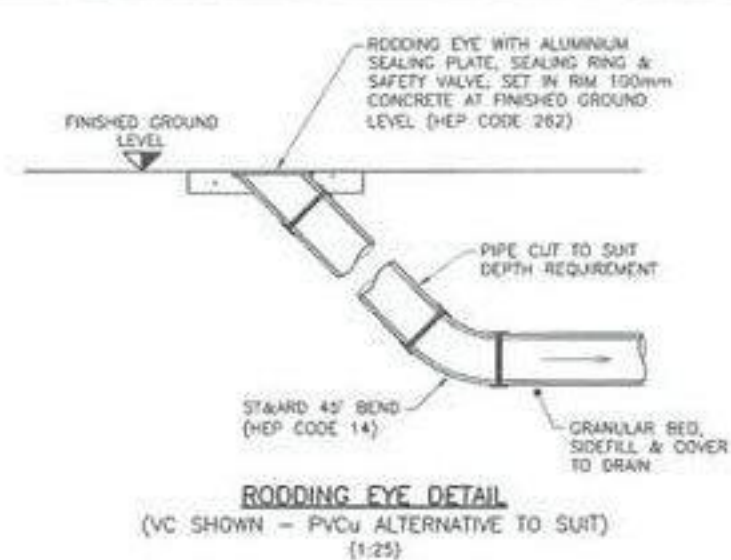
**STORM WATER ATTENUATION TANK W/AVN / OSMO 'AQUACELL' ATTENUATION INSTALLATION WITH VENT PIPE DETAIL (SCALE 1:25@A1)**



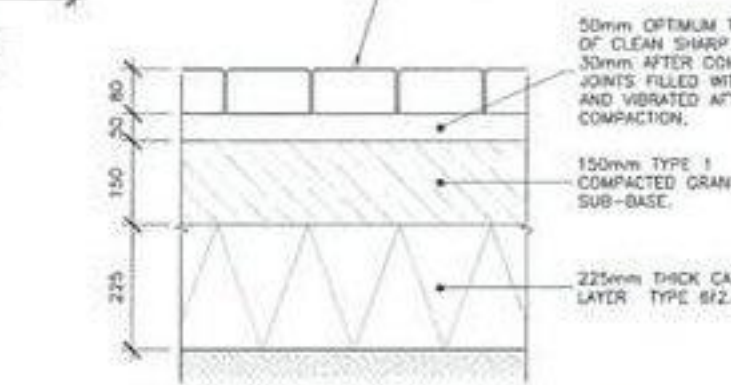
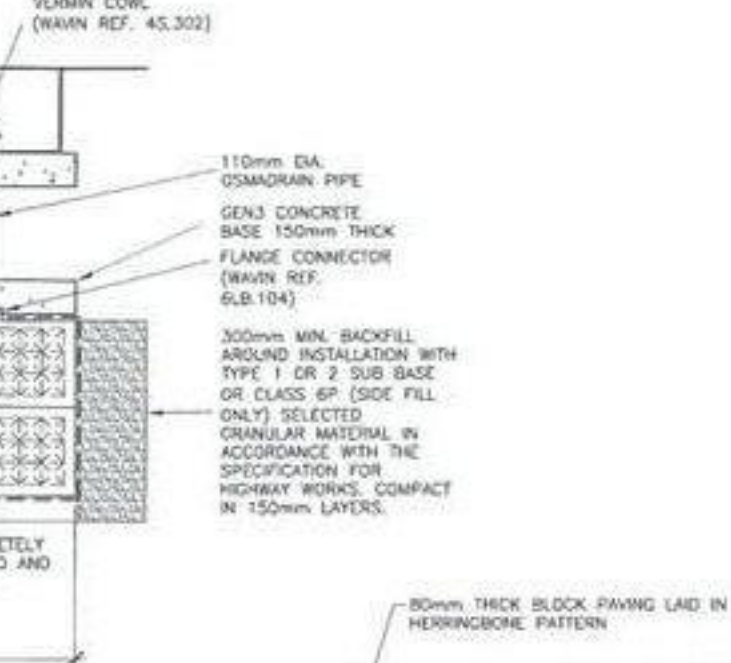
**ALTERNATIVE BASE LAYOUTS FOR TYPE 3 CHAMBERS (1:25)**

