Knowl Park House
Crowlees Road, Mirfield

Drainage Strategy & Sustainability Report

HSP2021-C3257-C&S-TR-106 RevA
July 2021

hsp consulting

CIVIL | STRUCTURAL | GEOTECHNICAL & ENVIRONMENTAL | TRAFFIC AND TRANSPORT

Lawrence House | 6 Meadowbank Way | Nottingham | NG16 3SB
01773 535555 | design@hspconsulting.com | www.hspconsulting.com

Reliance

This report was produced by HSP Consulting Engineers Ltd for Frank Shaw Associates (Client) for works known as Knowl Park House.

This report may not be used by any person other than the Client and must not be relied upon by any other party and/or for any other purpose without the explicit written permission of HSP Consulting Engineers Ltd. In any event, HSP Consulting Engineers Ltd accepts no liability for any costs, liabilities or losses arising as a result of the use or reliance upon the contents of this report by any person other than the Client.

All parties to this report do not intend any of the terms of the Contracts (Rights of Third Party Act 1999) to apply to this report. Please note that this report does not purport to provide definitive legal advice.

Report Limitations

This document is based on information available to HSP during its preparation and as may have been supplied by and/or obtained from Third Parties. HSP accepts no liability if the information used is found to be inaccurate or incomplete or if additional information exists or becomes available at a later date.

HSP disclaims any duty to update the report for events taking place after the date on which the report is delivered.

This statement is provided for guidance purposes only and provides no guarantee against flooding. HSP accepts no liability for the accuracy of water levels, flow rates and associated probabilities or risks.

This statement has been prepared for the purpose of providing an initial appraisal prior to developing a detailed design. Additional works will be required to secure detailed planning and/or building consent.

This report has been produced for the sole use of the Client and no extended duty of care to any third party is implied or offered.

Third parties making reference to this report should consult the Client and HSP as to the extent to which findings may be appropriate for their use.

Quality Assurance

HSP Consulting confirms that all reasonable efforts have been made to ensure that information contained within this report is accurate. HSP Consulting would further confirm that due care, attention and technical skill were used in creation of this report.

Issue & Revision History

Revision	Status	Originator	Checked	Approved	Date
-	Information	P Daykin BSc(Hons) MCIOB MCIHT CEnv	S Argyle BSc(Hons) MSc	P Daykin BSc(Hons) MCIOB MCIHT CEnv	23.03.21
A	Information	P Daykin BSc(Hons) MCIOB MCIHT CEnv	S Argyle BSc(Hons) MSc	P Daykin BSc(Hons) MCIOB MCIHT CEnv	17.07.21
Project Number: C3257			Document Reference: HSP2021-C3257-C&S-TR-106 RevA		

Contents

Reliance

Report Limitations

Quality Assurance

1 Introduction 1
2 Flood Risk 1
3 Existing Surface Water Drainage 1
4 Existing Foul Water Drainage 3
5 Surface Water Drainage Strategy 4
5.1 Sustainable Drainage Systems 4
5.2 Disposal Hierarchy 5
5.3 Discharge Rate 5
5.4 Discharge Quality 6
5.5 Discharge Volume 8
5.6 Operation and Maintenance 9
6 Foul Water Drainage Strategy 9
7 Construction Works Temporary Surface Water Drainage 9
8 Summary & Conclusions 11
8.1 Proposals 11
8.2 Flood Risk 11
8.3 Surface Water Runoff 11
8.4 Foul Water Effluent 12
8.5 Construction Works Temporary Surface Water Drainage 12

APPENDIX 1
- Mapmatic Topographic & Utility Survey, revision 1

APPENDIX 2
- Yorkshire Water Public Sewer Records
- Miscellaneous Yorkshire Water Correspondence

APPENDIX 3
- HSP Drainage Drawing20017-HSP-XX-XX-DR-C-2001 (rev P06)
- Surface water simulation results (summary)

APPENDIX 4
- Indicative Maintenance Strategy

1 Introduction

1.1 HSP Consulting (HSP) were appointed in 2020 as civil engineers responsible for the feasibility and, in due course, the detailed design of the proposed replacement care facility at the site.

1.2 The site is brownfield, of approximately 0.55ha in plan area.

1.3 It is proposed to demolish the existing care facilities and replace them with an improved care facility.

1.4 The purpose of this report is to summarise the detailed design and how that complies, or otherwise, with the original PRP drainage concept.

2 Flood Risk

2.1 A Preliminary Flood Risk Review, referenced HSP2020-C3257-C&S-FRAS1-11, was produced in September 2020 during feasibility appraisal works. The Review identified:

i. With respect to Planning, the site is located in Flood Zone 1; that is, an area considered to be at the lowest risk of fluvial flooding.

ii. The site is below the 1 ha threshold requiring a formal Flood Risk Assessment

iii. The Lead Local Flood Authority has confirmed that the site is not located within a Critical Drainage Area.

iv. With respect to flood risk, the site proposals are categorised as “More vulnerable” but given the conjectural flood risk(s) for the area it is compatible with Planning Policy.

v. Based upon the region’s Strategic Flood Risk Assessment, “*Development should aim for a reduction in surface water runoff rates of at least 30% for Brownfield sites up to a 1 in 100 year storm event, considering climate change*”. The final rate is to be agreed with the Lead Local Flood Authority and Sewerage Undertaker

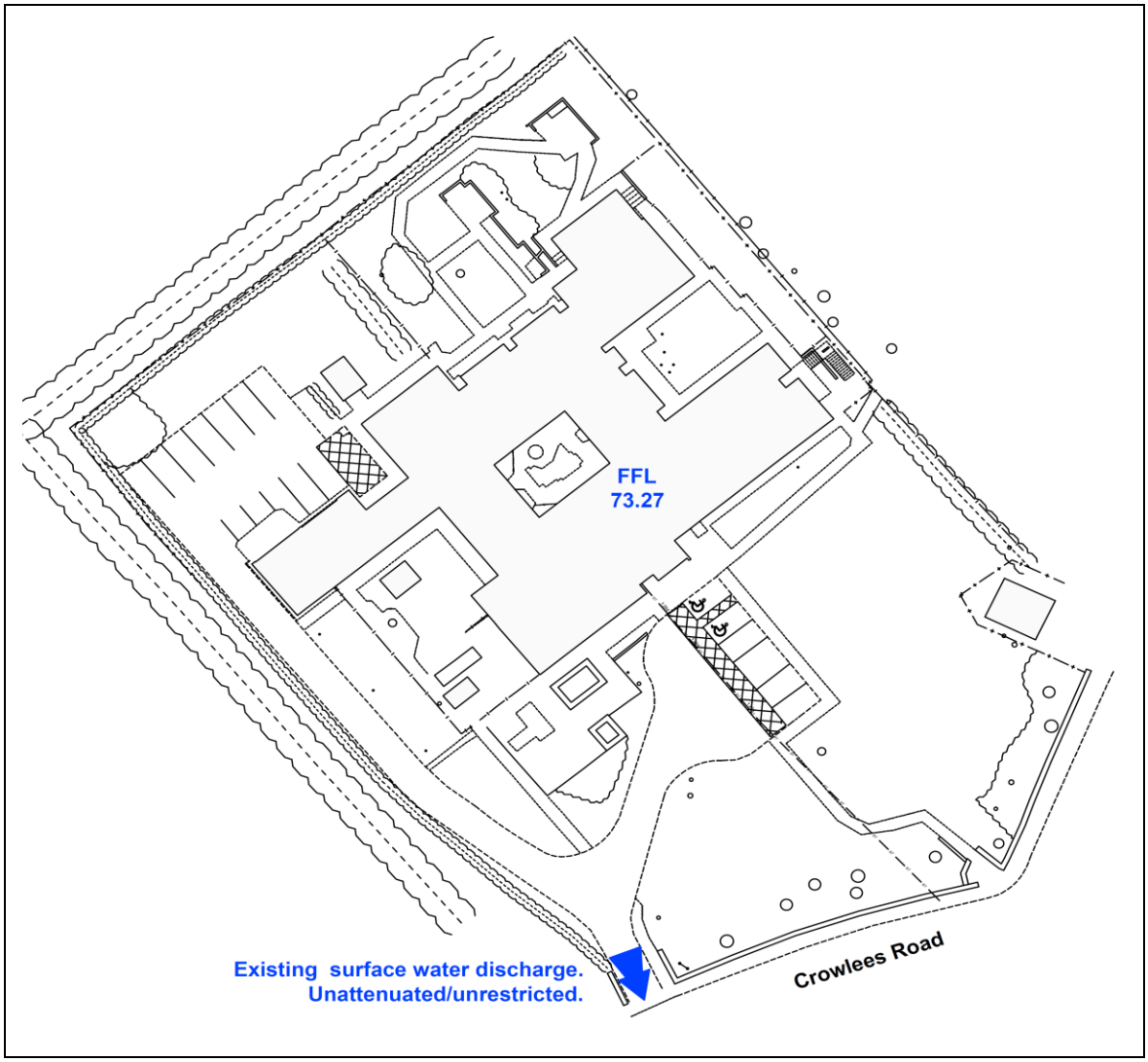
vi. The management of surface water runoff from the proposed development is considered to be the most significant flood risk related matter.

3 Existing Surface Water Drainage

3.1 A connectivity/utility survey has been undertaker which demonstrates that runoff from the existing hard areas is collected and discharged to a Yorkshire Water (the sewerage Undertaker) Public Sewer located at the front of the site, within Crowlees Road.

3.2 The current discharge is unrestricted. No storage or pollution control assets, other than sumped gullies, were observed.

3.3 The simplified image below illustrates the current point of surface water discharge.



3.4 Refer to Appendix 1 and 2 respectively for reproductions of the utility survey and the Undertaker's record plans.

3.5 The existing drained area is estimated to be approximately 0.18 ha (33%) of the site area.

3.6 The existing connection to the public sewer is understood to be 100 mm diameter. The connection is made by junction and no public manholes are present in the vicinity of the site. A trial hole was excavated in March 2021 to determine the invert of the discharge pipe at, approximately, the site boundary.

