Appendix F – Existing Drainage Information

Lancashire Digital Technology Centre
Bancroft Road
Burnley
Lancashire
BB10 2TP

Tel: (01282) 872541
Fax: 0871 528 4200

Offices also at:
Blackburn & Lancaster

ACS Partnership

Chartered Building Surveyors & Building Engineers

Est 1985

Mrs Margaret Adams,
Bursar,
All Saints Catholic Language College
Haslingden Road,
Rawtenstall

Our Ref JS/HDT/1845

June 15th 2016

Dear Margaret.

<u>Re: Failing Culvert to the North East Side of Playing Field, All Saints Catholic High School, Rawtenstall</u>

Further to your recent instructions we write to confirm that we have carried out an inspection on 2nd June 2016. The weather conditions at the time were fine and dry but mild.

Please note that this report should be regarded as a general comment on the specific matters referred to.

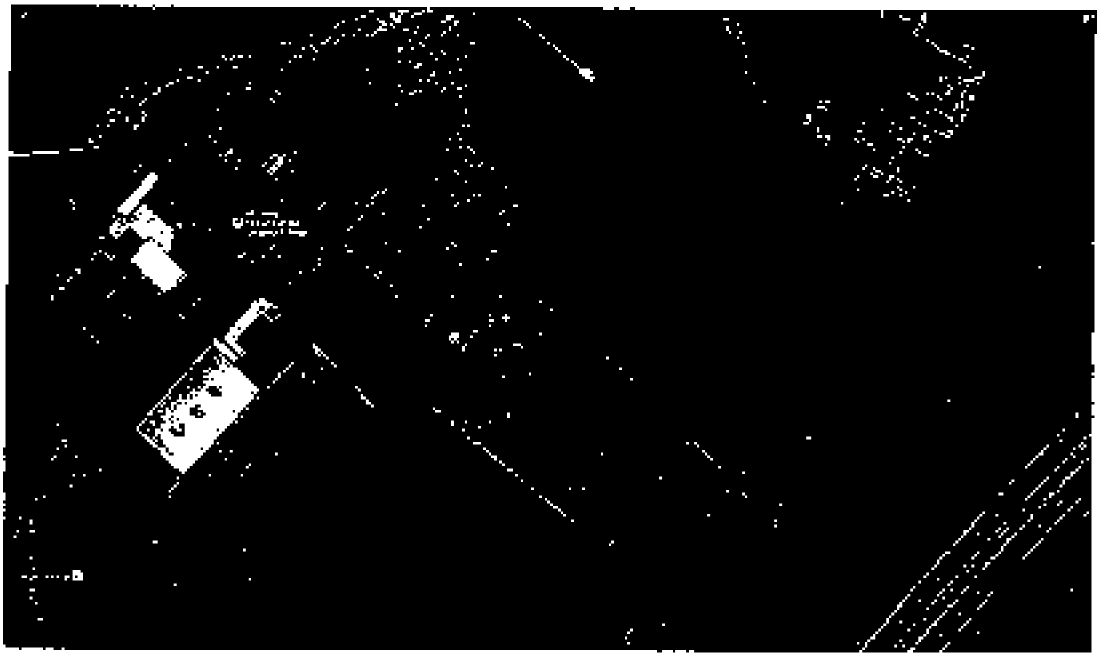
We were instructed to investigate an underground culvert underneath the North East side of the school playing field of All Saints Catholic Language College, Rawtenstall, following recent problems of water run-off causing problems to the adjacent motorway - as reported by LCC Highways Department.

It has been confirmed that LCC Highways Section have carried out works to mitigate the risk of freezing caused by a flow of water on the side of the carriageway closest to All Saints School

This report aims to identify the failed areas of the culvert within All Saints school boundaries and identify where, if in fact, the culvert is in full working order. We then proceed to give advice and recommendations on how to remediate the issue or provide a solution

It is important to appreciate that this report should be read in conjunction with the previously confirmed instructions

The suspected culvert begins from a manhole situated on the playing fields towards the motorway end (North East fence). The suspect area of culvert is marked in red below, and the position of the manhole is marked in blue

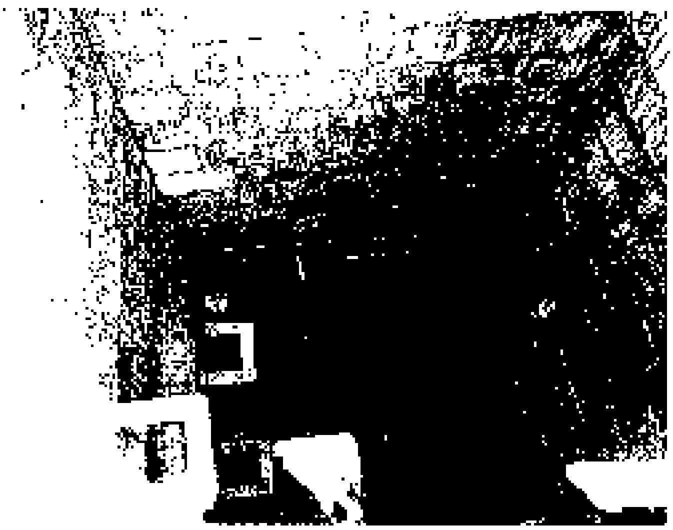


OBSERVATIONS

An inspection chamber is located to the North East Side of the playing field

When the cover was lifted it revealed large amounts of silt deposits within the chamber. this suggests that the water has backed up (drain blocked) and deposited silt and earth into the chamber space.

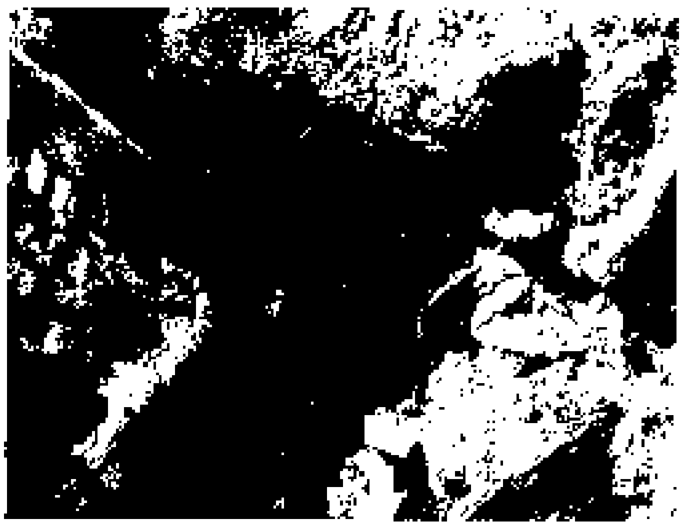
This prompted concerns in relation to the further area of culvert; in that it may be defective or damaged and thus causing water and silt to "back-up"



In order to investigate further trial holes were excavated by way of machinery in specific areas on the field for investigation of the culvert.

The first trial hole situated approximately 5m from the site boundary (palisade fence) and circa 1.90m deep from the inspection chamber cover level.

The first excavation revealed black ash lines (approximately 1.9m) deep within the substrate which appears to outline the position of where the culvert had previously been situated



After clearing the debris it became clear that the culvert had collapsed.

The debris of the culvert which is made up of various stone and manmade materials (masonry/dried clay, pot, masonry/flags) has merged with the surrounding substrate

When looking at the rear side of the first trial hole (side closest to motorway), black ash lines from the perimeter of the drain are evident in the substrate, the red circle identifies what should have been the culvert position.

this serves to confirm that the culvert is defective. The defective section appears to run from the inspection chamber

This results in water that would otherwise be transferred thro the culvert (if it was working correctly) spreading into surrounding substrate, hence creating marshy conditions within the vicinity and water run-off onto the lower ground (closest to the motorway).

A second trial hole was excavated at the time of inspection to identify how far the collapsed culvert travelled before it was found to be in reasonable working order. The second hole was excavated at a distance of [illegible] from the first.

This hole is approximately 5.5m from the palisade fence and to a depth of about 2.4m

The hole had to be excavated deeper than the first trial hole to locate the culvert. this was due to the downhill slope of the land (quite a steep gradient) toward's the motorway.

:

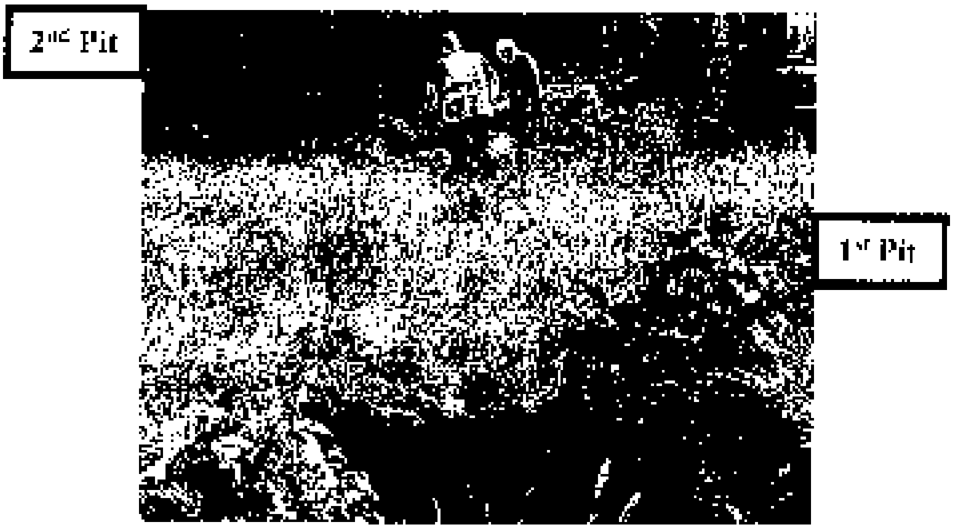
When the culvert was located/identified it was inspected from both sides. This revealed a section in good working order to one side, whilst also revealing a partial collapse to the other side.

The partial collapse in the second trial hole is located closest to the inspection chamber and extends for approximately 17 metres in total.

From inspection the culvert appears to be working beyond this point - towards the carriageway, this gives an indication that the section of culvert drain travelling from the inspection chamber to the second trial hole [approximately 17 metres in length], will need full removal and replacement of the same or of improved spec.

It is noted that the second trial hole revealed that the direction of the culvert changes - it diverts towards the South East, from where the first initial trial hole was excavated.

The culvert then appears to have a splayed connection which then travels in a North Easterly direction, back towards the inspection chamber cover across the boundary (closest to the side of motorway carriageway).



Conclusions & Recommendations

It is clear from the preliminary inspection of the excavated holes that a section approximately 17 metres in length has collapsed and become defective, therefore water is flowing through the substrate of the playing field, creating marshy conditions and causing flooding issues beyond the site boundary.

Hence full scale replacement of the subject area is required.

Excavation should begin from the inspection cover and continue to at least the position of the second trial hole .

Replacement with a pre-cast concrete drain or similar is recommended.

The newly installed culvert should have a sealed connection to the manhole chute and extend for the distance required to provide a clear flow of water to the area of culvert .

Advice

It is not clear how the damage to the culvert has occurred but from inspection of the debris, it is possible that large plant/ machinery may have caused the culvert to collapse

As there is damage to the culvert it is advised that any surrounding culverts be checked to ensure that they are all in a good working order.

We would be pleased to take further instructions in the event that opening up works are needed for the investigation of the further culverts

We trust that the above is helpful.

Yours sincerely

John Sharples BSc Cert Ed MRICS MBEng MFPWS

Lancashire County Council

Mrs Margaret Adams
All Saints RC Language College
Haslingden Road
Rawtenstall
BB4 6SJ

Phone: 0300 123 6780
Email: highways@lancashire.gov.uk
Your ref:
Our ref: LHS/CC/2016/R03/CM/VC

Date: 14 January 2016

Dear Mrs Adams

RE: BLOCKED CULVERT – ALL SAINTS RC LANGUAGE COLLEGE

Further to our site meeting on Monday 11 January, I can confirm that the culvert appears to be blocked under the college property and water is being forced to issue through the highway banking and onto the A682. As well as eroding the banking during heavy rain, it also occasionally floods across the A682 causing a surface water problem, and during colder periods freezes which has already resulted in 1 road traffic accident

We have carried out investigation works and can only get as far as approximately 500mm beyond the fence in your property. Additionally, a previous investigation has shown a blockage 12m in from the field manhole and 2m in from where a new manhole has been recently installed.

We have currently installed a temporary fix to pick up the water to stop it getting onto the highway, however this is only temporary and during periods of very heavy rain it can become overwhelmed.

As the pipe is a culverted watercourse, as riparian land owner you are responsible for the maintenance of the culvert under your land and we are requesting that you carry out repairs to the culvert as soon as possible.

Whilst we understand that it takes time to organise such works and secure finances, we would appreciate if you could carry out the works within the next 3 months.

