Drainage Strategy

Title	Station Road, Broughton
Client	Carrier Landscape Limited
Location	Station Road, Upper Broughton, Melton Mowbray, Nottinghamshire
Project number	22-0316
BIM reference	SRBT-BSP-XX-XX-T-W-0001-P01_Drainage_Strategy
Date	06 JAN 2023

Authorisation Sheet & Revisions Record

Project Number:	22-0539
Project Title:	Station Road, Broughton
Client:	Carrier Landscapes Limited
Location:	Station Road, Upper Broughton, Melton Mowbray, Nottinghamshire
Document Reference:	SRBT-BSP-XX-XX-T-W-0001-P01_Drainage_Strategy
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Rev:	Issue Date:	Description:	Prepared:	Checked:	Authorised:
P01	06/01/2023	Initial issue	AKS	SCB	TG

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Contents

Executive Summary

Introduction	BSP Consulting has been commissioned by Carrier Landscapes Limited to undertake a Drainage Strategy for a new single residential dwelling at Station Road, Upper Broughton, Melton Mowbray, Nottinghamshire. This report has been prepared in accordance with the Department for Communities and Local Government (DCLG) publication 'Technical Guidance to the National Planning Policy Framework, published in July 2018 and updated in July 2021.
Existing Site Conditions	The site currently comprises entirely of stone surface, with the northern and western boundaries of the site formed by brambles and dense hedges. Ground levels on-site generally fall from 106.2mAOD in the southeast to 103.74mAOD in the northwest. At the time of the survey, standing water was present on-site, adjacent to the western boundary of the site.
Development Description and Planning Context	The proposed development comprises the construction of a new single farm workers dwelling, complete with a garage, access, supporting infrastructure and landscaping.
Climate Change	The implications of climate change of up to 40% have been considered in this assessment and mitigation measures have been determined accordingly.
Off-Site Impacts	The posed development surface water will be managed by source control methods. Therefore, the development will not increase flooding adjacent to or downstream of the site for the lifetime of the development.
Recommendations	• In accordance with best practice, external ground levels should comprise falls away from the proposed dwelling in order to encourage surface water runoff away from the dwelling and towards drainage features. In areas where there is an increased risk of surface water flooding, the finished floor level should be raised by 150mm to prevent internal flooding. • The proposed surface water drainage system should be designed to accommodate the 1 in 30-year rainfall event without any surface water flooding and should be capable of retaining the 1 in 100-year plus climate change (40%) storm event on site without flooding any buildings. • For the purpose of this report it has been assumed that soakaways or similar or surface water discharge to an open watercourse will not be viable.

	• Due to the relatively small scale of the development source control methods should be utilised for surface water management on-site, allowing surface water to runoff to ground at source, as present. • A new foul sewer connection will be required for the proposed dwelling. The existing commercial development to the east is served by a private package treatment works. Due to the distance between the proposed dwelling and the existing commercial development, it will be more suitable to install a new private package treatment works or cesspit to serve the proposed farm workers dwelling only.

1.0 Introduction

1.1 Terms of Reference

1.1.1 This Drainage Strategy has been prepared in accordance with the Department for Communities and Local Government (DCLG) publication 'Technical Guidance to the National Planning Policy Framework, published in July 2018 and updated in July 2021, and according to best practice guidance. For and on behalf of Carrier Landscapes Limited.

1.2 Site Details

1.2.1 The proposed development site is located to the west of Upper Broughton village and to the west of the Old Dalby Test Track railway line, centred on OSNGR 466760E, 325941N. The site, shown by the red boundary in Figure 1.1 below, occupies an approximate area of 0.23ha.