3.7 The existing discharge pipe is a limiting factor in the existing surface water drainage.

3.8 A basic/schematic drainage model has been constructed and used to estimate surface water discharge from the existing site. The results are summarised in the table below:

Return Period	Existing Discharge (l/s)	Comments
1 year	18.4	
30 year	18.4	7.3 m^3 of flooding
100 year	19.7	20.8 m^3 of flooding
100 year +40%	19.7	39.9 m^3 of flooding
FSR inputs used for return periods less than 100 year. FEH inputs used for return periods of 100 year and above.		

3.9 For comparative purposes, if the existing site benefitted from a free discharge the surface water flow (drained areas) is estimated to be as follows:

Return Period	Existing Discharge (l/s)
1 year	23
30 year	54
100 year	78
100 year +40%	106
FSR inputs used for return periods less than 100 year. FEH inputs used for return periods of 100 year and above.	

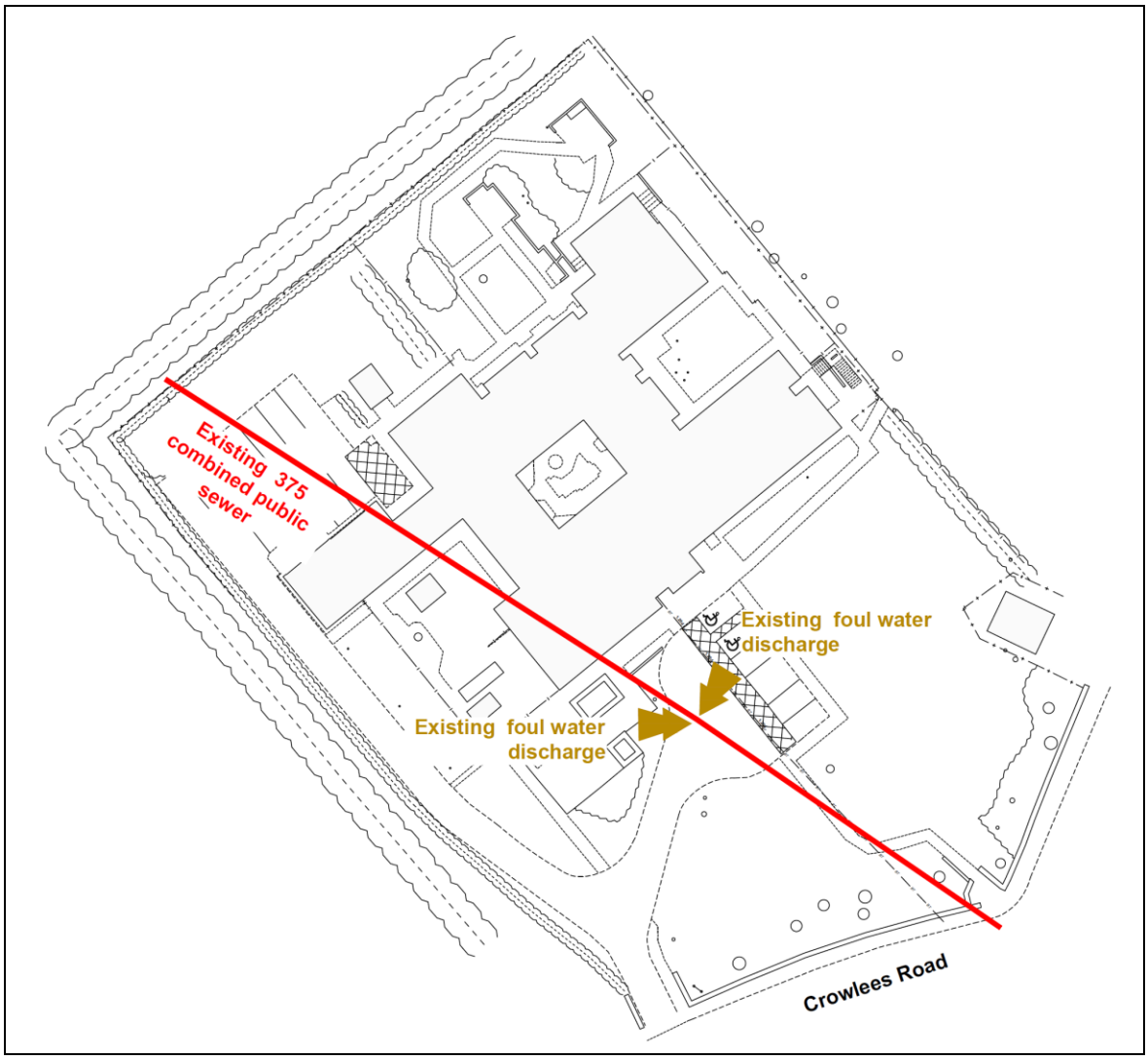
3.10 See also Section 5.3 “Discharge Rate” for additional comment is respect of existing capacity.

4 Existing Foul Water Drainage

4.1 A connectivity/utility survey has been undertaken.

4.2 From the connectivity survey it is inferred that the current facility discharges into the public combined sewer network via a manhole located, in broad terms, at the centre of the site.

4.3 The public sewer passes beneath the existing building.



4.4 Refer to Appendix 1 and 2 respectively for reproductions of the utility survey and the Undertaker's record plans.

5 Surface Water Drainage Strategy

5.1 Sustainable Drainage Systems

5.1.1 The existing surface water drainage system is wholly 'traditional'; that is, it is piped directly to surface water sewer without attenuation of flow or contamination.

5.1.2 The proposed development will introduce a positive drainage strategy which will reduce the rate and improve the quality of discharged runoff.

5.1.3 Runoff (rate and quality) will be controlled '*at source*' in accordance with the ethos of sustainable drainage; refer to subsequent sections for methodology.

5.2 Disposal Hierarchy

5.2.1 Building Regulations (Part H) and other contemporary guidance requires that surface water should be disposed according to the following hierarchy:

i. Infiltration to Ground.

ii. Discharge to a local Watercourse.

iii. Discharge to the local sewerage network.

5.2.2 Soakaways & Infiltration Drainage

5.2.2.1 An intrusive, Phase 2, site investigation was undertaken by HSP in October 2010. As reported:

"*The intrusive works have confirmed stiff clay overlying mudstone bedrock below any Made Ground.*" (Para 4.8, HSP Phase II Geo-environmental Assessment, Revision A)

5.2.3 As a result, infiltration drainage is not considered viable at the site

5.2.4 Watercourse

5.2.4.1 There are no watercourses in the vicinity of the site.

5.2.5 Public Sewer

5.2.5.1 The surface water runoff from the proposed will continue to discharge into Yorkshire Water's Public Sewer located at the front of the site.

5.2.5.2 By discharging to sewer, the proposed drainage is in accordance with the third tier of the disposal hierarchy but is considered appropriate given the absence of alternatives.

5.3 Discharge Rate

5.3.1 Yorkshire Water has confirmed that it will permit the post developed site to continue to discharge surface water runoff into the public sewer within Crowlees Road.

5.3.2 During initial consultations a discharge rate of between 13 l/s and 18 l/s was anticipated, assuming a 30% reduction in comparison to that of the existing. The lower value (13 l/s) has been agreed with Yorkshire Water together with an acceptance that a higher value will be approved with suitable evidence.

5.3.3 Subsequently, further site investigation to determine the gradient of the existing outfall pipe and subsequent calculations has indicated that:

i. Its conveyance ability is less than originally envisaged;

ii. It is laid to approximate gradient of 1 in 12.7; and

iii. Its unsurcharged capacity is estimated to be 17.1 l/s. However, due to surcharge within the pipework, actual flow may be in excess of this value.

5.3.4 A drainage strategy has been developed on the basis of:

i. 12 l/s discharge rate; that is, a 30% reduction compared to existing

ii. No flooding from storms up to and including the 100 year + 40% for climate change event derived from FEH (Flood Estimation Handbook) parameters

5.3.5 A preliminary drainage model has been constructed to provide '*proof of concept*' of the above. Refer to Appendix 3 for a summary of simulation results.

5.3.6 The discharge rate will be restricted by means of a Hydrobrake, or similar, device and will provide a significant reduction in the rate of surface water disposal in comparison to the existing. The table below summarises the potential betterment:

Return Period	Existing Discharge* (l/s)	Proposed Discharge (l/s)	Improvement
1 year	18.4	12	53%
30 year	18.4	12	53% plus 7.3 m^3 flooding eliminated
100 year	19.7	12	64% plus 20.8 m^3 flooding eliminated
100 year +40%	19.7	12	64% plus 39.9 m^3 flooding eliminated
*Based upon actual flow estimates. The '*free discharge*' rate is considerably greater. The potential improvement on discharge rate may therefore be underestimated.			

5.3.7 Flow in excess of the design discharge rate will be attenuated within modular storage cells. Refer to HSP drawing 20017-HSP-XX-XX-DR-C-2001 within Appendix 3 for an illustration of the proposed drainage strategy.

5.3.8 Significantly, it is considered unlikely that the existing discharge pipe could convey flow from the site during severe flood events without flooding. During significant rainfall events, it is anticipated that excess watershed from the existing site would be conveyed by overland flow onto Crowlees Road. The proposed drainage will significantly reduce flood risk.

5.4 Discharge Quality

5.4.1 "The SuDS Manual", published by CIRIA, provides a methodology and guidance for the design of drainage systems to meet the water water quality criteria and good practice standards.