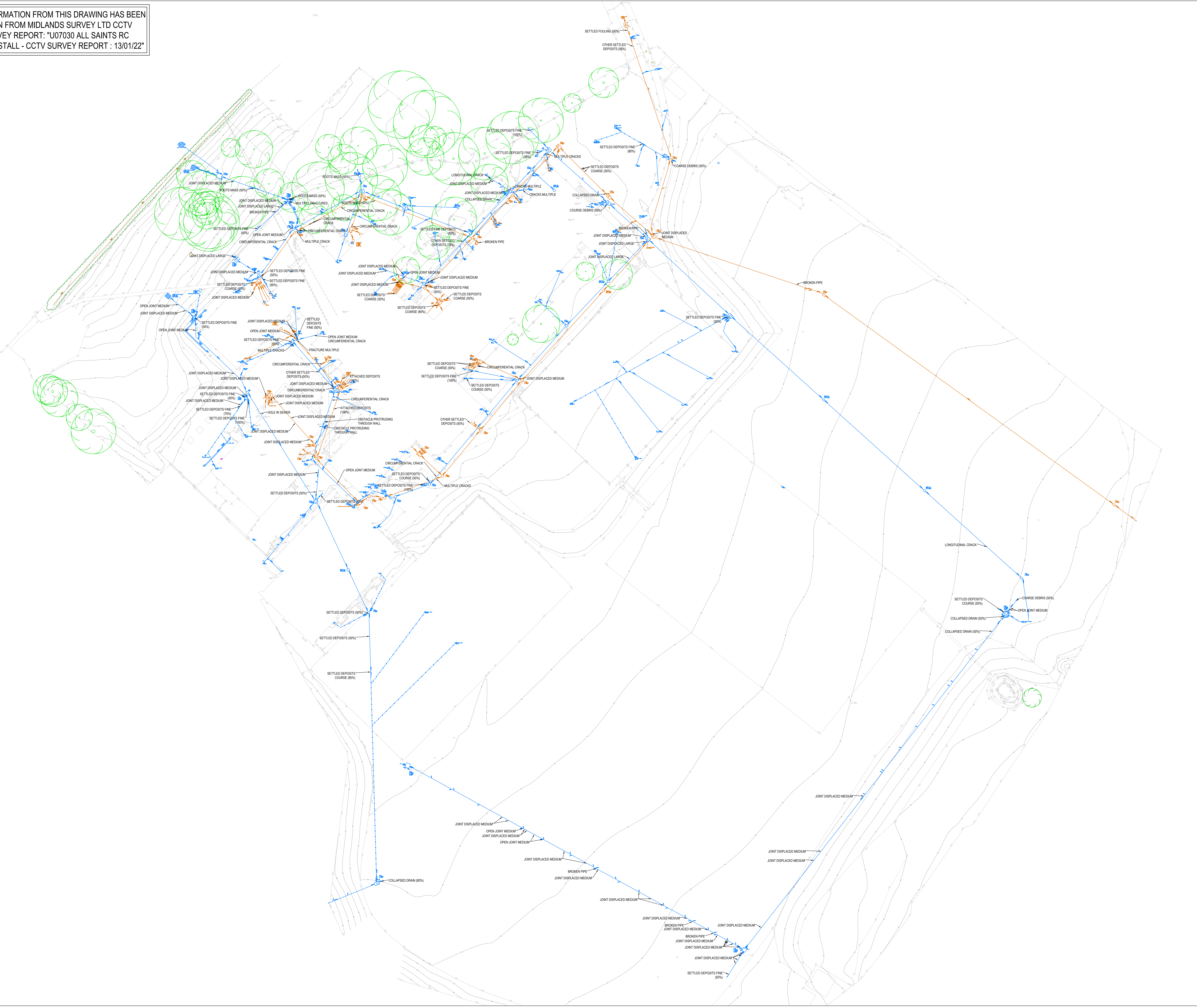
Could you please let me know when you intend to carry out these works as I will arrange for our contractors to carry out works to replace our section of pipe at the same time? I would therefore ask that you contact me on 01282 475594, or in writing quoting the above reference.

Yours sincerely

C Metcalfe

Chris Metcalfe
Engineer
Highways
Lancashire County Council

ALL INFORMATION FROM THIS DRAWING HAS BEEN TAKEN FROM MIDLANDS SURVEY LTD CCTV SURVEY REPORT: "U07030 ALL SAINTS RC RAWTENSTALL - CCTV SURVEY REPORT : 13/01/22"



IMPORTANT NOTES

1. SETTING OUT SHALL BE UNDERTAKEN USING ONLY THE INFORMATION GIVEN. DISTANCES SHOULD NOT BE SCALED FROM THIS DRAWING.
2. ALL SEWERS SHALL BE CONSTRUCTED IN ACCORDANCE WITH SEWERS FOR ADOPTION 7TH EDITION AND UNITED UTILITIES DETAILS & GUIDELINES.
3. THE MINIMUM GRAVITY PIPE DIAMETER UNDER ADOPTABLE HIGHWAYS SHALL BE 150mm
4. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL INFORMATION GIVEN WITH REGARDS TO EXISTING SERVICES AND DRAINAGE CONNECTIONS ETC. PRIOR TO COMMENCING THE WORKS. THE RATES SHALL INCLUDE FOR HAND DIG AROUND SERVICES WHERE NECESSARY. THE CONTRACTOR SHALL ADHERE TO THE CDM REGULATIONS AT ALL TIMES
5. THE OUTSIDES OF ALL SEWERS SHALL BE A MINIMUM OF 1.0m FROM KERB LINES AND THE OUTSIDE OF MANHOLES SHALL BE A MINIMUM OF 0.5m FROM KERB LINES
6. EXISTING FLOWS IN WATERCOURSES, SEWERS AND LAND DRAINS SHALL BE MAINTAINED AT ALL TIMES
7. ONLY TRAINED PERSONNEL SHALL BE PERMITTED TO ENTER CONFINED SPACES
8. ALL MATERIALS TO BEAR THE RELEVANT B.S. KITEMARK AND COMPLY FULLY WITH THE SPECIFICATIONS. ALL CONCRETE & CONCRETE PRODUCTS MUST USE SULPHATE RESISTANT CEMENT (UNLESS THE SITE INVESTIGATION REPORT PROVES THAT SULPHATE ATTACK FROM SOILS AND GROUNDWATER WILL NOT OCCUR TO WITHSTAND A CLASS
9. ALL OPENING NOTICES ETC. AS REQUIRED UNDER HIGHWAYS ACTS ETC. ARE TO BE OBTAINED PRIOR TO COMMENCEMENT OF WORKS. ALL WORKS ARE TO BE INSPECTED BY L.A., NHBC OR THE NETWORK OPERATOR AS APPLICABLE.
10. WHERE "ULTRA RIB" UPVC PIPES (OR SIMILAR APPROVED) ARE USED IN ADOPTABLE DRAINAGE THEY SHALL STILL BE HANDLED AND LAID IN ACCORDANCE WITH THE SPECIFICATION AND GUIDANCE ISSUED BY THE HIGH PERFORMANCE PIPE ASSOCIATION.
11. A CLASS S BED AND SURROUND MUST BE USED FOR SUCH PIPES. TRENCH BACKFILL IN HIGHWAYS TO WITHIN 1M OF HIGHWAY SHALL, AS DIRECTED BY THE HIGHWAY AUTHORITY BE A SUITABLE GRANULAR MATERIAL ALL IN ACCORDANCE WITH SEWERS FOR ADOPTION CL. 4.3.4.
12. SLAB LEVELS SHALL NOT BE VARIED WITHOUT REFERENCE TO THE ENGINEER FOR GUIDANCE
13. DOMESTIC DRAINAGE SHALL BE TO BUILDING REGULATIONS APPROVED DOCUMENT H. 110mm U.P.V.C. PIPES LAID TO THE FOLLOWING MINIMUM FALLS UNLESS OTHERWISE SHOWN.

	FOUL	S.W.
HEAD RUN	1 IN 40	1 IN 60
ELSEWHERE	1 IN 80	1 IN 100

14. ALL GULLY CONNECTIONS TO BE 150mm VITRIFIED CLAY UNLESS NOTED OTHERWISE
15. ALL MANHOLE COVERS TO BE RECESSED TO ACCEPT FINISH AS DETAILED BY LANDSCAPE ARCHITECT
16. SLOW REST BENDS TO BE USED IN ALL LOCATIONS MADE UP FROM 2No. 45 DEG BENDS (600mm TO INVERT FROM FFL)
17. MANHOLE POSITIONS AND ACCESS COVERS TO BE ACCURATELY SET-OUT BY LANDSCAPE ARCHITECT TO SUIT EXTERNAL FINISHES
18. ALL DRAINS CAST THROUGH FOUNDATIONS TO HAVE ROCKER PIPES ON BOTH SIDES OF FOUNDATION
19. ALL POP UP POSITIONS TO BE CONFIRMED SET OUT DIMENSIONS TO BE AGREED & PROVIDED BY OTHERS
20. ALL DISCHARGE RATES TO BE CONFIRMED BY M&E DESIGNER
21. ALL SURFACE WATER COLLECTION FEATURES TO BE CONFIRMED BY THE LANDSCAPE ARCHITECT
22. STORAGE HAS BEEN PROVIDED IN A CELLULAR STORAGE TANK AND UP-SIZED MANHOLES AND PIPES.
23. EXISTING SEWER DEPTHS HAVE BEEN APPROXIMATED FROM LIMITED INFORMATION, NEW CONNECTIONS TO BE CONFIRMED PRIOR TO CONSTRUCTION OF ANY DRAINAGE WORKS.
24. LANDSCAPE ARCHITECT TO CONFIRM GULLY AND DRAINAGE CHANNEL LOCATIONS TO LANDSCAPED AREAS.
25. FOUL NETWORK TO BE CONFIRMED FOLLOWING CONFIRMATION OF BRANCH CONNECTION POINTS FROM BUILDING M&E DESIGNER
26. CCTV SURVEY OF EXISTING SITE DRAINAGE REQUIRED PRIOR TO THE COMMENCEMENT OF ANY WORKS STARTING ON SITE

LEGEND

EXISTING FOUL WATER SEWER

EXISTING SURFACE WATER SEWER

REV	DATE	DESCRIPTION	BY	CHK	APP
P01	26.07.2022	PRELIMINARY ISSUE	JJR	JRS	PB

DRAWING STATUS: **PRELIMINARY**

CLIENT: TILBURY DOUGLAS

ARCHITECT: STRIDE TREGLOWN

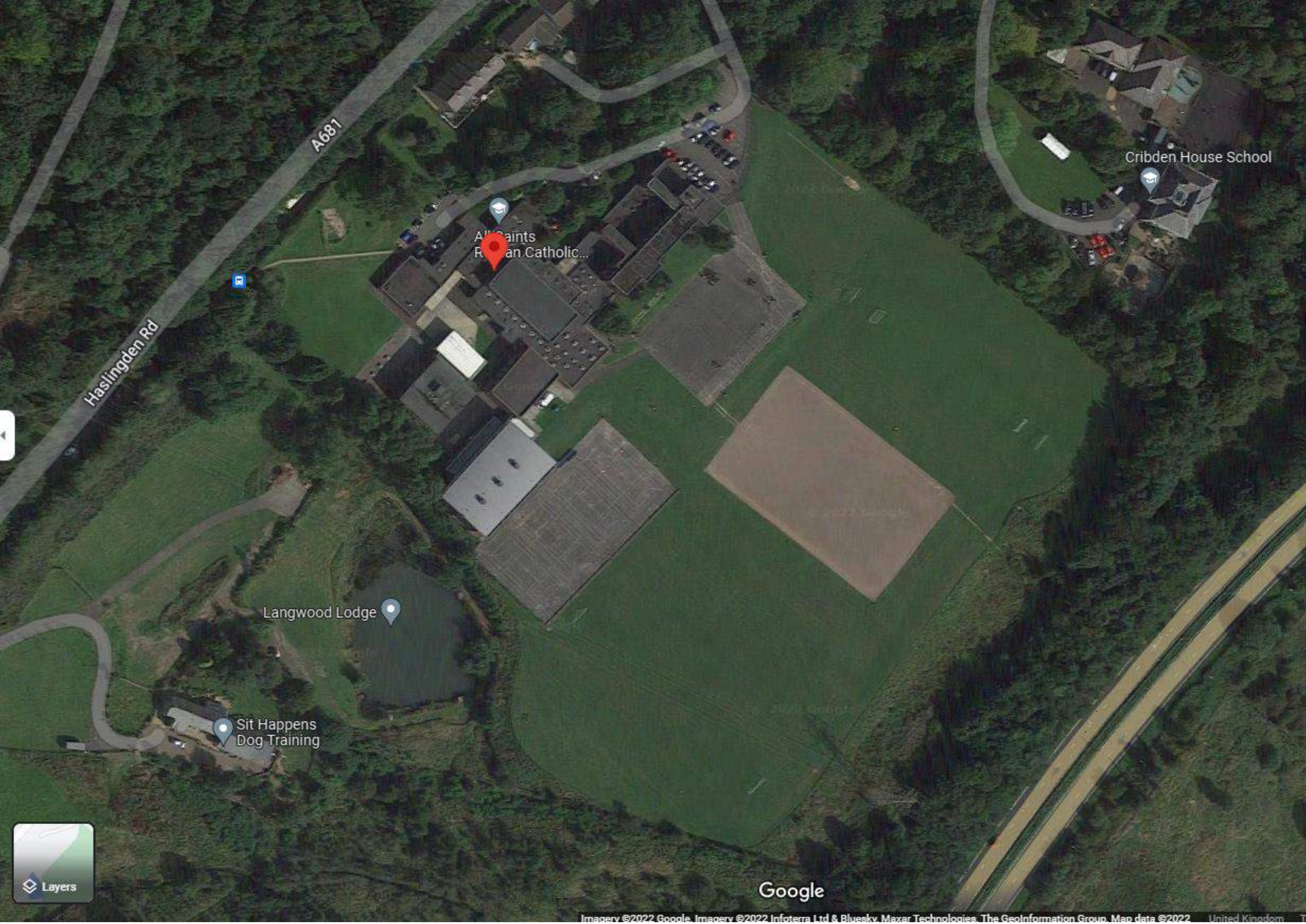
PROJECT: ALL SAINTS HIGH SCHOOL RAWNTENSTALL

