RichardJackson
Engineering Consultants

SURFACE WATER DRAINAGE STRATEGY

Land at Reepham Road / Holt Road

Drayton Farms Ltd / RG Carter Farms Ltd

March 2020

Project no: 48110

RichardJackson
Engineering Consultants

Document Review Sheet: -

Document prepared by: -	Lauren Gray on behalf of Richard Jackson Ltd
Date: -	3 March 2020
Document checked by: -	Martin Doughty BEng(Hons) CEng FICE FCIHT MAPM on behalf of Richard Jackson Ltd
Date: -	6 March 2020
Document approved by: -	Martin Doughty BEng(Hons) CEng FICE FCIHT MAPM on behalf of Richard Jackson Ltd
Date: -	6 March 2020

Document Status

DRAFT	FINAL
☐	☒

Revision Status

Issue	Date	Description	Prepared	Checked	Approved

Contents:-

Drawings

48110-PP-103A – Preliminary Surface Water Drainage Strategy (Reepham Road)
48110-PP-104A – Preliminary Surface Water Drainage Strategy (Holly Lane)

1. INTRODUCTION

1.1. Richard Jackson Ltd (RJ Ltd) has been commissioned by Drayton Farms Ltd / RG Carter Farms Ltd to undertake a Surface Water Drainage Strategy (SWDS) to support an allocation for residential development, for between 850 and 1000 dwellings, and also some commercial land.

1.2. It has been carried out in accordance with the National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) on Flood Risk and Coastal Change and the Norfolk County Council (NCC), Lead Local Flood Authority (LLFA) Surface Water Drainage Guidance March 2019. The Lead Local Flood Authority (LLFA) for this site will be NCC.

1.3.

2. DEVELOPMENT SITE AND LOCATION

2.1. The proposed development at land off Reepham Road and Holt Road, Hellesdon.

2.2. The site is mainly arable farm land and is situated mainly to the east of Reepham Road and west of Holt Road. In addition, there is an area of land to the west of Reepham Road. The site location has approximate OS coordinates of 624772, 283865 and a postcode of NR6 6QA. The proposed development is for the construction of residential dwellings with associated infrastructure.

2.3. The sites' topography is such that the highest point is along Reepham Road and to the west the site falls from a level of approximately 40m Above Ordnance Datum (AOD) to about 34.5m to 35m AOD. The land to the east of Reepham Road falls from Reepham Road in an easterly and north easterly direction, with levels adjacent to Holt Road at approximately 35.0 AOD. The land falls further to the north towards Holly Lane where the levels are progressively falling to 32.0m near Manor Farm and at approximately 28m AOD adjacent to Holly Lane.

2.4. Residential land use of this nature is considered "More Vulnerable" according to the technical guidance to the NPPF. More vulnerable uses are listed in the PPG as appropriate development for Flood Zone 1 to which this site lies.

2.5. An assessment of the ground conditions has been made through a desktop review of locally available data. This will inform the drainage strategy.

3. PROPOSED DEVELOPMENT

3.1. The site is proposed for both residential development and some commercial development. Where the total number of dwellings is likely to be up to 1000 and the commercial land will be served from Holly Lane.

3.2. The site through the central section, travelling from west to east, does have a land designation of 'Airport Public Safety Zone' (APSZ), which has specific policies and, thus, housing is unlikely to be placed in these locations.

3.3. The site is close to Norwich Airport and as such the drainage strategy does need to take into consideration the reduction in open space and open water for attenuation. The risk associated with bird migration to open water must be avoided on the land, specifically due to the fact that the land is on the approach to the main Norwich Airport runway.

3.4. Due to the fact above, the drainage strategy will need to consider, where possible, attenuation and Sustainable Drainage (SuDS) that is underground. Where surface attenuation is used, this should be conducted in areas of high public use, such that the migration of birds is not prevalent, as they will not see the areas as desirable resting places due to public/human activity.

4. SEQUENTIAL TEST

4.1. As this site is located in Flood Risk Zone 1, which is considered to be at very low risk to fluvial and/or tidal flooding as well as being at low risk of surface water flooding, the Sequential Test does not apply to these proposals.

5. CLIMATE CHANGE

5.1. Climate change over the next 100 years or so is predicted to increase the probability of surface water flooding, as peak rainfall is predicted to significantly increase. Therefore, it is proposed to factor an allowance of 40% climate change, in accordance with the PPG advice on rain fall intensity for developments of a design life of 100 years and also the NCC 'Lead Local Flood Authority Statutory Consultee for Planning' document, (March 2019).

6. SITE SPECIFIC FLOOD RISK ASSESSMENT

Existing Flood Sources

6.1. When assessing any development site, there are five potential sources of flooding which need to be considered both in terms of their effect on the development itself and its end users and that caused to others. The main sources of flooding that need to be considered are as follows:

- Fluvial and/or tidal flooding;
- Ground water;
- Overloading of the existing drainage network;
- Surface water flooding; and
- Artificial sources of flooding.

Fluvial and Tidal Sources of Flooding

6.2. From investigation of the existing watercourses and the Gov.UK floodplain maps, there are no identified influences of fluvial or tidal flooding at the site and the site is in Flood Risk Zone 1. Therefore, this has not been investigated further.