5.4.2 In outline terms, the SuDS Manual provides, via indices, a means of rating pollutants by end use and correlating the effectiveness of clean-up techniques/assets with that pollutant rating. The following is a reproduction of Table 26.2 of the SuDS Manual entitled “Pollution Hazard Indices for Different Land Use Classifications”:

Category	Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
1	Residential roofs	Very low	0.2	0.2	0.05
2	Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
3	Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
4	Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.4	0.7
5	Sites with heavy pollution (eg 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	High	0.8	0.8	0.9

5.4.3 The post-development surface water will be derived from roofs and vehicle pavement with a respective split of approximate 45%/55%. The proposed care facility is non-residential and of relatively small scale. Accordingly, it is appraised as being Category 3, Low Pollution Hazard.

5.4.4 With respect to the subject site, the site is relatively constrained by:

i. The required building, parking and access infrastructure occupies a significant proportion of the site in order to provide the healthcare facilities required;

ii. The periphery of the site is constrained by trees, no dig areas, etc.

As a result, it is considered impractical to incorporate surficial SuDS components such as swales and basins. Such features may also present a risk to potential users of the facility.

5.4.5 Mindful of the above, manufactured treatment components are to be incorporated prior to the surface water outfall into the public sewer.

5.4.6 The following information was provided by a manufacturer of interceptors/separator tanks:

	Pollutant Mitigation Indices		
Asset Type	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Full Retention	0.8	0.8	>0.95
Bypass	0.6	0.6	0.75
Information provided by Spel,Products 9 March 2020			

5.4.7 Based upon the above, the required treatment indices will be exceeded by the inclusion of a bypass interceptor.

5.4.8 Moreover, parking and the vehicle drop off layby are proposed be constructed using Type C (no infiltration) permeable pavement construction. The sub-base beneath the permeable pavement will provide additional attenuation of flow and pollutants and will further enhance the sustainability of the project.

5.5 Discharge Volume

5.5.1 In the absence of infiltration and/or evapo-transpiration, the discharge volume is purely a function of drained area.

5.5.2 The proposed drained area is approximately 0.28 ha. This exceeds the 0.18 ha drained area of the existing. In volumetric terms, the post-development volume of runoff will increase in comparison to the existing.

5.5.3 Notwithstanding the above, given the significant reduction in the rate of disposal, it is considered risk of flooding offsite will be reduced. This is considered to be a tangible benefit which offsets any increase in the volume of runoff discharged.

5.6 Operation and Maintenance

5.6.1 The long-term efficacy of any installed drainage system will be compromised by a lack of maintenance.

5.6.2 During the detailed design stage, consideration should be given to the maintenance of any proposed system. It is recommended that a drainage maintenance regime is developed and provided in an “Operation and Maintenance Manual” for the scheme.

5.6.3 The maintenance regime should conform to the requirements set out within CIRIA C753 The SuDS Manual.

5.6.4 Typical inclusions/requirements are illustrated within Appendix 4.

6 Foul Water Drainage Strategy

6.1 In principle, the proposed drainage strategy mimics that of the existing; namely, effluent will be discharged into the combined sewer which traverses the site.

6.2 Anglian Water has confirmed adequate capacity in their network; see Appendix 2.

6.3 The public sewer passes beneath the existing building. Anglian Water has confirmed that that the proposed development will not be permitted to build over the sewer (like the existing) and that a diversion will be required. At the time of writing, the S185 diversion application was being processed/reviewed by Anglian Water.

6.4 Post development, maintenance access to the combined public sewer will improved in comparison to the existing; this is considered to be a betterment to the public sewer network. The risk to the on-site structures associated with sewer failure will also be reduced.

7 Construction Works Temporary Surface Water Drainage

7.1 The design of temporary works is outside of the scope of this document with responsibility resting with the Contractor.

7.2 Notwithstanding the above, it is anticipated that controls will be required to prevent runoff impacting upon Crowlees Road and, potentially, the area of public open space to the west of the site.

7.3 Subject to Undertaker approval, potential exists to maintain and reuse the existing surface water connection into the sewer and gully at the site entrance.

7.4 Temporary drainage grips within the site may also be required to prevent and/or control watershed prior to installation of the permanent drainage works.

7.5 Pollution prevention measures are likely to be required to any site discharge. This may require proprietary measures such as those provided by “Siltbuster” (or similar).

8 Summary & Conclusions

8.1 Proposals

8.1.1 The existing health care facility will be demolished and replaced with similar.

8.2 Flood Risk

8.2.1 The site is not considered to be at risk of flooding and is not located within a Critical Drainage Area (CDA).

8.3 Surface Water Runoff

8.3.1 The site is brownfield and existing runoff discharges freely into the public surface water sewer network. No attenuation or pollution prevention assets are present.

8.3.2 The use of infiltration drainage systems is not considered viable due to the made ground and underlying clay geology. There are no nearby watercourses to which the site could discharge.

8.3.3 The new facilities will continue to discharge runoff into the public sewer.

8.3.4 The proposed drained area will increase. However, it is proposed to limit the discharge rate and attenuate excess flow on-site in order to mitigate potential impacts.

8.3.5 Based upon the region's Strategic Flood Risk Assessment,

"*Development should aim for a reduction in surface water runoff rates of at least 30% for Brownfield sites up to a 1 in 100 year storm event, considering climate change*"

8.3.6 The design storm will be the 1 in 100 year event plus an additional 40% for climate change.

8.3.7 The table below illustrates the improvement in post development discharge rate in comparison to the existing.

Return Period	Existing Discharge* (l/s)	Proposed Discharge* (l/s)	Improvement
1 year	18.4	12	53%
30 year	18.4	12	53% plus 7.3 m^3 flooding eliminated
100 year	19.7	12	64% plus 20.8 m^3 flooding eliminated
100 year +40%	19.7	12	64% plus 39.9 m^3 flooding eliminated
*Based upon actual flow estimates. The '*free discharge*' rate is considerably greater. The potential improvement on discharge rate may therefore be underestimated. See Section 5.3 for additional commentary in respect of discharge rate.			

This reduction in flow significantly exceeds that required and demonstrates an increasing improvement storm severity; that is, those events which typically result in hazardous flooding.

8.3.8 A by-pass separator will also be included within the drainage strategy. This will provide standards of pollution control which exceed the requirements of The SuDS Manual.

8.3.9 Parking and drop off zones will be constructed from Type C permeable surfacing which will further enhance sustainability by attenuating flow and pollutants.

8.3.10 In summary, the development will incorporate a sustainable drainage scheme which is designed not to flood for all storms with a 100 year return period with an allowance of 40% for climate change and will provide a betterment in:

i. Discharge quality and

ii. Discharge rate

iii. Flood risk on and off the site

8.4 Foul Water Effluent

8.4.1 The existing facility discharges foul water into a public foul sewer which passes through the site and beneath the existing structure.

8.4.2 The existing combined sewer will be diverted around the proposed building. At the time of preparation of this document the S185 diversion application was being processed by Anglian Water.

8.4.3 Anglian Water has confirmed suitable capacity exists within its network.

8.4.4 The proposed development will continue discharge into the combined public sewer.

8.4.5 Post development, maintenance access to the combined public sewer will improved in comparison to the existing; this is considered to be a betterment to the public sewer network. The risk to the on-site structures associated with sewer failure will also be reduced.

8.5 Construction Works Temporary Surface Water Drainage

8.5.1 The Contractor will be required to consider the control of surface water runoff during construction works.

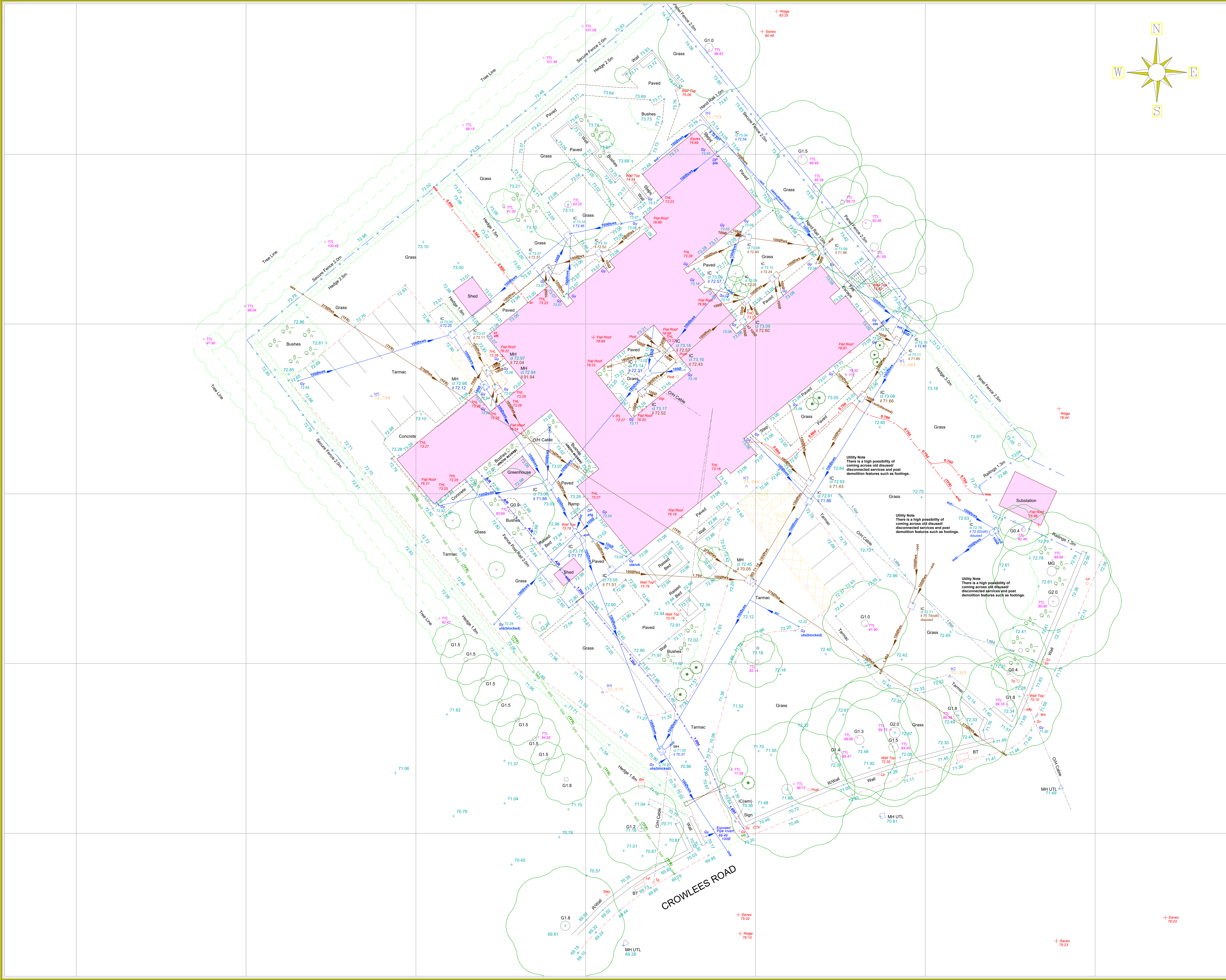
8.5.2 Subject to Undertaker approval, potential exists to maintain and reuse the existing surface water connection into the sewer.

