Drainage Strategy

Richmond-upon-Thames College - Sports Centre
5141939-REP-002

12 May 2017

Notice

This document and its contents have been prepared and are intended solely for Richmond-upon-Thames College's information and use in relation to the Richmond upon Thames Reserve Matters and Discharge Conditions planning applications

Atkins assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 17 pages including the cover.

Document history

Document ref: 5141939-REP-002						
Revision	Purpose description	Originated	Checked	Reviewed	Authorised	Date
Rev 1.0	For planning	AST	JT	GC	JT	12/05/17

Table of contents

1. Introduction

This statement has been prepared with the purpose of supporting the Reserve Matters Applications of the Outline Planning Application for the Richmond-upon-Thames College Phase 2 Sports Centre Development.

This document is supported by the following additional documentation:

- Soiltechnics *Ground Investigation Report (*Rev 01, 2008)
- Soiltechnics *Ground Investigation Report* (Rev 02, 2015)
- CSI *Sustainable Drainage Assessment* (June 2015)

The redevelopment of Richmond upon Thames College is being undertaken in three phases. Phase 2 Sports Centre refers to the Sports Centre building and adjacent car park. A Reserve Matters Application has previously been submitted for the Phase 1 development of Richmond upon Thames College. Phase 1 refers to the College building refer to 5137894-ATK-00-XX-DR-C-0301 for clarification of phasing areas.

2. Existing Drainage

2.1. Existing Foul Water

The existing foul water discharge network servicing the existing Richmond-upon-Thames College (College) on site is split into two sections. The discharge collected from the western portion of the site incorporates several pumping stations and rising mains for the eventual discharge via gravity main into the Thames Water network on Craneford Way. This network also collects discharge from the neighbouring Nuffield Health Fitness & Wellbeing Centre.

The discharge collected from the eastern portion of the existing college is conveyed via a gravity fed system for discharge in two locations to the Thames Water network along the southern end of Egerton Road.

2.2. Existing Surface Water

The existing College site utilises infiltration and soakaway techniques to manage the surface water generated by rainfall events and directs them to the local secondary aquifer within the Kempton Park gravel strata. While no official surface water connections have been recorded from the site, on inspection of the network there is evidence of several soakaways overflowing into the foul network on a regular basis. This is more evident in the southern site area.

The groundwater level on site has been monitored and within the Phase 2 Sports Centre development boundary has been recorded to be at depths ranging from 7.92 to 8.40 m AOD (approximately 1.3 to 0.65m below existing ground level).

Existing soakaways local to the Phase 2 Sports Centre boundary have been surveyed and have recorded sump levels of between 6.53 m AOD and 6.46 m AOD. As such it is expected that the existing soakaways are permanently submerged in groundwater. This was confirmed via visual inspection of the network.

Furthermore, groundwater flooding has been observed in the foul water rising main chambers within the Phase 2 Sports Centre boundary.

3. Proposed Drainage

Surface and foul water have been proposed to drain as per the layouts provided in Appendix A. Relevant design calculations have been included for reference in Appendix B.

3.1. Proposed Foul Water

3.1.1. Phase 2 Sports Centre Strategy

The foul water is expected to discharge from the Phase 2 Sports site at a calculated peak flow of 6.2 l/s. The shallow invert level of the local Thames Water foul sewer network (990 mm cover below road level) has necessitated a gravity fed/pumping solution to discharge the foul water.

The discharge will be conveyed via gravity to a new pumping station. Capacity has been allowed within the network and pumping station for flows collected from the Sports Centre, College, STEM, Haymarket, Nuffield Health Centre (neighbour) and a portion of the Residential Development (79 units).

A design flow from the combined developments of 25.7l/s has been conservatively estimated. This is a small increase over what is expected to be the current discharge rate (20.2 l/s) through the connection in Craneford Way. Due to the shallow depth of the Thames Water sewer, a pressurised rising main will then transport the foul water southwards for eventual discharge into the Thames Water sewer network, utilising the existing gravity connection on Craneford Road.

The foul water network was designed and modelled using Micro Drainage in compliance with BS EN 752 (2008) and Sewers for Adoption (7th edition) minimum gradients to achieve acceptable self-cleansing flow velocities.

The foul pumping station will be located just to the south of the Sports Centre carpark and will be put forward for adoption by Thames Water along with the downstream rising main. The pumping station and downstream discharge network will be installed/constructed during Phase 1, together with the main private collection network within the access road to the west of the Sports Centre. This is to manage foul water discharge from the new College building, and Nuffield Health Centre buildings that have been established in Phase 1.

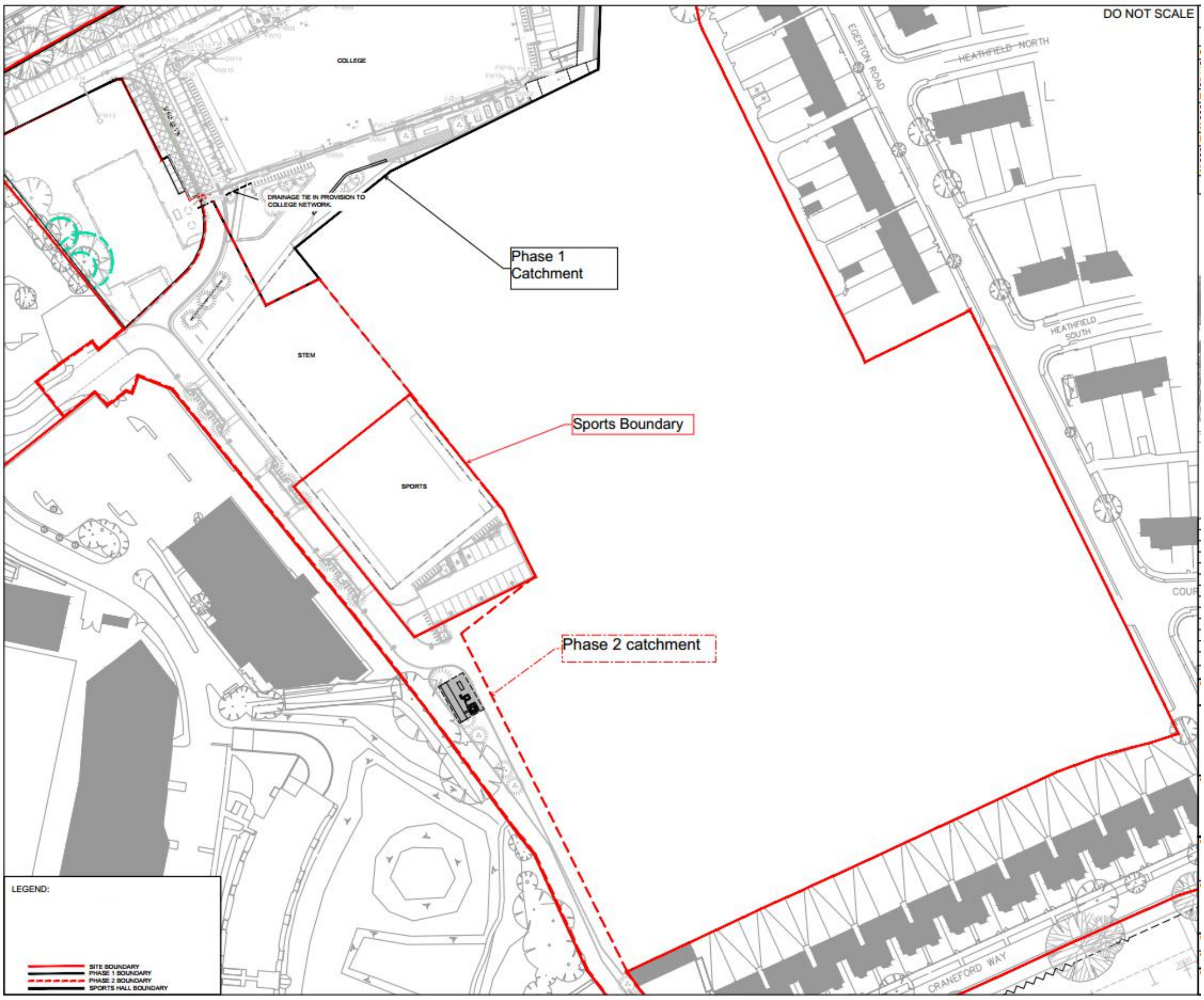
All design and emergency storage requirements will comply with Sewers for Adoption (7th edition).

3.2. Proposed Surface Water

3.2.1. Site Wide Drainage and Surface Water Management

An overarching sustainable drainage assessment and strategy was prepared by CSI (June 2015). Phase 2 specific updates resulting from the detailed design have been included within this document.

Figure 3-1 Catchment Areas



3.2.2. External areas

During exploratory investigations on site (Soiltechnics, 2008 & 2015), Kempton Park Gravel (sand and gravel) was encountered within the Phase 2 Sports Centre boundary between 0.44 to 0.95 m below existing ground level. Infiltration testing was undertaken at the approximate permeable pavement depth of 600 mm (Soiltechnics 2015) to confirm the infiltration rate at subgrade level. The infiltration rate recorded as being 8.4 x 10^{-7} m/s. As such no infiltration (Type C) is proposed in accordance with CIRIA SuDS Manual C753.

Groundwater infiltration as a form of surface water discharge was furthermore discounted due to a high groundwater level recorded within the Phase 2 boundary. Levels were recorded to be as shallow as 8.40 m AOD (0.622 m below proposed ground level) within the Phase 2 Sports Centre development boundary. With a minimum finished level in the Sports Centre Carpark of 9.02 m AOD, insufficient freeboard can be achieved between the base of the infiltration system and the recorded seasonal ground water high.

In others areas on site, specifically Phase 1 boundary, permeable paving has been deemed a viable surface water management solution due to favourable groundwater levels and infiltration rates. But within the Phase 2 sports centre boundary, the design is constrained by the higher groundwater level, and borderline infiltration results.

Consequently, all external surfaces within the Sports Centre development boundary will be impermeable. The runoff will be collected from external areas via a series of gullies tailored to the site features and constraints. All surfaces have been designed to transfer surface water laterally into the adjacent gullies. Run-off collected by the gullies will be retained in the shared attenuation tank, then conveyed by the surface water pipe network installed in Phase 1 to the Thames Water sewer.

For information, the Phase 1 attenuation tank has been sized to accommodate all the run-off within the Phase 2 Sports Centre development boundary. The attenuation tank is 450 m^3, and will be located beneath the Haymarket/College car park. In line with the recommendations by the Environment Agency (Sustainable Drainage assessment, ESI June 2015), the proposed total discharge from the site will be restricted to the Greenfield runoff. In previous assessments, a SOIL type of 1 (SPR 0.1) has been assumed giving a Qbar rural of 0.14 l/s/ha (IH124 method). However, it is best practice (and as recommended in CIRIA C753) when permeable soil types are encountered to assume a minimum discharge of 5 l/s. This is because when using flow control devices it is not practical to restrict the control to a discharge rate below this value. As such for the 2.04 ha area (see Figure 3-1 for the assumed extent) a discharge rate of 5 l/s has been applied for all storm events. The Phase 2 development contributes 0.85 ha to this.

Due to restrictive shallow levels on the external Thames Water surface water network (approximately 500 mm cover depth at proposed connection), a small submersible lifting chamber will be installed near the northern property boundary, to pump surface water up so that it can fall via gravity to the Thames Water network. Emergency storage requirements will be facilitated via the attenuation tank and will be agreed with the appointed Building Regulations Inspector. A pump failure (i.e. no outflow) in a 100 year event + 30 % climate change has been analysed in MicroDrainage. In a 24 hour storm the entire runoff volume can be attenuated resulting in minimal flooding across the site. It has been reasonably assumed that the pump will be able to be replaced within a 24 hour period.

3.2.3. Roof runoff collection network

Runoff from roofs will be collected from the building rainwater downpipes (RWP) via the central surface water network, and conveyed to the shared attenuation tank before being discharged into the northern Thames Water network. This will help reduce both the long-term volumetric run-off and the peak discharge rate during short duration events.