Groundwater Vulnerability

6.3. The local historical ground investigations for the site to the west of Reepham Road found that under the 'Made Ground' there were underlying 'Natural Deposits of Glacial Sands and Gravels', these soil elements comprised of orange and yellow, occasionally slightly clayey sand. The land to the west of the site also comprised of occasional horizons of yellow sandy gravel, weak poorly cemented, orange sandstone and stiff, light brown closely fissured clay. It is suggested that as the data from the site to the west of Reepham Road is very close, the ground conditions will be similar for the remainder of the site.

6.4. The Gov.UK mapping defines groundwater Source Protection Zone around all major groundwater abstraction points. Source Protection Zones (SPZ) are defined to protect areas of groundwater that are used for potable supply, (including mineral and bottled water) or for use in the production of commercial food and drinks. There is a groundwater source protection Zone 3 that lies across the site. The site lies within a Catchment Zone 3 which is an area covered by the total catchment of a source of water abstraction. On this basis, any water that flows back into the ground must be managed to protect the groundwater through SuDS.

6.5. In addition, the Groundwater Vulnerability Zone Maps for the site show that the site is covered by a medium – high Principal, Secondary A, aquifer.

6.6. This type of aquifer is created in permeable layers capable of supporting water supplies on a local rather than strategic scale. Therefore, protection and management of water from a development is to be maintained to protect the underlying groundwater, which could be completed using a range of SuDS features.

Overloading and the Existing Surface Water System and Ground Conditions

6.7. No records from Anglian Water have been analysed or been made available but it is understood that it is unlikely any surface water sewers exist across the site.

6.8. Using the parameters above to establish the existing soil parameters, a desk top investigation into the potential ground conditions has been undertaken. The likely parameters of infiltration for the Site, based on the existing soil type, suggests permeability of soils ranging from 1.0×10^{-4} m/s to 1.0×10^{-5} m/s. To be robust, a value of 1.0×10^{-5} m/s will be used within the SuDS design, based on the information available to date. A ground investigation to the west of the site in 2011 provided data indicating no water strike at 5.0m below ground level, thus, soakaways or other infiltration devices could be utilised on the site.

Surface Water Flooding

6.9. The existing surface water flooding has been investigated. There is some minor flooding indicated on the southern boundary of the Site and just outside of the Site to the north east, which is for the 1 in 1000 year event. Consideration to this area of the site is to be kept clear of development and managed for potential exceedance events. These areas are shown on Drawing 48110-PP-103A.

6.10. Any new systems of drainage should consider the flow from the site and suitable SuDS to accommodate storage before discharging/infiltrating into the ground.

Artificial Sources of Flooding

6.11. A view of the Reservoir Flooding Risks to the site has also been assessed via the Gov.UK mapping and shows no risk, so this has not been investigated further.

7. FLOOD RISK IMPACT

7.1. It has been determined using the Ordnance Survey and topographical survey level information available, that surface water runoff from the site will occur in a north easterly direction for the majority of the site. The land to the west of Reepham Road, however, falls to the west.

7.2. A proportion of rainfall falling across the existing site will also infiltrate into the soils of the site given the current ground conditions. A proportion of this infiltrating surface water will also contribute to any groundwater recharge. Ground permeability has been checked for the site as mentioned.

7.3. To determine the rainfall data for the site when undertaking the detail design, the Flood Estimation Handbook (FEH) data will be used for establishing the critical rainfall scenario as outlined in the LLFA Guidance March 2019.

Soil Types and SuDS Suitability

7.4. The NPPF and appropriate guidance indicates that the FRA should identify the risks of flooding and manage those risks to ensure the site remains safe. One way to manage the flood risk is to incorporate SuDS within proposals for new sites. There is a general requirement that SuDS be installed where appropriate, in order to limit the amount of surface water runoff entering drainage systems and to return surface water into the ground to follow its natural drainage path. This advice is also replicated in the SuDS Manual C753 (2015).

7.5. The details of the ground conditions have yet to be determined through a full ground investigation but advice on the use of SuDS/soakaways is such that they could be used, based on local ground conditions to the west of the site. The permeability of the site has been determined as being between 1 x 10^{-4} m/s and 1.0 x 10^{-5} m/s based on the soil type, so to be robust a value of 1.0 x 10^{-5} m/s shall be used.

SuDS Assessment

7.6. The suitability of the use of SuDS on the site is based on the criteria as set out in the Ciria document C753 dated November 2015, where in Chapter 26 the appropriateness of SuDS can be established. The table below suggests the potential SuDS selection for Highways and Private Drives and also for Private Roofs.

Table A – SuDS Selection

Type of SuDS	Highways & Private Drives TSS=0.5 Metal=0.4 Hydrocarbons=0.4	Private Roofs TSS=0.2 Metals=0.2 Hydrocarbons=0.05	Roads to Commercial Areas TSS = 0.7 Metals = 0.6 Hydrocarbons = 0.7
Filter Strip	*	✓	*
Filter Drain	*	✓	*
Swale	✓	✓	*
Permeable Paving	✓	✓	✓
Detention Basin	✓	✓	*
Pond	✓	✓	*
Wetland	✓	✓	✓
Soakaway (surrounded with infiltration materials)	*	✓	*
Infiltration Trench	*	✓	*

* Where the SuDS selection does not meet the pollution indices, then a selection of different SuDS used collectively could be used to provide a suitable level of pollution control.