8.5.3 It may be possible to reuse the gully at the site entrance in order to limit the potential offsite flows.

8.5.4 Temporary drainage grips and proprietary pollution prevention measures may be required.

Appendix 1

- Mapmatic Topographic & Utility Survey, revision 1



KEY FOR UNDERGROUND SERVICES

Combined water
Foul water
Surface water
Other
Gas — GAS
Electric — E
Telephone — BT
Cable TV — CATV
Unidentified — U
Water
Closed Circuit TV — CCTV
Communications — COM
Heating Pipe — HP
Empty Duct — ED
Fibre Optics — FO
Vents — V
Pipe — PIPE
Traffic Signal — TS
Gauge Lines — G
Vapor Recovery — VR
Offsets — O
Fuel — F

Where chamber extents are significantly greater than the cover size, their approximate extents are shown thus;

ABBREVIATION KEY

assumed route, backdrop, bed level, cover level, down pipe, end of trace, fire hydrant, gully, gas valve, head of run, high level, inspection chamber, invert level, manhole, pipe riser, pipe to ground, pipe to surface, rodding eye, rainwater pipe, stop valve, soil vent pipe, trapped exit, taken from records, telegraph pole, unable to find, unable to lift, unable to survey, unable to trace, vent pipe, water level, water meter, wash out valve, depth

UTILITY SURVEY NOTES

ELECTROMAGNETIC AND/OR GROUND PENETRATING RADAR TECHNIQUES HAVE BEEN USED TO LOCATE AND MAP UNDERGROUND UTILITIES AND FEATURES ON THIS DRAWING. MAPMATIC HAVE MADE EVERY ENDEAVOUR TO MAKE SURE THAT THE INFORMATION CONTAINED WITHIN THIS DRAWING IS ACCURATE AND OF THE HIGHEST QUALITY. HOWEVER, THE RESULTS FROM THESE TYPES OF SURVEYS ARE NOT INFALLIBLE AND SHOULD THE LOCATION OR DEPTH OF SERVICES/FEATURES BE OF PARTICULAR IMPORTANCE TO A PROJECT, THEN IT IS STRONGLY ADVISED THAT TRIAL EXCAVATIONS SHOULD BE UNDERTAKEN TO CONFIRM SURVEY RESULTS.

MAPMATIC HAVE USED ALL RECORD DRAWINGS THAT WERE AVAILABLE TO US BY THE CLIENT OR BY THE STATUTORY UTILITY PROVIDERS AT THE TIME OF THE SURVEY. ANY INFORMATION TAKEN FROM THESE DRAWINGS (IE PIPE SIZES, MATERIAL) IS NOT GUARANTEED. SERVICES LOCATED FROM RECORD DRAWINGS WILL BE SHOWN AND ANNOTATED AS TAKEN FROM RECORDS (TFR). HISTORIC RECORD INFORMATION IS OFTEN INCOMPLETE/INACCURATE AND CANNOT BE RELIED UPON.

A SINGLE LINE INDICATING A UTILITY MAY INDICATE THE PRESENCE OF MULTIPLE SERVICES WITHIN CLOSE PROXIMITY TO EACH OTHER. WHERE A SINGLE LINE TYPE IS SHOWN WE RECOMMEND HAND DIGGING WITHIN 0.5m, TO EXPOSE HIDDEN SERVICES.

WHERE QUOTED, DEPTH INFORMATION OF UNDERGROUND SERVICES/FEATURES IS STATED. DEPTHS ARE GENERALLY WITHIN +/- 10% ACCURATE, BUT CANNOT BE GUARANTEED. ANY DEPTHS SHOWN ARE USUALLY TO THE TOP OF THE SERVICE/FEATURE. GRAVITY SEWERS AND DRAINS ARE USUALLY TO INVERT (BASE OF DRAINAGE CHANNEL) UNLESS OTHERWISE STATED.

AT MAPMATIC WE USE SKILLED STAFF AND MODERN CALIBRATED EQUIPMENT TO PERFORM OUR SURVEYS. HOWEVER, THE COMPLETENESS OF ANY UNDERGROUND SURVEY CANNOT BE 100% GUARANTEED AND WE CANNOT BE HELD RESPONSIBLE FOR ANY INACCURACIES BEYOND THOSE THAT COULD BE REASONABLY EXPECTED BY A COMPETENT COMPANY.

CONTRACTORS UTILIZING OUR DRAWINGS FOR INTRUSIVE WORK SHOULD TAKE ALL REASONABLE MEASURES TO WORK SAFELY IN ACCORDANCE WITH HSG47 GUIDELINES "AVOIDING DANGER FROM UNDERGROUND SERVICES".

SITE SPECIFIC NOTES–

DUE TO THE HISTORY OF THE SITE THERE IS A HIGH POSSIBILITY OF COMING ACROSS OLD DISUSED AND DISCONNECTED SERVICES DURING EXCAVATION.

THE GAS SUPPLY TO THE SITE IS PE AND IS UNABLE TO TRACE USING BOTH GROUND PENETRATING RADAR AND RADIO DETECTION, THE ROUTE OF THE GAS MAIN SHOWN ON THE DRAWING HAS BEEN TAKEN FROM RECORDS AND IS TO BE USED AS A GUIDE ONLY.

MAPMATIC STRONGLY RECOMMEND HAVING A CCTV SURVEY OF ALL DRAINAGE WITHIN THE SURVEY AREA TO OBTAIN A MORE COMPLETE PICTURE INCLUDING LATERAL CONNECTIONS.

IT WAS NOT POSSIBLE TO ROD THE 375ø FOUL WATER SEWER UP STREAM THROUGH THE SITE DUE TO FAST FLOW, THE POSITION OF THE DRAIN UPSTREAM HAS BE ADDED TO THE DRAWING FROM RECORDS AND IS NOT TO BE TREATED AS ACCURATE.

THERE ARE SEVERAL AREAS OF VEGETATION THAT ARE UNABLE TO SURVEY DUE TO A LACK OF ACCESS.

THE WATER MAIN HAS BEEN TRACED INTO THE SITE TO AN END OF TRACE UNDER A SHED, AN ASSUMED ROUTE IS SHOWN THERE AFTER AND IS TO BE USED AS A GUIDE ONLY.

ANY SERVICE SHOWN IN THE DRAWING WITH EITHER TFR (TAKEN FROM RECORDS) OR AR (ASSUMED ROUTE) WRITTEN ON IT IS TO BE USED AS A GUIDE ONLY AND IS NOT TO BE TREATED AS ACCURATE.

Key:

FL: Floor level
CL: Ceiling level
SusCL: Suspended ceiling level
U/S: Underside level
SHL: Sill height level
HHL: Head height level
SPR: Spring Point

Building line
Beam
Window
Dimension

Ground light
Sanitary ware
Door / sliding door
Heater / radiator
Inspection cover

Av	Air valve	G:	Girth circumference	Sv	Stop valve
Bg	Back gully	Gy	Gully	TCB	Telephone call box
BH	Borehole	Ht.	Height	TTL:	Tree top level
BM	Benchmark	IC	Inspection cover	THL	Threshold level
Boll	Bollard	IFL	Internal floor level	TCB	Telephone call box
Bs	Bus stop	IL	Invert level	TL	Traffic light
BT	British Telecom	Lb	Letter box	THL	Threshold level
Bg	Back Gully	Lp	Lamp Post	Tp	Telegraph post
CL	Cover Level	MG	Multigirth	Ts	Traffic signal
CBX	Control box	MH	Manhole	TT	Tactile paving
CPS	Concrete paving slab	Mkr	Marker post	Twl:	Top of wall level
CTV	Cable TV cover	NVP	No visible pipes	UTL	Unable to lift
Elc	Electric cover	PInv	Pipe invert	WL	Water level
Ep	Electricity post	Pb	Post box	Wm	Water meter
Er	Earth rod	Re	Rodding eye	Wo	Wash out
Fh	Fire hydrant	Sp	Sign post		
Fs	Flagstaff	St	Stop tap		

Road
Drop Kerb
Verge Tarmac
Verge Concrete
Verge Grass
Verge
Tops
Bottoms

Ordnance Survey information is provided for a guide only.
OS BUILDING OUTLINE
OS DETAIL

Station	Easting (m)	Northing (m)	Level (m)
M1	420397.107	420256.487	73.084
M2	420402.858	420218.469	72.325
M3	420378.936	420240.898	73.046
M4	420361.981	420216.624	71.575
M5	420334.744	420251.518	72.798
M6	420373.494	420284.007	73.759

REV	DATE	DESCRIPTION OF WORK	SURVEYOR	CHECKED BY
R1	15.03.2021	Additional Information added	AW	AW

MAPMATIC
MEASURED SURVEYS

SETTING OUT · UTILITY SURVEYS · CAMERA SURVEYS · FLOOD RISK ASSESSMENT
AERIAL PHOTOGRAPHY · EARTHWORK CALCULATIONS · MEASURED BUILDING SURVEYS · TOPOGRAPHICAL SURVEYS

Mapmatic, Suite 1, Woburn House, South Street, Vernon Gate, Derby, DE1 1UL
Tel: 01332 650 580 www.mapmatic.com Email: info@mapmatic.com

CLIENT
HSP Consulting

PROJECT
Knowl Park House
Crowlees Road
Mirfield WF14 9PP

TITLE
Topographical & Utility Survey

Scale	1: 200@A1	Date	30.09.2020
Drawn	MR. CL	Checked	AW. TH
Level datum	GNSS	Grid orientation	GNSS
Job number	3793B	Revision	1
Drawing no.	0001	Sheet	1 of 1

Notes:

All critical measurements should be checked on site prior to design. No liability will be taken for this plan if passed onto 3rd parties. Trees and other survey data may be omitted due to dense vegetation. Some services may have been omitted due to parked vehicles and vegetation. Please note the drainage information has been ascertained by visual inspection from the surface and therefore values are estimated.