| NOMINAL BORE OF PIPE (mm) | SIZE (mm)    |         |
|---------------------------|--------------|---------|
|                           | SINGLE-SIZED | GRADED  |
| 100 & 150                 | 10           | -       |
| 225 & 300                 | 10 OR 20     | 20 TO 5 |
| 375 - 500                 | 20           | 20 TO 5 |

**PIPE BED & SURROUND DETAIL (CLASS S) (1:25)**



**ROADDING EYE DETAIL (VC SHOWN - Pvcu ALTERNATIVE TO SUIT) (1:25)**



**BIN STORE AREA CONSTRUCTION DETAIL (1:10@A1)**



**PARKING AREAS PERMEABLE BLOCK PAVING CONSTRUCTION DETAIL (1:10@A1)**

**GENERAL NOTES**

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND DETAILS.
- ALL FIGURED DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED DIMENSIONS.
- ANY DISCREPANCIES BETWEEN THIS DRAWING AND OTHER INFORMATION IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF THE WORKS ON SITE.
- THE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR THE SETTING OUT AND ACCURACY OF ALL DIMENSIONS. THE CONTRACTOR IS TO ENSURE THE STABILITY AND STRUCTURAL INTEGRITY OF THE EXISTING PROPERTY AT ALL TIMES DURING WORKS AND IS TO BE RESPONSIBLE FOR ALL PROPPING AND SHORING AS REQUIRED.
- MAIN CONTRACTOR TO PROVIDE AND FIX SUITABLE BRACING AND PROPPING FOR ALL ELEMENTS IN THE TEMPORARY CONDITION DURING CONSTRUCTION STAGE, SUCH AS TO ENSURE STRUCTURE STABILITY AT ALL TIMES.
- IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY FOR ASCERTAINING SAFE DISPOSAL OF ANY OFF-SITE EXCAVATED SPILL. NO CLAIM RESULTING FROM AERIAL TYP. REQUIREMENTS WILL BE ENTERTAINED.

**CDM REGULATIONS 2015**

ALPHABETICALLY BY ACTIVITY NAME, CONSIDERED AND, WHERE REASONABLY PRACTICABLE, INDICATED CONSIDERABLE RISK IN THE PREPARATION OF THE DESIGN SHOWN IN THIS AND RELATED DRAWINGS. SIGNIFICANT RISKS WHICH REMAIN AND ASSOCIATED CONTROL MEASURES ARE IDENTIFIED BELOW AND SHOULD BE GIVEN PARTICULAR ATTENTION BY THE MAIN CONTRACTOR ON SITE.

| ACTIVITY | HAZARD | CONTROL |
|----------|--------|---------|
|          |        |         |

NOTE: THE ABOVE ASSESSMENT RECORDS ONLY THOSE ELEMENTS CONSIDERED UNUSUAL, DIFFICULT TO MANAGE OR OUTSIDE OF THE ANTICIPATED COVERAGE OF A COMPETENT CONTRACTOR

**RUSHBY BREWSTER**  
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Construction Engineering & Surveying

ISO 9001  
ISO 14001

**PMC CONSTRUCTION**

Author: KENN SCADDEN ASSOCIATES

Project Title: 9-11 ST GEORGES WALK WATERLOOVILLE

**DRAINAGE DETAILS SHEET 1**

|                 |              |                 |            |            |
|-----------------|--------------|-----------------|------------|------------|
| Scale: AS SHOWN | Page Set: A1 | Date: NOV. 2015 | Drawn: PJM | Check: ARW |
|-----------------|--------------|-----------------|------------|------------|