Green roofs are being utilised on the Phase 2 Sports building as a part of the sustainable drainage and ecological enhancement strategies for the project. It is proposed that 70% of the available roof area will comprise of green roof. All other roof area is taken up by essential plant equipment (ventilation, vents, roof lights and the roof access hatch with additional space required for maintenance of these structures). Inside the parapet, this comprises 20% of the total roof area.

The green roof will comprise of an interlocking modular system containing pre-grown plants in a substrate with a depth of 80 mm. This will help reduce both the long-term volumetric run-off and the peak discharge rate during short duration rainfall events. The effects of the green roof have not been modelled when considering the 30 and 100 year events (+climate change respectively) as per the guidance in CIRIA C753.

3.2.4. Management of discharge to controlled waters

Impermeable paving has been proposed within the Phase 2 Sports boundary for the car park and surrounding external areas. In accordance with industry best practice, Pollution Prevention Guidelines 3 (PPG3) indicates trapped gully pots can provide adequate protection for car parks that are too small to justify the installation of a separate, but they must be properly maintained. It should be noted the PPG3 has now been withdrawn however it remains industry best practice.

The policy PPG3 also defines the different sites that need to have measures in place to prevent polluting the environment – *“car parks typically larger than 800m^2 in area or for 50 or more car parking spaces”.*

The car park within the Sports Centre development boundary is 435m^2 with less than 50 car parking spaces which would conclude a petrol interceptor is not required for this area of the site.

The CIRIA SuDS Manual 2015 (C753) - Table 26.2 also discusses the pollution hazard indices for different land use classifications, this table rates the pollution from non -residential car parking and infrequent change (e.g. school’s offices < 300 traffic movement/day as a low pollution hazard level.

Further detail of the drainage design of future phases will be provided in the submission for the relevant phase.

4. Flood Risk and Mitigation

4.1. General

The Richmond-upon-Thames College Phase 2 Sports Centre development is located within Flood Zone 1 (similar to the neighbouring LBRuT Borough School development). It is acknowledged that the playing fields (located far south of the Phase 2 development) are within Flood Zone 2. Refer Appendix D1.

4.2. Sources of Flooding

The design has been strategised and undertaken in accordance with the National Planning Policy Framework (NPPF), Regional Planning Policy and Flood Risk Assessment (FRA), LBRuT Strategic FRA (March 2016), and local policy. The parameters assumed in the design have been described above in Sections 3.1 and 3.2 however key points include:

- Maximisation of an infiltration discharge solution
- Integrated SuDS features
- Discharge offsite restricted to greenfield
- No flooding in 100 year + 30% CC

On review of the sources of flood risk that may affect the site, the Flood Maps sourced from the Environment Agency and from within the LBRuT Strategic Flood Risk Assessment have been referenced. A compilation of maps have been appended to this report (Appendix D) however in summary the flood risk presented to the site is as follows:

SOURCE OF FLOODING	RISK	MITIGATION	REFERENCES
Tidal and Fluvial	Very Low – Flood Zone 1.	Implementation of a formalised drainage system in Phase 2 will improve drainage and mitigate risk.	Appendix D2
Surface Water	Mostly low risk flooding	Implementation of a formalised drainage system in Phase 2 will improve drainage and mitigate risk. Network has been designed so that there is no resultant flooding in a 1 in 100 year event (+30% CC).	Section 3.2.2, 3.2.4 Appendix D3
Sewer	No flooding recorded on 2011 map Minimal incidents recorded 2011-2015	Implementation of a formalised drainage system in Phase 2 will improve drainage and mitigate risk. Thames Water have confirmed that the development will have negligible impact on their sewer network	Section 3.2.2, 3.2.4 Appendix D4 Section 5 Appendix E
Groundwater	LBRuT Maps show potential for flooding to occur. Seasonal groundwater monitoring has been undertaken within the vicinity of the Phase 2 development zone. This recorded a groundwater high level of	Non-infiltration system is to be implemented as an appropriate freeboard could not be achieved and ground parameters are less favourable towards an infiltration solution within the development boundary	Section 3.2.3, 3.2.5 Appendix D5

	1.04m below existing ground level 8.8m AOD.		
Reservoir	Nil		Appendix D6

4.3. Interaction with neighbouring developments

As aforementioned the critical 100 year event plus climate changes is to be attenuated within the development without flooding. In higher intensity storm events, Phase 2 site contours have been developed to direct the overland flow path away from all site buildings and key infrastructure into areas which do not create risk to people or property.

In terms of the Sports Pitches located to the far south of the site (and within Flood Zone 2); this area of the site is much lower than the proposed development and as such, given the improvements and formalisation of the drainage in Phase 2, the development will have nil effect on the southern site other than to improve flood risk through the reducing the overland flow.

An appropriate FRA will be submitted for this area when required.

4.4. Correspondence with LBRuT

As agreed with LBRuT asset coordinator Brian Humphries (refer to the correspondence attached in Appendix C), it is understood that the content within this strategy document is sufficient to close out any queries regarding flood risk and as such a formal Flood Risk Assessment is not required for Phase 2 of the Richmond-upon-Thames College development.

5. Thames Water Consultation

Where discharge into external sewer networks are proposed, Thames Water (has been consulted through the predevelopment enquiry process. At the time of the enquiry Thames Water has confirmed that no impact study is required for the foul water but have requested additional information to confirm that all other methods of disposal have been considered before they will accept discharge into their surface water network. This Drainage Strategy document is intended to inform this decision.

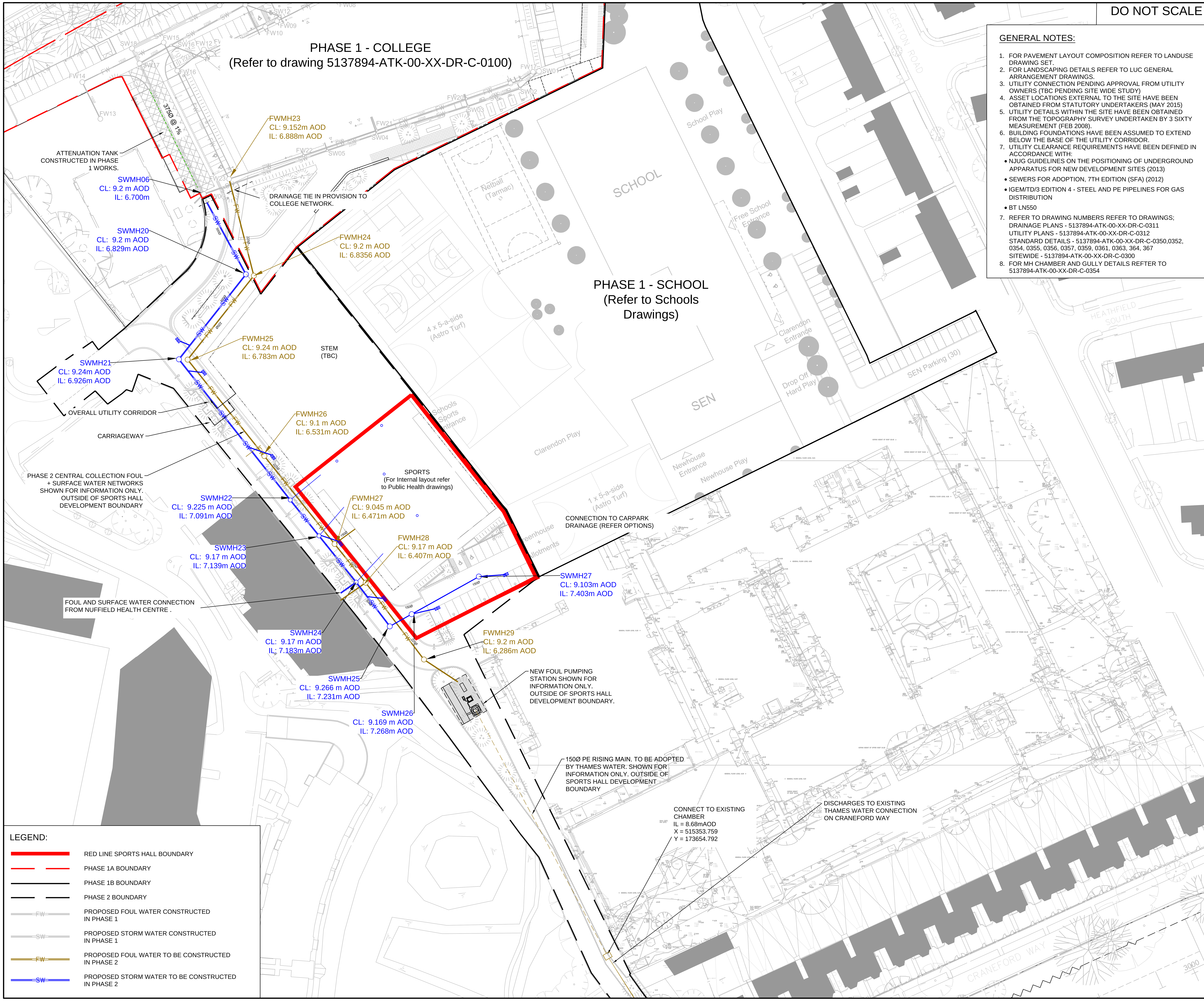
This letter has been appended to this document in Appendix E for reference.

Appendices

Appendix A. Stage D Drainage Drawings

Document Number	Document Title
5137894-ATK-00-XX-DR-C-0301	Sports Centre Drainage Plan Reserve Matters
5137894-ATK-00-XX-DR-C-0350	Utility Corridor Typical Cross Sections
5137894-ATK-00-XX-DR-C-0354	Foul and Surface Water Drainage Manhole Details
5137894-ATK-00-XX-DR-C-0355	Foul and Surface Water Drainage Typical Pipe Bedding Details

DO NOT SCALE



GENERAL NOTES:

1. FOR PAVEMENT LAYOUT COMPOSITION REFER TO LANDUSE DRAWING SET.
2. FOR LANDSCAPING DETAILS REFER TO LUC GENERAL ARRANGEMENT DRAWINGS.
3. UTILITY CONNECTION PENDING APPROVAL FROM UTILITY OWNERS (TBC PENDING SITE WIDE STUDY)
4. ASSET LOCATIONS EXTERNAL TO THE SITE HAVE BEEN OBTAINED FROM STATUTORY UNDERTAKERS (MAY 2015)
5. UTILITY DETAILS WITHIN THE SITE HAVE BEEN OBTAINED FROM THE TOPOGRAPHY SURVEY UNDERTAKEN BY 3 SIXTY MEASUREMENT (FEB 2008).
6. BUILDING FOUNDATIONS HAVE BEEN ASSUMED TO EXTEND BELOW THE BASE OF THE UTILITY CORRIDOR.
7. UTILITY CLEARANCE REQUIREMENTS HAVE BEEN DEFINED IN ACCORDANCE WITH:
   - NJUG GUIDELINES ON THE POSITIONING OF UNDERGROUND APPARATUS FOR NEW DEVELOPMENT SITES (2013)
   - SEWERS FOR ADOPTION, 7TH EDITION (SFA) (2012)
   - IGEM/TD/3 EDITION 4 - STEEL AND PE PIPELINES FOR GAS DISTRIBUTION
   - BT LN550
7. REFER TO DRAWING NUMBERS REFER TO DRAWINGS;
   DRAINAGE PLANS - 5137894-ATK-00-XX-DR-C-0311
   UTILITY PLANS - 5137894-ATK-00-XX-DR-C-0312
   STANDARD DETAILS - 5137894-ATK-00-XX-DR-C-0350,0352, 0354, 0355, 0356, 0357, 0359, 0361, 0363, 364, 367
   SITEWIDE - 5137894-ATK-00-XX-DR-C-0300
8. FOR MH CHAMBER AND GULLY DETAILS REFTER TO 5137894-ATK-00-XX-DR-C-0354

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

UNKNOWN BURIED SERVICES – REFER TO SERVICES PLANS AND USE CABLE AVOIDANCE TOOLS BEFORE DIGGING. HIGH PRESSURE GAS MAINS – EXERCISE EXTREME CAUTION IN THEIR VICINITY. CONTAMINATED LAND IN THE PROCESS OF REMEDIATION – CONFIRM THE STATUS OF EACH AREA BEFORE DIGGING AND PRECAUTIONS TO BE TAKEN AT DIFFERENT LEVELS. IF IN DOUBT – STOP WORK AND ASK