This survey has been orientated to the Ordnance Survey (OS) national grid via a Global Navigation Satellite System (GNSS) and the OS Active Network (OS NET). A true OSGB36 coordinate has been established near to the site centre via a transformation using the OSTN15 & OSGM15 transformation models. The survey has been correlated to this point and a further one or more OSGB36 points established to create a true OS bearing for angle orientation. No scale factor has been applied to the survey therefore the coordinates shown are arbitrary and not true OS coordinates. Please refer to the survey station table to enable establishment of the on-site grid.

RICS ICES

Appendix 2

- Yorkshire Water Public Sewer Records
- Miscellaneous Yorkshire Water Correspondence

YorkshireWater

Mr R Hopkins
HSP Consulting
Lawrence House
Meadowbank Way
Eastwood
Nottingham
NG16 3SB
robert.hopkinson@hspconsulting.com

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482
Fax:

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

Your Ref:
Our Ref: W015079

15th November 2020

Dear Mr Hopkins,

Knowl Park House, Crowlees Road, Mirfield, Kirklees, WF14 9PP - Pre-Planning Sewerage Enquiry U030012 (COMMERCIAL)

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

Existing Infrastructure

There is a 375 mm diameter public combined water sewer recorded crossing the site. No buildings, or other obstructions, are to be erected within 3 (three) metres, nor trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

Foul Water

Development of the site should take place with separate systems for foul and surface water drainage. The separate systems should extend to the points of discharge to be agreed.

Foul water domestic waste can discharge to the 375 mm diameter public combined sewer crossing the site. There is spare capacity to except the foul flows.

Foul water from kitchens and/or food preparation areas of any restaurants and/or canteens etc. must pass through a fat and grease trap of adequate design before any discharge to the public sewer network.

Surface Water

In order to agree the proposed surface water rate I will need to know the carrying capacity/gradient of the final 100 mm surface water drainage coming from the site and connecting to the public 225 mm surface water sewer in Crowlees Road.

Surface water run-off from communal parking (greater than 800 sq metres or more than 50 car parking spaces) and hardstanding must pass through an oil, petrol and grit interceptor/separator of adequate design before any discharge to the public sewer network. Roof water should not pass through the traditional 'stage' or full retention type of interceptor/separator. It is good drainage practice for any interceptor/separator to be located upstream of any on-site balancing, storage or other means of flow attenuation that may be required.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

Under the provisions of section 111 of the Water Industry Act 1991 it is unlawful to pass into any public sewer (or into any drain or private sewer communicating with the public sewer network) any items likely to cause damage to the public sewer network interfere with the free flow of its contents or affect the treatment and disposal of its contents. Amongst other things this includes fat, oil, nappies, bandages, syringes, medicines, sanitary towels and incontinence pants. Contravention of the provisions of section 111 is a criminal offence.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for adoption under Section 104 of the Water Industry Act 1991. Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

Chris Roberts
Development Services Technician

Richard Harrison

From: Chris.Roberts@yorkshirewater.co.uk on behalf of technical.sewerage@yorkshirewater.co.uk
Sent: 29 November 2020 16:47
To: Paul Daykin
Subject: Knowl Park House, Crowlees Road, Mirfield, Kirklees, WF14 9PP - Pre-Planning Sewerage Enquiry U030012 (COMMERCIAL)
Attachments: pic01200.gif; roberts4_radDB656.PDF; pic26058.gif

Dear Mr Daykin,

Thank you for your recent emails.

In regards to invert levels we only have details shown for invert depths shown on the plan I provided as pink number next to the manholes. I've included the plan again for ease of reference.

In regards to the SW sewer carrying capacity. The reason I need to ask this is to understand if it was acting as a throttle so if I use your higher figure of 18 l/s and a take off the 30% it equates to 12.6 l/s call it 13 l/s maximum site surface water discharge into the 225 mm public surface water sewer, if however when you carry out your trial pit you can evidence a higher carrying capacity and like you I believe it will do I will be happy to revise the site SW discharge rate.

(Embedded image moved to file: pic01200.gif)
*** Please note, all correspondence must be sent to technical.sewerage@yorkshirewater.co.uk and will be responded to within 10 working days ***

Yorkshire Water plays a key role in protecting public health and we're doing everything we can to continue to provide essential water and waste water services to customers during the Covid-19 outbreak. As a result we have decided to scale back some of our developer services activity. This is to allow colleagues from our developer services team to support frontline colleagues in delivering our core services to customers. This will mean we aren't able to respond as quickly as usual. Thank you for your patience, we will keep you updated as the situation progresses.

(See attached file: roberts4_radDB656.PDF)

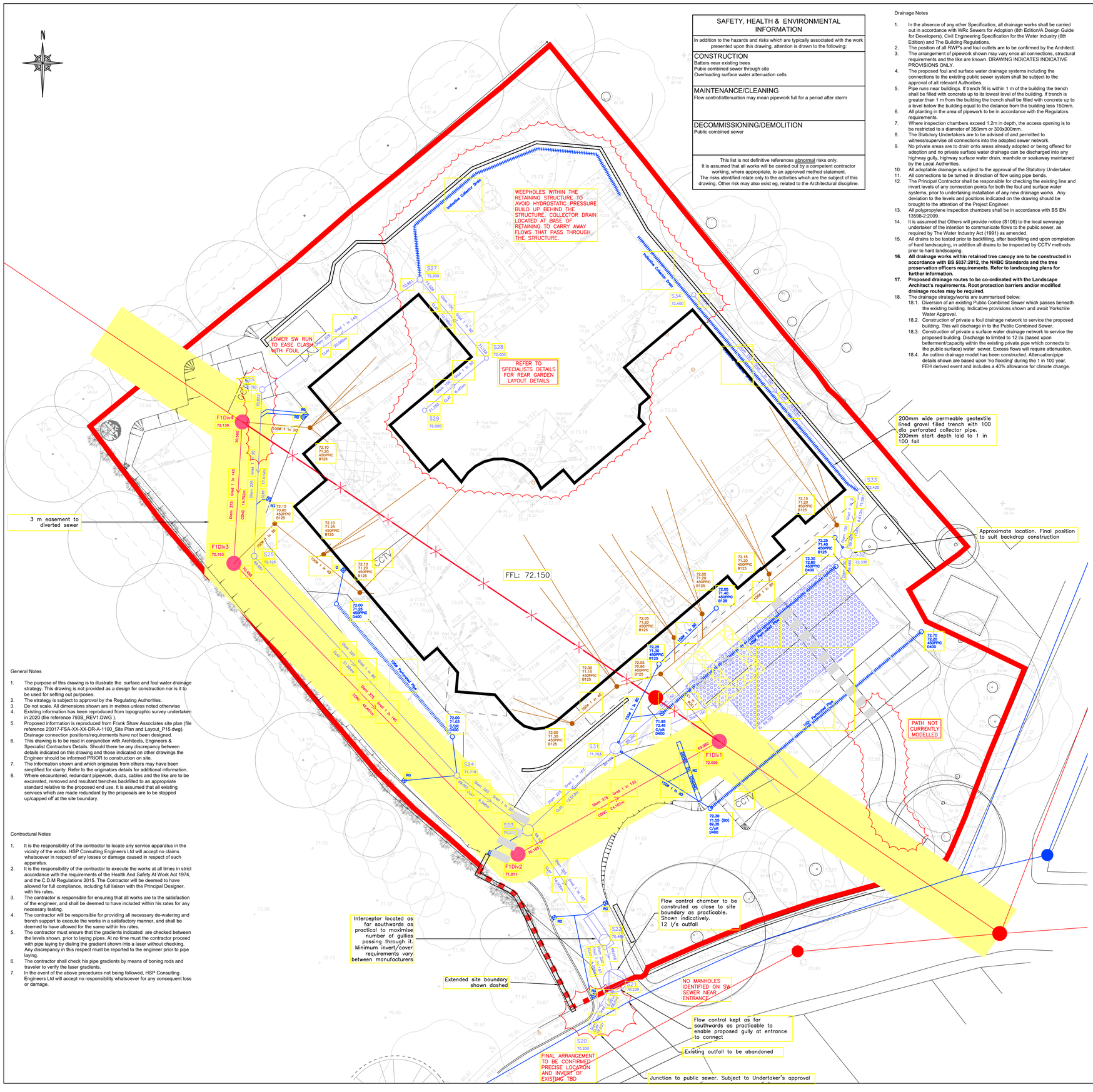
(Embedded image moved to file: pic26058.gif)
*** Please note, all correspondence must be sent to technical.sewerage@yorkshirewater.co.uk and will be responded to within 10 working days ***

Yorkshire Water plays a key role in protecting public health and we're doing everything we can to continue to provide essential water and waste water services to customers during the Covid-19 outbreak. As a result we have decided to scale back some of our developer services activity. This is to allow colleagues from our developer services team to support frontline colleagues in delivering our core services to customers. This will mean we aren't able to respond as quickly as usual. Thank you for your patience, we will keep you updated as the situation progresses.

|---------->
| From: |
|---------->
>----------|
|Paul Daykin <paul.daykin@hspconsulting.com> |
>----------|
|---------->

Appendix 3

- HSP Drainage Drawing20017-HSP-XX-XX-DR-C-2001 (rev P06)
- Surface water simulation results (summary)



SAFETY, HEALTH & ENVIRONMENTAL INFORMATION

In addition to the hazards and risks which are typically associated with the work presented upon this drawing, attention is drawn to the following:

CONSTRUCTION
Batters near existing trees
Pubic combined sewer through site
Overloading surface water attenuation cells

MAINTENANCE/CLEANING
Flow control/attenuation may mean pipework full for a period after storm

DECOMMISSIONING/DEMOLITION
Public combined sewer

This list is not definitive references abnormal risks only.
It is assumed that all works will be carried out by a competent contractor working, where appropriate, to an approved method statement.
The risks identified relate only to the activities which are the subject of this drawing. Other risk may also exist eg, related to the Architectural discipline.