Project No: PMC222

Drawing No: 551

| OPERATION AND MAINTENANCE REQUIREMENTS FOR PERMEABLE PAVING |                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| MAINTENANCE SCHEDULE                                        | REQUIRED ACTION                                                                                                                                                                     | TYPICAL FREQUENCY                                                                                                                                                                                                                                                                                                            |
| REGULAR MAINTENANCE                                         | BRUSHING AND VACUUMING (STANDARD COSMETIC SWEEP OVER WHOLE SURFACE)                                                                                                                 | ONCE A YEAR, AFTER AUTUMN LEAF FALL, OR REDUCED FREQUENCY AS REQUIRED, BASED ON SITE-SPECIFIC OBSERVATIONS OF CLOGGING OR MANUFACTURER'S RECOMMENDATIONS - PAY PARTICULAR ATTENTION TO AREAS WHERE WATER RUNS ONTO PERVIOUS SURFACE FROM ADJACENT IMPERMEABLE AREAS AS THIS AREA IS MOST LIKELY TO COLLECT THE MOST SEDIMENT |
| OCCASIONAL MAINTENANCE                                      | STABILISE AND MOW CONTRIBUTING AND ADJACENT AREAS                                                                                                                                   | AS REQUIRED                                                                                                                                                                                                                                                                                                                  |
|                                                             | REMOVAL OF WEEDS OR MANAGEMENT USING GLYPHOSATE APPLIED DIRECTLY INTO THE WEEDS BY AN APPLICATOR RATHER THAN SPRAYING                                                               | AS REQUIRED - ONCE PER YEAR OR LESS FREQUENTLY                                                                                                                                                                                                                                                                               |
| REMEDIAL ACTIONS                                            | REMEDIAL ANY LANDSCAPING WHICH, THROUGH VEGETATION MAINTENANCE OR SOIL SLIP, HAS BEEN RAISED TO WITHIN 50MM OF THE LEVEL OF THE PAVING                                              | AS REQUIRED                                                                                                                                                                                                                                                                                                                  |
|                                                             | REMEDIAL WORK TO ANY DEPRESSIONS, RUTTING AND CRACKS OR BROKEN BLOCKS CONSIDERED DETRIMENTAL TO THE STRUCTURAL PERFORMANCE OR A HAZARD TO USERS, AND REPLACE LOST JOINTING MATERIAL | AS REQUIRED                                                                                                                                                                                                                                                                                                                  |
|                                                             | REHABILITATION OF SURFACE AND UPPER SUB-STRUCTURES BY REMEDIAL SWEETING                                                                                                             | EVERY 10 TO 15 YEARS OR AS REQUIRED (IF INFILTRATION PERFORMANCE IS REDUCED DUE TO SIGNIFICANT CLOGGING)                                                                                                                                                                                                                     |
| MONITORING                                                  | INITIAL INSPECTION                                                                                                                                                                  | MONTHLY FOR THREE MONTHS AFTER INSTALLATION                                                                                                                                                                                                                                                                                  |
|                                                             | INSPECT FOR EVIDENCE OF POOR OPERATION AND/OR WEED GROWTH - IF REQUIRED, TAKE REMEDIAL ACTION                                                                                       | THREE-MONTHLY, 48 HOURS AFTER LARGE STORMS IN FIRST SIX MONTHS                                                                                                                                                                                                                                                               |
|                                                             | INSPECT SILT ACCUMULATION RATES AND ESTABLISH APPROPRIATE BRUSHING FREQUENCIES                                                                                                      | ANNUALLY                                                                                                                                                                                                                                                                                                                     |
|                                                             | MONITOR INSPECTION CHANGERS                                                                                                                                                         | ANNUALLY                                                                                                                                                                                                                                                                                                                     |