7.7. Using the Table A above which is derived from Table 26.3 and 26.4 of Ciria C753 then it can be concluded that the better SuDS' choices for the site are as set out below;

Private Drives	- Permeable paving to soakaway.
Residential Roofs	- To permeable paving to soakaway as required.
Highways (Estate Roads)	- To Swales, Filter Drain and Storage Crates surrounded with at least 300mm good contaminant soil.
Highways (Commercial Roads)	- As for Estate roads but instead of swales, a proprietary control device may be needed. The drainage systems to carry water to the SuDS will be traditional gullies and highway catch-pits, outfalling into the SuDS.

7.8. A surface water strategy is therefore proposed to utilise the permeable paving and soakaways for the drives and private roof areas and swales and/or Filter Drains with additional attenuation for the highway water from Estate roads for events up to the 1 in 100 year storm event, plus climate change at 40%. In the event of commercial use, there will be a need to implement an additional level of SuDS/pollution feature, which is likely to be through a proprietary product. The proprietary product will be situated between the filter drain adjacent to the highway. See location on Drawing 48110-PP-104A. This strategy is based on the SuDS management train and also the favourable soakage rates as previously indicated.

8. FLOOD RISK MANAGEMENT

8.1. Having determined that the soils across both sites do possess sufficient infiltration capacity for the use of infiltration devices, the methods of surface water disposal have been investigated, to determine the feasibility of discharging and treating the water prior to it entering the ground.

8.2. To determine the appropriate use of the SuDS features, the pollution indices were used to determine the type of SuDS to be used. For the purposes of the design for the site, which has yet to be detailed and is only at masterplan stage, a selection of likely solutions have been prepared for different house types, drive areas and widths of highway.

8.3. The private drives will provide permeable paving to act as a pollution treatment and then the water can be collected and drain towards the soakaway proposed for the private dwelling. The permeability rate of 1 x 10^{-5}m/s in 0.036m/hr as indicated as the lower permeability rate will be used for a robust assessment.

8.4. Suggested sizes for the private dwelling drainage are indicated on Table B below:

Table B – Indicative SuDS Storage Sizes

Dwelling Type	Dwelling Area (m^2)	Garage Area (m^2)	Private Drive Area (m^2)	Total Area (m^2)	1 in 100 year plus 40% CC Storage (LxWxH)m
A	40	N/A	30	70	2.0 x 2.5 x 1.2 Vol = 4.7m^3
B	60	45	30	135	4.0 x 2.0 x 1.6 Vol = 9.8m^3
C	90	45	30	165	3.5 x 2.5 x 1.6 Vol = 12.1m^3
D	130	45	60	235	5.0 x 2.5 x 1.6 Vol = 17.3m^3

8.5. The highway water will be directed towards the swales and/or infiltration basins which are to be positioned adjacent to the highway for the estate roads and onto filter drains and attenuation crates. The size will be determined by the exact dimensions of the roads and footways going to the swales/attenuation but an indication of the sizes are given in this Chapter. For purposes of being robust, a permeability rate of 1 x 10^{-5} m/s or 0.036m/hr will be used.

8.6. For an estimated Highways SuDS sizing see Table C below which shows swales and Table D shows catchments of larger areas in infiltration basins:

Table C – Highway Swale for smaller areas

Overall Highway Width (m)	Length of Highway (m)	Swale Profile	1 in100 year storm plus 40% CC		
			Depth (m)	Volume (m^3)	Overall Width (m)
4.8 + 1.5 + 1.5 = 7.8m	10m	Side Slope = 1 in 4 Base Width = 0.8m	0.305	4.7	3.2
6.0 + 3.0 + 2.0 = 11.0m	10m	Side Slope = 1 in 4 Base Width = 0.8m	0.369	6.7	3.75
7.3 + 3.0 + 2.0 = 12.3m	10m	Side Slope = 1 in 4 Base Width = 1.0m	0.388	8.0	3.75

8.7. For an estimated Highways SuDS sizing see Table D below:

Table D – Highway Infiltration Attenuation Design for Larger areas

Overall Highway Width (m)	Length of Highway (m)	Basin Profile	1 in100 year storm plus 40% CC	
			Crate Size (m)	Volume (m^3)
7.8m	250m	Filter Drain and Infiltration Storage Crates	11 x 17 x 0.8	140
11.0m	250m	Filter Drain and Infiltration Storage Crates	11 x 25 x 0.8	197.4
12.3m	250m	Filter Drain and Infiltration Storage Crates	11 x 27 x 0.8	222.7

8.8. For the scenarios of drainage and areas required for the SuDs, an indicative strategy is shown on Drawings 48110-PP-103A and 104A.

9. SUMMARY AND CONCLUSIONS

9.1. It can be seen from the indicative ground conditions taken from local information sources that the permeability rate for the area is likely to be favourable and a SuDS strategy could be implemented to deliver a scheme for the development site. This type of strategy would be in accordance with National and Local planning policy, by treating the water for quality and quantity on site, thus not creating a detrimental effect downstream of the site.

9.2. The sizes of the soakaways for the houses might be a little large to fit into gardens, so if this is the case, then alternative arrangements for the water in line with the areas and volumes could be included within permeable paving. Sufficient land must be set aside for accommodating the swales / infiltration facilities.

9.3. An indicative area of drainage needed for the residential units and highways are shown on Drawings 48110-PP-103A and 104A showing the SuDS and locations, subject to further masterplanning processes.