Drainage Notes

1. In the absence of any other Specification, all drainage works shall be carried out in accordance with WRc Sewers for Adoption (8th Edition/A Design Guide for Developers), Civil Engineering Specification for the Water Industry (6th Edition) and The Building Regulations.
2. The position of all RWP's and foul outlets are to be confirmed by the Architect.
3. The arrangement of pipework shown may vary once all connections, structural requirements and the like are known. DRAWING INDICATES INDICATIVE PROVISIONS ONLY.
4. The proposed foul and surface water drainage systems including the connections to the existing public sewer system shall be subject to the approval of all relevant Authorities.
5. Pipe runs near buildings. If trench fill is within 1 m of the building the trench shall be filled with concrete up to its lowest level of the building. If trench is greater than 1 m from the building the trench shall be filled with concrete up to a level below the building equal to the distance from the building less 150mm.
6. All planting in the area of pipework to be in accordance with the Regulators requirements.
7. Where inspection chambers exceed 1.2m in depth, the access opening is to be restricted to a diameter of 350mm or 300x300mm.
8. The Statutory Undertakers are to be advised of and permitted to witness/supervise all connections into the adopted sewer network.
9. No private areas are to drain onto areas already adopted or being offered for adoption and no private surface water drainage can be discharged into any highway gully, highway surface water drain, manhole or soakaway maintained by the Local Authorities.
10. All adoptable drainage is subject to the approval of the Statutory Undertaker.
11. All connections to be turned in direction of flow using pipe bends.
12. The Principal Contractor shall be responsible for checking the existing line and invert levels of any connection points for both the foul and surface water systems, prior to undertaking installation of any new drainage works. Any deviation to the levels and positions indicated on the drawing should be brought to the attention of the Project Engineer.
13. All polypropylene inspection chambers shall be in accordance with BS EN 13598-2:2009.
14. It is assumed that Others will provide notice (S106) to the local sewerage undertaker of the intention to communicate flows to the public sewer, as required by The Water Industry Act (1991) as amended.
15. All drains to be tested prior to backfilling, after backfilling and upon completion of hard landscaping, in addition all drains to be inspected by CCTV methods prior to hard landscaping.
16. **All drainage works within retained tree canopy are to be constructed in accordance with BS 5837:2012, the NHBC Standards and the tree preservation officers requirements. Refer to landscaping plans for further information.**
17. **Proposed drainage routes to be co-ordinated with the Landscape Architect's requirements. Root protection barriers and/or modified drainage routes may be required.**
18. The drainage strategy works are summarised below:
    - 18.1. Diversion of an existing Public Combined Sewer which passes beneath the existing building. Indicative provisions shown and await Yorkshire Water Approval.
    - 18.2. Construction of private a foul drainage network to service the proposed building. This will discharge in to the Public Combined Sewer.
    - 18.3. Construction of private a surface water drainage network to service the proposed building. Discharge to limited to 12 l/s (based upon betterment/capacity within the existing private pipe which connects to the public surface) water sewer. Excess flows will require attenuation.
    - 18.4. An outline drainage model has been constructed. Attenuation/pipe details shown are based upon 'no flooding' during the 1 in 100 year, FEH derived event and includes a 40% allowance for climate change.

General Notes

1. The purpose of this drawing is to illustrate the surface and foul water drainage strategy. This drawing is not provided as a design for construction nor is it to be used for setting out purposes.
2. The strategy is subject to approval by the Regulating Authorities.
3. Do not scale. All dimensions shown are in metres unless noted otherwise
4. Existing information has been reproduced from topographic survey undertaken in 2020 (file reference 7938_REV1.DWG).
5. Proposed information is reproduced from Frank Shaw Associates site plan (file reference 20017-FSA-XX-XX-DR-A-1100_Site Plan and Layout_P15.dwg). Drainage connection positions/requirements have not been designed.
6. This drawing is to be read in conjunction with Architects, Engineers & Specialist Contractors Details. Should there be any discrepancy between details indicated on this drawing and those indicated on other drawings the Engineer should be informed PRIOR to construction on site.
7. The information shown and which originates from others may have been simplified for clarity. Refer to the originators details for additional information.
8. Where encountered, redundant pipework, ducts, cables and the like are to be excavated, removed and resultant trenches backfilled to an appropriate standard relative to the proposed end use. It is assumed that all existing services which are made redundant by the proposals are to be stopped up/capped off at the site boundary.

Contractural Notes

1. It is the responsibility of the contractor to locate any service apparatus in the vicinity of the works. HSP Consulting Engineers Ltd will accept no claims whatsoever in respect of any losses or damage caused in respect of such apparatus.
2. It is the responsibility of the contractor to execute the works at all times in strict accordance with the requirements of the Health And Safety At Work Act 1974, and the C.D.M Regulations 2015. The Contractor will be deemed to have allowed for full compliance, including full liaison with the Principal Designer, with his rates.
3. The contractor is responsible for ensuring that all works are to the satisfaction of the engineer, and shall be deemed to have included within his rates for any necessary testing.
4. The contractor will be responsible for providing all necessary de-watering and trench support to execute the works in a satisfactory manner, and shall be deemed to have allowed for the same within his rates.
5. The contractor must ensure that the gradients indicated are checked between the levels shown, prior to laying pipes. At no time must the contractor proceed with pipe laying by dialing the gradient shown into a laser without checking. Any discrepancy in this respect must be reported to the engineer prior to pipe laying.
6. The contractor shall check his pipe gradients by means of boning rods and traveler to verify the laser gradients.
7. In the event of the above procedures not being followed, HSP Consulting Engineers Ltd will accept no responsibility whatsoever for any consequent loss or damage.

Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe: Code	Pipe: Inverts	Pipe: Diams	Manhole Size	Types: Manhole	Types: Cover
F1Div1	72.099	2 3 1 To	1 1.002	69.982	375			
E. 420386.156	1.742		2 Private	70.207	150			
N. 420225.150			3 Abandoned			1500	B	D400
F1Div2	71.011	1 To	0 Ex. sewer	69.982	375			
E. 420365.128	0.471		1 1.001	70.165	375			
N. 420213.361			0 1.002	70.165	375	1500	C	D400
F1Div3	72.193	1 2 To	1 1.000	70.458	375			
E. 420335.467	1.360		2 Private	70.683	150			
N. 420243.745			0 1.001	70.458	375	1500	C	D400
F1Div4	72.136	1 3 2 To	1 Ex. sewer	70.560	375			
E. 420336.334	1.201		3 Abandoned					
N. 420258.512			2 Private	70.785	150			
			0 1.000	70.560	375	1500	C	D400

Manhole types in accordance with "A Design and Construction Guide for Developers"/Sewers for Adoption B

Manhole Number / Coordinates	Cover Level / Depth To Soffit	Connections	Pipe: Code	Pipe: Inverts	Pipe: Diams	Manhole Size	Types: Manhole	Types: Cover
S20	70.200	1	1 1.008	68.937	225			
E. 420372.589	1.038					225		Junction
N. 420195.618			0 1.008	68.990	225			
S21	70.239	1 0	1 1.007	68.990	225			
E. 420375.233	1.024					2400	CONC	D400
N. 420200.166			0 1.006	69.016	225			
S22	70.484	1 0	1 1.006	69.016	225			
E. 420374.181	1.243					1200	CONC	D400
N. 420204.396			0 1.007	69.016	225			
S23	71.099	2 1 0	1 2.003	69.100	225			
E. 420366.175	1.774		2 1.005	69.100	225			
N. 420215.888			0 1.006	69.100	225	1200	CONC	D400
S24	71.718	1 0	1 1.004	69.561	225			
E. 420358.768	1.932					600	PPIC	D400
N. 420221.590			0 1.005	69.561	225			
S25	72.125	1 0	1 1.003	69.951	225			
E. 420337.583	1.949					600	PPIC	D400
N. 420244.501			0 1.004	69.951	225			
S26	72.150	1 0	1 1.002	70.822	225			
E. 420338.410	1.103					600	PPIC	C250
N. 420261.900			0 1.003	70.822	225			
S27	72.200	1 0	1 1.001	71.036	150			
E. 420354.885	1.014					600	PPIC	B125
N. 420273.397			0 1.002	70.961	225			
S28	72.000	1 0	1 1.000	71.156	150			
E. 420361.842	0.694					450	PPIC	B125
N. 420265.177			0 1.001	71.156	150			
S29	72.000	0	1 1.000	71.250	150			
E. 420355.360	0.600					450	PPIC	B125
N. 420259.740			0 1.000	71.250	150			
S31	71.695	1 0	1 2.002	69.250	150			
E. 420375.310	2.295					1200	CONC	D400
N. 420224.440			0 2.003	69.175	225			
S32	72.335	1 0	1 2.001	69.465	150			
E. 420399.418	2.720					1200	CONC	D400
N. 420244.643			0 2.002	69.465	150			
S33	72.425	1 0	1 2.000	71.581	150			
E. 420400.836	0.694					450	PPIC	B125
N. 420251.303			0 2.001	71.581	150			
S34	72.400	0	1 2.000	71.850	150			
E. 420383.488	0.400					450	PPIC	B125
N. 420271.800			0 2.000	71.850	150			