| SUDS OPERATION & MAINTENANCE |                                                                                                                                                          |                                 |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|
| MODULAR ATTENUATION TANK     |                                                                                                                                                          |                                 |
| MAINTENANCE SCHEDULE         | REQUIRED ACTION                                                                                                                                          | FREQUENCY                       |
| REGULAR MAINTENANCE          | REMOVE SEDIMENT & DEBRIS FROM PRE-TREATMENT DEVICES & FLOOR OF INSPECTION TUBE OR CHAMBER                                                                | ANNUALLY                        |
|                              | CLEANING OF ANY GUTTERS & ANY FILTERS ON DOWNPIPES                                                                                                       | ANNUALLY                        |
|                              | CHECK THE FLOW CONTROL IN THE CONTROL MANHOLE IS NOT BLOCKED, ONE INSPECTION SHOULD BE SCHEDULED TO OCCUR AFTER TREE LEAF FALL IN AUTUMN                 | TWICE YEARLY                    |
|                              | CLEAR THE SILT TRAPS LOCATED PRIOR TO THE ATTENUATION TANK OF SILT AND DEBRIS, ONE CLEARANCE SHOULD BE SCHEDULED TO OCCUR AFTER TREE LEAF FALL IN AUTUMN | TWICE YEARLY                    |
| MONITORING                   | INSPECT/CHECK ALL INLETS, OUTLETS, VENTS AND OVERFLOWS TO ENSURE THAT THEY ARE IN GOOD CONDITION AND OPERATING AS DESIGNED                               | ANNUALLY AND AFTER LARGE STORMS |

| FOUL MANHOLE SCHEDULE |             |              |                 |      |        |              |                        |
|-----------------------|-------------|--------------|-----------------|------|--------|--------------|------------------------|
| REF                   | COVER LEVEL | INVERT LEVEL | DEPTH TO INVERT | SIZE | TYPE   | COVER        | COMMENTS               |
| F1                    | 48.550      | 47.000       | 1.550           | 450# | TYPE 3 | B125 450x450 | RESTRICTED ACCESS 350# |
| F2                    | 48.650      | 47.080       | 1.570           | 450# | TYPE 3 | B125 450x450 | RESTRICTED ACCESS 350# |
| F3                    | 48.650      | 47.120       | 1.530           | 450# | TYPE 3 | B125 450x450 | RESTRICTED ACCESS 350# |
| F4                    | 48.650      | 47.140       | 1.510           | 450# | TYPE 3 | B125 450x450 | RESTRICTED ACCESS 350# |
| F5                    | 47.850      | 47.220       | 0.630           | 450# | TYPE 3 | C250 450x450 |                        |
| F6                    | 48.350      | 47.360       | 0.990           | 450# | TYPE 3 | C250 450x450 |                        |
| F7                    | 48.550      | 47.450       | 1.100           | 450# | TYPE 3 | C250 450x450 |                        |
| F8                    | 48.600      | 47.250       | 1.350           | 450# | TYPE 3 | B125 450x450 | RESTRICTED ACCESS 350# |
| F9                    | 48.550      | 47.350       | 1.200           | 450# | TYPE 3 | B125 450x450 |                        |
| F10                   | 48.600      | 47.440       | 1.160           | 450# | TYPE 3 | B125 450x450 |                        |
| F11                   | 48.400      | 47.550       | 0.850           | 450# | TYPE 3 | B125 450x450 |                        |