MAINTENANCE/CLEANING

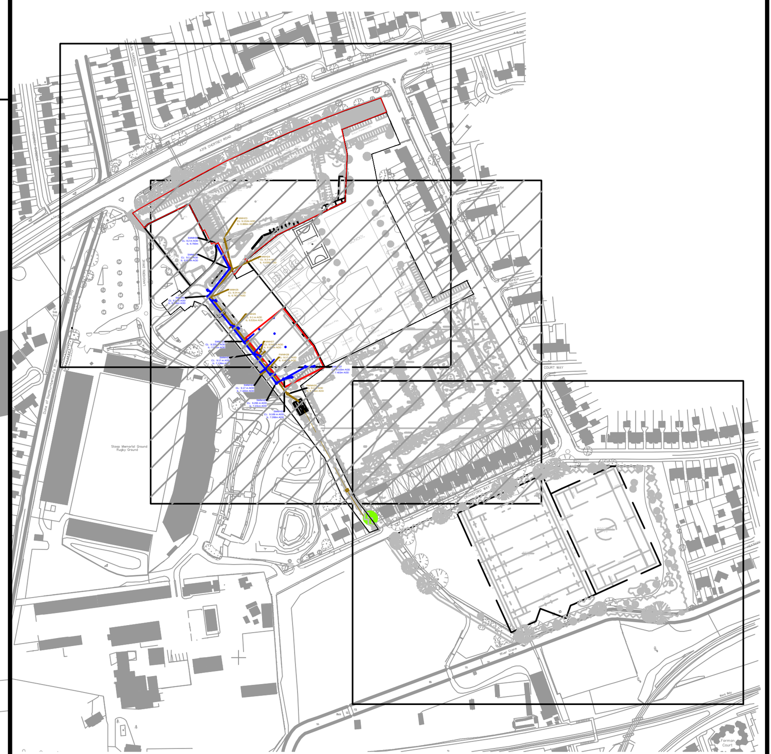
MULTIPLE BURIED SERVICES INCLUDING HIGH PRESSURE GAS MAINS – CONSULT SERVICES PLANS AND HOST UTILITY COMPANIES AND USE CABLE AVOIDANCE TOOLS BEFORE DIGGING. REMEDIATED BROWN FIELD SITE – DO NOT EXCAVATE BELOW THE MARKER LAYER WITHOUT A SITE SPECIFIC METHOD STATEMENT FOR THE LOCATION IN HAND. IF IN DOUBT – STOP WORK AND ASK.

DECOMMISSIONING/DEMOLITION

MULTIPLE BURIED SERVICES INCLUDING HIGH PRESSURE GAS MAINS – CONSULT SERVICES PLANS AND HOST UTILITY COMPANIES AND USE CABLE AVOIDANCE TOOLS BEFORE DIGGING. REMEDIATED BROWN FIELD SITE – DO NOT EXCAVATE BELOW THE MARKER LAYER WITHOUT A SITE SPECIFIC METHOD STATEMENT FOR THE LOCATION IN HAND. IF IN DOUBT – STOP WORK AND ASK.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

KEY PLAN:



Rev.	Date	Description	By	Chk'd	App'd
P1	12/05/17	FOR PLANNING	AST	JT	GC

Drawing Status: FOR INFORMATION — Suitability: S2

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Client: Richmond upon Thames College

Project Title: RICHMOND UPON THAMES COLLEGE REDEVELOPMENT

Drawing Title: PHASE 2 SPORTS CENTRE DRAINAGE PLAN

Scale	Designed	Drawn	Checked	Authorised
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Original Size	Date	Date	Date	Date
A1	10/04/2017	10/04/2017	10/04/2017	10/04/2017

Drawing Number	Revision
5137894-ATK-00-XX-DR-C-0301	P1.0

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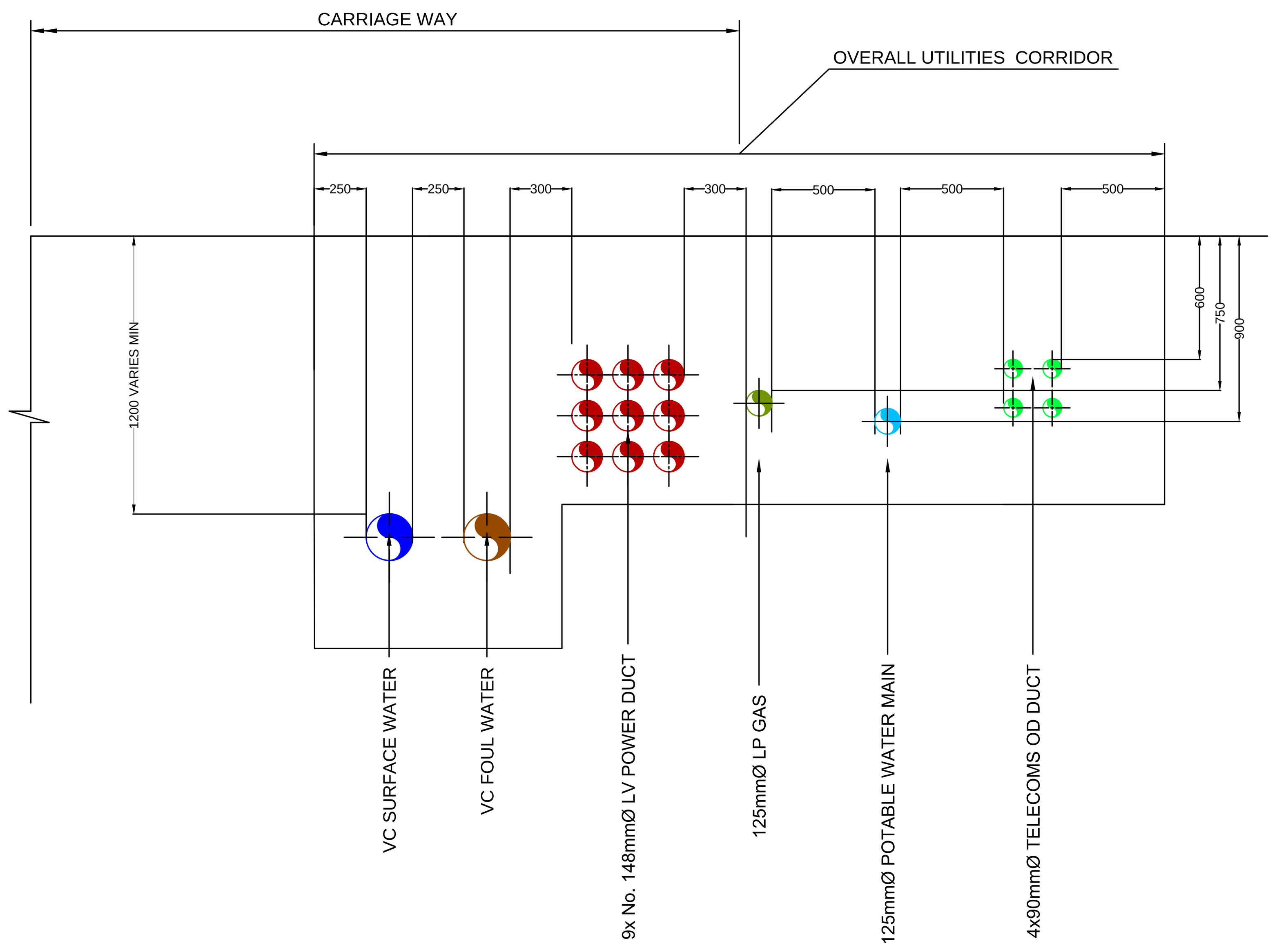
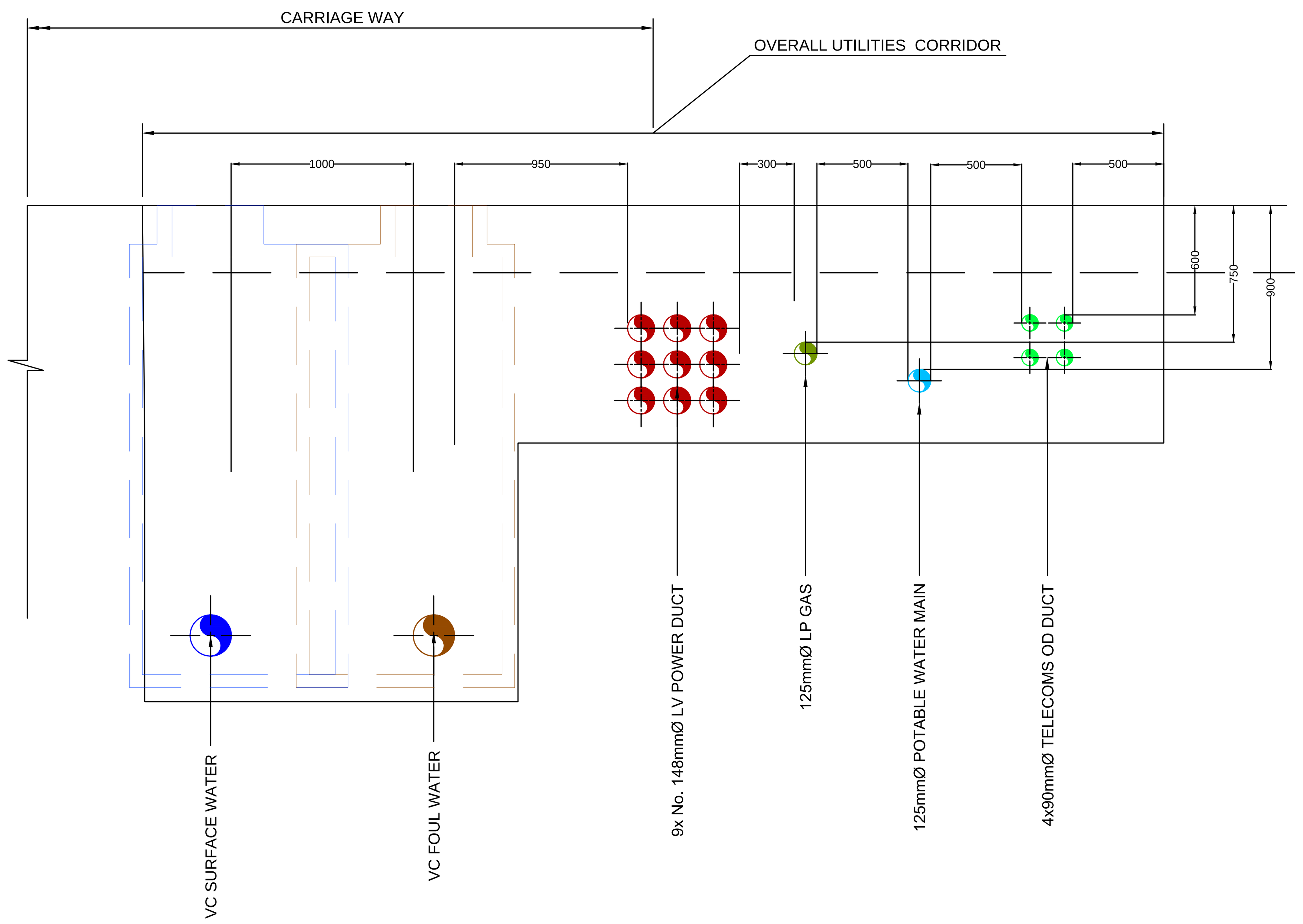


TYPICAL UTILITIES CORRIDOR - SECTION 1
Scale 1:25



TYPICAL UTILITIES CORRIDOR - SECTION 2
Scale 1:25

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

BURIED SERVICES INCLUDING POSSIBILITY OF UNCHARTED SERVICES - REFER TO SERVICES PLANS AND USE CABLE AVOIDANCE TOOLS BEFORE DIGGING.
POTENTIAL FOR POCKETS OF BURIED CONTAMINATION INCLUDING ASBESTOS CONTAINING MATERIALS.
POSSIBILITY OF UNEXPLODED ORDNANCE - KEEP WATCH DURING GROUND WORKS.
IF IN DOUBT, STOP WORK AND ASK.