9.4. It is therefore concluded that a suitable drainage scheme meeting local and national criteria can be met.

10. LIMITATIONS

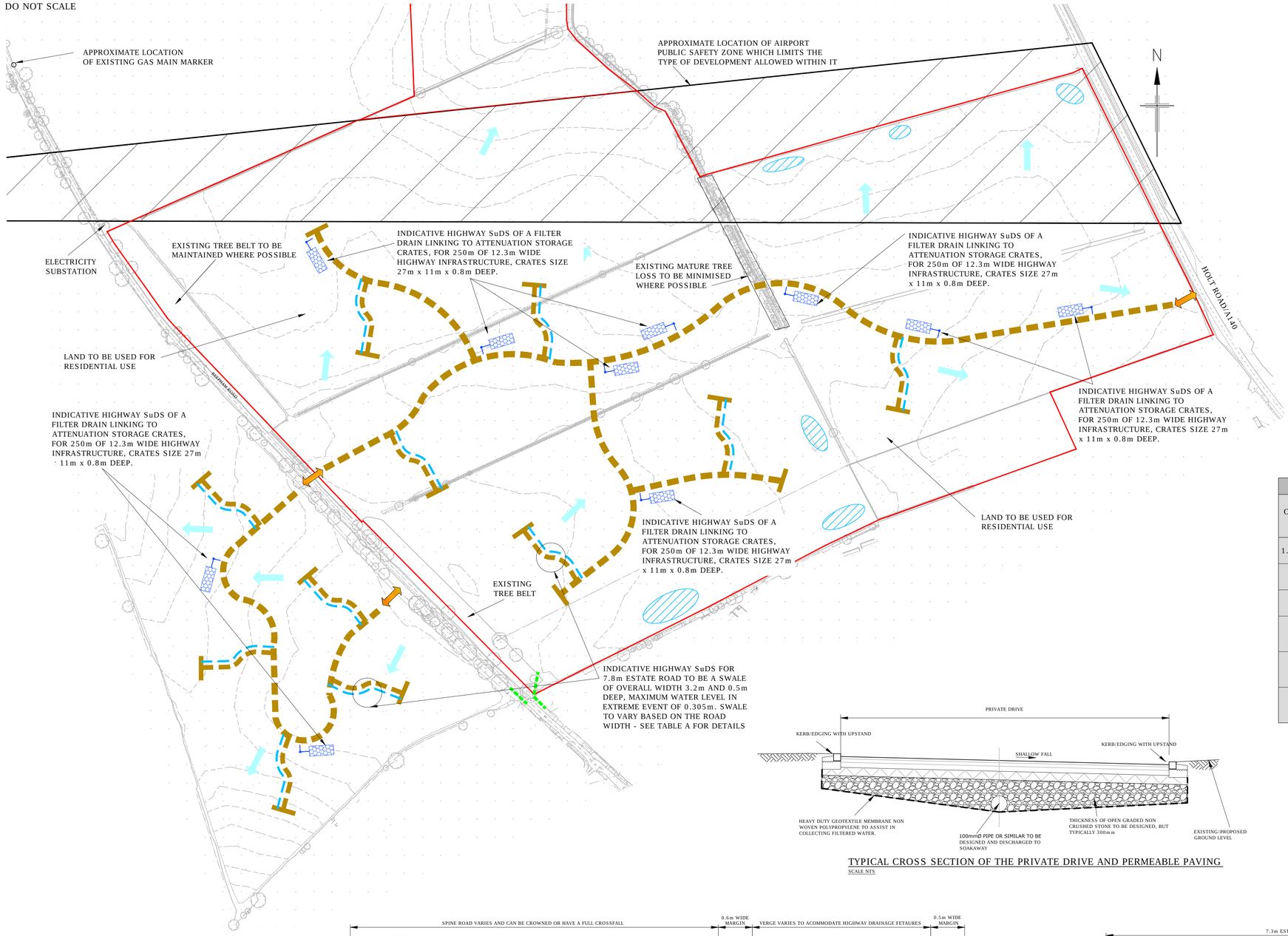
10.1. This report has been produced for the sole use of Drayton Farms Ltd / RG Carter Farms Ltd for the construction of residential and commercial development. Its contents should not be relied upon by others without the written authority of Richard Jackson Limited. If any unauthorized third party makes use of this report, they do so at their own risk and Richard Jackson Limited owes them no duty of care or skill.

10.2. All information provided by others is taken in good faith as being accurate, but Richard Jackson Limited cannot, and does not, accept any liability for the detailed accuracy, errors or omissions in such information.

RichardJackson Engineering Consultants

DRAWINGS

DO NOT SCALE



NOTES:

1. FOR DIMENSIONS REFER TO ANNOTATIONS. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. ACCESS LOCATIONS ARE INDICATIVE AND SUBJECT TO CHANGE.
3. HIGHWAY CRATE STORAGE ARE BASED ON VARIOUS ROAD WIDTHS AND FOR 250m OF HIGHWAY LENGTH. SEE TABLE A FOR DETAILS. OTHER SIZES FOR DIFFERENT ROADS COULD BE UTILISED.
4. AIRPORT PUBLIC SAFETY ZONE LOCATION IS APPROXIMATE AND FURTHER DISCUSSIONS WOULD BE REQUIRED SHOULD THE SITE BE PUT FORWARD FOR PLANNING.
5. MINIMISING TREE LOSS SHOULD BE PRIORITISED WHEN FINALISING ACCESS LOCATIONS.
6. THE DWELLINGS ARE TO HAVE INDIVIDUAL SOAKAWAYS AND THESE ARE TO BE PLACED IN THE GARDENS. WHERE IT IS NECESSARY TO PROVIDE SOAKAWAYS OR PERMEABLE PAVING ACROSS THE SITE FOR DWELLINGS, THEN THESE ARE TO BE SEPARATE FROM THE HIGHWAY DRAINAGE SHOWN AND PROVIDED LOCAL TO THE DWELLINGS THEY SERVE. SEE TABLE B FOR DETAILS. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
7. ALL LEVELS ARE IN METRES AND REFER TO ORDNANCE SURVEY DATUM.
8. TOPOGRAPHICAL SURVEY 24432EA-01_11 DATED JULY 2019 HAS BEEN PROVIDED TO RICHARD JACKSON LTD FROM THE CLIENT / SURVEY SOLUTIONS AND RJ LTD ACCEPT NO RESPONSIBILITY FOR ERROR OR OMISSION.
9. SURFACE WATER IS STRATEGY IS BASED ON LOCAL SOILS DATA. DESIGN OF SuDS IS BASED ON NCC AND LLFA GUIDANCE AT DATE OF DRAWING, FEBRUARY 2020. AS POLICY AND GUIDANCE CHANGES, SO TOO MAY THE STRATEGY.
10. ALL SERVICES DATA WILL NEED TO BE CHECKED BEFORE DETAILED DESIGN. UPDATED INFORMATION MUST BE USED PRIOR TO ANY FURTHER DETAILED DESIGN OR EXCAVATION TAKES PLACE.
11. ALL ESTATE ROAD HIGHWAY DRAINAGE HAS BEEN DESIGN FOR A 1 IN 100 YEAR EVENT WITH 40% CLIMATE CHANGE FOR SWALES TO ASSESS THE REQUIRED INFRASTRUCTURE ROBUSTLY.
12. THE DESIGN CURRENTLY, DOES NOT INCLUDE FOR URBAN CREEP. A VALUE OF URBAN CREEP SHOULD BE APPLIED IN ACCORDANCE WITH THE LLFA GUIDANCE ONCE THE DENSITY OF THE DEVELOPMENT IS KNOWN.
13. THE MAIN HIGHWAY SWALE AND DRAINAGE FOR STORAGE CRATES AND SOAKAWAYS/PERMEABLE PAVING WILL BE AS TABLE A AND B AS APPROPRIATE.
14. INFILTRATION RATES FOR THE SITES ARE USED AS 0.036m/Hr, BASED ON LOCAL SOILS DATA.
15. THE SOAKAWAY CALCULATIONS PLACED IN TABLE B INDICATE THE LIKELY SIZES FOR SAMPLE DWELLING TYPE AND DRIVE SIZES. THESE ARE SUBJECT TO CHANGE BASED ON FUTURE LAYOUT CONFIRGURATIONS.
16. CONSIDERATION HAS BEEN GIVEN TO THE DESIGN OF THE SuDS TO REDUCE STANDING WATER ON SITE DUE TO THE PROXIMITY OF THE AIRPORT. INFILTRATION BASINS AND OPEN WATER FEATURES HAVE NOT BEEN USED DUE TO THIS CONSTRAINT.

TABLE A - PRELIMINARY HIGHWAY DRAINAGE REQUIREMENTS

OVERALL HIGHWAY WIDTH	LENGTH OF HIGHWAY (m)	SuDS PROFILE	1in100 YEAR +40%CC RESULT	
			DEPTH (m) OR SIZE	VOLUME (m³)
1.5+4.8+1.5 = 7.8m	10m	SWALE SIDE SLOPE 1in4, BASE WIDTH 0.8m	0.305m AND WIDTH 3.2m	4.7
3+6+2 = 11m	10m	SWALE SIDE SLOPE 1in4, BASE WIDTH 0.8m	0.369 AND WIDTH 3.75m	6.7
3+7.3+2 = 12.3	10m	SWALE SIDE SLOPE 1in4, BASE WIDTH 1.0m	0.388 AND WIDTH 3.75m	8.0
7.8m	250m	FILTER DRAIN AND iNFILTRATION STORAGE CRATES	11 x 17 x 0.8	140
11.0m	250m	FILTER DRAIN AND iNFILTRATION STORAGE CRATES	11 x 25 x 0.8	197.4
12.3m	250m	FILTER DRAIN AND iNFILTRATION STORAGE CRATES	11 x 27 x 0.8	222.7

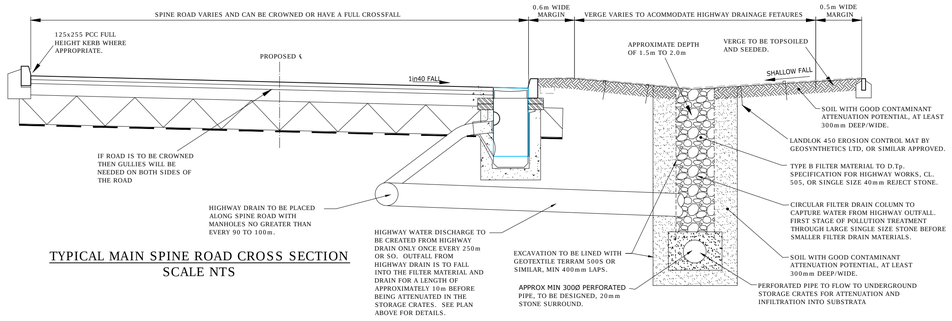
TABLE B - PRELIMINARY STORAGE CRATE SOAKAWAY REQUIREMENTS

HOUSE TYPE	AREA OF DWELLING (m²)	GARAGE (m²)	PRIVATE DRIVE AREA (m²)	TOTAL AREA (m²)	1in100 YEAR + 40%CC CRATE SOAKAWAY SIZE
A	40	N/A	30	70	2 x 2.5 x 1.2m Vol = 4.7m³
B	60	45	30	135	4 x 2 x 1.6m Vol = 9.8m³
C	90	45	30	165	3.5 x 2.5 x 1.6m Vol = 12.1m³
D	130	45	60	235	5 x 2.5 x 1.6m Vol = 17.3m³