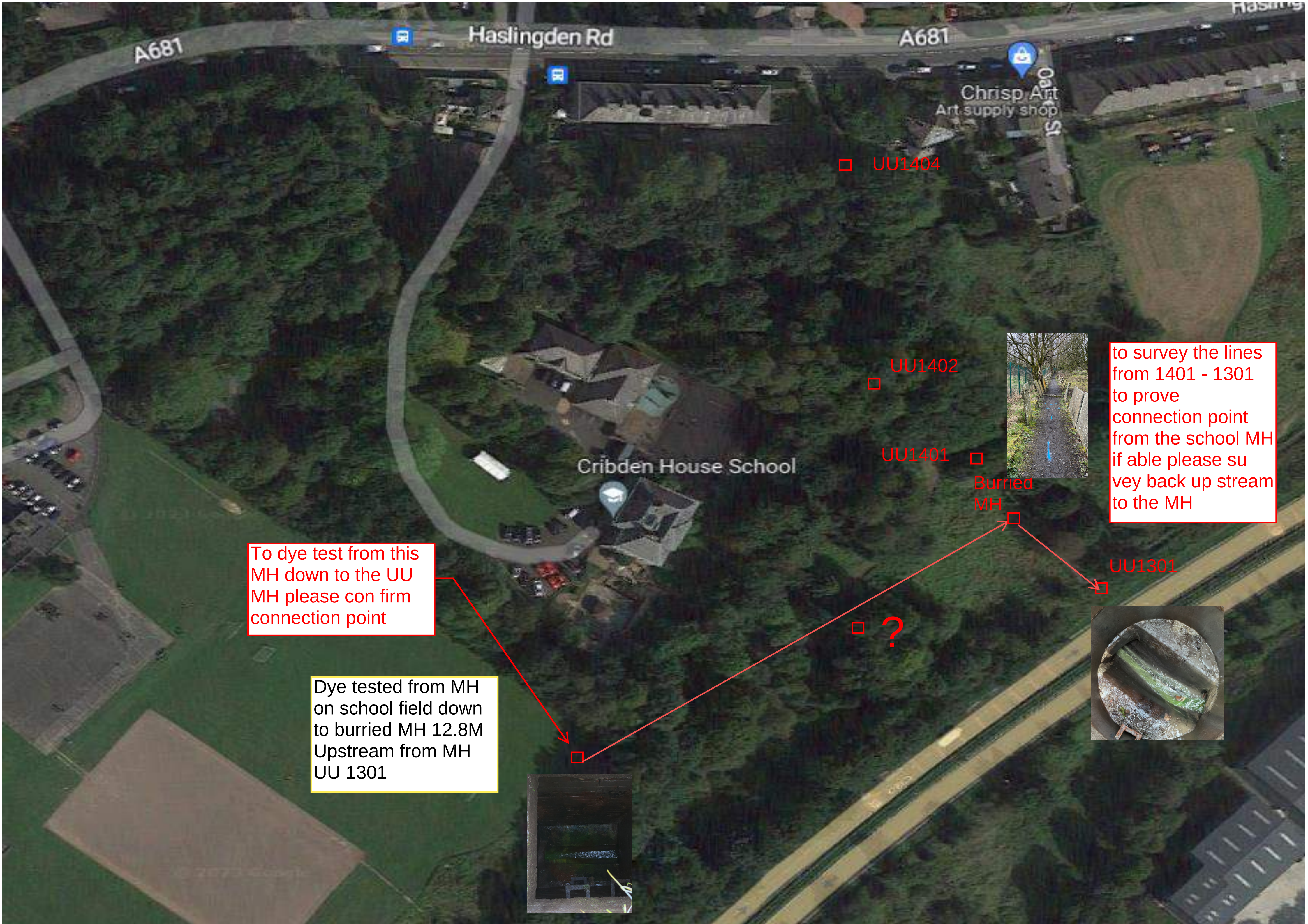
TITLE: CCTV SURVEY REVIEW

STATUS:	PROJECT No.	PROJECT - ORIGINATOR - VOL/SYS - LEVEL - TYPE - ROLE - DRAWING No.	REV:
S2	222-089	ASHS - AJP - ZZ - XX - SK - C - 0001	P01

SCALE @ A0:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
N.T.S	JJR	JJR	JRS	PB	JUL 2022

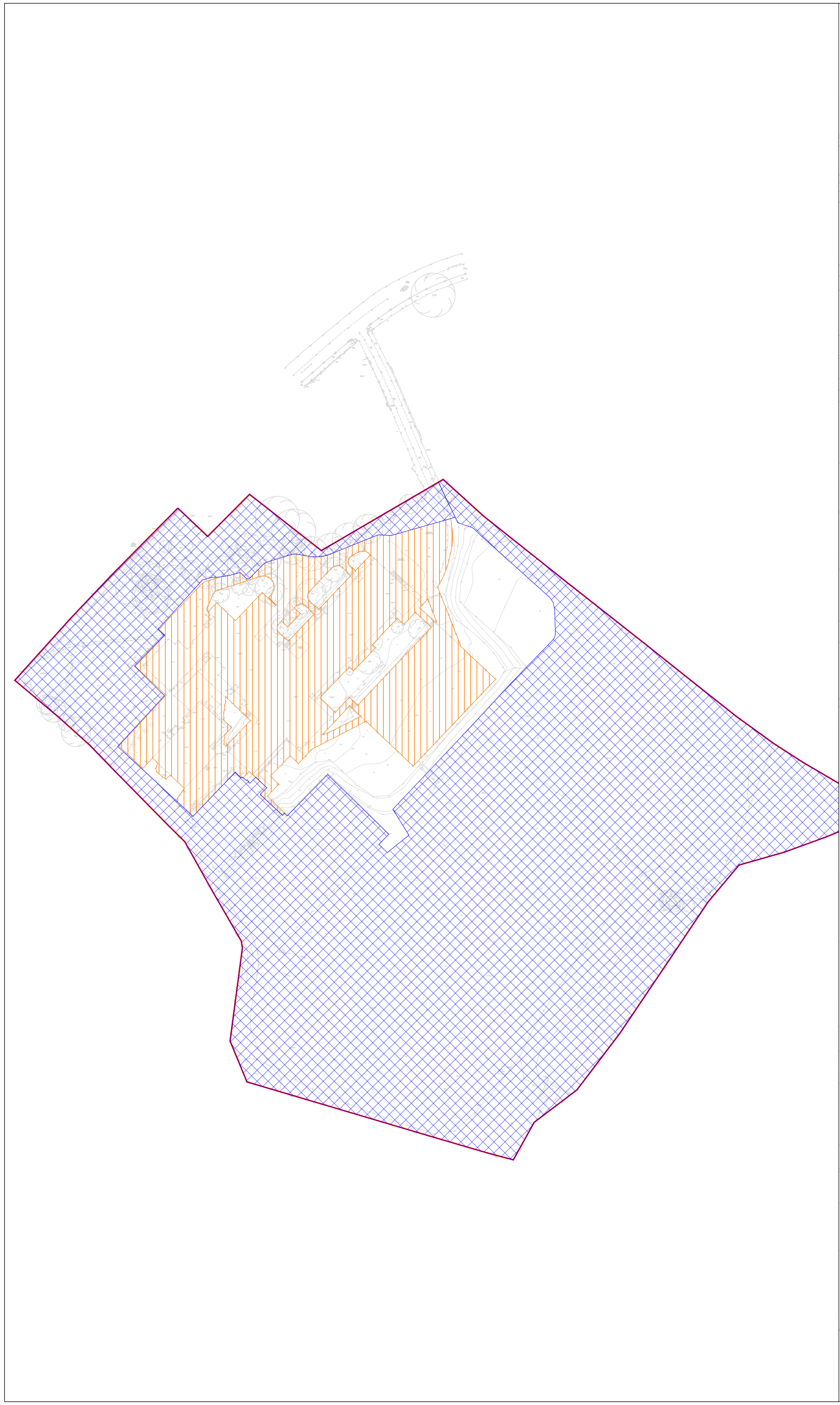
AJP consulting engineers
0151 227 1462 info@ajpltd.co.uk 91 Dale Street, Liverpool, L2 2ET

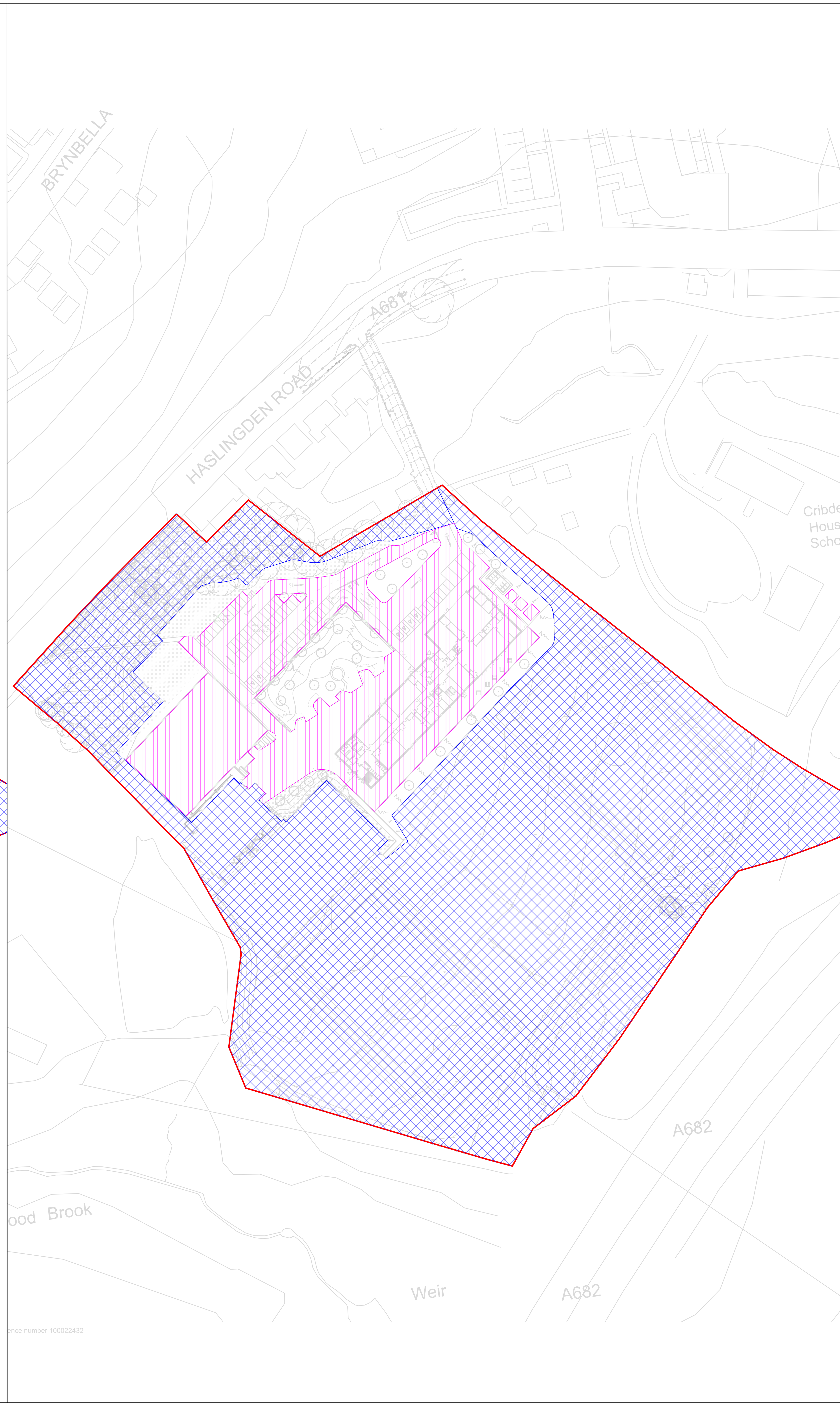

A681
Haslingden Rd
Cribden House School
All Saints Roman Catholic...
Langwood Lodge
Sit Happens
Dog Training
Layers
Google
Imagery ©2022 Google, Imagery ©2022 Infoterra Ltd & Bluesky, Maxar Technologies, The GeoInformation Group, Map data ©2022
United Kingdom