MAINTENANCE/CLEANING

MULTIPLE BURIED SERVICES - CONSULT SERVICES PLANS, USE CABLE AVOIDANCE TOOLS AND FOLLOW RAMS WHEN EXCAVATING.
IF IN DOUBT, STOP WORK AND ASK.

DECOMMISSIONING/DEMOLITION

MULTIPLE BURIED SERVICES - CONSULT SERVICES PLANS, HOST UTILITY COMPANIES AND USE CABLE AVOIDANCE TOOLS BEFORE EXCAVATING.
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It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

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   STANDARD DETAILS - 5137894-ATK-00-XX-DR-C-0350,0352, 0354, 0355, 0356, 0357, 0359, 0361, 0363, 364, 367
   SITEWIDE - 5137894-ATK-00-XX-DR-C-0300

Rev.	Date	Description	By	Chk'd	App'd
P1	12/05/17	FOR TENDER	AST	JT	GC

Drawing Status: FOR TENDER
Suitability: D2

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Client: Richmond upon Thames College

Project Title: RICHMOND UPON THAMES COLLEGE REDEVELOPMENT

Drawing Title: UTILITY CORRIDOR TYPICAL CROSS SECTIONS

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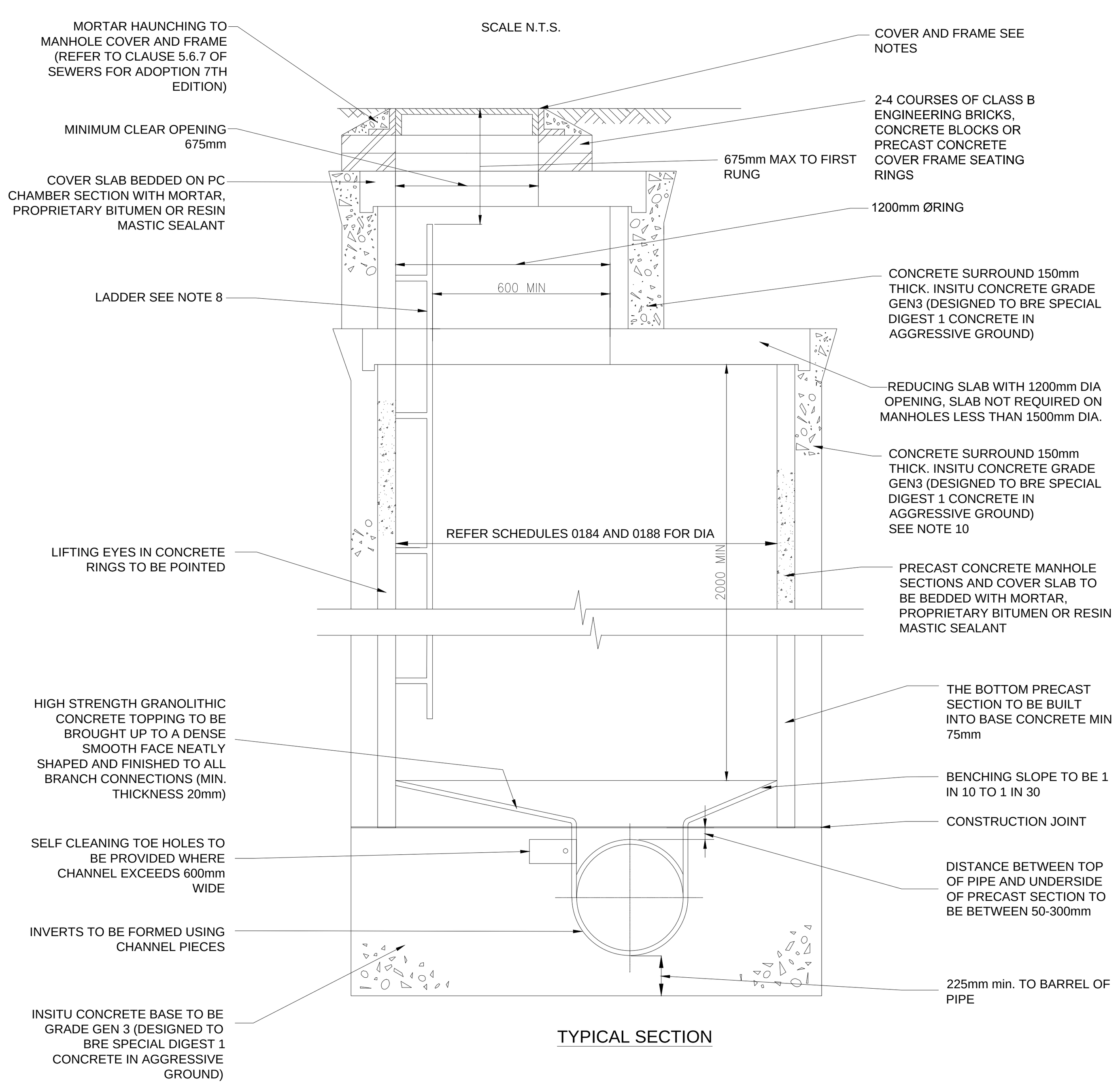
Drawing Number: 5137894-ATK-00-XX-DR-C-0350
Revision: P1.0

Millimetres 0 10 100

DO NOT SCALE

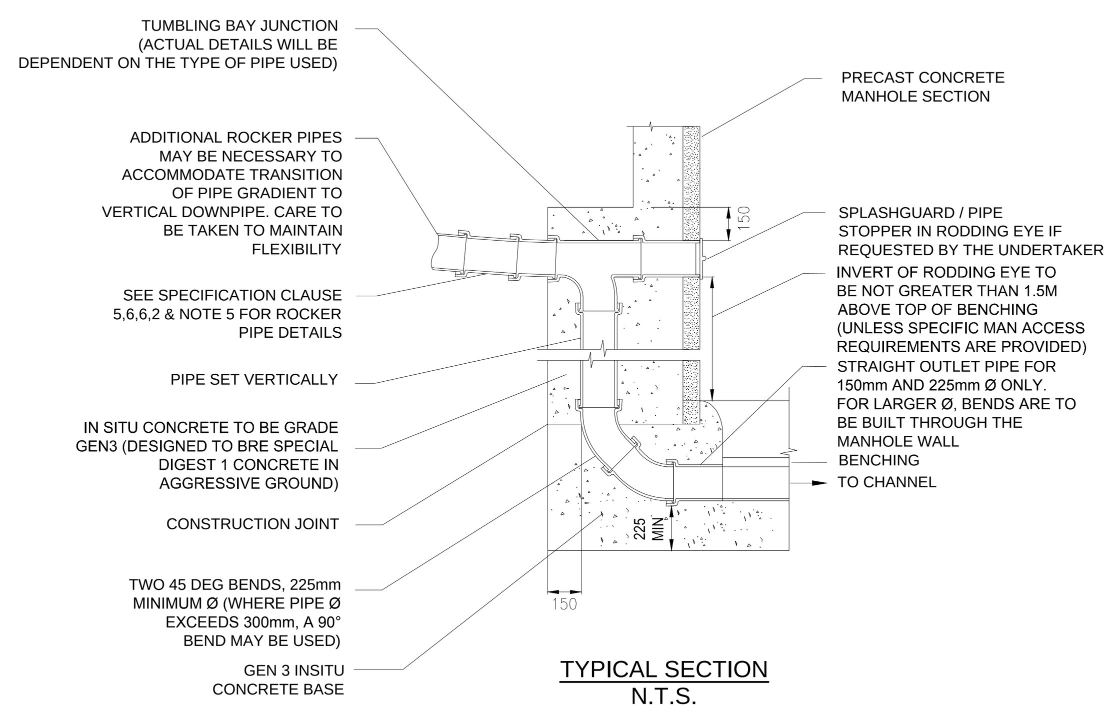
TYPICAL MANHOLE DETAIL TYPE A DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 3M TO 6M

SCALE N.T.S.



TYPICAL SECTION

TYPICAL VERTICAL BACKDROP DETAIL (SEE NOTE 7 AND 8)



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N.T.S.