Cover strengths to be coordinated with maintenance equipment loadings (currently TBC)

Legend

- GREY — Existing typically shown in GREY. See notes.
- BLACK — Proposed typically shown in **BLACK**
- Indicative site boundary
- Existing public combined sewer Digitised from Undertakers Record Plan
- Existing public surface water sewer Digitised from Undertakers Record Plan
- Indicative route of combined sewer diversion Subject to Yorkshire Water approval.
- Abandoned public combined sewer
- Diverted combined sewer easement
- Principal private surface water drainage components included in hydraulic model)
- Flow control chamber
- Interceptor
- Modular storage cells
- Indicative private surface water drainage. Shown with Cover level, Invert level, Chamber type, Cover strength
- Gully. RG = Road gully, G = Drive/yard gully
- Linear Drain
- Filter drain/perforated pipe
- Indicative private foul water drainage. Shown with Cover level, Invert level, Chamber type, Cover strength

REV	BY	DATE	DETAILS	CKD
P06	PD	06.05.21	Wholesale changes based upon revised layout	MB
P05	PD	22.03.21	Drainage amended to suit latest Archlay.	SA
P04	JM	15.02.21	Drainage amended to suit latest Archlay.	PRD
P03	JM	14.12.20	Drainage amended to suit latest Archlay.	PRD
P02	IA	01.12.20	Added private foul drainage/filter drain lengths	PRD
P01	JM	22.11.20	Base drawing	PRD

STATUS: S3 - REVIEW/COMMENT

CLIENT: Frank Shaw Associates

PROJECT: Kirklees Care Homes
Knowl Park House

TITLE: Drainage Strategy

hsp consulting
Lawrence House, 6 Meadowbank Way, Eastwood, Nottingham, NG16 3SB
Tel: 01773 535555
www.hspconsulting.com

SCALE	PROJECT NO.	SHEET SIZE A1
1:200	C3257	
DATE	DRAWN	CHECKED
01.12.20	JM	PRD

DRAWING NO. 20017-HSP-XX-XX-DR-C-2001 REV P06

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
209	0.008	2.00	72.000	450	420355.473	420259.608	0.750
208	0.000		72.000	450	420361.842	420265.177	0.844
207	0.008	2.00	72.200	450	420354.885	420273.397	1.164
205	0.048	2.00	72.394	600	420330.189	420252.497	2.781
206	0.035	2.00	72.075	450	420339.065	420260.009	2.258
204	0.033	2.00	71.718	600	420358.768	420221.590	2.526
222	0.026	2.00	72.300	450	420388.551	420265.896	0.850
221	0.000		72.309	450	420403.086	420247.948	1.116
220	0.000	2.00	72.335	1200	420399.418	420244.843	2.907
219	0.109	2.00	71.695	1200	420375.310	420224.440	2.553
203	0.031	2.00	71.099	600	420366.175	420215.888	2.032
202	0.000		70.484	1200	420374.181	420204.397	1.501
201			70.239	2400	420375.456	420201.211	1.277
200			70.300	225	420372.589	420195.618	1.401

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type
1.000	209	208	8.460	0.600	71.250	71.156	0.094	90.0	150	Circular_Default Sewer Type
1.001	208	207	10.769	0.600	71.156	71.036	0.120	90.0	150	Circular_Default Sewer Type
1.002	207	206	20.725	0.600	71.036	69.817	1.219	17.0	150	Circular_Default Sewer Type
1.003	206	205	11.628	0.600	69.817	69.688	0.129	90.0	150	Circular_Default Sewer Type
1.004	205	204	42.095	0.600	69.613	69.192	0.421	100.0	225	Circular_Default Sewer Type
1.005	204	203	9.348	0.600	69.192	69.067	0.125	74.8	225	Circular_Default Sewer Type
2.000	222	221	23.095	0.600	71.450	71.193	0.257	90.0	150	Circular_Default Sewer Type
2.001	221	220	4.806	0.600	71.193	69.428	1.765	2.7	150	Circular_Default Sewer Type
2.002	220	219	31.583	0.600	69.428	69.217	0.211	149.7	150	Circular_Default Sewer Type
2.003	219	203	12.513	0.600	69.142	69.067	0.075	167.0	225	Circular_Default Sewer Type
1.006	203	202	14.005	0.600	69.067	68.983	0.084	167.0	225	Circular_Default Sewer Type
1.007	202	201	3.432	0.600	68.983	68.962	0.021	167.0	225	Circular_Default Sewer Type
1.008	201	200	6.285	0.600	68.962	68.899	0.063	100.0	225	Circular_Default Sewer Type

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.060	18.7	0.8	0.600	0.694	0.008	0.0	21	0.520
1.001	1.060	18.7	0.8	0.694	1.014	0.008	0.0	21	0.520
1.002	2.455	43.4	1.5	1.014	2.108	0.016	0.0	19	1.146
1.003	1.060	18.7	4.8	2.108	2.556	0.051	0.0	52	0.890
1.004	1.307	52.0	9.4	2.556	2.301	0.099	0.0	65	0.997
1.005	1.514	60.2	12.5	2.301	1.807	0.132	0.0	69	1.197
2.000	1.060	18.7	2.5	0.700	0.966	0.026	0.0	37	0.734
2.001	6.153	108.7	2.5	0.966	2.757	0.026	0.0	16	2.528
2.002	0.819	14.5	2.5	2.757	2.328	0.026	0.0	42	0.612
2.003	1.009	40.1	12.8	2.328	1.807	0.135	0.0	87	0.900
1.006	1.009	40.1	28.3	1.807	1.276	0.298	0.0	139	1.090
1.007	1.009	40.1	28.3	1.276	1.052	0.298	0.0	139	1.090
1.008	1.307	52.0	28.3	1.052	1.176	0.298	0.0	118	1.333

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	✓	Check Discharge Volume	✓
Summer CV	0.750	Drain Down Time (mins)	240	100 year 360 minute (m^3)	
Winter CV	0.840	Additional Storage (m^3/ha)	20.0		
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m^3)	

Node 219 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	69.325
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	63

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	142.0	0.0	0.800	142.0	0.0	0.801	0.0	0.0

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	209	9	71.316	0.066	6.7	0.0246	0.0000	OK
15 minute summer	208	10	71.289	0.133	6.7	0.0211	0.0000	OK
15 minute summer	207	10	71.243	0.207	13.4	0.0616	0.0000	SURCHARGED
15 minute summer	205	9	70.831	1.218	65.1	0.7652	0.0000	SURCHARGED
15 minute winter	206	10	71.194	1.377	37.2	0.6456	0.0000	SURCHARGED
15 minute winter	204	10	70.255	1.063	80.9	0.5785	0.0000	SURCHARGED
15 minute summer	222	9	71.732	0.282	21.8	0.2171	0.0000	SURCHARGED
15 minute summer	221	9	71.235	0.042	19.6	0.0067	0.0000	OK
60 minute winter	220	58	69.985	0.557	9.0	0.6303	0.0000	SURCHARGED
60 minute winter	219	59	69.984	0.842	83.6	95.3327	0.0000	SURCHARGED
60 minute winter	203	58	69.982	0.915	53.0	0.5379	0.0000	SURCHARGED
60 minute winter	202	58	69.972	0.989	16.6	1.1183	0.0000	SURCHARGED
60 minute winter	201	58	69.967	1.005	14.3	4.5488	0.0000	FLOOD RISK
15 minute summer	200	1	68.899	0.000	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	209	1.000	208	6.7	0.903	0.358	0.0908	
15 minute summer	208	1.001	207	7.0	0.913	0.372	0.1835	
15 minute summer	207	1.002	206	16.2	0.973	0.373	0.3649	
15 minute summer	205	1.004	204	58.2	1.463	1.120	1.6742	
15 minute winter	206	1.003	205	29.3	1.664	1.565	0.2047	
15 minute winter	204	1.005	203	77.6	1.951	1.289	0.3718	
15 minute summer	222	2.000	221	19.6	1.507	1.045	0.2504	
15 minute summer	221	2.001	220	19.5	2.571	0.179	0.0521	
60 minute winter	220	2.002	219	8.2	0.537	0.568	0.5560	
60 minute winter	219	2.003	203	-38.3	-0.962	-0.954	0.4977	
60 minute winter	203	1.006	202	16.6	0.820	0.414	0.5570	
60 minute winter	202	1.007	201	14.3	1.199	0.356	0.1365	
60 minute winter	201	ACO Q-Brake	200	12.0				147.7

Appendix 4

- Indicative Maintenance Strategy

Manholes and Inspection Chambers

Description

Manholes providing rodding and jetting access to pipe work.

Typically manholes, in distinction to inspection chambers, are designed to allow for operatives to access. Manholes should only be accessed following a risk assessment, and the specification of the safe system of work, paying regard to confined space risks.

Maintenance Issues

Manholes are unlikely to present maintenance issues in themselves. However, they provide access to the drainage infrastructure and allow visual inspection from the surface of any major maintenance issues.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Lift covers and ensure that there are no blockages. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Ensure covers are in a good state of repair.	Monthly
	Inspect manholes, and inspection chambers, to ensure that the drainage is running freely.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Suction sweeping and cleansing (to WRC Jetting Code of Practice) and CCTV where necessary.	Every 2 – 4 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repairs. • System rehabilitation following a pollution event. • Manhole Cover Replacement. • Repairs to brickwork or concrete. • Chanel repair.	As required (tasks to repair problems due to wear, damage or vandalism).