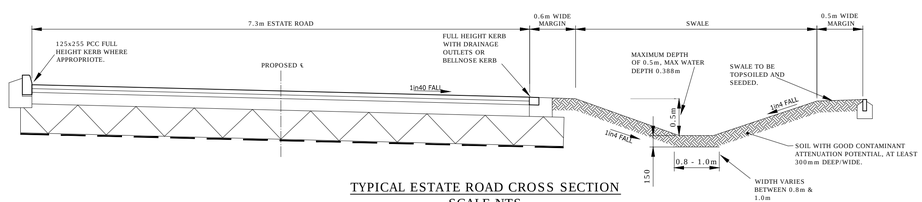
TYPICAL CROSS SECTION OF THE PRIVATE DRIVE AND PERMEABLE PAVING
SCALE NTS

KEY

- FALL OF LAND / EXCEEDANCE EVENT FLOW
- INDICATIVE ACCESS
- INDICATIVE ROAD
- TYPICAL SWALE LOCATION
- AREA OF POTENTIAL EXISTING SURFACE WATER FLOODING, TO BE AVOIDED
- PROPOSED FOOTWAY LINK



TYPICAL MAIN SPINE ROAD CROSS SECTION
SCALE NTS



TYPICAL ESTATE ROAD CROSS SECTION
SCALE NTS

PRELIMINARY

REVISIONS

REV	DATE	DESCRIPTION	DRAWN	CHKD
A	18.02.20	DESIGN DETAILS UPDATED.	LG	MD

Project	LAND OFF REEPHAM ROAD HELLESDON	Title	PRELIMINARY SURFACE WATER DRAINAGE STRATEGY
Client	DRAYTON FARMS LTD / R G CARTER FARMS LTD		
Drawn MJD	Date 17/07/19		
Job Manager M. DOUGHTY	Checked M. DOUGHTY		
Approved M. DOUGHTY	Scale APPROX 1:2500 @A1		

This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.

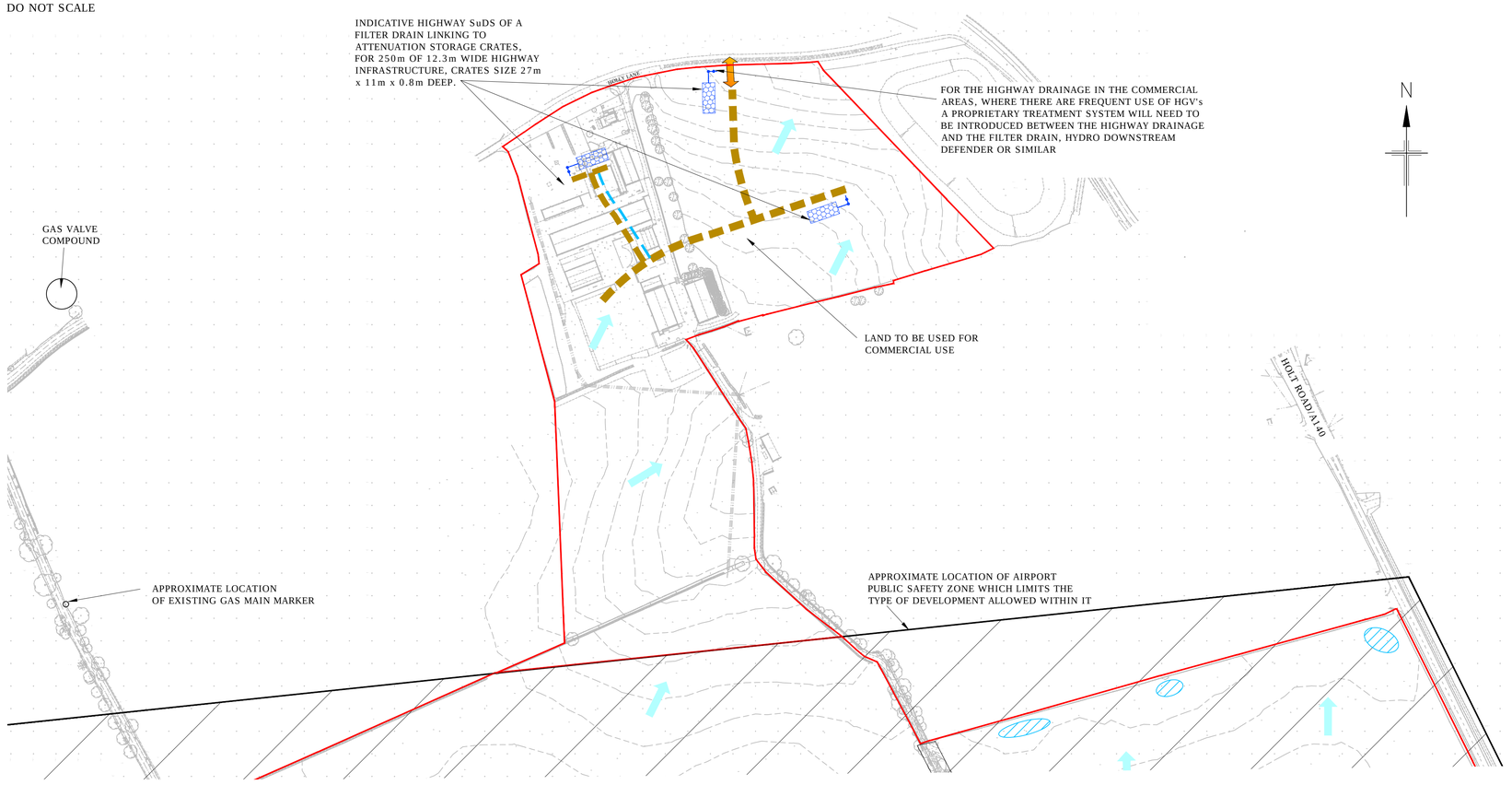
RichardJackson Engineering Consultants
B47 The Crescent, Colchester, Essex CO4 9YQ — Tel: 01206 228800
Suite 409, 1 Alie Street, London E1 8DE — Tel: 020 7448 9910
York House, 3 Station Court, Station Rd, Great Shelford, Cambs CB22 5NE — Tel: 01223 314794
6 The Old Church, St. Matthews Road, Norwich, Norfolk NR1 1SP — Tel: 01603 230240
The Wheelhouse, Bonds Mill, Stonehouse, Gloucestershire GL10 3RF — Tel: 01172 020070
Email Address: mail@rj.uk.com — Website: http://www.rj.uk.com