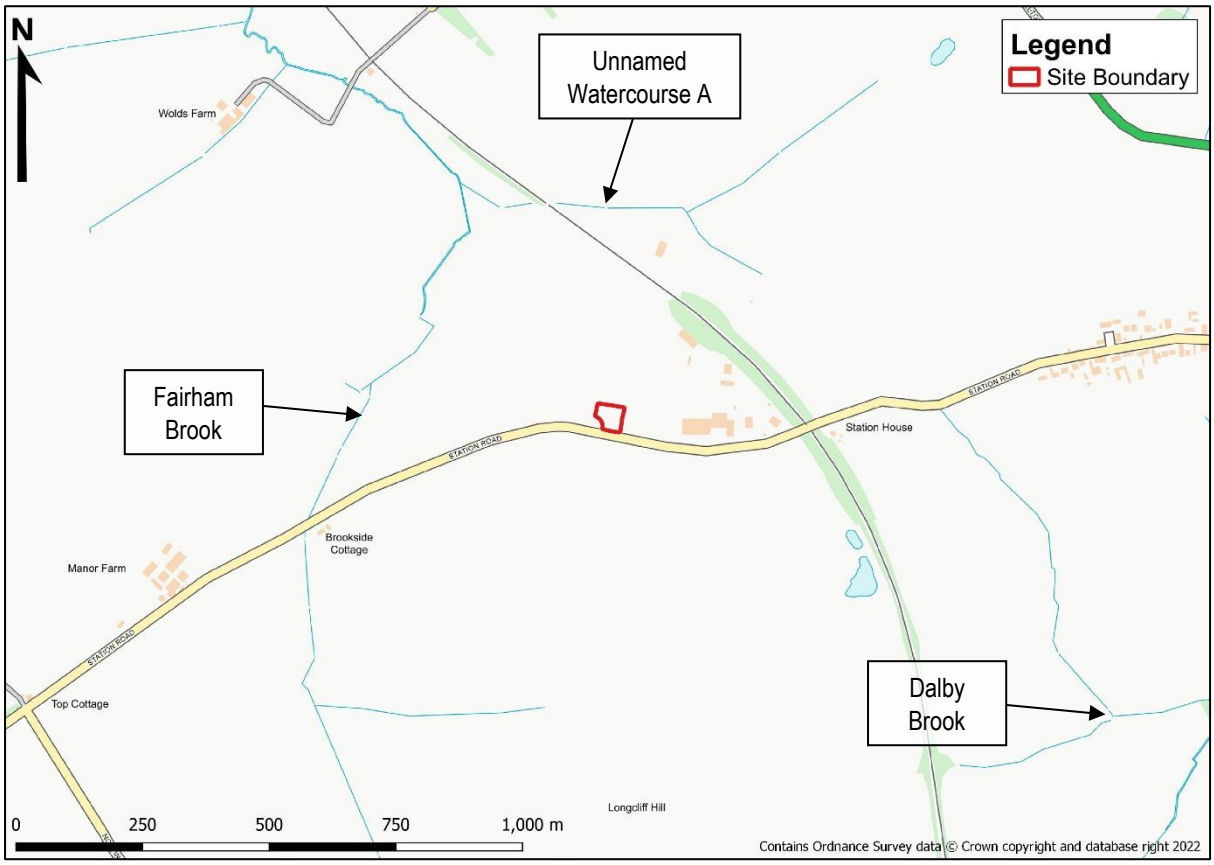


Figure 1.1 Station Road, Broughton – Site Location

1.2.2 The site is bounded by greenfield land to the west and north, existing commercial development occupied by Sulney Nursey to the east, and Station Road and then greenfield land to the south.

1.2.3 The site currently comprises entirely of a loose stone surfacing, with the northern and western boundaries of the site formed by brambles and dense hedges. A topographical survey of the site has been included

in **Appendix A**. Ground levels on-site generally fall from 106.2mAOD in the southeast to 103.74mAOD in the northwest, with a bund present with the hedgerow along the northern and western boundaries of the site. At the time of the survey, standing water was present on-site, adjacent to the western boundary of the site.

1.3 Detailed Development Proposals

1.3.1 The proposed development comprises the construction of a new single farm workers dwelling, complete with a garage, access, supporting infrastructure and landscaping. The proposed site plan is included in **Appendix B**.

2.0 Definition of Flood Hazard & Probability

A number of sources of potential flood risk to the site have been assessed in order to provide context to the proposed drainage strategy for the development. Details of the levels of risk to the site from each source are provided below:

2.1 Fluvial Flood Risk

2.1.1 The EA Risk of Flooding from Rivers and Sea mapping indicates that the development site is located in Flood Zone 1, with a less than 1 in 1,000 annual probability (<0.1% AEP) of flooding from Rivers and the Sea. The primary source of flood risk to the site is the Fairham Brook, an Ordinary Watercourse located approximately 360m to the northwest of the site at its closest point. Fairham Brook drains in a north-westerly direction away from the site and is a tributary of the River Trent. As such, Fairham Brook does not pose a risk of fluvial flooding to the site.

2.2 Tidal Flood Risk

2.2.1 The site is not within close proximity of any tidal watercourses and is therefore not at risk of tidal flooding.

2.3 Surface Water Flood Risk

2.3.1 Existing ground levels on-site comprise a gradual fall from southeast to northwest. Figure 2.1 below shows the EA Risk of Flooding from Surface Water mapping, which indicates that the entire site and immediate surrounding area is at very low risk of flooding from surface water. There is a low risk (0.1% AEP) surface water flood flow path indicated within Station Road to the south of the site, although this is shown to drain in a westerly direction away from the site and towards a field drainage ditch which conveys flows towards Fairham Brook.