A681
Haslingden Rd
A681
Chrisp Art
Art supply shop
Oak St
UU1404
UU1402
UU1401
Burried MH
Cribden House School
to survey the lines from 1401 - 1301 to prove connection point from the school MH if able please su vey back up stream to the MH
UU1301
To dye test from this MH down to the UU MH please con firm connection point
?
Dye tested from MH on school field down to burried MH 12.8M Upstream from MH UU 1301

Appendix G – Pre & Post Development Impermeable Areas Drawing





PRE DEVELOPMENT IMPERMEABLE AREAS = 9,196m^2

POST DEVELOPMENT IMPERMEABLE AREAS = 9,405m^2

AREAS TO REMAIN AS PER EXISTING = 37,646m^2

REV	DATE	DESCRIPTION	BY	CHK	APP
P02	19.04.2023	PRELIMINARY ISSUE - UPDATED TO SUIT LATEST SITE LAYOUT	JJR	JRS	PL
P01	16.12.2022	PRELIMINARY ISSUE	JJR	JRS	PL

DRAWING STATUS:
PRELIMINARY

CLIENT:
TILBURY DOUGLAS

ARCHITECT:
ELLIS WILLIAMS ARCHITECTS

PROJECT:
ALL SAINTS RC HIGH SCHOOL
RAWTENSTALL

TITLE:
PRE & POST DEVELOPMENT
IMPERMEABLE AREAS

STATUS:	PROJECT No.	PROJECT - ORIGINATOR - VOL/SYS - LEVEL - TYPE - ROLE - DRAWING No.	REV:
S2	222-089	SRP1051 - AJP - ZZ - 00 - SK - **C - 0001**	**P02**

SCALE @ A1:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:1000	JJR	JJR	JRS	PL	APR 2023

AJP consulting engineers
☏0151 227 1462 ✉info@ajpltd.co.uk 1 Dale Street, Liverpool, L2 2ET

Appendix H – Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	SAAR (mm)	1400	Urban	0.000
Area (ha)	1.430	Soil	0.500	Region Number	Region 10

Results	**l/s**
QBAR Rural	17.8
QBAR Urban	17.8
Q1 year	15.5
Q1 year	15.5
Q30 years	30.1
Q100 years	37.0

Appendix I – Preliminary Storage Estimate

Appendix J – Outline Drainage Strategy Drawing & SW Calculations

ALL RWP/SVP/SS CONNECTIONS ARE TO BE 100Ø UNLESS STATED OTHERWISE

ALL SS/SVP'S ARE TO HAVE RODDABLE ACCESS FROM ABOVE GROUND

ALL AC'S ARE TO BE 600Ø & MINIMUM 750mm DEEP UNLESS NOTED OTHERWISE

ARCHITECT TO CONFRM IF MANHOLE COVERS IN PAVED AREAS ARE TO BE RECESSED TO ACCEPT SURFACE FINISHES

ALL 'POP-UP' SETTING OUT IS PROVIDED BY THE ARCHITECT

PRELIMINARY SUBJECT TO CONFIRMATION OF UNITED UTILITIES AND LLFA ACCEPTANCE OF DISCHARGE CONNECTION LOCATIONS AND FLOW RATES

SITE COMMENTS

D1 STEEP SLOPES SO LIKELY BACK OF RETAINING WALL DRAINAGE REQUIRED AND SCHOOL IDENTIFIED DRAINAGE ISSUES IN THIS AREA SO MAKE ALLOWANCES FOR ADDITIONAL DRAINAGE IN THIS SLOPED AREA

D2 ALLOWANCE FOR DITCH AT BASE OF SLOPE AT LOWER LEVEL THAN ADJACENT CAR PARK/PROPOSED DEVELOPMENT LEVELS TO PREVENT SURFACE WATER RUNOFF FROM SLOPE ENCROACHING UPON ADJACENT DEVELOPMENT. ALLOWANCE FOR PERFORATED UNDERDRAIN IN DITCH.

D3 EXISTING SPORTS HALL BUILDING, MUGA AND TENNIS COURTS TO REMAIN. CONFIRMATION REQUIRED IF EXISTING DRIANAGE IS TO REMAIN OR IF THESE AREAS ARE TO BE DRAINED INTO PROPOSED NEW DRAINAGE NETWORKS. CURRENTLY ASSUMED THAT NEW DRAINAGE WILL BE REQUIRED.

D4 ASSUMED EXISTING FOUL PIPELINE RUNNING NORTH TO SOUTH THROUGH GRASSED AREA CAN BE RE-USED. ALLOWANCE TO MADE TO REPAIR/REPLACE EXISTING FOUL DRAINAGE PIPELINE.

D5 ASSUMED EXISTING SPORTS PITCH DRAINAGE IT TO REMAIN AS PER EXISTING SCENARIO

D6 ALLOWANCE TO BE MADE FOR DIVERSION OF EXISTING FOUL AND SURFACE WATER DRAINAGE AROUND PROPOSED SCHOOL BUILDING. THIS IS TO ENSURE EXISTING SCHOOL BUILDING CAN REMAIN IN USE DURING CONSTRUCTION OF NEW BUILDING. ONCE EXISTING SCHOOL BUILDING IS DEMOLISHED ALL EXISTING PRIVATE DRAINAGE CAN BE ABANDONED AND GRUBBED UP.

Langwood

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LEGEND

- PROPOSED SURFACE WATER MANHOLE
- PROPOSED FOUL WATER MANHOLE
- AC PROPOSED FOUL WATER PPIC
- PROPOSED SURFACE WATER DRIANGE
- PROPOSED SURFACE WATER PERFORATED PIPE
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED DIVERSION OF EXISTING SURFACE WATER DRAINAGE
- PROPOSED DIVERSION OF EXISTING FOUL WATER DRAINAGE
- PROPOSED DIVERSION OF EXISTING CULVERTED WATERCOURSE
- PROPOSED PERMEABLE MACADAM WITH PERFORATED UNDERDAINS 300mm THICK TYPE 3 POROUS MATERIAL (MIN 30% POROSITY)
- PROPOSED RAIN GARDENS WITH PERFORATED UNDERDAINS
- PROPOSED ATTENUATION TANK
- RG PROPOSED ROAD GULLY
- VP VENT PIPE - LOCATION TO BE CONFIRMED BY ARCHITECT
- YG PROPOSED YARD GULLY
- FG PROPOSED FLOOR GULLY
- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING ABANDONED PRIVATE SURFACE WATER SEWER
- EXISTING PRIVATE FOUL WATER SEWER
- EXISTING ABANDONED PRIVATE FOUL WATER SEWER
- SITE BOUNDARY

REV	DATE	DESCRIPTION	BY	CHK	APP
P08	10.10.2023	UPDATED TO SUIT LATEST SITE LAYOUT	JJR	PB	PB
P07	06.09.2023	KEY UPDATED	MG	PL	PB
P06	20.04.2023	STAGE 4 ISSUE	JRS	PL	PB
P04	24.02.2023	UPDATED FOR PLANNING	JJR	JP	PB
P03	16.12.2022	STAGE 3 ISSUE	JJR	JRS	PB
P02	01.12.2022	STAGE 2 ISSUE	JJR	JRS	PB
P01	01.08.2022	PRELIMINARY ISSUE	JJR	JRS	PB

DRAWING STATUS: **STAGE 4**

CLIENT: TILBURY DOUGLAS

ARCHITECT: ELLIS WILLIAMS ARCHITECTS

PROJECT: ALL SAINTS RC HIGH SCHOOL RAWTENSTALL

TITLE: BELOW GROUND DRAINAGE OUTLINE DRAINAGE STRATEGY

STATUS:	PROJECT No.	PROJECT / ORIGIN / FUNCT. / SPACIAL / FORM / DISC. / DRAWING No.	REV:
S3	222-089	SRP1051 - AJP - ZZ - 00 - D - C - 1000	P08

SCALE @ A0:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:500	JRS	JJR	JRS	PB	AUG 2022

AJP consulting engineers
0151 227 1462 info@ajpltd.co.uk 1 Dale Street, Liverpool, L2 2ET

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)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	10
Ratio R	0.255	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	1.000	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.265	4-8	0.458	8-12	0.008

Total Area Contributing (ha) = 0.731

Total Pipe Volume (m³) = 35.457

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	26.956	0.270	100.0	0.068	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	59.210	0.596	99.4	0.102	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	35.387	0.859	41.2	0.052	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	15.015	0.525	28.6	0.015	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.000	35.408	0.354	100.0	0.057	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.001	15.585	0.155	100.5	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.000	38.394	0.385	99.8	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.34	186.100	0.068	0.0	0.0	1.2	1.31	52.0	13.5
S1.001	50.00	5.97	185.755	0.170	0.0	0.0	3.1	1.58	111.5	33.8
S1.002	50.00	6.21	185.160	0.222	0.0	0.0	4.0	2.46	173.6	44.1
S1.003	50.00	6.29	184.300	0.237	0.0	0.0	4.3	2.95	208.6	47.1
S2.000	50.00	5.45	187.074	0.057	0.0	0.0	1.0	1.31	52.0	11.3
S2.001	50.00	5.65	186.720	0.082	0.0	0.0	1.5	1.30	51.8	16.3
S3.000	50.00	5.49	186.110	0.000	0.0	0.0	0.0	1.31	52.0	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.000	20.488	0.210	97.6	0.098	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	23.955	0.240	99.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S3.001	14.301	0.095	150.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.002	54.675	0.340	161.0	0.099	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.002	8.770	0.100	87.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.003	9.189	0.088	105.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S2.004	9.189	0.087	105.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	17.662	0.879	20.1	0.065	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.005	18.584	0.130	143.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	58.282	0.585	99.6	0.150	5.00	0.0	0.600	o	225	Pipe/Conduit	
S2.006	28.995	0.935	31.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.004	12.166	0.610	19.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	24.467	0.090	271.9	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.006	32.545	0.080	406.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.007	34.511	1.726	20.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.000	50.00	5.26	186.175	0.098	0.0	0.0	1.8	1.32	52.6	19.5
S4.001	50.00	5.56	185.965	0.098	0.0	0.0	1.8	1.31	52.0	19.5
S3.001	50.00	5.75	185.650	0.098	0.0	0.0	1.8	1.28	90.4	19.5
S3.002	50.00	6.49	185.555	0.197	0.0	0.0	3.6	1.24	87.4	39.1
S2.002	50.00	6.57	185.215	0.279	0.0	0.0	5.0	1.68	118.7	55.4
S2.003	50.00	6.67	185.115	0.279	0.0	0.0	5.0	1.53	108.4	55.4
S2.004	50.00	6.77	184.927	0.279	0.0	0.0	5.0	1.53	108.2	55.4
S5.000	50.00	5.13	186.720	0.065	0.0	0.0	1.2	2.26	39.9	12.9
S2.005	50.00	7.01	184.840	0.344	0.0	0.0	6.2	1.31	92.8	68.3
S6.000	50.00	5.74	185.370	0.150	0.0	0.0	2.7	1.31	52.1	29.8
S2.006	50.00	7.18	184.710	0.494	0.0	0.0	8.9	2.83	200.3	98.1
S1.004	50.00	7.24	183.775	0.731	0.0	0.0	13.2	3.54	250.0	145.2
S1.005	50.00	7.61	183.090	0.731	0.0	0.0	13.2	1.09	120.8«	145.2
S1.006	50.00	8.22	183.000	0.731	0.0	0.0	13.2	0.89	98.5«	145.2
S1.007	50.00	5.20	182.920	0.000	26.0	0.0	2.4	2.94	116.9	26.0