TYPICAL MANHOLE DETAIL TYPE B MAX DEPTH FROM COVER LEVEL TO SOFFIT OF PIPE 3.0M

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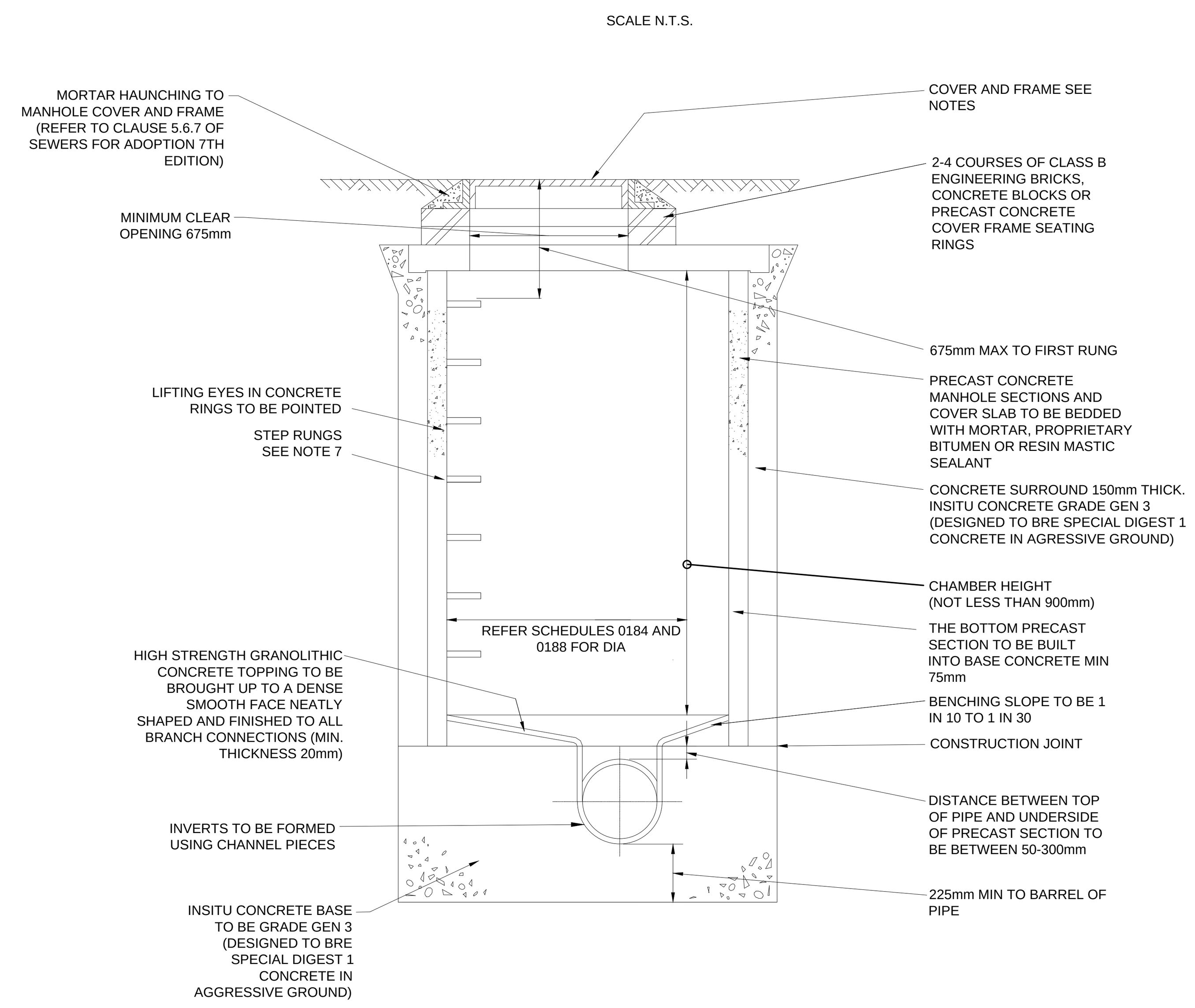
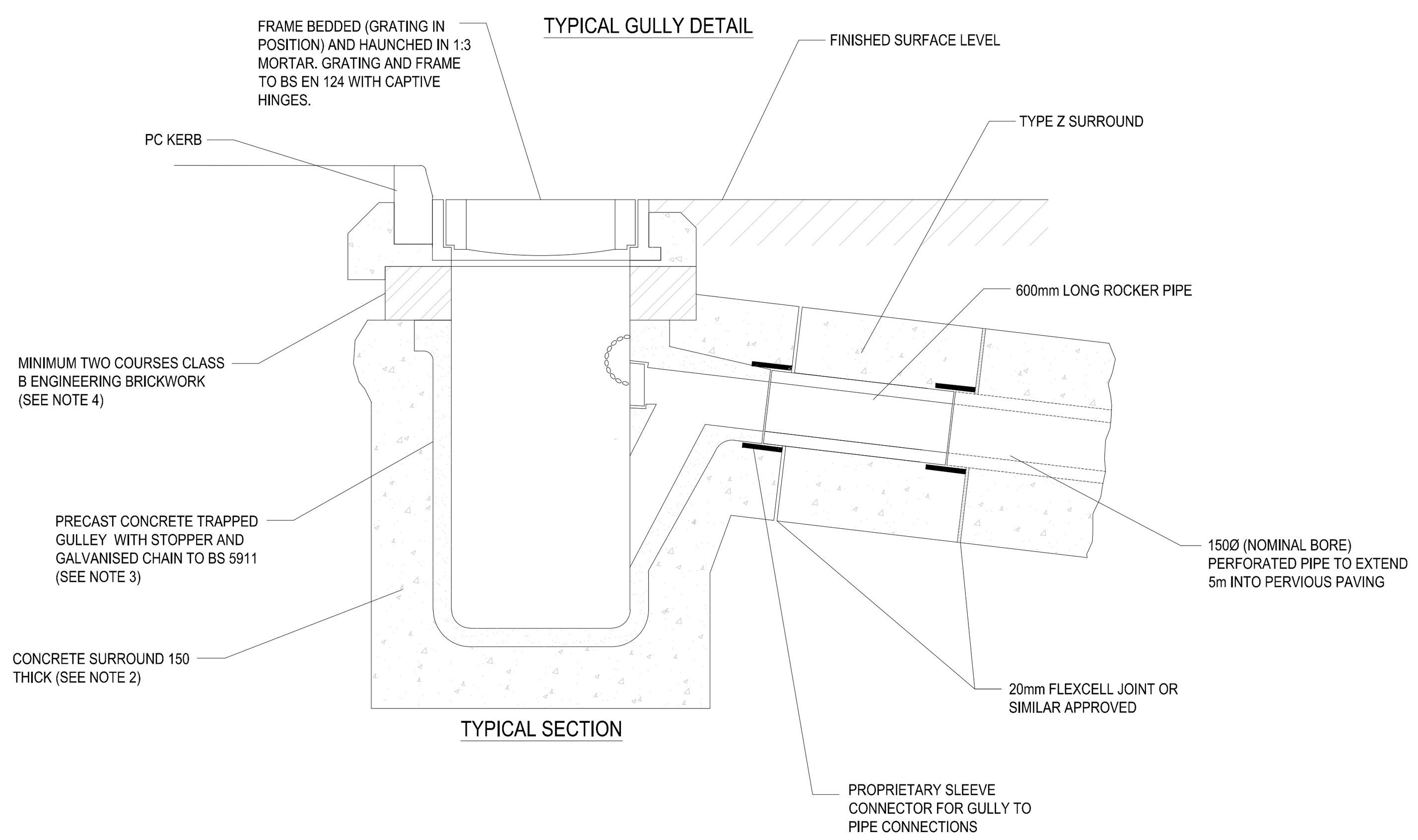
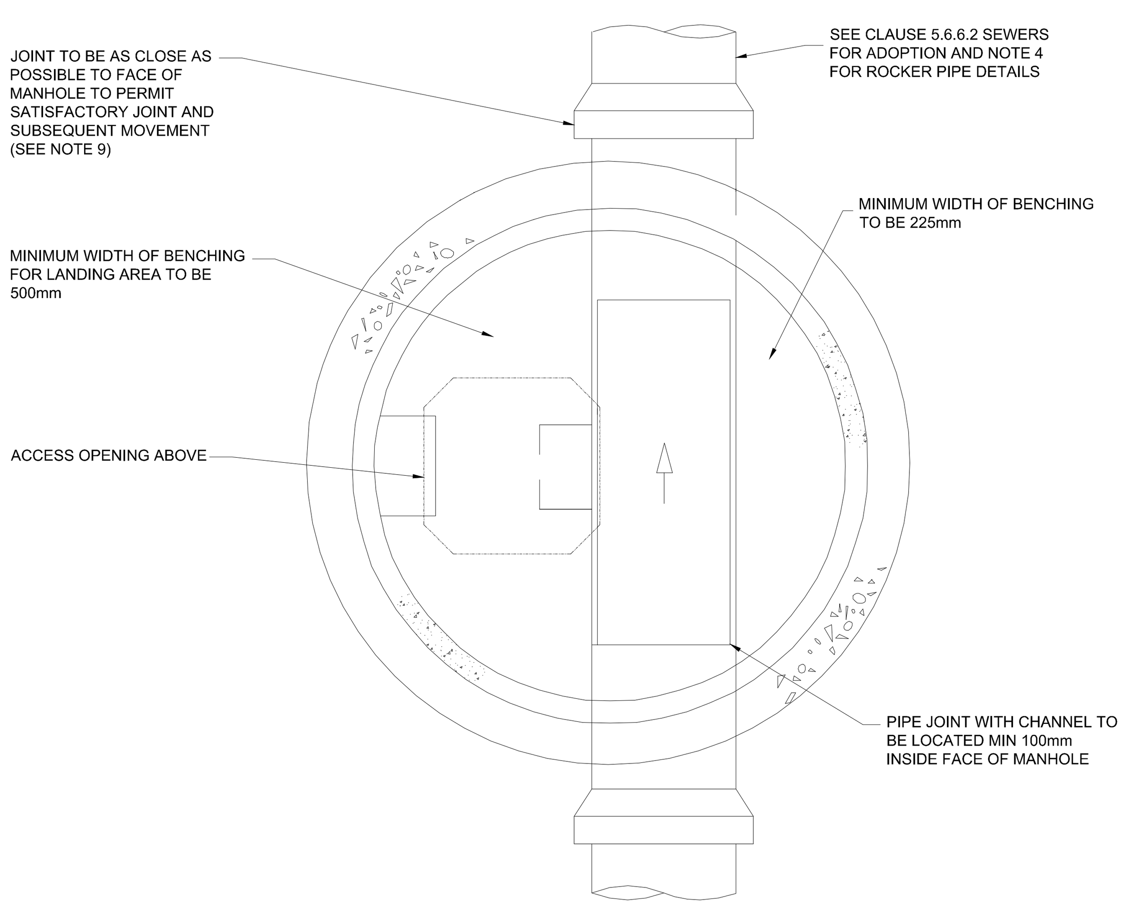


TYPICAL SECTION

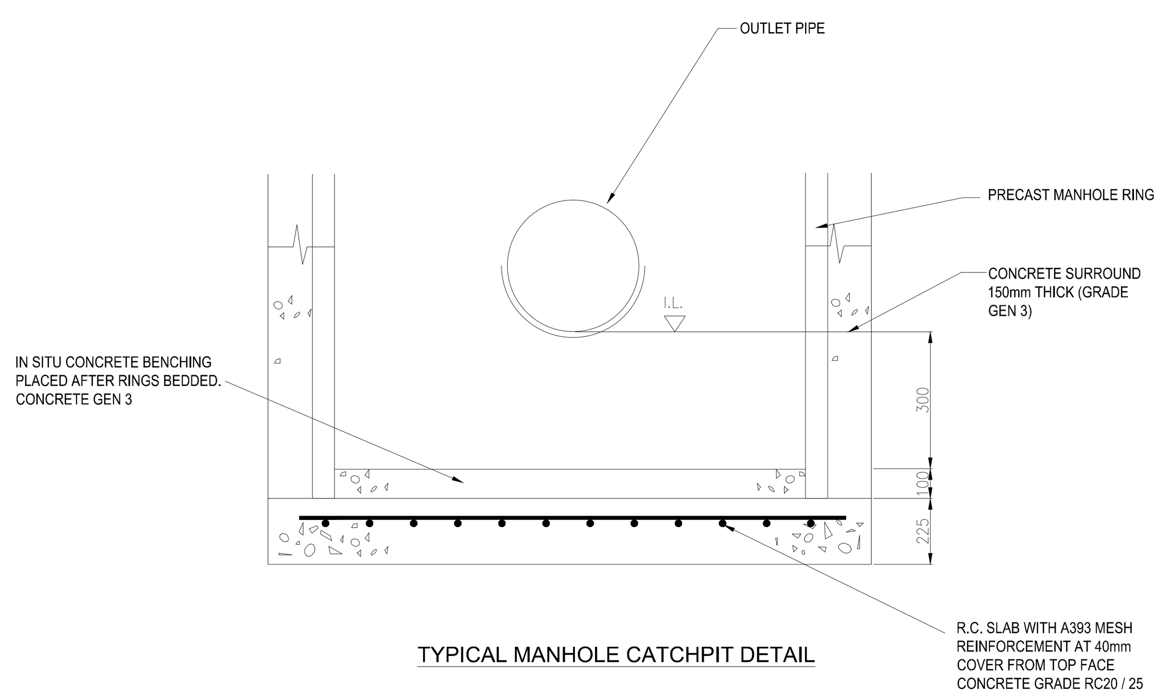
TYPICAL GULLY DETAIL



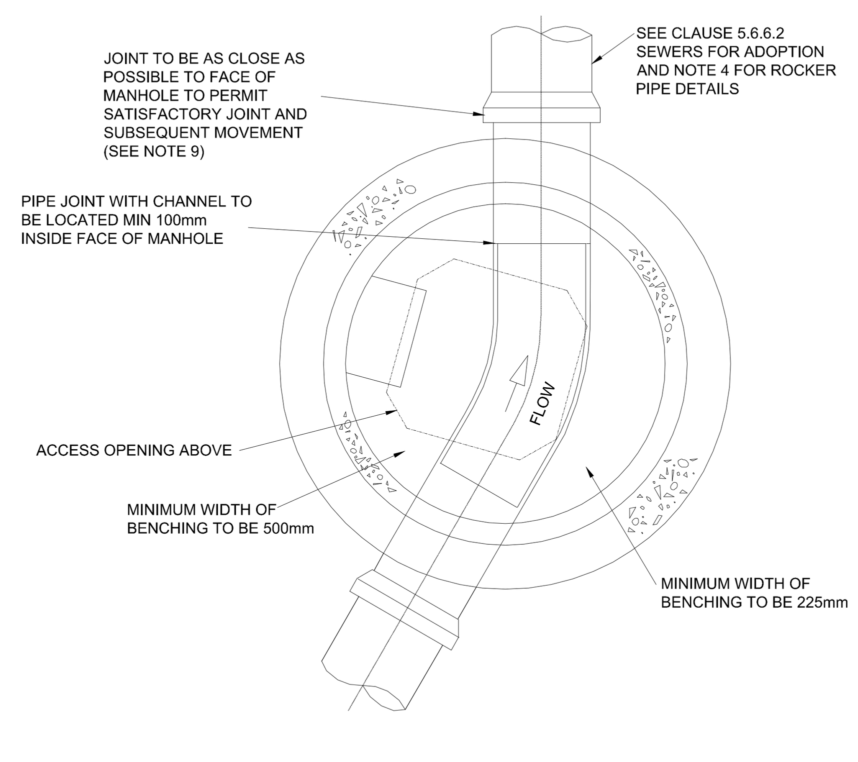
TYPICAL SECTION



PLAN
TYPE A MANHOLE



TYPICAL MANHOLE CATCHPIT DETAIL



PLAN
TYPE B MANHOLE

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

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CONSTRUCTION

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1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED. ALL WORKS TO BE IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION, AND WHERE UNDERTAKER SPECIAL REQUIREMENTS APPLY, TO THAMES WATER REQUIREMENTS. CLAUSE NUMBERING REFERS TO SEWERS FOR ADOPTION 7TH EDITION.
2. FRAMES FOR MANHOLE COVERS ARE TO BE BEDDED AS PER THE REQUIREMENTS OF CLAUSE 6.7.2 OF SEWERS FOR ADOPTION 7TH EDITION.
3. ROCKER PIPE LENGTHS AS FOLLOWS:-

SCHEDULE OF ROCKER PIPE LENGTHS

NOMINAL DIAMETER OF PIPE (mm)	ROCKER PIPE LENGTH (mm)
150 TO 600	600
675 TO 750	1000
OVER 750	1250

4. MANHOLE COVERS AND FRAMES TO BE DUCTILE IRON TO LOAD CLASS B125 IN SOFT LANDSCAPE AREAS AND D400 IN VEHICLE ACCESS AREAS.
5. STEP RUNGS TO BE DOUBLE WIDTH POLYPROPYLENE ENCAPSULATED AT 300 CENTRES.
6. MAXIMUM GRADIENT ACROSS CHAMBER COVERS TO BE 1 IN 10.
7. WHERE THE DROP IS LESS THAN 1.8m A 45° DROP PIPE MAY BE USED.
8. CONSTRUCTION DETAILS TO BE IN COMPLIANCE WITH SEWERS FOR ADOPTION 7TH EDITION.