| SURFACE WATER MANHOLE SCHEDULE |             |              |                 |       |        |              |                          |
|--------------------------------|-------------|--------------|-----------------|-------|--------|--------------|--------------------------|
| REF                            | COVER LEVEL | INVERT LEVEL | DEPTH TO INVERT | SIZE  | TYPE   | COVER        | COMMENTS                 |
| S1                             | 47.700      | 46.000       | 1.700           | 450#  | TYPE 3 | C250 450x450 |                          |
| S2                             | 48.300      | 46.200       | 2.100           | 1200# | POC    | C250 600x600 | HYDROBRAKE MANHOLE       |
| S3                             | 48.300      | 46.500       | 1.800           | 450#  | TYPE 3 | C250 450x450 | SILT TRAP 300# DEEP SUMP |
| S4                             | 47.800      | 47.000       | 0.800           | 450#  | TYPE 3 | C250 450x450 |                          |
| S5                             | 47.860      | 47.200       | 0.660           | 450#  | TYPE 3 | B125 450x450 |                          |

| NOTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |        |         |          |        |         |  |  |  |
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| <p>© This drawing is the copyright of Rushby Brewster Limited. It may not be copied, altered or reproduced without their written authority. This drawing must not be issued if not EQUATEd.</p> <p><b>GENERAL NOTES</b></p> <ol style="list-style-type: none"> <li>THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, ENGINEERS AND SPECIALISTS DRAWINGS AND DETAILS.</li> <li>ALL FIGURED DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED DIMENSIONS.</li> <li>ANY DISCREPANCIES BETWEEN THIS DRAWING AND OTHER INFORMATION IS TO BE BROUGHT TO THE ATTENTION OF THE ENGINEER PRIOR TO THE COMMENCEMENT OF THE WORKS ON SITE.</li> <li>THE MAIN CONTRACTOR SHALL BE RESPONSIBLE FOR THE SETTING OUT AND ACCURACY OF ALL DIMENSIONS. THE CONTRACTOR IS TO ENSURE THE STABILITY AND STRUCTURAL INTEGRITY OF THE EXISTING PROPERTY AT ALL TIMES DURING WORKS AND IS TO BE RESPONSIBLE FOR ALL PROPPING AND SHORING AS REQUIRED.</li> <li>MAIN CONTRACTOR TO PROVIDE AND FIX SUITABLE BRACING AND PROPPING FOR ALL ELEMENTS IN THE TEMPORARY CONDITION DURING CONSTRUCTION STAGE, SUCH AS TO ENSURE STRUCTURE STABILITY AT ALL TIMES.</li> <li>IT IS THE CONTRACTORS SOLE RESPONSIBILITY FOR ASCERTAINING SAFE DISPOSAL OF ANY OFF-SITE EXCAVATED SPOIL. NO CLAIM RESULTING FROM ABNORMAL TOP REQUIREMENTS WILL BE ENTERTAINED.</li> </ol> <p><b>CDM REGULATIONS 2015</b></p> <p>RUSHBY BREWSTER HAS CONSIDERED AND, WHERE REASONABLY PRACTICABLE, ADDED PRELIMINARY ASPECTS IN THE PREPARATION OF THE DESIGN SHOWN ON THIS AND RELATED DRAWINGS. SIGNIFICANT RISKS WHICH REMAIN AND ASSOCIATED CONTROL MEASURES ARE IDENTIFIED BELOW AND SHOULD BE GIVEN PARTICULAR ATTENTION BY THE MAIN CONTRACTOR ON SITE.</p> <table border="1"> <thead> <tr> <th>ACTIVITY</th><th>HAZARD</th><th>CONTROL</th></tr> </thead> <tbody> <tr> <td></td><td></td><td></td></tr> </tbody> </table> <p>NOTE: THE ABOVE ATTENDANCE RECORDS ONLY THOSE ELEMENTS CONSIDERED UNUSUAL. EFFORT TO AVOID OR OUTSIDE OF THE ANTICIPATED EXPERIENCE OF A COMPETENT CONTRACTOR.</p> |        |         | ACTIVITY | HAZARD | CONTROL |  |  |  |
| ACTIVITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | HAZARD | CONTROL |          |        |         |  |  |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |         |          |        |         |  |  |  |