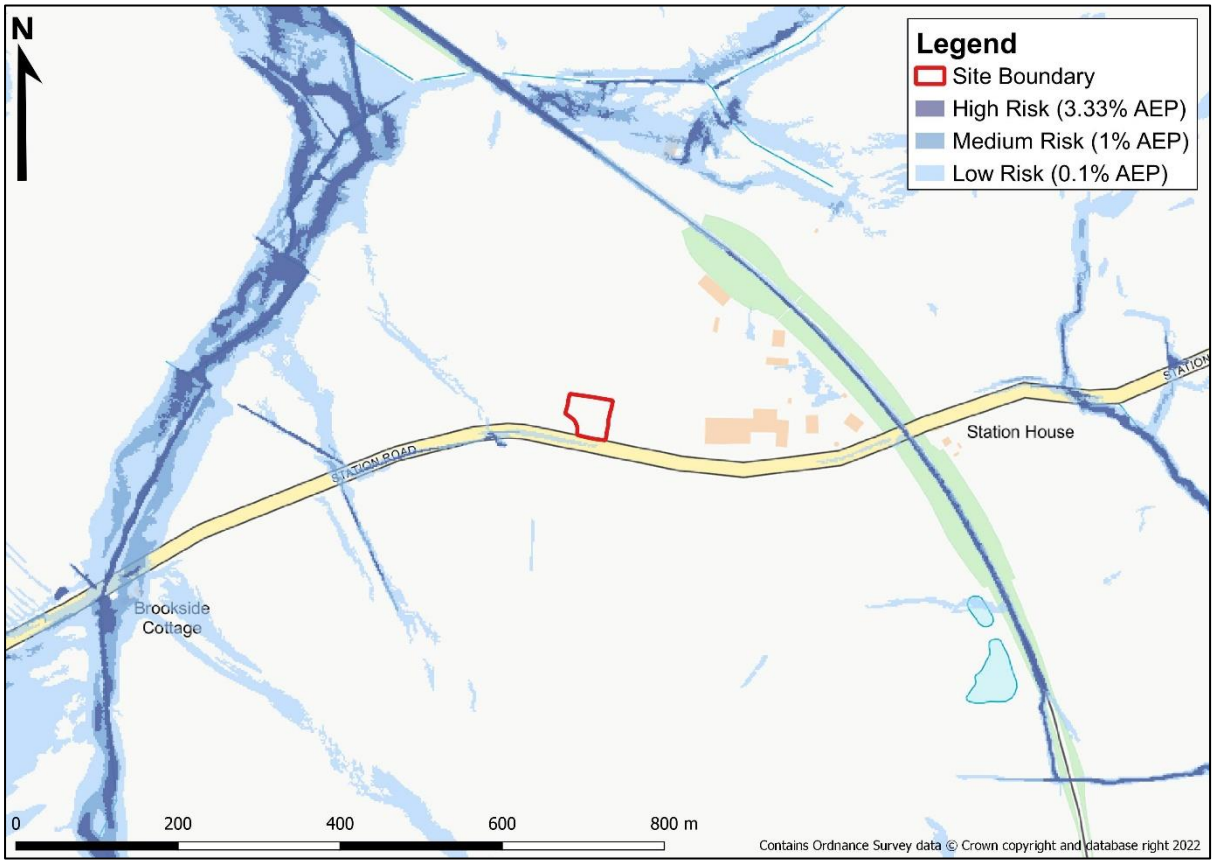


Figure 2.1 Station Road, Broughton – Risk of Flooding from Surface Water (Source: EA)

2.3.2 However, at the time of completing the topographical survey, standing water was present across the western edge of the site. It is likely that surface water runoff drains to the natural low point on-site before collecting against the bund indicated to be present within the hedgerow on the topographical survey included in **Appendix A**. Therefore, whilst the site is not at significant risk of flooding from surface water runoff from adjacent land and does not pose a risk of surface water flooding to the adjacent field, suitable mitigation measures should be taken to ensure the proposed dwelling is not at risk of internal surface water flooding.

2.4 Ground Water Flood Risk

2.4.1 The British Geological Survey's Geology of Britain mapping indicates that the site is situated upon bedrock geology consisting of Charmouth Mudstone Formation – Mudstone, and superficial deposits consisting of Oadby Member - Diamicton. Charmouth Mudstone Formation is generally classed as rock types with essentially no groundwater.

2.4.2 The Environment Agency Aquifer Designation Map identifies the site as being situated on bedrock classed as Secondary (Undifferentiated) Aquifer: in cases where it has not been possible to attribute either category A or B to a rock type.

2.4.3 Based on the information from the above sources the site is considered to be at low risk of flooding from groundwater sources. As the site is indicated to be at low risk of fluvial, tidal and pluvial flooding, local variations in groundwater levels are likely to be low. Moreover, due to the impermeable nature of the mudstone bedrock beneath the site, any local rises in groundwater levels will be unlikely to be able to permeate to the surface. Therefore, the site is not considered to be at risk of groundwater flooding.

2.5 Flood Risk from Sewers & Infrastructure

2.5.1 Public sewers within the local are operated and maintained by Severn Trent Water (STW). However, given the rural setting of the site, the existing commercial development to the east of the site has a private drainage arrangement, with foul water treated by a package treatment works. There are no known sewer flooding issues at this location and therefore, the site is not considered to be at risk of sewer flooding.

2.5.2 The EA Flood Risk from Reservoirs mapping confirms that the site does not lie in an area that is at risk of flooding from reservoirs.

2.5.3 The site is not within close proximity of any wet process industrial works.

2.5.4 The sewers and infrastructure flood risk source can therefore be discounted as a significant source of flood risk to the site.

2.6 Climate Change

2.6.1 The implications of climate change should be taken into account in relation to surface water drainage. Guidance from the EA advises that the upper end allowances for both the 1 in 30-year (3.3% AEP) and 1 in 100-year (1% AEP) events should be assessed, with the development designed to ensure that there is no increase in flood risk elsewhere and the development will be safe from surface water flooding during the 1 in 100-year event when the upper end allowance for climate change is applied. In this instance, peak rainfall intensity for longer lifetime residential developments within the Lower Trent and Erewash Management Catchment are estimated to increase by 35% for the 3.3% AEP event and 40% for the 1% AEP event. Therefore, it is recommended that the upper end allowance of 40% is applied to design rainfall intensity to allow for the potential implications of climate change.