Rev.	Date	Description	By	Chk'd	App'd
P1	12/05/17	FOR TENDER	AST	JT	GC

Drawing Status: FOR TENDER
Suitability: D2

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Client: Richmond upon Thames College

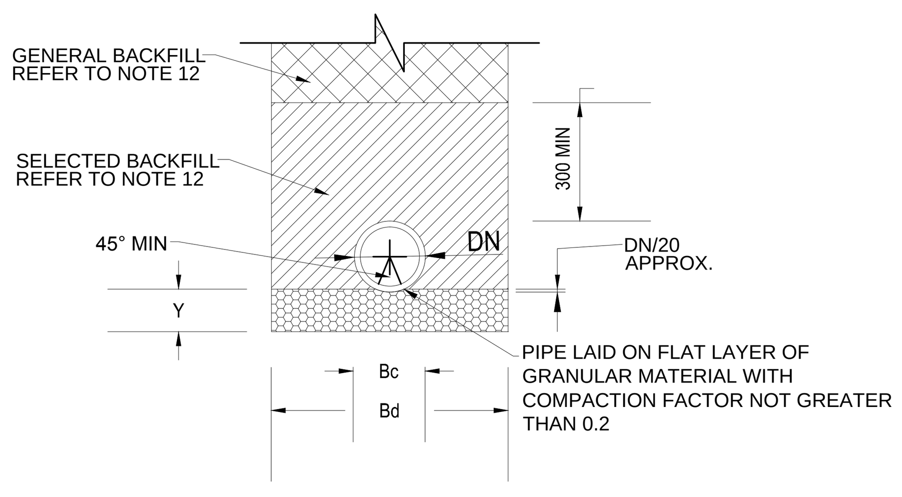
Project Title: RICHMOND UPON THAMES COLLEGE REDEVELOPMENT

Drawing Title: FOUL AND SURFACE WATER DRAINAGE MANHOLE DETAILS

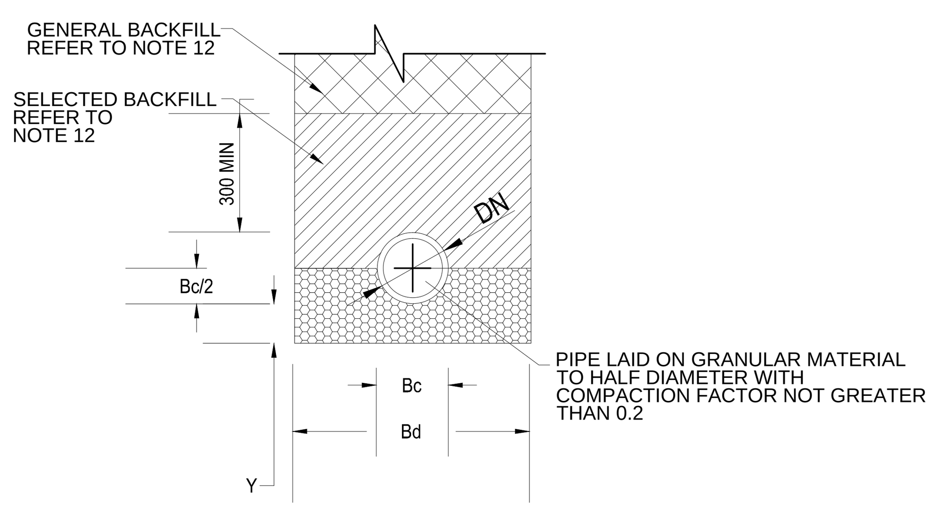
Scale	Designed	Drawn	Checked	Authorised
1:500	AST	AY	JT	GC
Original Size	Date	Date	Date	Date
A1	11/04/2017	11/04/2017	11/04/2017	11/04/2017

Drawing Number: 5137894-ATK-00-XX-DR-C-0354
Revision: P1.0

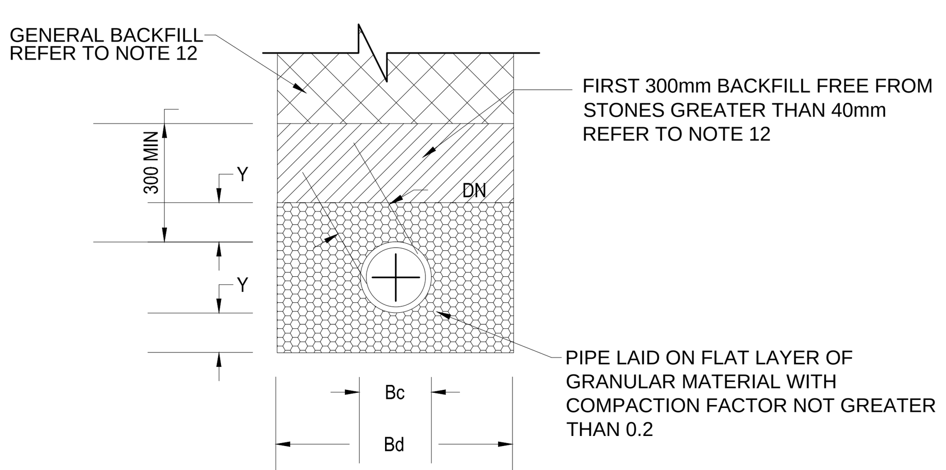
DO NOT SCALE



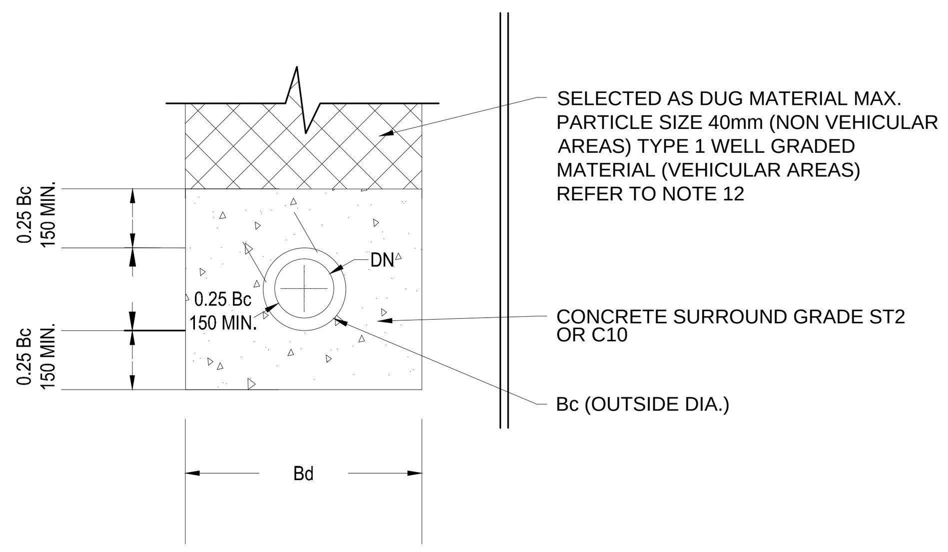
TYPICAL PIPE BEDDING - CLASS F



TYPICAL PIPE BEDDING - CLASS B



TYPICAL PIPE BEDDING - CLASS S



NOTE:- THE FLEXIBILITY OF PIPELINE SURROUNDED WITH CONCRETE SHOULD BE MAINTAINED BY THE PROVISION OF FLEXIBLE CONSTRUCTION JOINTS THROUGH THE CONCRETE AT EACH PIPE JOINT. THESE SHOULD BE MADE FROM BITUMEN IMPREGNATED INSULATING BOARD COMPLYING WITH BS 1142: 1989 OR OTHER EQUALLY COMPRESSIBLE MATERIAL

TYPICAL PIPE BEDDING UNREINFORCED CONCRETE SURROUND CLASS Z1

ENGINEER'S ADVICE SHOULD BE SOUGHT IF PERCHED WATER IS ENCOUNTERED

TABLE A

BEDDING MATERIAL		
NOMINAL PIPE DIAMETER mm	SINGLE SIZE GRANULAR BEDDING MATERIAL mm	GRADED GRANULAR MATERIAL mm
150	10,14	14 TO 5
225 - 300	10, 14 OR 20	14 TO 5, 20 TO 5
375 - 525	14, 20	14 TO 5, 20 TO 5
OVER 525	14, 20, 40	14 TO 5, 20 TO 5, 40 TO 5

TABLE B

SELECTED FILL	
NOMINAL PIPE DIAMETER mm	MAXIMUM STONE SIZE mm
150	15
200 - 525	20
OVER 525	40

TABLE C

DN/Ø	Bc	Bd	Y SEE NOTE 3
150/160	210	600	100
225/200	300	700	110
300	375	750	110
375/400	490	1050	110
450	575	1150	110
525	670	1200	120
600	775	1350	130
675	815	1450	150
750	905	1500	160
825	985	1600	170
900	1070	1900	190
1050	1265	2050	220
1200	1430	2300	250
1350	1615	2450	280
1500	1745	2600	300
1600	1910	2400	340
1800	2090	2950	370

TABLE D - VITRIFIED CLAY & CONCRETE PIPES BEDDING REQUIREMENTS

Narrow Trench (ie Trench width = B_d)

Bedding Type & Location:-	Bedding Factor VC	Bedding Factor Concrete	150	225	300	400/375	400/375	450	525	600	675	750	825	900	1050	1200	1400
Material / strength			VC 40KN/m	VC 45KN/m	VC 72KN/m	VC 64KN/m	Concrete SC120	Concrete SC120	Concrete SC120	Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120
Trafficked / Paved Areas																	
Class Z1	4.5	4.5	-	-	-	-	-	-	-	7.0 - 10.0	7.0 - 10.0	7.0 - 10.0	7.0 - 10.0	5.3 - 10.0	5.5 - 10.0	5.6 - 10.0	5.6 - 9.0
Class S	2.5	2.2	-	-	7.0 - 10.0		4.5 - 10.0	4.2 - 10.0	3.9 - 10	4.5 - 7.0	4.3 - 7.0	4.5 - 7.0	4.5 - 7.0	3.8 - 5.3	4.1 - 5.5	4.1 - 5.6	4.1 - 5.6
Class B	2.5	1.9	5.5 - 10.0	5.0 - 10.0	4.0 - 7.0	2.5 - 10.0	2.6 - 4.5	2.3 - 4.2	1.2 - 3.9	2.4 - 4.5	1.2 - 4.3	1.2 - 4.5	1.9 - 4.5	1.9 - 3.8	1.9 - 4.1	2.0 - 4.1	2.0 - 4.1
Class F	1.9	1.5	*1.2 - 5.5	*1.2 - 5.0	*1.2 - 4.0	*1.2 - 2.5	*1.2 - 2.6	*1.2 - 2.3	-	*1.2 - 2.4	-	-	*1.2 - 1.9	*1.2 - 1.9	*1.2 - 1.9	*1.2 - 2.0	*1.2 - 2.0
Class Z1	Protection (4.5)		< 1.2m for Back of House and <0.9m for Front of House & Concourse Areas														
Un-Paved / Landscape Areas																	
Class Z1	4.5	4.5	-	-	-	-					7.0 - 10.0		8.0 - 10.0	8.0 - 10.0	7.0 - 10.0	7.0 - 10.0	7.0 - 10.0
Class S	2.5	2.2	-	-	8.0 - 10.0	-	5.0 - 10.0	4.7 - 10.0	4.5 - 10.0	5.0 - 10.0	5.0 - 7.0	5.0 - 10.0	4.7 - 8.0	4.7 - 8.0	4.9 - 7.0	5.0 - 7.0	5.0 - 7.0
Class B	2.5	1.9	5.9 - 10.0	3.5 - 10.0	5.5 - 8.0	3.7 - 10.0	3.6 - 5.0	3.3 - 4.7	3.0 - 4.5	3.3 - 5.0	3.3 - 5.0	3.3 - 5.0	3.4 - 4.7	3.4 - 4.7	3.4 - 4.9	3.5 - 5.0	3.5 - 5.0
Class F	1.9	1.5	0.65 - 5.9	0.65 - 3.5	0.65 - 5.5	0.65 - 3.7	0.65 - 3.6	0.8 - 3.3	0.8 - 3.0	0.8 - 3.3	0.8 - 3.3	0.8 - 3.3	0.6 - 3.4	0.6 - 3.4	0.6 - 3.4	0.6 - 3.5	0.6 - 3.5
Class B	-	1.9	-	-	-	-	-	0.6 - 0.8	0.6 - 0.8	0.6 - 0.8	0.6 - 0.8	0.6 - 0.8	-	-	-	-	-
Class Z1	Protection (4.5)		< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6