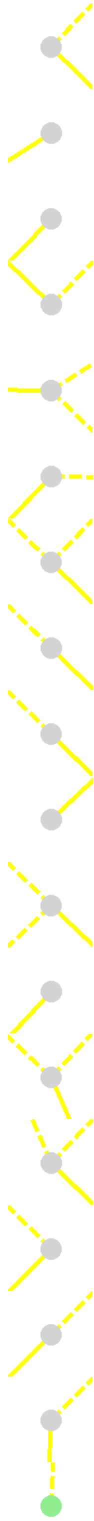
Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S01	187.300	1.200	Open Manhole	1200	S1.000	186.100	225				
S02	187.300	1.545	Open Manhole	1200	S1.001	185.755	300	S1.000	185.830	225	
S03	187.300	2.140	Open Manhole	1200	S1.002	185.160	300	S1.001	185.160	300	
S04	187.300	3.000	Open Manhole	1200	S1.003	184.300	300	S1.002	184.301	300	1
S05	188.550	1.476	Open Manhole	1200	S2.000	187.074	225				
S06	188.550	1.830	Open Manhole	1200	S2.001	186.720	225	S2.000	186.720	225	
S07	187.250	1.140	Open Manhole	1200	S3.000	186.110	225				
S08	187.300	1.125	Open Manhole	1200	S4.000	186.175	225				
S09	187.300	1.335	Open Manhole	1200	S4.001	185.965	225	S4.000	185.965	225	
S10	188.000	2.350	Open Manhole	1200	S3.001	185.650	300	S3.000	185.725	225	
								S4.001	185.725	225	
S11	188.200	2.645	Open Manhole	1200	S3.002	185.555	300	S3.001	185.555	300	
S12	187.900	2.685	Open Manhole	1200	S2.002	185.215	300	S2.001	186.565	225	1275
								S3.002	185.215	300	
S13	187.900	2.785	Open Manhole	1200	S2.003	185.115	300	S2.002	185.115	300	
SSeparator	187.800	2.873	Open Manhole	1200	S2.004	184.927	300	S2.003	185.027	300	100
S14	187.770	1.050	Open Manhole	1200	S5.000	186.720	150				
S15	187.300	2.460	Open Manhole	1200	S2.005	184.840	300	S2.004	184.840	300	
								S5.000	185.841	150	851
S16	187.300	1.930	Open Manhole	1200	S6.000	185.370	225				
S17	187.300	2.590	Open Manhole	1350	S2.006	184.710	300	S2.005	184.710	300	
								S6.000	184.785	225	
S18	185.240	1.465	Open Manhole	1350	S1.004	183.775	300	S1.003	183.775	300	
								S2.006	183.775	300	
S19	185.100	2.010	Open Manhole	1350	S1.005	183.090	375	S1.004	183.165	300	
STank	185.100	2.100	Open Manhole	1350	S1.006	183.000	375	S1.005	183.000	375	
S20 H/B	185.100	2.180	Open Manhole	2100	S1.007	182.920	225	S1.006	182.920	375	
SEx.MH 68	182.450	1.256	Open Manhole	1500		OUTFALL		S1.007	181.194	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S01	379942.173	422397.931	379942.173	422397.931	Required	
S02	379961.541	422379.182	379961.541	422379.182	Required	
S03	379920.649	422336.361	379920.649	422336.361	Required	
S04	379896.209	422310.770	379896.209	422310.770	Required	
S05	379854.776	422394.354	379854.776	422394.354	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S06	379830.069	422368.991	379830.069	422368.991	Required	
S07	379926.312	422417.501	379926.312	422417.501	Required	
S08	379925.477	422394.949	379925.477	422394.949	Required	
S09	379911.155	422380.299	379911.155	422380.299	Required	
S10	379893.902	422396.917	379893.902	422396.917	Required	
S11	379879.602	422397.092	379879.602	422397.092	Required	
S12	379841.245	422358.129	379841.245	422358.129	Required	
S13	379847.528	422352.010	379847.528	422352.010	Required	
SSeparator	379854.083	422345.570	379854.083	422345.570	Required	
S14	379847.755	422327.048	379847.755	422327.048	Required	
S15	379860.638	422339.130	379860.638	422339.130	Required	
S16	379914.031	422368.986	379914.031	422368.986	Required	
S17	379874.207	422326.432	379874.207	422326.432	Required	
S18	379885.867	422299.885	379885.867	422299.885	Required	
S19	379894.549	422291.363	379894.549	422291.363	Required	
STank	379877.282	422274.028	379877.282	422274.028	Required	
S20 H/B	379854.276	422251.010	379854.276	422251.010	Required	
SEx.MH 68	379852.675	422216.536			No Entry	



PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S01	187.300	186.100	0.975	Open Manhole	1200
S1.001	o	300	S02	187.300	185.755	1.245	Open Manhole	1200
S1.002	o	300	S03	187.300	185.160	1.840	Open Manhole	1200
S1.003	o	300	S04	187.300	184.300	2.700	Open Manhole	1200
S2.000	o	225	S05	188.550	187.074	1.251	Open Manhole	1200
S2.001	o	225	S06	188.550	186.720	1.605	Open Manhole	1200
S3.000	o	225	S07	187.250	186.110	0.915	Open Manhole	1200
S4.000	o	225	S08	187.300	186.175	0.900	Open Manhole	1200
S4.001	o	225	S09	187.300	185.965	1.110	Open Manhole	1200
S3.001	o	300	S10	188.000	185.650	2.050	Open Manhole	1200
S3.002	o	300	S11	188.200	185.555	2.345	Open Manhole	1200
S2.002	o	300	S12	187.900	185.215	2.385	Open Manhole	1200
S2.003	o	300	S13	187.900	185.115	2.485	Open Manhole	1200
S2.004	o	300	SSeparator	187.800	184.927	2.573	Open Manhole	1200
S5.000	o	150	S14	187.770	186.720	0.900	Open Manhole	1200
S2.005	o	300	S15	187.300	184.840	2.160	Open Manhole	1200
S6.000	o	225	S16	187.300	185.370	1.705	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	26.956	100.0	S02	187.300	185.830	1.245	Open Manhole	1200
S1.001	59.210	99.4	S03	187.300	185.160	1.840	Open Manhole	1200
S1.002	35.387	41.2	S04	187.300	184.301	2.699	Open Manhole	1200
S1.003	15.015	28.6	S18	185.240	183.775	1.165	Open Manhole	1350
S2.000	35.408	100.0	S06	188.550	186.720	1.605	Open Manhole	1200
S2.001	15.585	100.5	S12	187.900	186.565	1.110	Open Manhole	1200
S3.000	38.394	99.8	S10	188.000	185.725	2.050	Open Manhole	1200
S4.000	20.488	97.6	S09	187.300	185.965	1.110	Open Manhole	1200
S4.001	23.955	99.8	S10	188.000	185.725	2.050	Open Manhole	1200
S3.001	14.301	150.5	S11	188.200	185.555	2.345	Open Manhole	1200
S3.002	54.675	161.0	S12	187.900	185.215	2.385	Open Manhole	1200
S2.002	8.770	87.7	S13	187.900	185.115	2.485	Open Manhole	1200
S2.003	9.189	105.0	SSeparator	187.800	185.027	2.473	Open Manhole	1200
S2.004	9.189	105.4	S15	187.300	184.840	2.160	Open Manhole	1200
S5.000	17.662	20.1	S15	187.300	185.841	1.309	Open Manhole	1200
S2.005	18.584	143.0	S17	187.300	184.710	2.290	Open Manhole	1350
S6.000	58.282	99.6	S17	187.300	184.785	2.290	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S2.006	o	300	S17	187.300	184.710	2.290	Open Manhole	1350
S1.004	o	300	S18	185.240	183.775	1.165	Open Manhole	1350
S1.005	o	375	S19	185.100	183.090	1.635	Open Manhole	1350
S1.006	o	375	STank	185.100	183.000	1.725	Open Manhole	1350
S1.007	o	225	S20 H/B	185.100	182.920	1.955	Open Manhole	2100

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S2.006	28.995	31.0	S18	185.240	183.775	1.165	Open Manhole	1350
S1.004	12.166	19.9	S19	185.100	183.165	1.635	Open Manhole	1350
S1.005	24.467	271.9	STank	185.100	183.000	1.725	Open Manhole	1350
S1.006	32.545	406.8	S20 H/B	185.100	182.920	1.805	Open Manhole	2100
S1.007	34.511	20.0	SEx.MH 68	182.450	181.194	1.031	Open Manhole	1500

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.068	0.068	0.068
1.001	-	-	100	0.102	0.102	0.102
1.002	-	-	100	0.052	0.052	0.052
1.003	-	-	100	0.015	0.015	0.015
2.000	-	-	100	0.057	0.057	0.057
2.001	-	-	100	0.025	0.025	0.025
3.000	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.098	0.098	0.098
4.001	-	-	100	0.000	0.000	0.000
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.099	0.099	0.099
2.002	-	-	100	0.000	0.000	0.000
2.003	-	-	100	0.000	0.000	0.000
2.004	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.065	0.065	0.065
2.005	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.150	0.150	0.150
2.006	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.731	0.731	0.731

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	SEx.MH 68	182.450	181.194	178.300	1500	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	1.000	Additional Flow - % of Total Flow	10.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	2
Number of Online Controls	1	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.255		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S20 H/B, DS/PN: S1.007, Volume (m³): 11.0

Unit Reference	MD-SHE-0196-1780-0400-1780
Design Head (m)	0.400
Design Flow (l/s)	17.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	196
Invert Level (m)	182.920
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	17.8	Kick-Flo®	0.362	17.0
Flush-Flo™	0.262	17.8	Mean Flow over Head Range	-	12.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.8	0.800	24.8	2.000	38.5	4.000	53.8	7.000	70.7
0.200	17.4	1.000	27.6	2.200	40.3	4.500	56.5	7.500	73.2
0.300	17.7	1.200	30.1	2.400	42.0	5.000	59.6	8.000	75.7
0.400	17.8	1.400	32.4	2.600	43.7	5.500	62.6	8.500	78.0
0.500	19.8	1.600	34.5	3.000	46.8	6.000	65.4	9.000	80.3
0.600	21.6	1.800	36.6	3.500	50.4	6.500	68.1	9.500	82.5

Storage Structures for Storm

Bio-Retention Area Manhole: S07, DS/PN: S3.000

Invert Level (m) 186.950 Infiltration Coefficient Side (m/hr) 0.00000
Porosity 0.30 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000

Depth (m)	Area (m²)	Perimeter (m)	Depth (m)	Area (m²)	Perimeter (m)
0.000	305.0	82.789	0.300	305.0	82.789

Porous Car Park Manhole: S14, DS/PN: S5.000

Infiltration Coefficient Base (m/hr) 0.00000 Width (m) 20.0
Membrane Percolation (mm/hr) 1000 Length (m) 80.0
Max Percolation (l/s) 444.4 Slope (1:X) 0.0
Safety Factor 2.0 Depression Storage (mm) 5
Porosity 0.30 Evaporation (mm/day) 3
Invert Level (m) 187.270 Cap Volume Depth (m) 0.300

Cellular Storage Manhole: STank, DS/PN: S1.006

Invert Level (m) 183.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	364.0	0.0	1.600	364.0	0.0	1.601	0.0	0.0

Time Area Diagram for Green Roof at Pipe Number S3.000 (Storm)

Area (m³) 759 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.013793	32	36	0.002785	64	68	0.000562	96	100	0.000114
4	8	0.011292	36	40	0.002280	68	72	0.000460	100	104	0.000093
8	12	0.009245	40	44	0.001867	72	76	0.000377	104	108	0.000076
12	16	0.007569	44	48	0.001528	76	80	0.000309	108	112	0.000062
16	20	0.006197	48	52	0.001251	80	84	0.000253	112	116	0.000051
20	24	0.005074	52	56	0.001024	84	88	0.000207	116	120	0.000042
24	28	0.004154	56	60	0.000839	88	92	0.000169			
28	32	0.003401	60	64	0.000687	92	96	0.000139			

Time Area Diagram for Green Roof at Pipe Number S5.000 (Storm)

Area (m³) 1627 Evaporation (mm/day) 3
Depression Storage (mm) 5 Decay Coefficient 0.050

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
0	4	0.029566	16	20	0.013285	32	36	0.005969	48	52	0.002682
4	8	0.024206	20	24	0.010877	36	40	0.004887	52	56	0.002196
8	12	0.019819	24	28	0.008905	40	44	0.004001	56	60	0.001798
12	16	0.016226	28	32	0.007291	44	48	0.003276	60	64	0.001472

Time Area Diagram for Green Roof at Pipe Number S5.000 (Storm)

Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)	Time From:	(mins) To:	Area (ha)
64	68	0.001205	80	84	0.000542	96	100	0.000243	112	116	0.000109
68	72	0.000987	84	88	0.000443	100	104	0.000199	116	120	0.000090
72	76	0.000808	88	92	0.000363	104	108	0.000163			
76	80	0.000661	92	96	0.000297	108	112	0.000134			

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
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 Offline Controls 0 Number of Time/Area Diagrams 2
Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 1.000
Region England and Wales Ratio R 0.255 Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S01	15 Summer	2	+0%	100/15 Summer				186.183
S1.001	S02	15 Summer	2	+0%	100/15 Summer				185.868
S1.002	S03	15 Summer	2	+0%	100/15 Summer				185.262
S1.003	S04	15 Summer	2	+0%	100/15 Summer				184.400
S2.000	S05	15 Summer	2	+0%					187.149
S2.001	S06	15 Summer	2	+0%	100/15 Summer				186.812
S3.000	S07	60 Summer	2	+0%	100/15 Summer				186.158
S4.000	S08	15 Summer	2	+0%	100/15 Summer	100/15 Summer			186.277
S4.001	S09	15 Summer	2	+0%	100/15 Summer				186.067
S3.001	S10	15 Summer	2	+0%	100/15 Summer				185.755
S3.002	S11	15 Summer	2	+0%	100/15 Summer				185.695
S2.002	S12	15 Summer	2	+0%	30/15 Summer				185.392
S2.003	S13	15 Summer	2	+0%	30/15 Summer				185.299
S2.004	SSeparator	15 Summer	2	+0%	30/15 Summer				185.111
S5.000	S14	120 Summer	2	+0%	100/30 Summer				186.772
S2.005	S15	15 Summer	2	+0%	30/15 Summer				185.015
S6.000	S16	15 Summer	2	+0%	30/15 Summer	100/15 Summer			185.499
S2.006	S17	15 Summer	2	+0%	100/15 Summer				184.848
S1.004	S18	15 Summer	2	+0%	30/15 Summer	100/15 Summer			183.945
S1.005	S19	30 Summer	2	+0%	2/15 Summer				183.474
S1.006	STank	360 Summer	2	+0%	30/30 Summer				183.326
S1.007	S20 H/B	360 Summer	2	+0%	2/30 Summer				183.315