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|----|----------|-------------------------------|------|
| PI | 20/11/15 | PRELIMINARY ISSUE FOR COMMENT | ANON |
| SR | Date     | Revised                       | SR   |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  <b>RUSHBY BREWSTER</b><br>CONSULTING CIVIL AND STRUCTURAL ENGINEERS<br>The Town House, St. George's Square, Bishop's Cleeve, Leamington, Warwickshire, CV34 4AF<br>E: <a href="mailto:info@rushbybrewster.co.uk">info@rushbybrewster.co.uk</a> W: <a href="http://www.rushbybrewster.co.uk">www.rushbybrewster.co.uk</a><br>T: 01926 167704 F: 01454 892226 |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

|                                                                                                                                   |                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
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|           |                         |
|-----------|-------------------------|
| Client    | PMC CONSTRUCTION        |
| Architect | KENN SCADDEN ASSOCIATES |

|               |                                    |
|---------------|------------------------------------|
| Project Title | 9-11 ST GEORGES WALK WATERLOOVILLE |
|---------------|------------------------------------|

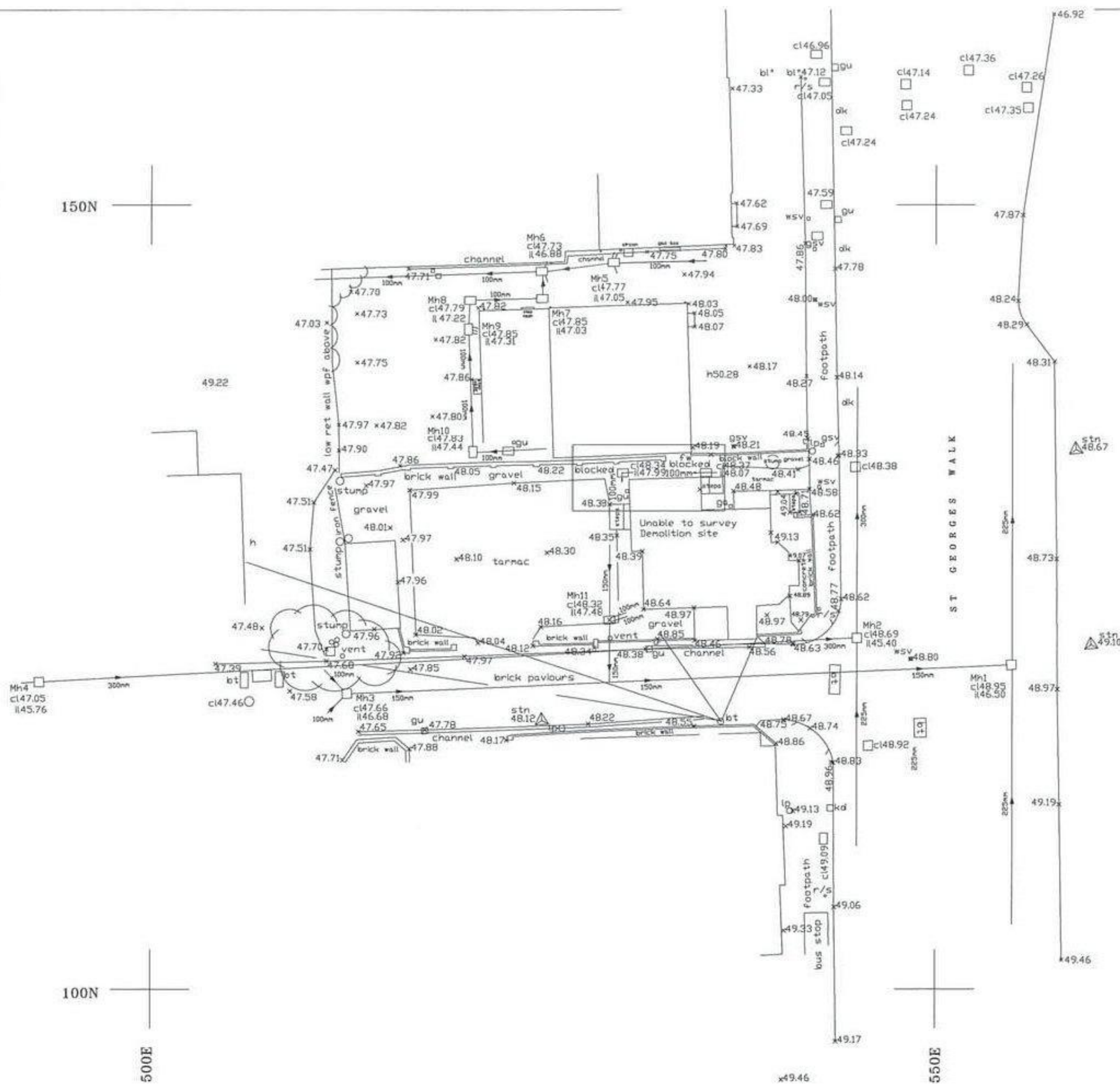
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| Drawing Title | DRAINAGE DETAILS SHEET 2 |
|---------------|--------------------------|