Catchpits

Description

Catchpits are similar to manholes but include a sump to the base which is designed to capture silt and prevent it reaching other parts of the drainage network. Catchpits provide a convenient location to remove silt from drainage networks. Catchpits should only be accessed following a risk assessment, and the specification of the safe system of work, paying regard to confined space risks.

Maintenance Issues

If the silt captured in catchpits is not removed regularly it will cause silt to migrate downstream to other part of the drainage network, some of which may be less accessible, or inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Lift manhole covers and ensure that there are no blockages. Inspect and identify any parts that are not operating correctly and remediate. Inspect silt storage in sump. Remove silt as required using subcontractor with vacuum extraction plant.	For 3 months following installation
	Ensure covers are in a good state of repair. Repair/replace as necessary.	Monthly
	Inspect catchpits to ensure that the drainage is running freely, and free of debris. Inspect silt storage in sump. Remove silt as required using subcontractor with vacuum extraction plant.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Suction sweeping and cleansing (to WRC Jetting Code of Practice) and CCTV where necessary. Remediate any chamber structural defects, or any defects that may reduce the free flow of water.	Every 2 – 4 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repairs. • System rehabilitation following a pollution event. • Manhole Cover Replacement. • Repairs to brickwork or concrete.	As required (tasks to repair problems due to wear, damage or vandalism).

Linear Drains

Description

Surface Water is drained over impermeable areas towards grated, or slot-type linear drains at low points and water is conveyed to below ground pipework.

Maintenance Issues

Linear drains can become blocked by silt or debris, causing flooding.

Linear drains often include silts traps at outlets which can cause siltation of downstream drainage infrastructure if not maintained adequality.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect linear drains to ensure that there are no blockages at surface level. Lift covers to outflow boxes and check for blockages or siltation. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Inspect linear drains to ensure that there are no blockages at surface level.	Monthly
	Lift covers to outflow boxes and check for blockages or siltation.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Jetting of linear drains and suction vacuuming of outlet boxes (to WRC Jetting Code of Practice). CCTV where necessary.	Every 1 – 2 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repairs. • System rehabilitation following a pollution event. • Linear drain cover replacement. • Chanel repair. • Ensure that impermeable surfaces surrounding linear drains have not settled below top of linear drain level, causing ponding.	As required (tasks to repair problems due to wear, damage or vandalism).

Gullies

Description

Surface Water is drained over impermeable areas towards grated gullies at low points, from where water is conveyed to below ground pipework.

Maintenance Issues

Gullies can become blocked by silt or debris, causing flooding.

Gullies include integral silt traps which can cause siltation of downstream drainage infrastructure if not adequality maintained.

Gullies often include a trapped outlet which prevents liquids lighter than water (ie oil and fuel) leaving the gully. If silt and light liquids are not removed regularly silt and oil will migrate downstream to other part of the drainage network, some of which may be less accessible, or inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect to ensure that there are no blockages at surface level, and that the outfall is operating effectively. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Ensure that there are no blockages at surface level.	Monthly
	Lift covers to check for blockages or siltation.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Remove oil and silt using specialist vacuum extraction plant.	Every 1 – 2 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repairs. • System rehabilitation following a pollution event. • Cover replacement. • Structural failure of gully pot. • Ensure that impermeable surfaces surrounding linear drains have not settled below top of gully cover level, causing ponding.	As required (tasks to repair problems due to wear, damage or vandalism).

Pipework

Description

Below ground drainage pipework connects drainage inlets (gullies, linear drains etc) to manholes and also provides connections between manholes.

Maintenance Issues

Pipes can become blocked by silt, debris fat, grease, or suffer structural collapse. It is also possible for pipe joints to become displaced or for roots to grow from the surrounding ground into pipes.

These factors cause a reduction in, or loss of, the hydraulic capacity of the pipes which can in turn cause flooding to land and buildings.

Defects in pipes can also cause a reduction in stability to ground underlying foundations, which can cause settlement and damage to buildings and external surfaces.

The material of pipes and associated couplings can be degraded if aggressive liquids are passed through the pipes.

It is recommended that trees are not planted within 3m of pipes to minimise the risk of root ingress.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Monitor working of drainage at ground level. Evidence of damage to pipework my include localised flooding or emission of smells.	Monthly
	Lift manholes covers to check for blockages.	Six Monthly
Occasional maintenance	CCTV pipework, clean to WRC Sewer Jetting Code of Practice. Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	• Silt removal. • Fat and Grease removal. • Erosion repairs. • Joint displacement. • Structural failure, cracking or collapse. • System rehabilitation following a pollution event.	As required (tasks to repair problems due to wear, damage or vandalism).

Vortex Controls

Description

Vortex controls, often called Hydrobrakes, are installed in some manholes to restrict the rate of flow. Vortex controls are usually constructed in steel and are installed in a manhole with a sump.

Maintenance Issues

Vortex controls can become blocked by debris, plastic bags or other sheet material. If silt is allowed build up in the sump the operation of the device can be hampered causing flooding upstream.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Refer to manufacturer's specification. Inspect and identify any parts that are not operating correctly, consult supplier and remediate as required.	For 3 months following installation
	Monitor working of drainage at ground level. If there is localised flooding check the condition of all system elements.	Monthly
	Lift manholes covers to check for blockages. Remove sediment from pre-treatment structures, gullies, catchpits etc.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Clean to WRC Sewer Jetting Code of Practice. Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	Inspect, and carry out remediation works to ensure that the features are in fully working order.	As required (tasks to repair problems due to wear, damage or vandalism).

Fat and Grease Separators

Description

Fat and Grease separators, separate fat and grease from oil emitting facilities such as kitchens and factories. This prevents fat and grease entering the public sewerage network. Preventing fat and grease is a requirement of Building Regulations (Part H) and The Water Industry Act (1991).

Maintenance Issues

For a fat and grease separator to operate effectively, and prevent pollutants leaving a site, it is necessary to remove the contained fat and grease on a regular basis. It is recommended that maintenance is proactive, rather than waiting for any installed alarm to highlight the need for emptying. The party responsible for maintenance, usually the owner or occupier, should consult the manufacturer to determine a suitable maintenance regime. Fat and Grease should only be removed by a licenced contractor.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Refer to manufacturer's specification. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Monitor working of drainage at ground level. If there is localised flooding check the condition of all system elements.	Monthly
	Check to determine the volume of fat and grease collected, and if necessary, arrange for removal by a licenced contractor.	Six Monthly or as recommended by supplier.
Occasional maintenance	Consult manufacturer to obtain details of an approved maintenance contractor. Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	Inspect, and carry out remediation works to ensure that the features are in fully working order.	As required (tasks to repair problems due to wear, damage or vandalism).

Geocellular Attenuation Storage

Description

Geocelluar storage systems are modular plastic units with a high porosity that can be used to efficiently create a below-ground structure for the temporary storage of surface water before being released.

Maintenance Issues

The main maintenance issue with geocellular attenuation storage is the prospective build up of silt within the units. It is imperative that the upstream and downstream catchpits are inspected and emptied regularly to prevent the ingress of silt into the system.

Maintenance Regime

Schedule	Action Required	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	For 3 months following installation, then annually.
	Remove debris from the catchment surface (where it may cause a risk to performance)	Monthly
	For systems where rainfall infiltrate into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove Sediment from pre-treatment structures and/or internal forebays.	Annual, or as required
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build-up and remove if necessary.	Every five years or as required

Petrol Interceptors/Oil Separators

Description

Petrol interceptors, also called oil separators, separate out light liquids, such as oil or fuel, and silt and grit. The purpose of the separation is to prevent oil and silt (which may contain heavy metals) polluting watercourses downstream.

Maintenance Issues

For a separator to operate effectively, and prevent pollutants leaving a site, it is necessary to remove the contained oil and silt on a regular basis. It is recommended that maintenance is proactive, rather than waiting for any installed alarm to highlight the need for emptying. The party responsible for maintenance, usually the owner or occupier, should consult the manufacturer to determine a suitable maintenance regime. Oil and silt should only be removed by a licenced contractor.

Maintenance Regime

Activity	Action Required	Frequency
Routine/regular maintenance (including inspections and monitoring)	Refer to manufacturer's specification. Inspect and identify any parts that are not operating correctly and remediate.	For 3 months following installation
	Monitor working of drainage at ground level. If there is localised flooding check the condition of all system elements.	Monthly
Routine/regular maintenance (including inspections and monitoring)	• Check volume of sludge/silt. • Check thickness of light liquid. • Check function of automatic closure device. • Empty the separator, if required. • Check the coalescing material and clean or change if necessary (Class 1 only). • Check the function of the warning device (if fitted).	Six Monthly and every autumn after leaf fall
Occasional maintenance	• Consult manufacturer to obtain details of an approved separator maintenance contractor. • Check watertightness of system. • Check structural condition. • Check internal coatings. • Check built-in parts • Check electrical devices and installations. • Adjust automatic closure devices.	5 Yearly Maximum
Remedial maintenance	Inspect, and carry out remediation works to ensure that the features are in fully working order.	As required

Pervious Pavements

Description

Pervious pavements, together with their associated substructures, are an efficient means of managing surface water runoff close it its source – intercepting runoff, reducing the volume and frequency of runoff and providing a treatment medium.

Maintenance Issues

Pervious pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Typically sweeping once a year should be sufficient to maintain an acceptable infiltration rate on most sites. However, the frequency should be adjusted to suit site specific circumstances and should be informed by inspection reports.

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

hsp consulting

CIVIL | STRUCTURAL | GEOTECHNICAL & ENVIRONMENTAL | TRAFFIC AND TRANSPORT

Lawrence House | 6 Meadowbank Way | Nottingham | NG16 3SB

01773 535555 | design@hspconsulting.com | www.hspconsulting.com