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S01	-0.142	0.000	0.29		13.8	OK	
S1.001	S02	-0.188	0.000	0.29		31.0	OK	
S1.002	S03	-0.198	0.000	0.25		39.7	OK	

2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.003	S04	-0.200	0.000	0.24		42.2	OK	
S2.000	S05	-0.150	0.000	0.24		11.6	OK	
S2.001	S06	-0.133	0.000	0.35		15.9	OK	
S3.000	S07	-0.177	0.000	0.10		5.0	OK	
S4.000	S08	-0.123	0.000	0.42		20.0	OK	5
S4.001	S09	-0.123	0.000	0.42		20.1	OK	
S3.001	S10	-0.195	0.000	0.27		20.1	OK	
S3.002	S11	-0.160	0.000	0.43		35.4	OK	
S2.002	S12	-0.123	0.000	0.64		51.0	OK	
S2.003	S13	-0.116	0.000	0.69		51.3	OK	
S2.004	SSeparator	-0.116	0.000	0.69		51.2	OK	
S5.000	S14	-0.098	0.000	0.26		9.5	OK	
S2.005	S15	-0.125	0.000	0.63		50.8	OK	
S6.000	S16	-0.096	0.000	0.60		30.3	OK	4
S2.006	S17	-0.162	0.000	0.44		79.1	OK	
S1.004	S18	-0.130	0.000	0.61		119.9	OK	5
S1.005	S19	0.009	0.000	1.13		118.2	SURCHARGED	
S1.006	STank	-0.049	0.000	0.22		19.5	OK	
S1.007	S20 H/B	0.170	0.000	0.16		17.8	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 10.000
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 Offline Controls 0 Number of Time/Area Diagrams 2
Number of Online Controls 1 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 1.000
Region England and Wales Ratio R 0.255 Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S01	15 Summer	30	+0%	100/15 Summer				186.220
S1.001	S02	15 Summer	30	+0%	100/15 Summer				185.936
S1.002	S03	15 Summer	30	+0%	100/15 Summer				185.323
S1.003	S04	15 Summer	30	+0%	100/15 Summer				184.571
S2.000	S05	15 Summer	30	+0%					187.180
S2.001	S06	15 Summer	30	+0%	100/15 Summer				186.862
S3.000	S07	60 Summer	30	+0%	100/15 Summer				186.178
S4.000	S08	15 Summer	30	+0%	100/15 Summer	100/15 Summer			186.329
S4.001	S09	15 Summer	30	+0%	100/15 Summer				186.118
S3.001	S10	15 Summer	30	+0%	100/15 Summer				185.871
S3.002	S11	15 Summer	30	+0%	100/15 Summer				185.840
S2.002	S12	15 Summer	30	+0%	30/15 Summer				185.607
S2.003	S13	15 Summer	30	+0%	30/15 Summer				185.467
S2.004	SSeparator	15 Summer	30	+0%	30/15 Summer				185.324
S5.000	S14	60 Summer	30	+0%	100/30 Summer				186.804
S2.005	S15	15 Summer	30	+0%	30/15 Summer				185.184
S6.000	S16	15 Summer	30	+0%	30/15 Summer	100/15 Summer			185.729
S2.006	S17	30 Summer	30	+0%	100/15 Summer				185.005
S1.004	S18	15 Summer	30	+0%	30/15 Summer	100/15 Summer			184.450
S1.005	S19	360 Summer	30	+0%	2/15 Summer				183.746
S1.006	STank	360 Summer	30	+0%	30/30 Summer				183.731
S1.007	S20 H/B	360 Summer	30	+0%	2/30 Summer				183.748

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S01	-0.105	0.000	0.54		26.0	OK	
S1.001	S02	-0.120	0.000	0.63		67.0	OK	
S1.002	S03	-0.137	0.000	0.55		88.1	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.003	S04	-0.029	0.000	0.53		92.9	OK	
S2.000	S05	-0.119	0.000	0.44		21.8	OK	
S2.001	S06	-0.083	0.000	0.70		32.0	OK	
S3.000	S07	-0.157	0.000	0.20		9.9	OK	
S4.000	S08	-0.071	0.000	0.79		37.7	OK	5
S4.001	S09	-0.072	0.000	0.79		37.9	OK	
S3.001	S10	-0.079	0.000	0.52		38.9	OK	
S3.002	S11	-0.015	0.000	0.84		69.7	OK	
S2.002	S12	0.092	0.000	1.21		95.5	SURCHARGED	
S2.003	S13	0.052	0.000	1.29		95.3	SURCHARGED	
S2.004	SSeparator	0.097	0.000	1.26		93.3	SURCHARGED	
S5.000	S14	-0.066	0.000	0.56		20.9	OK	
S2.005	S15	0.044	0.000	1.17		93.5	SURCHARGED	
S6.000	S16	0.134	0.000	1.09		54.8	SURCHARGED	4
S2.006	S17	-0.005	0.000	0.78		141.6	OK	
S1.004	S18	0.375	0.000	1.09		212.9	SURCHARGED	5
S1.005	S19	0.281	0.000	0.88		92.1	SURCHARGED	
S1.006	STank	0.356	0.000	0.30		26.4	SURCHARGED	
S1.007	S20 H/B	0.603	0.000	0.22		24.7	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000
Hot Start (mins) 0
Hot Start Level (mm) 0
Manhole Headloss Coeff (Global) 0.500
Foul Sewage per hectare (l/s) 0.000
Additional Flow - % of Total Flow 10.000
MADD Factor * 10m³/ha Storage 2.000
Inlet Coeffiecient 0.800
Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0
Number of Offline Controls 0
Number of Time/Area Diagrams 2
Number of Online Controls 1
Number of Storage Structures 3
Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR
Region England and Wales
M5-60 (mm) 19.000
Ratio R 0.255
Cv (Summer) 1.000
Cv (Winter) 1.000

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 30, 100
Climate Change (%) 0, 0, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S01	30 Summer	100	+45%	100/15 Summer				186.601
S1.001	S02	30 Summer	100	+45%	100/15 Summer				186.424
S1.002	S03	30 Summer	100	+45%	100/15 Summer				185.958
S1.003	S04	30 Summer	100	+45%	100/15 Summer				185.502
S2.000	S05	15 Summer	100	+45%					187.280
S2.001	S06	30 Summer	100	+45%	100/15 Summer				187.092
S3.000	S07	60 Summer	100	+45%	100/15 Summer				187.076
S4.000	S08	30 Summer	100	+45%	100/15 Summer	100/15 Summer			187.304
S4.001	S09	30 Summer	100	+45%	100/15 Summer				187.237
S3.001	S10	30 Summer	100	+45%	100/15 Summer				187.159
S3.002	S11	30 Summer	100	+45%	100/15 Summer				187.160
S2.002	S12	60 Summer	100	+45%	30/15 Summer				186.978
S2.003	S13	60 Summer	100	+45%	30/15 Summer				186.841
S2.004	SSeparator	60 Summer	100	+45%	30/15 Summer				186.709
S5.000	S14	60 Summer	100	+45%	100/30 Summer				187.273
S2.005	S15	60 Summer	100	+45%	30/15 Summer				186.579
S6.000	S16	30 Summer	100	+45%	30/15 Summer	100/15 Summer			187.302
S2.006	S17	60 Summer	100	+45%	100/15 Summer				186.271
S1.004	S18	60 Summer	100	+45%	30/15 Summer	100/15 Summer			185.247
S1.005	S19	360 Summer	100	+45%	2/15 Summer				184.788
S1.006	STank	360 Summer	100	+45%	30/30 Summer				184.765
S1.007	S20 H/B	360 Summer	100	+45%	2/30 Summer				184.738

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S01	0.276	0.000	0.89		43.0	SURCHARGED	
S1.001	S02	0.369	0.000	1.02		107.6	SURCHARGED	
S1.002	S03	0.498	0.000	0.77		123.8	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.003	S04	0.902	0.000	0.70		123.1	SURCHARGED	
S2.000	S05	-0.019	0.000	0.82		40.4	OK	
S2.001	S06	0.147	0.000	1.24		56.8	SURCHARGED	
S3.000	S07	0.741	0.000	1.10		54.1	FLOOD RISK	
S4.000	S08	0.904	3.622	1.10		52.7	FLOOD	5
S4.001	S09	1.047	0.000	0.91		43.5	FLOOD RISK	
S3.001	S10	1.209	0.000	0.94		70.9	SURCHARGED	
S3.002	S11	1.305	0.000	1.00		83.0	SURCHARGED	
S2.002	S12	1.463	0.000	1.48		117.6	SURCHARGED	
S2.003	S13	1.426	0.000	1.47		108.8	SURCHARGED	
S2.004	SSeparator	1.482	0.000	1.35		100.1	SURCHARGED	
S5.000	S14	0.403	0.000	1.20		44.6	SURCHARGED	
S2.005	S15	1.439	0.000	1.69		135.8	SURCHARGED	
S6.000	S16	1.707	2.467	1.60		80.4	FLOOD	4
S2.006	S17	1.261	0.000	1.05		190.0	SURCHARGED	
S1.004	S18	1.172	6.930	1.39		272.9	FLOOD	5
S1.005	S19	1.323	0.000	1.58		164.7	SURCHARGED	
S1.006	STank	1.390	0.000	0.45		39.5	SURCHARGED	
S1.007	S20 H/B	1.593	0.000	0.33		36.7	SURCHARGED	

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 370 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	182.384	0.384	0.0	17.8	17.8	291.7	O K
30 min Summer	182.533	0.533	0.0	17.8	17.8	404.4	O K
60 min Summer	182.699	0.699	0.0	17.8	17.8	530.4	O K
120 min Summer	182.860	0.860	0.0	17.8	17.8	652.8	O K
180 min Summer	182.931	0.931	0.0	17.8	17.8	706.9	O K
240 min Summer	182.966	0.966	0.0	17.8	17.8	732.9	O K
360 min Summer	182.992	0.992	0.0	17.8	17.8	753.3	O K
480 min Summer	183.000	1.000	0.0	17.8	17.8	759.2	O K
600 min Summer	182.999	0.999	0.0	17.8	17.8	758.3	O K
720 min Summer	182.992	0.992	0.0	17.8	17.8	753.3	O K
960 min Summer	182.969	0.969	0.0	17.8	17.8	735.8	O K
1440 min Summer	182.906	0.906	0.0	17.8	17.8	687.7	O K
2160 min Summer	182.799	0.799	0.0	17.8	17.8	606.5	O K
2880 min Summer	182.675	0.675	0.0	17.8	17.8	512.4	O K
4320 min Summer	182.465	0.465	0.0	17.8	17.8	352.7	O K
5760 min Summer	182.327	0.327	0.0	17.8	17.8	247.8	O K
7200 min Summer	182.243	0.243	0.0	17.5	17.5	184.7	O K
8640 min Summer	182.199	0.199	0.0	17.0	17.0	151.4	O K
10080 min Summer	182.181	0.181	0.0	15.7	15.7	137.5	O K
15 min Winter	182.385	0.385	0.0	17.8	17.8	291.9	O K
30 min Winter	182.533	0.533	0.0	17.8	17.8	404.6	O K
60 min Winter	182.699	0.699	0.0	17.8	17.8	530.4	O K
120 min Winter	182.860	0.860	0.0	17.8	17.8	653.1	O K
180 min Winter	182.933	0.933	0.0	17.8	17.8	708.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	119.081	0.0	298.8	25
30 min Summer	83.252	0.0	420.5	39
60 min Summer	55.699	0.0	571.6	68
120 min Summer	35.871	0.0	737.2	126
180 min Summer	27.190	0.0	838.7	184
240 min Summer	22.183	0.0	912.6	242
360 min Summer	16.658	0.0	1028.2	330
480 min Summer	13.565	0.0	1116.5	390
600 min Summer	11.553	0.0	1188.8	454
720 min Summer	10.126	0.0	1250.2	520
960 min Summer	8.212	0.0	1351.7	660
1440 min Summer	6.096	0.0	1503.9	940
2160 min Summer	4.511	0.0	1677.5	1352
2880 min Summer	3.636	0.0	1802.5	1740
4320 min Summer	2.687	0.0	1995.0	2464
5760 min Summer	2.169	0.0	2153.6	3120
7200 min Summer	1.839	0.0	2281.3	3760
8640 min Summer	1.607	0.0	2392.0	4416
10080 min Summer	1.436	0.0	2489.4	5144
15 min Winter	119.081	0.0	298.8	25
30 min Winter	83.252	0.0	420.5	39
60 min Winter	55.699	0.0	571.6	68
120 min Winter	35.871	0.0	737.2	124
180 min Winter	27.190	0.0	838.7	180