3.0 Sustainable Drainage Strategy

3.1 Detailed Development Proposals

3.1.1 The proposed development comprises the construction of a new single farm workers dwelling, complete with a garage, access, supporting infrastructure and landscaping. The proposed site plan is included in **Appendix B**.

3.2 Surface Water Flood Risk Mitigation

3.2.1 In accordance with best practice, external ground levels should comprise falls away from the proposed dwelling in order to encourage surface water runoff away from the dwelling and towards drainage features. In areas where there is an increased risk of surface water flooding, the finished floor level should be raised by 150mm to prevent internal flooding.

Sustainable Drainage Systems

3.2.2 Part H of the Building Regulations 2010 recommends that surface water run-off shall discharge to one of the following, listed in order of priority:

a) an adequate soakaway or some other adequate infiltration system, or where that is not reasonably practicable.

b) a watercourse, or, where that is not reasonably practicable.

c) a sewer.

3.2.3 It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local run-off profile by using systems that can either attenuate run-off and reduce peak flow rates or positively impact on the existing flood profile.

3.3 Existing Constraints

Infiltration Based Systems

3.3.1 The British Geological Survey's Geology of Britain mapping indicates that the site is situated upon bedrock geology consisting of Charmouth Mudstone Formation – Mudstone, and superficial deposits consisting of Oadby Member - Diamicton.

3.3.2 The Cranfield Soil and Agrifood Institute's Soilscapes mapping indicates the site to be situated on soils categorised as Soilscape 18: slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

3.3.3 Based on the above desktop sources, formal infiltration is not likely to be feasible for the disposal or surface water runoff from the site. However, due to the scale of the proposals, where rainwater harvesting is not feasible, source control features should be utilised to encourage percolation and manage surface water runoff at source.

Open Watercourses

3.3.4 There are no open watercourses in close proximity to the site which are suitably located to receive a direct surface water discharge from the site.

Sewers

3.3.5 As it is proposed to utilise SuDS features to manage surface water runoff at source, it will not be necessary to discharge surface water to a sewer.

3.4 Sustainable Urban Drainage Systems

3.4.1 Sustainable Urban Drainage Systems (SuDS) are designed to reduce the risk of surface water runoff in urbanised areas in an effective manner while offering cost-benefits, reduced maintenance and increased amenity value. A summary of the different types of SuDS options available and their viability in the context of the proposed development are included in Table 3.1 below:

Table 3.1: Sustainable Urban Drainage Systems Options

SuDS Category	SuDS Technique	Viability	Explanation
Infiltration	Infiltration Trenches	✗	Due to the indicated ground conditions of the site and current site use, formal infiltration will not be possible.
	Infiltration Basins	✗	
	Soakaways	✗	
Filtration	Bioretention/Rain Gardens	✓	Due to the small scale of the proposals, filtration devices should be utilised to manage surface water runoff at source and provide water quality treatment.
	Filter Strips	✓	
Source Control	Green Roofs	✗	As proposals are for a residential development comprising pitched roofs, green roofs will not be feasible.
	Rainwater Harvesting	✓	As proposals are for a single dwelling, there is potential for water butts to be installed. However, as the dwelling is to be used by farm workers, rainwater harvesting methods will impose maintenance requirements upon the site management and may not be suitable. Where possible, these options should be encouraged but should not be mandatory.
	Pervious Pavements	✓	Pervious paving could be utilised for any external private parking spaces, pedestrian walkways, or private shared areas, where re-surfacing is proposed. This will serve to increase the rainfall-runoff response time, provide water quality benefits, and manage surface water runoff at source.
Conveyance	Swales	✗	The topography of the site is likely to support the use of conveyance features, subject to detail design. However, due to the relatively small scope of the development, features such as filter drains will likely be more appropriate than swales.
	Filter Drains	✓	
	Channels/Rills	✓	
Retention/Detention	Detention Basin	✗	Due to the relatively small scale of the development, attenuation will not be required. Instead, other SuDS features should be used to manage surface water onsite.
	Retention Pond	✗	
	Subsurface Storage	✗	
	Wetlands	✗	

3.5 Runoff Assessment

3.5.1 The 0.23ha site area currently comprises entirely of stone surface which is not positively drained. Therefore, for the purpose of this assessment the site will be treated as greenfield. The ICP SUDS and IH124 (Flood Studies Report) method has been used to calculate the surface water runoff from a small (<50ha) greenfield site ($QBAR_{RURAL}$), which is detailed below:

$QBAR_{RURAL} = 0.00108 \times (0.01 \times AREA)^{0.89} \times SAAR^{1.17} \times SPR^{2.17}$

Where
AREA = Area (ha)
SAAR = Standard Average Annual Rainfall (mm, 1941-1970)
SPR = Standard Percentage Runoff Coefficient

3.5.2 With a development area of 0.23ha and using Flood Studies Report values for SAAR (623mm) and SPR (0.450), $QBAR_{RURAL}$ is calculated as **0.9l/s**. This results in discharge rates for the following return periods:

1 in 1-year	0.7l/s
1 in 30-year	1.7l/s
1 in 30-year + 35% Climate Change	2.3l/s
1 in 100-year	2.3l/s
1 in 100-year + 40% Climate Change	3.2l/s

3.5.3 Greenfield runoff calculations are included in **Appendix C**.

Drainage Proposals – Main Strategy

3.5.4 Due to the relatively small scale of the development source control methods should be utilised for surface water management on-site, allowing surface water to runoff to ground, as present. For example, the inclusion of rain gardens within landscaped areas around the proposed dwelling and potentially the use of a water butt. Both above-mentioned source control methods will act to increase the rainfall-runoff response time by intercepting rainfall at source while also providing improvements to water quality. There may also be scope to include small scale conveyance features, such as filter drains and swales, subject to detailed design consideration.