Wide Trench (ie Trench width >B_d)

Bedding Type Location:-	Bedding Factor VC	Bedding Factor Concrete	150	225	300	400/375	400/375	450	525	600	675	750	825	900	1050	1200	1400
Material / strength			Vitrified Clay 40KN/m	Vitrified Clay 45KN/m	Vitrified Clay 72KN/m	Vitrified Clay 64KN/m	Concrete SC120	Concrete SC120	Concrete SC120	Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120	Reinforced Concrete SC120
Trafficked / Paved Areas			For depths of cover exceeding 7.0m refer to Narrow Trench schedule above														
Class Z1	4.5	4.5	-	-	-	-	4.0 - 7.0	4.5 - 7.0	4.7 - 7.0	4.6 - 7.0	3.9 - 7.0	4.0 - 7.0	4.2 - 7.0	4.2 - 7.0	4.2 - 7.0	4.1 - 7.0	5.0 - 7.0
Class S	2.5	2.2	-	-	-	-	3.0 - 4.0	3.7 - 4.5	3.8 - 4.7	3.6 - 4.6	2.9 - 3.9	3.1 - 4.0	3.3 - 4.2	3.3 - 4.2	3.3 - 4.2	3.2 - 4.1	4.0 - 5.0
Class B	2.5	1.9	5.5 - 7.0	5.0 - 7.0	4.0 - 7.0	6.0 - 7.0	1.2 - 3.0	2.0 - 3.7	1.2 - 3.8	2.2 - 3.6	1.2 - 2.9	1.2 - 3.1	1.2 - 3.3	1.9 - 3.3	2.0 - 3.3	2.0 - 3.2	2.0 -4.0
Class F	1.9	1.5	*1.2 - 5.5	*1.2 - 5.0	*1.2 - 4.0	*1.2 - 6.0	-	*1.2 - 2.0	-	*1.2 - 2.2	-	-	-	*1.2 - 1.9	*1.2 - 2.0	*1.2 - 2.0	*1.2 - 2.0
Class Z1	Protection (4.5)		< 1.2m for Back of House and <0.9m for Front of House & Concourse Areas														
Un-Paved / Landscape Areas			For depths of cover exceeding 7.0m refer to Narrow Trench schedule above														
Class Z1	4.5	4.5	-	-	-	-	5.0 - 7.0	4.9 - 7.0	5.0 - 7.0	5.0 - 7.0	4.4 - 7.0	4.5 - 7.0	4.6 - 7.0	4.6 - 7.0	4.7 - 7.0	4.6 - 7.0	6.0 - 7.0
Class S	2.5	2.2	-	-	-	-	4.0 - 5.0	4.0 - 4.9	4.0 - 5.0	4.0 - 5.0	3.7 - 4.4	3.8 - 4.5	3.9 - 4.6	3.9 - 4.6	4.0 - 4.7	3.9 - 4.6	5.0 - 6.0
Class B	2.5	1.9	5.9 - 7.0	3.5 - 7.0	5.5 - 7.0	3.7 - 7.0	3.0 - 4.0	3.0 - 4.0	3.0 - 4.0	3.0 - 4.0	2.8 - 3.7	2.9 - 3.8	3.0 - 3.9	3.0 - 3.9	3.0 - 4.0	3.0 - 3.9	3.0 - 5.0
Class F	1.9	1.5	0.65 - 5.9	0.65 - 3.5	0.65 - 5.5	0.65 - 3.7	0.65 - 3.0	0.8 - 3.0	0.8 - 3.0	0.8 - 3.0	0.8 - 2.8	0.8 - 2.9	0.8 - 3.0	0.8 - 3.0	0.6 - 3.0	0.6 - 3.0	0.6 - 3.0
Class B	-	1.9	-	-	-	-	-	0.6 - 0.8	0.6 - 0.8	0.6 - 0.8	0.6 - 0.8	0.6 - 0.8	0.6 - 0.8	0.6 - 0.8	-	-	-
Class Z1	Protection (4.5)		< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6

TABLE E THERMOPLASTIC PIPES BEDDING REQUIREMENTS

Bedding Class	Material Type	Location	Depth of cover (upto 6.0m) for stated pipe size upto 600mm								
			Nominal pipe diameter (mm)	150	225	300	375	400	450	500	600
Class S	single size granular	Trafficked/ Paved Areas	Installation depths (m)	0.6 - 6.0	0.8 - 3.6	1.0 - 3.4	0.7 - 3.6	0.7 - 3.4	0.7 - 3.2	0.8 - 3.0	0.9 - 2.6
Class S	single size granular	Un-Paved / Landscape Areas		0.6 - 6.0	0.6 - 5.0	0.6 - 4.0	0.6 - 4.0	0.6 - 4.0	0.6 - 4.0	0.6 - 3.8	0.6 - 3.4
Class S	graded granular	Trafficked/ Paved Areas		0.9 - 3.4	1.0 - 2.8	1.1 - 2.2	1.0 - 2.2	1.1 - 2.2	1.1 - 2.0	1.2 - 1.9	-
Class S	graded granular	Un-Paved / Landscape Areas		0.6 - 4.0	0.6 - 3.6	0.6 - 3.2	0.6 - 3.2	0.6 - 3.2	0.6 - 3.2	0.6 - 3.0	0.6 - 3.0
Class Z2				< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6	< 0.6

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following:

CONSTRUCTION

BURIED SERVICES INCLUDING POSSIBILITY OF UNCHARTED SERVICES - REFER TO SERVICES PLANS AND USE CABLE AVOIDANCE TOOLS BEFORE DIGGING.
POTENTIAL FOR POCKETS OF BURIED CONTAMINATION INCLUDING ASBESTOS CONTAINING MATERIALS.
POSSIBILITY OF UNEXPLODED ORDNANCE - KEEP WATCH DURING GROUND WORKS.
IF IN DOUBT, STOP WORK AND ASK.

MAINTENANCE/CLEANING

MULTIPLE BURIED SERVICES - CONSULT SERVICES PLANS, USE CABLE AVOIDANCE TOOLS AND FOLLOW RAMS WHEN EXCAVATING.
IF IN DOUBT, STOP WORK AND ASK.

DECOMMISSIONING/DEMOLITION

MULTIPLE BURIED SERVICES - CONSULT SERVICES PLANS, HOST UTILITY COMPANIES AND USE CABLE AVOIDANCE TOOLS BEFORE EXCAVATING.
IF IN DOUBT, STOP WORK AND ASK.

It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL BEDDING DIMENSIONS ARE FOR UNIFORM SOIL. WHERE ROCK OR ARTIFICIAL HARD MATERIALS ARE ENCOUNTERED SEEK ENGINEERING ADVICE ON INCREASE TO 'Y' DIMENSIONS IN TABLE C.
3. NOTATION:
   DN - BORE OF PIPE
   Bc - OUTSIDE DIAMETER OF PIPE BARREL
   Bd - TRENCH WIDTH
   Y - BEDDING DEPTH (NO PACKING IS TO BE USED TO ADJUST LEVEL OF PIPE). TABLE C SHOWS MINIMUM 'Y' EXCEPT UNDER SOCKETS WHERE A MINIMUM OF 50mm APPLIES. NOTE THAT 'Y' SHALL NOT EXCEED A MAXIMUM OF 400mm.
4. BEDDING TYPES AND PIPE STRENGTHS ARE BASED ON HEPWORTH OR EQUAL PIPE PRODUCTS FOR CLAY, CONCRETE AND THERMOPLASTIC PIPE.
5. BEDDING MATERIAL SHALL BE IN ACCORDANCE WITH BS EN 13242 AND BS EN 12620, DIMENSIONS SHALL BE IN ACCORDANCE WITH TABLE D, BASED ON COVER, TRAFFIC LOADING, PIPE MATERIAL AND SIZE, AND TRENCH WIDTH.
6. TRENCH WIDTH (TABLE D) SHALL GENERALLY BE CONSTRUCTED 'NARROW TRENCH' UNLESS CONSTRUCTION COMPLEXITY DICTATES OTHERWISE. IN PARTICULAR, WHERE A FOUL AND AN SW SEWER IS CONSTRUCTED SHARING A TRENCH, 'WIDE TRENCH' BEDDING REQUIREMENTS SHALL BE PROVIDED.
7. GENERAL BACKFILL;

7.1 IMPERMEABLE PAVING, GENERAL BACKFILL SHALL BE CLASS 1 MATERIAL TO SHW600 SERIES. IT SHALL BE FREE FROM LUMPS OF CLAY OR STONES GREATER THAN 40mm NOMINAL.
7.2 PERMEABLE PAVING, GENERAL BACKFILL SHALL BE IN COMPLIANCE WITH THE SPECIFICATION REQUIREMENTS FOR INFILTRATION.
7.3 ELSEWHERE, GENERAL BACKFILL SHALL BE CLASS 8.

8. SELECTED FILL SHALL BE AS FOR GENERAL FILL, EXCEPT THE MAXIMUM STONE SIZES SHALL BE FURTHER RESTRICTED IN ACCORDANCE WITH TABLE B.
9. WHERE REQUIRED, FOR PROTECTION IN WATER LOGGED TRENCHES, WATERPROOF MEMBRANE TO COMPLY WITH BS 8102, SHW CLAUSE 514 x 514 AND TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS. MEMBRANE SHALL BE HORIZONTALLY OVERLAPPED BY 300mm. STANKS SHALL ALSO BE USED ALONG PIPELINE AT 5m INTERVALS.
10. PIPE MATERIAL TO BE VITRIFIED CLAY FOR 150mm AND 225mm DIA PIPES AND CONCRETE WHERE PIPE Ø IS GREATER THAN OR EQUAL TO 300mm.