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
240 min Winter	182.969	0.969	0.0	17.8	17.8	735.3	O K
360 min Winter	182.997	0.997	0.0	17.8	17.8	757.1	O K
480 min Winter	182.996	0.996	0.0	17.8	17.8	756.3	O K
600 min Winter	182.991	0.991	0.0	17.8	17.8	752.1	O K
720 min Winter	182.978	0.978	0.0	17.8	17.8	742.1	O K
960 min Winter	182.937	0.937	0.0	17.8	17.8	711.6	O K
1440 min Winter	182.833	0.833	0.0	17.8	17.8	632.0	O K
2160 min Winter	182.634	0.634	0.0	17.8	17.8	481.4	O K
2880 min Winter	182.456	0.456	0.0	17.8	17.8	346.0	O K
4320 min Winter	182.240	0.240	0.0	17.5	17.5	182.2	O K
5760 min Winter	182.179	0.179	0.0	15.4	15.4	135.8	O K
7200 min Winter	182.156	0.156	0.0	13.2	13.2	118.8	O K
8640 min Winter	182.142	0.142	0.0	11.6	11.6	108.1	O K
10080 min Winter	182.132	0.132	0.0	10.4	10.4	100.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
240 min Winter	22.183	0.0	912.6	236
360 min Winter	16.658	0.0	1028.2	344
480 min Winter	13.565	0.0	1116.6	400
600 min Winter	11.553	0.0	1188.8	472
720 min Winter	10.126	0.0	1250.3	550
960 min Winter	8.212	0.0	1351.8	706
1440 min Winter	6.096	0.0	1504.1	1012
2160 min Winter	4.511	0.0	1677.5	1428
2880 min Winter	3.636	0.0	1802.5	1784
4320 min Winter	2.687	0.0	1995.3	2384
5760 min Winter	2.169	0.0	2153.7	3000
7200 min Winter	1.839	0.0	2281.4	3688
8640 min Winter	1.607	0.0	2392.2	4416
10080 min Winter	1.436	0.0	2490.0	5144

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.278	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+45

Time Area Diagram

Total Area (ha) 1.035

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.345	4	8	0.345	8	12	0.345

Model Details

Storage is Online Cover Level (m) 184.000

Cellular Storage Structure

Invert Level (m) 182.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	799.0	0.0	1.000	799.0	0.0	1.001	0.0	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0189-1780-1000-1780
Design Head (m)	1.000
Design Flow (l/s)	17.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	189
Invert Level (m)	182.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	17.8	Kick-Flo®	0.713	15.2
Flush-Flo™	0.331	17.8	Mean Flow over Head Range	-	15.0

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.6	0.800	16.0	2.000	24.8	4.000	34.6	7.000	45.3
0.200	17.1	1.000	17.8	2.200	25.9	4.500	36.6	7.500	46.8
0.300	17.8	1.200	19.4	2.400	27.0	5.000	38.5	8.000	48.3
0.400	17.7	1.400	20.9	2.600	28.1	5.500	40.3	8.500	49.8
0.500	17.4	1.600	22.3	3.000	30.1	6.000	42.0	9.000	51.2
0.600	16.8	1.800	23.6	3.500	32.4	6.500	43.7	9.500	52.5

Appendix K – Completed SuDS Pro-forma

Lancashire County Council

Sustainable Drainage Systems (SuDS)

Pro-Forma

This Pro-forma is endorsed by the North West Regional Flood and Coastal Committee (RFCC), including representatives from Lancashire County Council, as the Lead Local Flood Authority and Highway Authority, and by United Utilities and the Environment Agency

Lancashire County Council
PO Box 100, County Hall, Preston, PR1 0LD

When to use this pro-forma

The pro-forma may be a requirement of Local Planning Policy or the planning validation checklist for any planning application for major development.

The Lead Local Flood Authority expect the pro-forma to be submitted with all planning applications for major development with surface water drainage.

It supports applicants in summarising and confirming how surface water from a development will be managed sustainably under current and future conditions.

Your Local Planning Authority may have their own version of the pro-forma within policy, supplementary planning documents or validation checklists. Where such lists include alternative or additional requirements, both sets should be adhered to.

Your sustainable drainage system should be designed in accordance with **CIRIA The SuDS Manual C753** and any necessary adoption standards.

How to complete the pro-forma

Blue Box	Instructs or asks you to provide information
Grey Box	States the evidence required which you will need to submit
White Box	These are the boxes the applicant needs to complete in full

1. Complete ALL white boxes

2. Submit this pro-forma to the Local Planning Authority, along with:

- Sustainable Drainage Strategy
- Site Specific Flood Risk Assessment (if required)
- Minimum supporting evidence, as indicated in grey boxes of this pro-forma.

Guidance to support you

The pro-forma should be completed in conjunction with ‘Completing your SuDS Pro Forma Guide', found on our website.

The pro-forma can be completed using freely available tools such as **Tools for Sustainable Drainage Systems** or appropriate industry standard surface water management design software.

Section 1. Your Application and Development Details

a) Planning Application

Planning Application Reference *(if available)*	2023/0103
Select the type of planning application you will be submitting	Pre-application ☐ Outline ☐ Full ☒ Hybrid ☐ Reserved matters ☐

b) Development Site

Developer(s) Name	Tilbury Douglas
Consultant(s) Name	Alan Johnston Partnership
Development Address *(including postcode)*	All Saints' Catholic High School, 298 Haslingden Rd, Rawtenstall, Rossendale BB4 6SH
Development Grid Reference *(Eastings/Northings)*	379875 , 422356
Total Development Site Area (Ha)	1.430
Contributing Area (Ha) of Development ***Note:*** *Consideration should be given to manage surface water from both impermeable and permeable surfaces (including gardens and verges) likely to enter the drainage system.*	0.941

Development Type		**State Proposed Number of Units**
Greenfield Site *Site is wholly undeveloped, and a new drainage system will be installed*	☒	1no. Building
Previously Developed / Brownfield Site *Site is already developed, and the entirety of the existing surface water drainage system will be used to serve the new development (evidence must be provided to prove existing surface water drainage system is reusable)*	☐	Click or tap here to enter text.

c) Details about Flood Risk and Sustainable Drainage Design

Please indicate the flood zone that your development is in. Select all that apply. *Based on the Flood Map for Planning and the relevant Local Authority Strategic Flood Risk Assessment (to identify Flood Zones 3a/3b).*	Flood Zone 1 ☒ Flood Zone 2 ☐ Flood Zone 3a ☐ Flood Zone 3b ☐
What is the surface water risk of the site? Select all that apply. *Based on the Risk of Surface Water Flooding Map.*	High ☐ Medium ☐ Low ☒ Very Low ☒

Have you submitted a Site-Specific Flood Risk Assessment (FRA)? *See separate guidance notes for clarification on when a FRA is required*	Yes ☒ No ☐
Have you submitted a Sustainable Drainage Strategy?	Yes ☒ No ☐
Select the minimum expected lifetime of development *(years)* *Refer to Planning Practice Guidance 'Flood Risk and Coastal Change' Paragraph 006*	100 years ☐ 75 years ☒ Other ☐

d) Multi-functional Benefits and Natural Flood Management

Select the benefits your sustainable drainage proposal will provide	Water quantity ☐ Water quality ☒ Amenity ☐ Biodiversity ☒
Summarise how your sustainable drainage system will provide the above benefits	Click or tap here to enter text.

Does your sustainable drainage proposal provide multi-functional benefits via SuDS? *Refer to Paragraphs 055 and 059 of the Planning Practice Guidance*	Yes ☒ No ☐
Does your sustainable drainage proposal include measures to reduce the causes and impacts of flooding? *Refer to Paragraphs 059 and 063 of the Planning Practice Guidance*	Yes ☒ No ☐
Has the proposed sustainable drainage system been integrated with other aspects of the development such as open space or green infrastructure?	Yes ☒ No ☐

Do you propose to use natural flood management opportunities on your development? Select all that apply. *Refer to Paragraph 067 of the Planning Practice Guidance*	On-site ☐ Off-site ☐ No ☒
Have you assessed the impact of the proposed natural flood management within the site-specific flood risk assessment?	Yes ☐ No ☐ N/A ☒

Section 2: Impermeable Area and Existing Drainage

	Existing (E)	Proposed (P)	Change (P – E)
State Impermeable Area (Ha)	0.920	0.941	0.021
Evidence Required: Plans showing development layout, with existing and proposed impermeable areas.			☒

Are there existing sewers, watercourses, water bodies, flow paths, highway drains, soakaways, filter drains and/or other drainage features on the site?	Yes ☒ No ☐ Don't know ☐
Evidence Required: Plan(s) showing the existing site layout, to include all: • Natural catchments • Watercourses, both open and culverted • Water bodies – e.g. ponds, swales, wetlands etc. • Overland flow routes • Areas at risk of flooding from any source • Infiltration features – e.g. soakaways, filter drains, areas of sand/gravel etc. • Sewers, manholes and outfall locations (where known) • Highway drains, manholes and gullies (where known) Plans should be appropriately labelled with pipe sizes, dimensions and design levels	☒

Drainage Design ***Outline planning applications*** *should be able to demonstrate that a suitable drainage system is achievable.* ***All other type of planning application*** *should provide full details or reference to previous planning application where drainage details have been submitted or approved.*	
Select which design approach you are taking to manage water quantity *(refer to Section 3.3 of The SuDS Manual C753)*	
Approach 1 – Volume control / Long Term Storage (Technical Standards S2/3, S4/5) • *The attenuated runoff volume for the 1 in 100 year 6 hour event (plus climate change allowance) is limited to the greenfield runoff volume for the 1 in 100 year 6 hour event, with any additional runoff volume utilising long term storage and either infiltrated or released at 2 l/s/ha or less* • *The discharge rate for the critical duration 1 in 1 year event is restricted to the 1 in 1 year greenfield runoff rate* • *The discharge rate for the critical duration 1 in 100 year event (plus climate change allowance) is restricted to the 1 in 100 year greenfield runoff rate*	☒
Approach 2 – Qbar (Technical Standards S6) • *Justification has been provided that the provision of volume control/long term storage is not appropriate and an attenuation only approach is proposed. All events up to the*	☐

critical duration 1 in 100 year event (plus climate change allowance) are limited to Qbar (1 in 2 year greenfield rate) or 2 l/s/ha, whichever is the greater.	
Select the hydraulic method used in your calculations *Refer to Table 24.1 of The SuDS Manual*	FEH ReFH2 ☐ FEH Statistical Method ☐ Other (please state) ☒ FSR
Evidence Required: Plan(s) showing: • Existing flow routes, catchments, and flood risks • Modified flow routes, catchments, and flood risks • Contributing and impermeable areas • Current (if any) and proposed ‘source control’ and ‘management train’ locations of sustainable drainage components (C753 Chapter 7) • Details of drainage ownership • Details of exceedance routes (Technical Standards S9) • Topographic survey • Locations and number of existing and proposed discharge points ***Note:*** *Consideration should be given to manage surface water from both impermeable and permeable surfaces (including gardens and verges) likely to enter the drainage system.*	☒

Section 3: Peak Runoff RATES

Technical Standards S2, S3 and S6 (unless S1 applies)

Rainfall Event	Existing Rate (l/s)	Greenfield Rate (l/s)	Proposed Rate (l/s)
Qbar *(Approach 2)*	Click or tap here to enter text.	17.8	17.8
1 in 1 Year Event *(Approach 1)*	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
1 in 30 Year Event	Click or tap here to enter text.	30.1	24.7
1 in 100 Year Event* *(Approach 1)*	Click or tap here to enter text.	37.0	36.7

** Total discharge at the 1 in 100 year rate should be restricted to the greenfield runoff volume for the 1 in 100 Year 6 hour event with additional volumes (long-term storage volume) released at a rate no greater than 2 l/s/ha where infiltration is not possible. Climate change allowance should only be applied to the proposed rate and not the existing or greenfield rate.*

Evidence Required: Methodology used to calculate peak runoff rate clearly stated and justified. Impermeable areas plan, supported by topographical survey confirming positive drainage. Hydraulic calculations and details of software used.	☒ ☒ ☒

Section 4: Discharge VOLUME

Technical Standards S4, S5 and S6 (unless S1 applies)

Rainfall Event	Existing Volume (m^3)	Greenfield Volume (m^3)	Proposed Volume (m^3)
1 in 100 Year 6 Hour Event *(Approach 1)*	Click or tap here to enter text.	575.581	977.082

Does the below statement apply to your development proposal? Long term storage is not achievable on this site and, in accordance with S6 of the Non Statutory Technical Standards for SuDS, the surface water discharge rates for events up to and including the 1 in 100 year critical event are limited to Qbar (Approach 2)	Yes ☐ No ☒
Evidence Required: Approach to managing the quantity of surface water leaving the site clearly stated and justified Methodology used to calculate discharge volume clearly stated and justified. Hydraulic calculations and details of software used.	☒ ☒ ☒

Section 5: Storage

Technical Standards S7 and S8

State climate change allowance used (%) *Allowances must be applied when designing SuDS for both the 3.3% (1 in 30-year) and 1% (1 in 100-year) annual exceedance probability events*	3.3% AEP	0
	1% AEP	45
Have you applied a 10% urban creep allowance in accordance with British Standard BS 8582 / 2013.	Yes ☒ No ☐ N/A ☐	
Evidence Required: State / used in appropriate industry standard surface water management design software.	☒	

State storage volume required (m³) *(excluding non-void spaces)* *Must include an allowance for climate change and urban creep. Must be consistent with the contributing area used to calculate the runoff rates and volumes.*	759.2
Have you incorporated interception into your design? *(Refer to Chapter 24 of The SuDS Manual C753)* *Where possible, infiltration or other techniques are to be used to try and achieve zero discharge to receiving waters for rainfall depths up to 5mm.*	Yes ☒ No ☐
Evidence Required: Drainage plans showing location of attenuation and all flow control devices and supporting calculations.	☒

Summarise how storage will be provided for the 1 in 30 year event on site (plus climate change and urban creep allowances). *Storage must be designed to ensure that no flooding occurs onsite in a 1 in 30 year event (plus climate change and urban creep allowances) except in areas designated to hold and/or convey water as part of the design **and** no flooding occurs offsite in a 1 in 100 year (plus climate change and urban creep allowances) event.*	Attenuation storage is provided using rain gardens, permeable paving and an online attenuation tank.
Summarise how storage will be provided for the 1 in 100 year event on site (plus climate change and urban creep allowances). *Where storage above the 1 in 30 year event (plus climate change and urban creep allowances) is provided in designated areas designed to accommodate excess surface water volumes, plans showing storage locations and surface water depths and supported by calculations used in appropriate industry standard surface water management design software. It is important to run a range of duration events to ensure the worst case condition is found for each drainage element on the site*	Attenuation storage is provided using rain gardens, permeable paving and an online attenuation tank.