3.5.5 The surface water drainage strategy will be subject to agreement with Nottinghamshire County Council as Lead Local Flood Authority.

3.6 Water Quality

3.6.1 In line with Planning Policy Guidance to the NPPF on Flood Risk, sustainable drainage systems (SuDS) should be used on new developments to provide benefits to water quality. In order to determine whether the proposed SuDS features for the development will be sufficient at removing pollutants from surface water runoff, the CIRIA SuDS Manual (2015) Simple Index Approach has been applied. This approach provides pollution hazard levels and indices to relevant pollutants based upon contributing hardstanding surfaces.

3.6.2 Table 3.2 below provides an extract of the land use types and pollutant indices from the CIRIA SuDS Manual which are relevant to the proposed development.

Table 3.2: Pollution hazard indices for different land use classifications (Source: CIRIA SuDS Manual 2015)

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change	Low	0.5	0.4	0.4

3.6.3 Based upon the above, the worst case indices for the development are 0.5 (Total Suspended Solids), 0.4 (Metals) and 0.4 (Hydrocarbons). Table 3.3 below indicates the mitigation indices for different types of SuDS components, with only those relevant to the development included. Under the Simple Index Approach, in order to suitably mitigate surface water pollutants, the total combined indices for any SuDS components will need to be greater than the worst case indices above. Where multiple SuDS components are proposed, the primary component is given its full indices, while subsequent component indices are applied with a factor of 50%.

Table 3.3: Indicative SuDS mitigation indices for discharges to ground waters (Source: CIRIA SuDS Manual 2015)

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Permeable Pavement	0.7	0.6	0.7
Bioretention System	0.8	0.8	0.8

3.6.5 Based upon the above, both permeable paving and bioretention systems provide more than adequate treatment of surface water in their own right. As such, roof water and runoff from any other impermeable surfaces should drain via either one of these proposed SuDS features.

3.7 Maintenance

3.7.1 The proposed surface water drainage system will require routine maintenance to ensure it remains fully operational and effective. The source control SuDS features will be maintained by site management.

3.8 Foul Water Drainage

3.8.1 A new foul sewer connection will be required for the proposed dwelling. The existing commercial development to the east is served by a private package treatment works. Due to the distance between the proposed dwelling and the existing commercial development, it will be more suitable to install a new private package treatment works or cesspit to serve the proposed farm workers dwelling only. In either case, a minimum suitable distance of 5m should be allowed between the dwelling and the proposed foul solution.

4.0 Off-Site Impacts

4.1.1 The proposed development surface water will be managed by source control methods. Therefore, the development will bring about improvements to the surface water regime in the area, and hence will not increase flooding adjacent to or downstream of the site for the lifetime of the development.

5.0 Recommendations

5.1.1 The following recommendations are made to reduce flood risk and promote a sustainable and practicable drainage strategy at the proposed development:

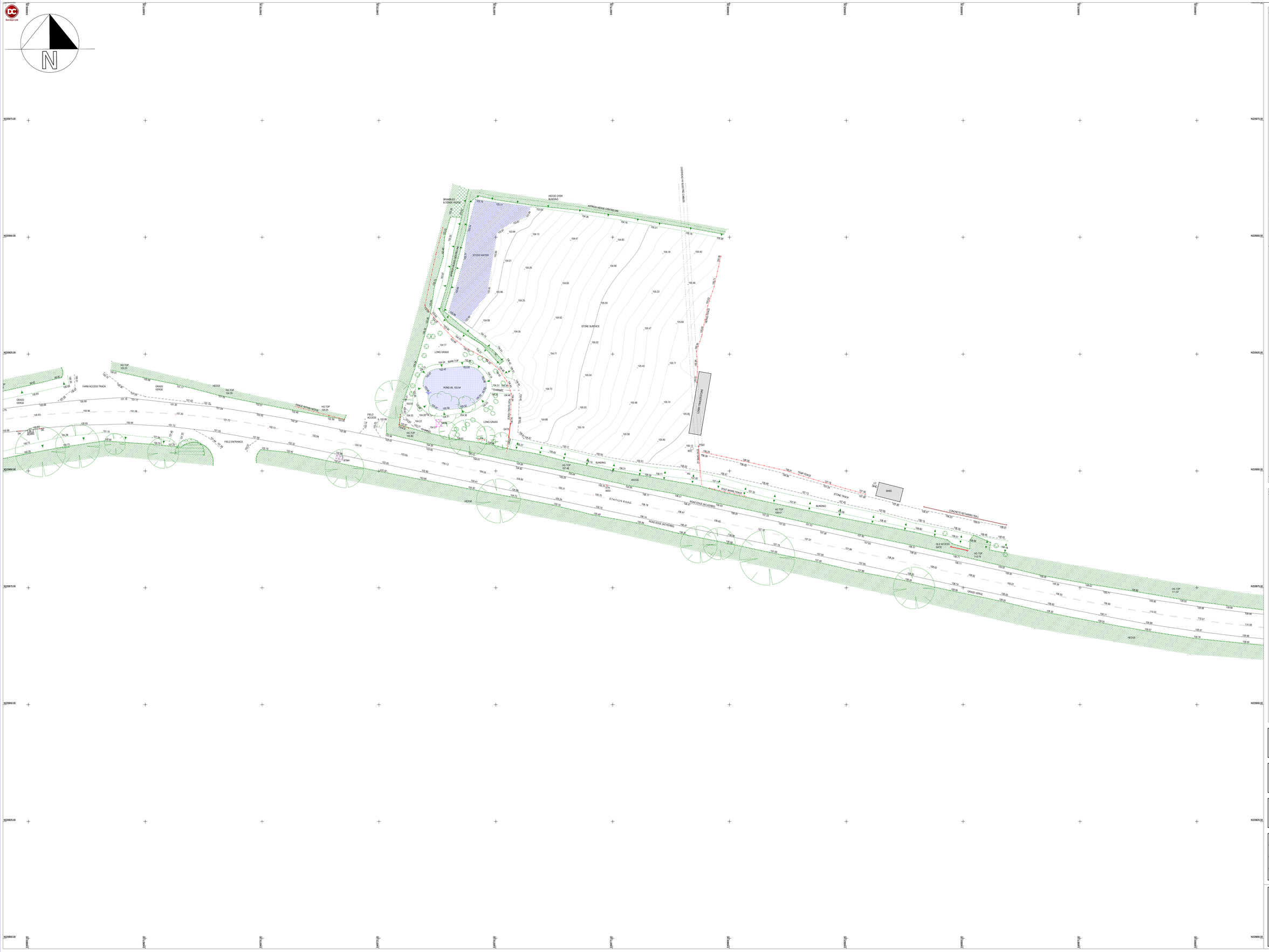
- In accordance with best practice, external ground levels should comprise falls away from the proposed dwelling in order to encourage surface water runoff away from the dwelling and towards drainage features. In areas where there is an increased risk of surface water flooding, the finished floor level should be raised by 150mm to prevent internal flooding.
- The proposed surface water drainage system should be designed to accommodate the 1 in 30-year rainfall event without any surface water flooding and should be capable of retaining the 1 in 100-year plus climate change (40%) storm event on site without flooding any buildings.
- For the purpose of this report it has been assumed that soakaways or similar or surface water discharge to an open watercourse will not be viable.
- Due to the relatively small scale of the development source control methods should be utilised for surface water management on-site, allowing surface water to runoff to ground at source, as present.
- A new foul sewer connection will be required for the proposed dwelling. The existing commercial development to the east is served by a private package treatment works. Due to the distance between the proposed dwelling and the existing commercial development, it will be more suitable to install a new private package treatment works or cesspit to serve the proposed farm workers dwelling only.

Disclaimer

We would note that all comments made in this report are based on the sources stated in Section 1.1. This report and its recommendations are intended for the use of Carrier Landscapes Limited for the above site only.

Appendix A

Topographical Survey



NOTES

ABBREVIATIONS & SYMBOLS

AV	AIR VALVE	OHC	OVERHEAD CABLE
BH	BORE HOLE	PB	POST BOX
CH	CHANNEL	PCL	PROPOSED LEVEL
CATV	CABLE TV MH	PM	PARKING METER
CCTV	SECURITY CAM	PO	POST
CL	COVER LEVEL	PT	PIPE TOP LEVEL
CH	CHANNEL	P/R	POST & RAIL FENCE
DC	CABLE TV LID	RE	RODDING EYE/POINT
DC	CABLE TV LID	RD	EDGE OF ROAD/NO KERB
DP	DOWN PIPE	RE	RODDING EYE/POINT
DS	DRAIN	RL	ROAD LEVEL
EL	EXISTING LEVEL	RP	RADIUS POINT
EP	ELECTRIC POLE	RS	ROAD SIGN
ER	EARTH ROD	SLVL	STONE LEVEL
FB	FLOWER BED	SOFF	SOFFIT LEVEL
FH	FIRE HYDRANT	SP	SPOT
FFL	FINISHED FLOOR LEVEL	SW	SURFACE WATER
FP	FLAG POLE	Tac	TACTILE PAVING
FW	FOUL WATER	TH	TRIAL HOLE
GV	GAS VALVE	TL	TRAFFIC LIGHTS
HG	HEDGE LEVEL	TP	TELEGRAPH POLE
IC	INSPECTION COVER	TOW	TOP OF WALL LEVEL
IL	I NVERT LEVEL	TP	TELEGRAPH POLE
KL	KERB LEVEL	UP	UNKNOWN
KO	KERB OFFLET	UTL	UNABLE TO LIFT
KT	KERB TOP	VP	VENT PIPE
LP	LAMP POST	WL	WATER LEVEL
LC	LIGHT COLUMN	WLVL	WATER LEVEL
MH	MANHOLE	WP	WATER POLO
MP	MARKER POST	WO	WASH OUT POINT