Rev.	Date	Description	By	Chk'd	App'd
P1	12/05/17	FOR TENDER	AST	JT	GC

Drawing Status: FOR TENDER
Suitability: D2

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Client: Richmond upon Thames College

Project Title: RICHMOND UPON THAMES COLLEGE REDEVELOPMENT

Drawing Title: FOUL AND SURFACE WATER DRAINAGE TYPICAL PIPE BEDDING DETAILS

Scale	Designed	Drawn	Checked	Authorised
1:500	AST	AY	JT	GC
Original Size	Date	Date	Date	Date
A1	11/04/2017	11/04/2017	11/04/2017	11/04/2017

Drawing Number: 5137894-ATK-00-XX-DR-C-0355
Revision: P1.0

Appendix B. Relevant Calculations

B.1. Drainage network capacity and flooding assessment

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	Add Flow / Climate Change (%)	30
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.200
Ratio R	0.409	Maximum Backdrop Height (m)	1.500
Maximum Rainfall (mm/hr)	250	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.406
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	100
Climate Change (%)	30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S7.000	S19	480 Winter	100	+30%	100/15 Summer			
S7.001	Srwp11	480 Winter	100	+30%	100/15 Summer			
S8.000	S7	480 Winter	100	+30%	100/15 Summer			
S7.002	S2	480 Winter	100	+30%	100/15 Summer			
S9.000	S9	480 Winter	100	+30%	100/15 Summer			
S7.003	Srwp05	480 Winter	100	+30%	100/15 Summer			
S10.000	S8	480 Winter	100	+30%	100/15 Summer			
S7.004	Srwp04	480 Winter	100	+30%	100/15 Summer			
S11.000	S14	480 Winter	100	+30%	100/15 Summer			
S12.000	S16	480 Winter	100	+30%	100/15 Summer			
S7.005	S16	480 Winter	100	+30%	100/15 Summer			
S13.000	S18	480 Winter	100	+30%	100/15 Summer			
S7.006	Srwp02	480 Winter	100	+30%	100/15 Summer			
S14.000	S27	360 Winter	100	+30%				
S15.000	S1	360 Winter	100	+30%				
S15.001	S5	480 Winter	100	+30%				
S15.002	S5	480 Winter	100	+30%				
S16.000	S23	480 Winter	100	+30%				

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S7.000	S19	8.197	0.592	0.000	0.01		0.1	SURCHARGED	
S7.001	Srwp11	8.197	0.709	0.000	0.06		1.7	SURCHARGED	
S8.000	S7	8.197	0.622	0.000	0.01		0.1	SURCHARGED	
S7.002	S2	8.197	0.740	0.000	0.11		3.3	SURCHARGED	
S9.000	S9	8.197	0.725	0.000	0.01		0.1	SURCHARGED	
S7.003	Srwp05	8.197	0.836	0.000	0.13		4.7	SURCHARGED	
S10.000	S8	8.196	0.801	0.000	0.01		0.1	SURCHARGED	
S7.004	Srwp04	8.196	0.928	0.000	0.15		5.9	SURCHARGED	
S11.000	S14	8.194	0.890	0.000	0.01		0.1	SURCHARGED	
S12.000	S16	8.194	0.962	0.000	0.02		0.1	SURCHARGED	
S7.005	S16	8.194	1.079	0.000	0.22		6.8	SURCHARGED	
S13.000	S18	8.193	1.010	0.000	0.01		0.1	SURCHARGED	
S7.006	Srwp02	8.193	1.184	0.000	0.19		7.9	SURCHARGED	
S14.000	S27	8.400	-0.150	0.000	0.00		0.0	OK	
S15.000	S1	8.345	-0.150	0.000	0.00		0.0	OK	
S15.001	S5	8.192	-0.225	0.000	0.00		0.0	OK	
S15.002	S5	8.193	-0.150	0.000	0.01		0.2	OK	
S16.000	S23	8.193	-0.087	0.000	0.01		0.1	OK	

Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S15.003	S33	480 Winter	100	+30%				
S14.001	Srwp08	480 Winter	100	+30%	100/360 Winter			
S17.000	S27	15 Winter	100	+30%	100/15 Summer	100/15 Winter		
S17.001	S27	15 Winter	100	+30%	100/15 Summer			
S17.002	S27	480 Winter	100	+30%	100/15 Summer			
S17.003	S8	480 Winter	100	+30%	100/15 Summer			
S18.000	S9	15 Winter	100	+30%	100/15 Summer			
S14.002	S7	480 Winter	100	+30%	100/15 Summer			
S7.007	S8	480 Winter	100	+30%	100/15 Summer			
S7.008	S9	480 Winter	100	+30%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S15.003	S33	8.193	-0.020	0.000	0.03		1.0	OK	
S14.001	Srwp08	8.193	0.079	0.000	0.05		1.8	SURCHARGED	
S17.000	S27	9.000	1.175	0.323	1.54		61.5	FLOOD	1
S17.001	S27	8.611	1.011	0.000	1.44		158.4	SURCHARGED	
S17.002	S27	8.196	0.919	0.000	0.22		34.6	SURCHARGED	
S17.003	S8	8.195	1.018	0.000	0.23		34.3	SURCHARGED	
S18.000	S9	8.239	0.114	0.000	1.90		54.6	SURCHARGED	
S14.002	S7	8.193	1.085	0.000	0.19		41.9	SURCHARGED	
S7.007	S8	8.191	1.327	0.000	0.04		5.4	SURCHARGED	
S7.008	S9	6.433	-0.398	0.000	0.03		5.4	OK	

Appendix C. Communications with London Borough of Richmond-upon-Thames

C.1. Flood Risk Assessment

From:	Brian Humphris
To:	Taylor, Jessica
Cc:	"Robert Mackenzie-Grieve"
Subject:	RE: Richmond-upon-Thames College
Date:	09 December 2016 11:45:55

Jessica

Your proposal are acceptable. As I said, I will be leaving Richmond in the near future, so please ensure that all that we have previously agreed is included, to ensure that anyone else dealing with it can easily find it.

Regards Brian

Brian Humphris
Highway Asset Co-ordinator
Serving Richmond and Wandsworth Councils

Environment Directorate
London Borough of Richmond upon Thames
2nd Floor
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44 York Street
Twickenham
TW1 3BZ

020 8891 7738

brian.humphris@richmond.gov.uk
www.richmond.gov.uk / www.wandsworth.gov.uk

From: Taylor, Jessica [mailto:Jessica.Taylor@atkinsglobal.com]
Sent: 07 December 2016 16:22
To: Brian Humphris
Cc: 'Robert Mackenzie-Grieve'
Subject: RE: Richmond-upon-Thames College

Hi Brian,

If we could kindly get you to confirm your agreement with our below comments it would be very much appreciated. We plan to submit the Reserve Matters application for the sight shortly and would like to confirm your stance for consistency going forward.

Thanks very much for your assistance with this to date.

Best regards,

Jess Taylor
Civil Engineer, Infrastructure
ATKINS

020 7121 2305

From: Taylor, Jessica
Sent: 06 December 2016 11:20
To: Brian Humphris <brian.humphris@richmond.gov.uk>
Cc: Robert Mackenzie-Grieve <robert.mackenzie-grieve@cgms.co.uk>
Subject: RE: Richmond-upon-Thames College

Hi Brian,

Thank you for your time this morning.

As discussed, the Phase 1 area of the Richmond-upon-Thames College development is located in a relatively low flood risk zone from all relevant sources (rivals, tidal, surface water, sewer).

As agreed we will incorporate a section to address the flood risk for the site within the Drainage Strategy document to be submitted with the Reserve Matters application. However a formal FRA will not be required.

If you could please respond and confirm this reflects our conversation this morning it would be very much appreciated.

Best regards,

Jess

Best regards,

Jess Taylor
Civil Engineer, Infastructure

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From: Brian Humphris [mailto:brian.humphris@richmond.gov.uk]
Sent: 05 December 2016 15:08
To: Taylor, Jessica <Jessica.Taylor@atkinsglobal.com>
Subject: RE: Richmond-upon-Thames College

Hi Jessica

I think it would be preferable for you to submit a formal FRA, including a summary of what has already been agreed, although this could be included within the Reserved Matters.

Regards Brian

Brian Humphris
Highway Asset Co-ordinator
Serving Richmond and Wandsworth Councils

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From: Taylor, Jessica [mailto:Jessica.Taylor@atkinsglobal.com]
Sent: 02 December 2016 12:10
To: Brian Humphris
Subject: Richmond-upon-Thames College

Hi Brian,

I hope this finds you well.

Just tried to give you a ring in relation to the below, but I missed you.

To recap - back in May of this year we were in touch to discuss the surface water management and discharge strategy for the Richmond-upon-Thames College redevelopment.

Atkins has undertaken the drainage design for the new Richmond-upon-Thames College Phase 1 main building build (site MasterPlan attached for reference). I have attached our original correspondence describing the surface water strategy however to summarise we are using a combination of infiltration (through permeable paving) into the underlying Kempton Park Gravels Strata and discharge (at greenfield) into the local Thames Water Surface Water sewer. We have approached Thames Water regarding the surface water connection, who have confirmed that no Impact Study is required.

We are now contacting you to confirm the requirements for the College Phase 1 development in terms of a Flood Risk Assessment.

Similar to the neighbouring School development the College Phase 1 site is within Flood Zone 1. We acknowledge that the playing fields located within the southern portion of the site are within Flood Zone 2. However his area of the site is much lower than the proposed development and as such this development will have no effect on their site other than to improve drainage in the area and therefore flooding.

Given that a detailed summary of the Drainage Strategy, flood mitigation and the SuDs employed in Phase 1 of the development will be submitted with the Reserve Matters, we feel that an FRA may not be required for this area of the site. This is similar to the strategy employed by the School.

Attached below is the EA flood Map for your quick reference.

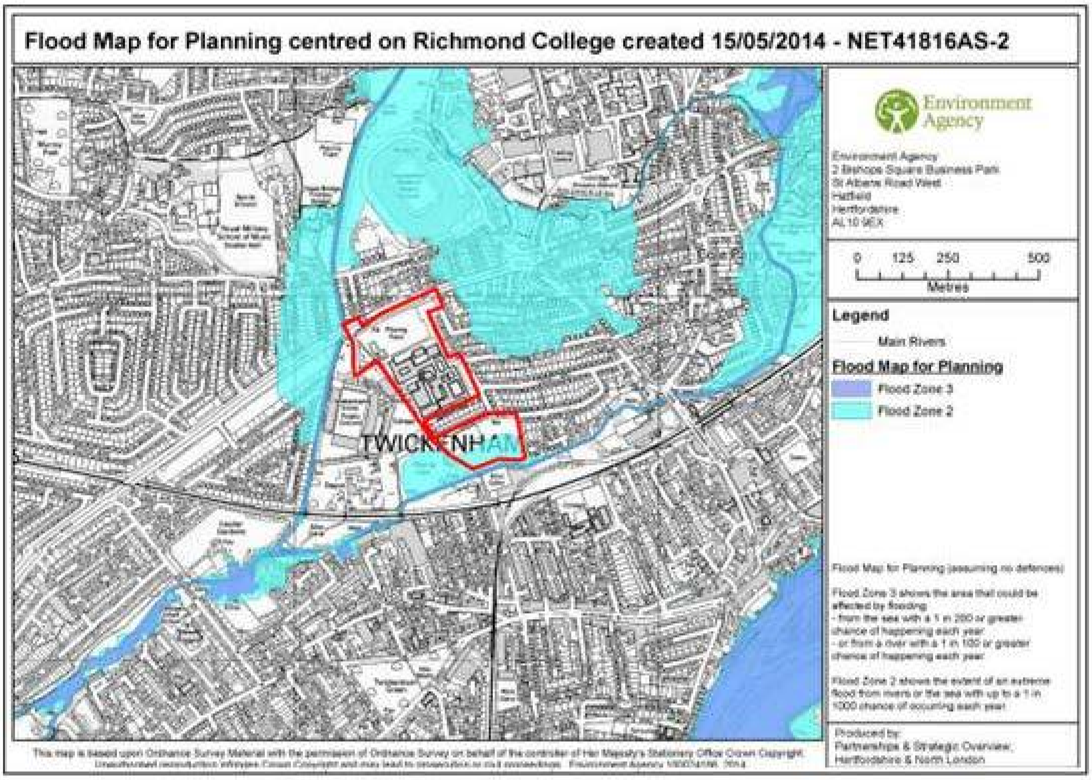

Figure 3.1 Environment Agency River and Coastal Flood Zone map (EA, 2014)

We appreciate that you are yet to sight our official drainage strategy documents however we just wanted to clarify this aspect of the drainage with you prior to prevent delays on submission of the Reserve Matters Application.

If you could please give me a ring back to discuss this in detail it would be greatly appreciated.

Best regards,

Jess Taylor
Civil Engineer, Infastructure

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Appendix D. Flood Risk Maps

D.1. Flood Map (EA)

D.2. Fluvial and Tidal Flood Maps (EA and LBRuT)

D.3. Surface Water Flood Map (EA and LBRuT)

D.4. Sewer Flood Map (EA and LBRuT)

D.5. Groundwater Flood Map (EA and LBRuT)

D.6. Reservoir Flood Map (EA)