|          |             |           |          |            |
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| Scale    | Figure Size | Date      | Drawn by | Checked by |
| AS SHOWN | A1          | NOV. 2015 | PJM      | ARW        |

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| Project No. | Drawing No. | Rev.                                                                                                                                                                                                                                                                                                      |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| PMC222      | 552         | <table border="1"><tr><td>1</td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table> | 1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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|             |             |                                                                                                                                                                                                                                                                                                           |   |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

ridge  
56.21

150N

eaves  
53.37

indicative

NOTES:

LEVELS RELATE TO DS DATUM

TREE SPECIES SHOULD BE VERIFIED WHERE OF CRITICAL IMPORTANCE

THE ARCHITECT SHOULD SATISFY HIMSELF THAT ALL TREES LIKELY TO AFFECT HIS DESIGN HAVE BEEN SHOWN

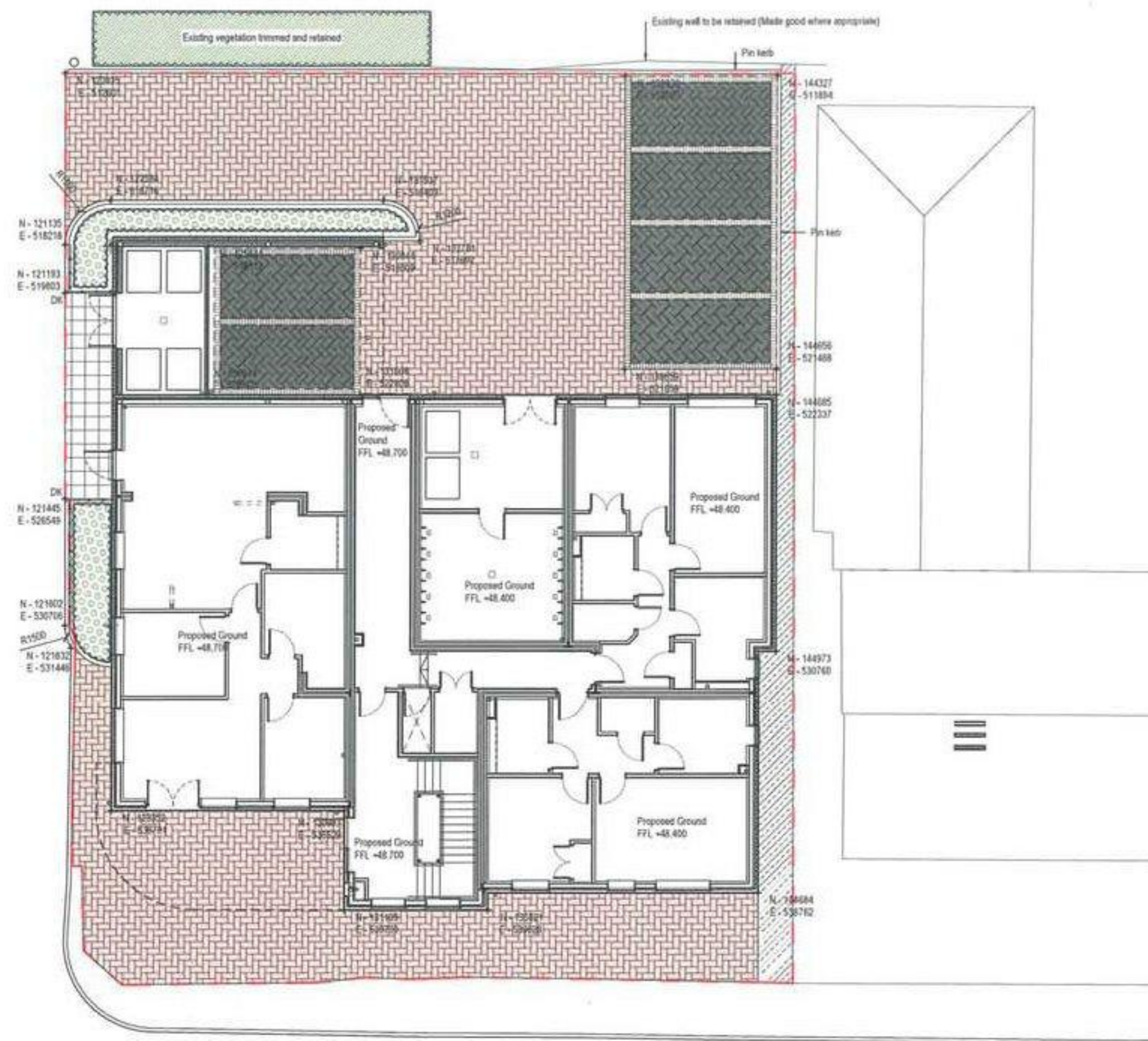
INTER CONNECTION OF MANHOLES SHOULD BE VERIFIED WHERE OF CRITICAL IMPORTANCE USING CCTV

PIPE SIZES & INVERTS DETERMINED WITHOUT ENTRY INTO MANHOLE

J C RADFORD SITE ENGINEERING & LAND SURVEYS LTD  
3-5 REDHILL BASSETT SOUTHAMPTON  
TEL (023) 8079 0217 MOBILE 07836 380795

CLIENT: WARNER GOODMAN LLP  
CONTRACT: 9-11 ST GEORGES WALK, WATERLOOVILLE  
TITLE: EXISTING SURVEY  
SCALE: 1:200 DATE: JULY 12

| GENERAL NOTES                                                                                                                                                                |                   |      |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------|----|
| 1. This drawing is to be read in conjunction with all relevant architects, structural engineers, mechanical & electrical engineers and specialist drawings / specifications. |                   |      |    |
| 2. Any discrepancies in dimensions or details between the various drawings should be reported immediately.                                                                   |                   |      |    |
| 3. All dimensions are in millimetres and all levels are in metres.                                                                                                           |                   |      |    |
| 4. Do not scale from this drawing, if in doubt ASK.                                                                                                                          |                   |      |    |
| Rev.                                                                                                                                                                         | Description       | Date | By |
| P1                                                                                                                                                                           | Preparation Issue |      | JK |



| LEGEND |                                      |
|--------|--------------------------------------|
|        | Marshall's Paved/Asphalt paving      |
|        | Channel (set in kerbstone formation) |
|        | Marshall's Paved/Asphalt paving      |
|        | Road (set in kerbstone formation)    |
|        | Marshall's Paved/Asphalt paving      |
|        | Road                                 |
|        | Road                                 |
|        | Road                                 |
|        | Road                                 |
|        | Road                                 |