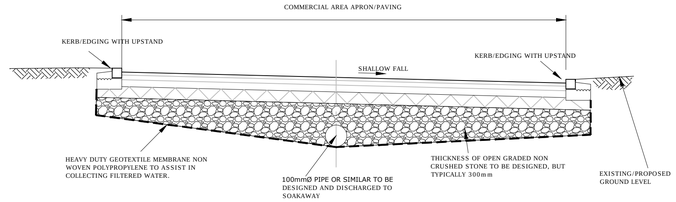
Drawing No. 48110-PP-103 — Revision A

Drawing Status
- [X] INFORMATION
- [ ] APPROVAL
- [ ] COSTING
- [ ] TENDER
- [ ] CONSTRUCTION
- [ ] AS CONSTRUCTED

A1

DO NOT SCALE





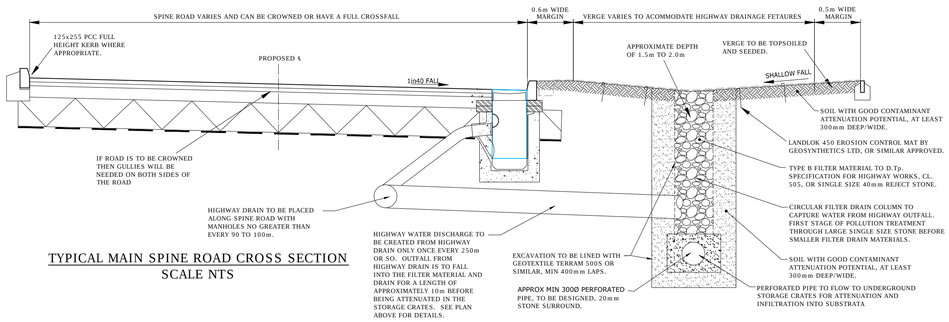
TYPICAL CROSS SECTION OF THE COMMERCIAL AREA APRON/PERMEABLE PAVING

SCALE NTS

TABLE A - PRELIMINARY HIGHWAY DRAINAGE REQUIREMENTS				
OVERALL HIGHWAY WIDTH	LENGTH OF HIGHWAY (m)	SuDS PROFILE	1in100 YEAR +40%CC RESULT	
			DEPTH (m) OR SIZE	VOLUME (m³)
1.5+4.8+1.5 = 7.8m	10m	SWALE SIDE SLOPE 1in4, BASE WIDTH 0.8m	0.305m AND WIDTH 3.2m	4.7
3+6+2 = 11m	10m	SWALE SIDE SLOPE 1in4, BASE WIDTH 0.8m	0.369 AND WIDTH 3.75m	6.7
3+7.3+2 = 12.3	10m	SWALE SIDE SLOPE 1in4, BASE WIDTH 1.0m	0.388 AND WIDTH 3.75m	8.0
7.8m	250m	FILTER DRAIN AND iNFILTRATION STORAGE CRATES	11 x 17 x 0.8	140
11.0m	250m	FILTER DRAIN AND iNFILTRATION STORAGE CRATES	11 x 25 x 0.8	197.4
12.3m	250m	FILTER DRAIN AND iNFILTRATION STORAGE CRATES	11 x 27 x 0.8	222.7

NOTES:

1. FOR DIMENSIONS REFER TO ANNOTATIONS. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. ACCESS LOCATIONS ARE INDICATIVE AND SUBJECT TO CHANGE.
3. HIGHWAY CRATE STORAGE ARE BASED ON VARIOUS ROAD WIDTHS AND FOR 250m OF HIGHWAY LENGTH. SEE TABLE A FOR DETAILS. OTHER SIZES FOR DIFFERENT ROADS COULD BE UTILISED.
4. AIRPORT PUBLIC SAFETY ZONE LOCATION IS APPROXIMATE AND FURTHER DISCUSSIONS WOULD BE REQUIRED SHOULD THE SITE BE PUT FORWARD FOR PLANNING.
5. MINIMISING TREE LOSS SHOULD BE PRIORITISED WHEN FINALISING ACCESS LOCATIONS.
6. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.
7. ALL LEVELS ARE IN METRES AND REFER TO ORDNANCE SURVEY DATUM.
8. TOPOGRAPHICAL SURVEY 24432EA-01_11 DATED JULY 2019 HAS BEEN PROVIDED TO RICHARD JACKSON LTD FROM THE CLIENT / SURVEY SOLUTIONS AND RJ LTD ACCEPT NO RESPONSIBILITY FOR ERROR OR OMISSION.
9. SURFACE WATER IS STRATEGY IS BASED ON LOCAL SOILS DATA. DESIGN OF SuDS IS BASED ON NCC AND LLFA GUIDANCE AT DATE OF DRAWING, FEBRUARY 2020. AS POLICY AND GUIDANCE CHANGES, SO TOO MAY THE STRATEGY.
10. ALL SERVICES DATA WILL NEED TO BE CHECKED BEFORE DETAILED DESIGN. UPDATED INFORMATION MUST BE USED PRIOR TO ANY FURTHER DETAILED DESIGN OR EXCAVATION TAKES PLACE.
11. ALL ESTATE ROAD HIGHWAY DRAINAGE HAS BEEN DESIGN FOR A 1 IN 100 YEAR EVENT WITH 40% CLIMATE CHANGE FOR SWALES TO ASSESS THE REQUIRED INFRASTRUCTURE ROBUSTLY.
12. THE DESIGN CURRENTLY, DOES NOT INCLUDE FOR URBAN CREEP. A VALUE OF URBAN CREEP SHOULD BE APPLIED IN ACCORDANCE WITH THE LLFA GUIDANCE ONCE THE DENSITY OF THE DEVELOPMENT IS KNOWN.
13. THE MAIN HIGHWAY SWALE AND DRAINAGE FOR STORAGE CRATES AND SOAKAWAYS/PERMEABLE PAVING WILL BE AS TABLE A AS APPROPRIATE.
14. INFILTRATION RATES FOR THE SITES ARE USED AS 0.036m/Hr, BASED ON LOCAL SOILS DATA.
15. CONSIDERATION HAS BEEN GIVEN TO THE DESIGN OF THE SuDS TO REDUCE STANDING WATER ON SITE DUE TO THE PROXIMITY OF THE AIRPORT. INFILTRATION BASINS AND OPEN WATER FEATURES HAVE NOT BEEN USED DUE TO THIS CONSTRAINT.

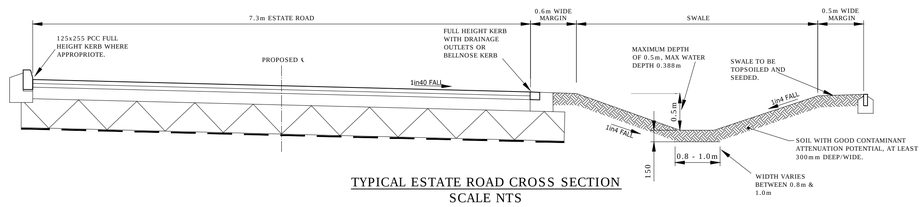


TYPICAL MAIN SPINE ROAD CROSS SECTION

SCALE NTS

KEY

- FALL OF LAND / EXCEEDANCE EVENT FLOW
- INDICATIVE ACCESS
- INDICATIVE ROAD
- TYPICAL SWALE LOCATION
- AREA OF POTENTIAL EXISTING SURFACE WATER FLOODING, TO BE AVOIDED
- PROPOSED FOOTWAY LINK



TYPICAL ESTATE ROAD CROSS SECTION

SCALE NTS

PRELIMINARY

REV	DATE	DESCRIPTION	DRAWN	CHKD
A	18.02.20	DESIGN DETAILS UPDATED.	LG	MD

REVISIONS

Project	LAND OFF HOLLY LANE HELLESDON
Title	PRELIMINARY SURFACE WATER DRAINAGE STRATEGY
Client	DRAYTON FARMS LTD / R G CARTER FARMS LTD
Drawn	MJD
Date	17/07/19
Job Manager	M. DOUGHTY
Checked	M. DOUGHTY
Approved	M. DOUGHTY
Scale	APPROX 1:2500 @A1

This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.

RichardJackson Engineering Consultants
847 The Crescent, Colchester, Essex CO4 9YQ — Tel: 01206 228800
Suite 409, 1 Ale Street, London E1 8DE — Tel: 020 7448 9910
York House, 3 Station Court, Station Rd, Great Shelford, Cambs CB22 5NE — Tel: 01223 314794
6 The Old Church, St. Matthews Road, Norwich, Norfolk NR1 1SP — Tel: 01603 230240
The Wheelhouse, Bonds Mill, Stonehouse, Gloucestershire GL10 3RF — Tel: 01172 020070
Email Address: mail@rj.uk.com — Website: http://www.rj.uk.com

Drawing No.	Revision
48110-PP-104	A

Drawing Status

- [X] INFORMATION
- [ ] APPROVAL
- [ ] COSTING
- [ ] TENDER
- [ ] CONSTRUCTION
- [ ] AS CONSTRUCTED

A1

Colchester 01206 228800

London 020 7448 9910

Norwich 01603 230240

Cambridge 01223 314794

Bristol 01172 020070

www.rj.uk.com