FENCE
HEDGE
ELECTRIC
BANK EDGE
STORM LINE
FOUL LINE
TELECOM LINE
GAS LINE
LARSEN PILES
CHANNELS
WATER MAIN
TREE
BOREHOLE
STATION
TBM
MANHOLE
GULLY
BATTER
WATER LVL
GATE

1. THE POSITION OF THIS SURVEY IS BASED ON GPS OSTN15 GRID.

2. ALL LEVELS RELATE TO GPS DATA ACQUIRED WITH TRIMBLE VRS.

3. TREES SPREADS ARE DRAWN TO SCALE AND SHOW THE GENERAL/AVERAGE CANOPY SPREAD.

4. ALL BELOW GROUND LEVEL INFORMATION INCLUDING VOIDS, DRAINAGE & SERVICES HAVE BEEN IDENTIFIED FROM THE SURFACE LEVEL ONLY. THEREFORE PIPE SIZES ETC ARE ESTIMATIONS ONLY. ALL CRITICAL DIMENSIONS SHOULD BE CHECKED PRIOR TO THE COMMENCEMENT OF ANY SITE WORKS

5. EVERY EFFORT HAS BEEN MADE TO LOCATE AND SURVEY ALL VISIBLE FEATURES. IT SHOULD BE NOTED THAT SOME ITEMS MAY HAVE BEEN OBSCURED AT THE TIME OF THE SURVEY AND THEREFORE NOT SHOWN ON THIS DRAWING.

6. PHYSICAL BOUNDARY FEATURES SHOWN ON THIS DRAWING DO NOT NECESSARILY REPRESENT THE ACTUAL LEGAL BOUNDARIES. BOUNDARIES SHOULD BE CONFIRMED WITH THE RELEVANT DOCUMENTATION.

7. THE CONTRACTOR MUST CHECK AND VERIFY ALL SITE LEVELS, DIMENSIONS, UTILITIES AND DRAINAGE DETAILS PRIOR TO THE COMMENCEMENT OF ANY SITE WORKS. ANY DISCREPANCIES MUST BE NOTIFIED TO DANIEL CHARLES SURVEYS LTD.

8. ALL SURVEY STATION CONTROL POINTS MUST BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING ANY SITE WORKS.

SURVEY CONTROL POINT INFORMATION

Point	Easting	Northing	Elevation
9000	467037.639	325868.329	106.934
9002	466915.087	325864.197	109.976
9003	466773.769	325896.858	105.729

SURVEY DATE	20/10/22	INITIALS	MJW

Rev	Amendments	Drn	Date

Client:
CARRIER LANDSCAPES Ltd

Project Title:
SULNEY NURSERIES
STATION ROAD
UPPER BROUGHTON - LEICS

Drawing Title:
TOPOGRAPHICAL SURVEY 2 of 3

Scale @ A0:	1:250	Date:	21/10/22
Drawing No:	22 - 124 - 02	Rev:	
C.A.D.Title:	M:\DCS\plotgrps mac\bn sulney nurseries\ master topo (22-124-01+02).mpt		
Drawn By:	MJW	Checked By:	MJL

Daniel Charles Surveys Ltd
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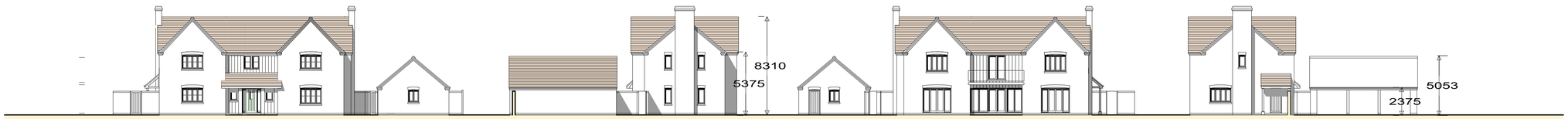
Appendix B

Proposed Site Plan



SOUTH ELEVATION EAST ELEVATION NORTH ELEVATION WEST ELEVATION

scale: 1/200

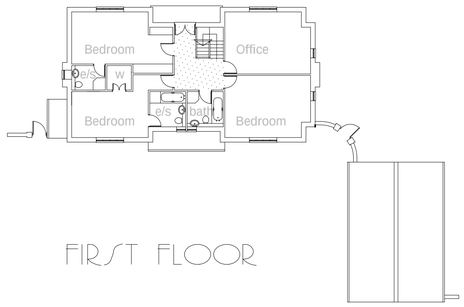
PROPOSED FARM WORKERS DWELLING

Sulney Nursery
Station Road
Upper Broughton
Leicestershire
LE14 3BQ

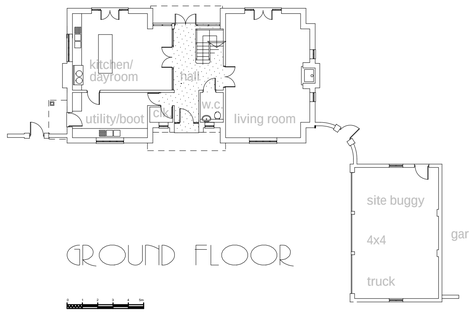
Carrier Landscapes Ltd

drawing	drg.no.
Scheme proposal	2711/22/04a
scale: 1/200	TERRY LAWTON Architectural Design
date: November 2022	m-07802 701603 e-terrylawton@hotmail.co.uk

Rev a Nov. 22. Office and buggy gateway denoted.