Evidence Required: Plans showing size and location of storage and supporting calculations. Where there is controlled flooding, extents and depths must be indicated.	☒

Section 6: Water Quality Protection

Contaminated surface water run-off can have negative impacts on the quality of receiving water bodies. The potential level of contamination will influence final the design of an appropriate treatment train as part of your sustainable drainage system.

Is the proposal site known to be or potentially contaminated?	Yes ☐ No ☒
If the site is contaminated, it should be demonstrated that the sustainable drainage system will not increase the risk of pollution to controlled waters though the mobilisation of contaminants and/or creation of new pollution pathways.	

Confirm the *Pollution Hazard Level* of the proposed development - Select ALL that apply *Refer to Pollution Hazard Indices for different Land Use Classifications in Table 26.2 of The SuDS Manual C753 for further guidance.*		
Pollution Hazard Level *Tick ALL that apply*		**Surface water run-off from the proposed development will drain from:**
VERY LOW	☐	• Residential roofs
LOW	☒	• Other roofs (typically commercial/industrial roofs) • Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, home-zones and general access roads) • Non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day
MEDIUM	☐	• Commercial yard and delivery areas • Non-residential car parking with frequent change (e.g. hospitals, retail) • All roads except low traffic roads and trunk roads/motorways[1]
HIGH	☐	• Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites) • Sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured • Industrial sites • Trunk roads and motorways[1]

If the development's Pollution Hazard Level is 'Very Low' or 'Low', has the sustainable drainage design been risk assessed and appropriate mitigation measures included?	Yes ☒ No ☐
• *If the proposed development has a very low or low polluting potential, you should design your sustainable drainage system to include an appropriate treatment train in accordance with The SuDS Manual C753*	

If the development's Pollution Hazard Level is 'Medium' or 'High', is the application supported by a detailed water quality risk assessment?	Yes ☐ No ☐

[1] Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).

	N/A ☒
• *If the proposed development has a high polluting potential, a detailed risk assessment will be required to identify an appropriate SuDS treatment train and ensure compliance with Paragraph 174 of the National Planning Policy Framework.* • *If the proposed development has a medium polluting potential, a detailed risk assessment may be required depending on the nature, scale and location of the development.*	

Has pre-application advice on water quality been obtained from the Environment Agency?	Yes ☐ No ☒
If YES, please provide details:	Click or tap here to enter text.

Section 7: Details of your sustainable drainage system

a) Function of your Sustainable Drainage System

Do your proposals store rainwater for later use (as a resource) using rainwater harvesting?	Yes ☐ No ☒
Evidence Required: Please provide a brief sentence in the adjacent white box to describe how this function has been achieved.	N/A

Do your proposals promote source control to manage rainfall close to where it falls? e.g. promoting natural losses through soakage, infiltration and evapotranspiration	Yes ☒ No ☐
Evidence Required: Please provide a brief sentence in the adjacent white box to describe how this function has been achieved.	Through rain gardens and permeable paving.

b) Hierarchy of Drainage Options – Planning Practice Guidance

Method of discharge are set out in order of priority. Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable, using as many options as possible as high up the hierarchy as you can.

i) Into the ground (infiltration)

Proposed method of surface water discharge		**Is this proposed?**	
Hierarchy Level 1: Into the ground (via infiltration)		Yes ☐ No ☒	
For full / reserved matters applications or outline applications where layout is <u>not</u> a reserved matter			
If YES – Evidence Required		**If NO – Evidence Required**	
☐	On-site ground investigation to demonstrate that the ground <u>is</u> free draining. Including infiltration test results in accordance with the methodology within BRE 365 (2016)	☒	On-site ground investigation to demonstrate that the ground <u>is not</u> free draining. Including infiltration test results in accordance with the methodology within BRE 365 (2016)
	AND		***OR***
☐	Completed Infiltration Checklist from The SuDS Manual (C753) Appendix B *An editable version of this form is available on [Susdrain website.]*	☐	Evidence to confirm that infiltration to ground would result in a risk of deterioration to ground water quality (e.g. a ground water source protection zone).
			OR
		☐	Geotechnical advice from a competent person* which determines that infiltration of

			water to ground would pose an unacceptable risk of geohazards to the site and/or local area. **Note: Competent person may include a Chartered Engineer, Chartered Geologists, Registered Ground Engineering Professionals (RoGEP).*
For outline applications where layout is a reserved matter or <u>where an applicant is unable to access a site</u> to conduct site investigations			
If YES – Evidence Required		**If NO – Evidence Required**	
☐	Thorough desk-based ground investigation e.g. a SuDS GeoReport or similar, making the best use of available resources including historical borehole logs and data available from the British Geological Survey	☐	Thorough desk-based ground investigation e.g. a SuDS GeoReport or similar, making the best use of available resources including historical borehole logs and data available from the British Geological Survey
	AND		
☐	'Plan B' sustainable drainage plan and statement of approach with an alternative discharge method, in case infiltration proposals are proven not feasible upon further site-specific ground investigation e.g. to consider seasonal variations to groundwater.		

ii) To a surface water body

Proposed method of surface water discharge		**Is this proposed?**	
Hierarchy Level 2: To a surface water body *(select type)* ***NOTE:*** *Consent from LLFA or Permit from Environment Agency may be required – refer to guidance*		Yes ☒ No ☐ N/A ☐ Main River ☐ Ordinary Watercourse ☒ Canal ☐ Other water body ☐	
If YES - Evidence Required		**If NO – Evidence Required**	
☒	Surface water body / watercourse survey and report	☐	Plan showing nearby watercourses and waterbodies
	AND		***AND***
☐	*(If the waterbody is off site or privately owned e.g. canal)* – evidence of an agreement with the appropriate landowner(s) to connect to the waterbody, **OR**, for outline applications, a 'plan b' sustainable drainage plan and statement of approach with an alternative discharge point	☐	Statement providing justification in your Sustainable Drainage Strategy ***Note:*** *Where discharge of any element in the hierarchy is discounted, an applicant should provide justification. If the reasoning for discounting a discharge of surface water to watercourse relates to issues associated with third party land or the securing of any other required consent, it may be necessary*

			for the applicant to provide evidence to the local planning authority to support their proposed approach.

iii) To a surface water sewer or highway drain

Proposed method of surface water discharge		**Is this proposed?**	
Hierarchy Level 3: To a surface water sewer or highway drain *(select type)*		Yes ☐ No ☐ N/A ☒ Surface water sewer ☐ Highway drain ☐	
If YES - Evidence Required		**If NO – Evidence Required**	
☐ ☐	Written correspondence from the Water and Sewerage Company / Highway Authority regarding proposed connection. ***AND*** *(If the sewer is off site)* – evidence of an agreement with the appropriate landowner(s) to connect to the sewer, ***OR***, for outline applications, a 'plan b' sustainable drainage plan and statement of approach with an alternative discharge point	☐ ☐	Plan showing nearby sewers and highway drains ***AND*** Statement providing justification in your Sustainable Drainage Strategy

vi) To a Combined Sewer

Proposed method of surface water discharge		**Is this proposed?**
Hierarchy Level 4: To combined sewer		Yes ☐ No ☐ N/A ☒
If YES - Evidence Required		**If NO – Evidence Required**
☐ ☐	Written correspondence from the Water and Sewerage Company ***AND*** *(If the sewer is off site)* – evidence of an agreement with the appropriate landowner(s) to connect to the sewer	***N/A***

c) Proposed SuDS Component Types

	Tick ALL that apply					
Within property boundary	☐ Rainwater harvesting	☐ Green/ blue roofs	☒ Pervious pavements *[**Type:** A ☐ B ☐ C ☒]*	☐ Soakaway	☒ Bio retention systems	☐ Water Butt

	Tick ALL that apply				
Within development site boundary *(not property)*	☐ Wetlands	☐ Infiltration basins	☒ Rain gardens	☐ Bio retention system	☐ Detention basins
	☐ Retention ponds	☐ Swales	☐ Filter strips, channels and rills	☐ Infiltration trenches	☐ Other (state below)
	If 'Other' please state: Click or tap here to enter text.				

Off site *(not within the boundary of the proposed development)*	**Please state:** **N/A**

I confirm that the above selected components have been designed in accordance with The SuDS Manual (C753).	I confirm ☒
I confirm that the management of flows resulting from rainfall in excess of a 1 in 100 year (plus climate change and urban creep allowances) rainfall event, and their exceedance route(s), has been fully considered in order to minimise the risks to people, property (new and existing) and infrastructure.	I confirm ☒

Section 8: Operation and Maintenance

Technical Standard S12 and National Planning Policy Framework

The applicant is responsible to ensure that ALL components selected in Section 7 can be maintained for the design life of the development. This information is required so the Local Planning Authority can ensure the maintenance and management of the sustainable drainage system. The Local Planning Authority will discuss how this will be secured (e.g. via planning condition or planning obligation).

Will any part of your sustainable drainage system use monitoring and operation technology?	Yes ☒ No ☐
Evidence Required: Please state what technology you propose to use and where we can find more details in your documents.	Oil Separator

	Information Provided?
Management Plan	Yes ☒ No ☐
Evidence Required: **Plan/ drawing provided to show the position of the different SuDS components with:** • Key included to identify any of the adopting bodies that you will be offering your sustainable drainage components for adoption *(relates to maintenance and management arrangements below).* • Plan/ drawing to identify any areas where certain activities are prohibited, detailing reasons why. **Action plan for accidental pollutant spillages.**	☒ ☒

	Information Provided?
Maintenance Schedule	Yes ☒ No ☐
Evidence Required: A copy of the maintenance schedule including both: • **Proactive and preventative maintenance** Detailing regular, occasional and remedial maintenance activities including recommendations for inspection and monitoring. This should include recommended frequencies, advice on plant/ machinery required and an explanation of the objectives for the maintenance proposed and potential implications of not meeting them. • **Reactive and corrective maintenance** (e.g. product repair and replacement). Including advice on excavations, or similar works, in locations that could affect the SuDS components/ adjacent structures.	☒

Maintenance and Management Arrangements	Information Provided? Yes ☒ No ☐
Evidence Required: Evidence of formal agreement with the party responsible for undertaking maintenance. Please select any of the adopting bodies that you will be offering your sustainable drainage components for adoption. Tick all that apply. ☐ **Water and Sewerage Company** *Section 104 agreement (Water Industry Act 1991)* ☐ **Highway Authority** *Section 278/38 agreement (Highways Act 1980)* ☐ **Local Authority Public Open Space** *[Refer to Local Authority Policy]* Please select the arrangement(s) for all non-adopted sustainable drainage components. Tick all that apply. ☒ **Management Company** ☒ **Property Owner** *(for SuDS components within property boundary only)* ☐ **Other** (please state) Click or tap here to enter text.	☒

Your Evidence

Please list any relevant documents and or drawing numbers (including revision reference) to support your answers in this pro-forma.
SRP1051-AJP-ZZ-XX-T-C-3000_P03 - FRA & Drainage Strategy Report SRP1051-AJP-ZZ-00-D-C-1000-P05 - Outline Drainage Strategy

Declaration and Submission

This pro-forma has been completed using evidence from information which has been submitted with the planning application.

The information submitted in the Sustainable Drainage Strategy and site-specific Flood Risk Assessment (FRA), where submitted, is proportionate to the site conditions, flood risks and magnitude of development and I agree that this information can be used as evidence to this sustainable drainage approach.

Submitter Details

Completed by	John Speers		
Authorised by	Peter Bryan		
Date *(dd/mm/yyyy)*	20/04/2023	**Company Name**	Alan Johnston Partnership

Client Details

Name	Darren Smith	**Company Name**	Tilbury Douglas