FIRST FLOOR



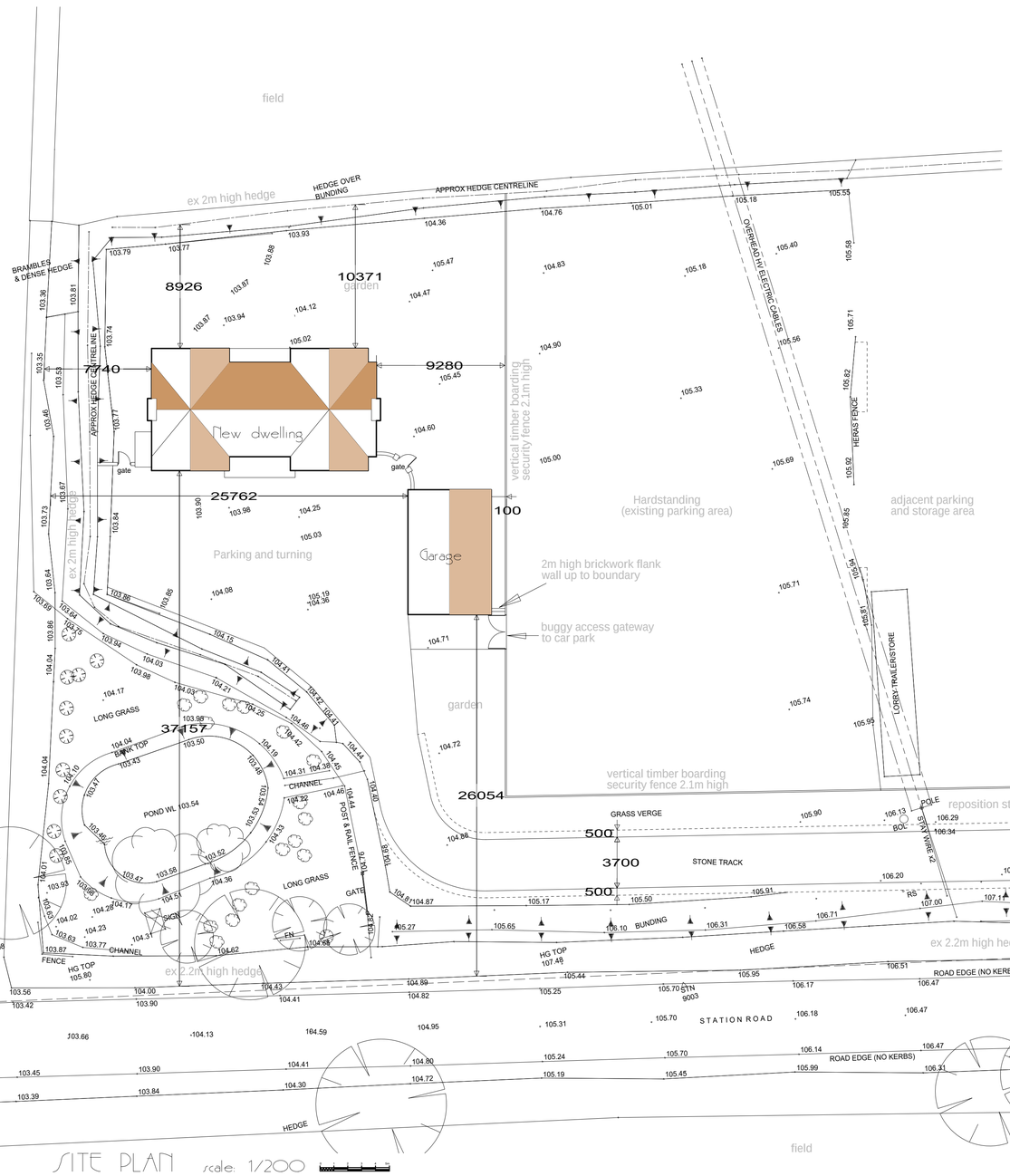
GROUND FLOOR

scale: 1/200

Roof : Concrete plain tile covering with matching ridge tiles (as office building).

Walls : Facing brickwork to match main company office building. Stained vertical timber boarding panels in recess. Feature projecting brickwork eaves and gable dentil course detail. Cambered brick soldier course lintol facings.

Windows and doors : Powder-coated aluminium frames with sealed unit glazing. Full height glazed french doors with glazed panel sidelights. Timber entrance doors to house, and aluminium framed timber up and over doors to garage.



SITE PLAN scale: 1/200

Appendix C

Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years) 1 SAAR (mm) 623 Urban 0.000
Area (ha) 0.230 Soil 0.450 Region Number Region 4

Results l/s

QBAR Rural 0.9
QBAR Urban 0.9

Q1 year 0.7

Q1 year 0.7
Q30 years 1.7
Q100 years 2.3

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