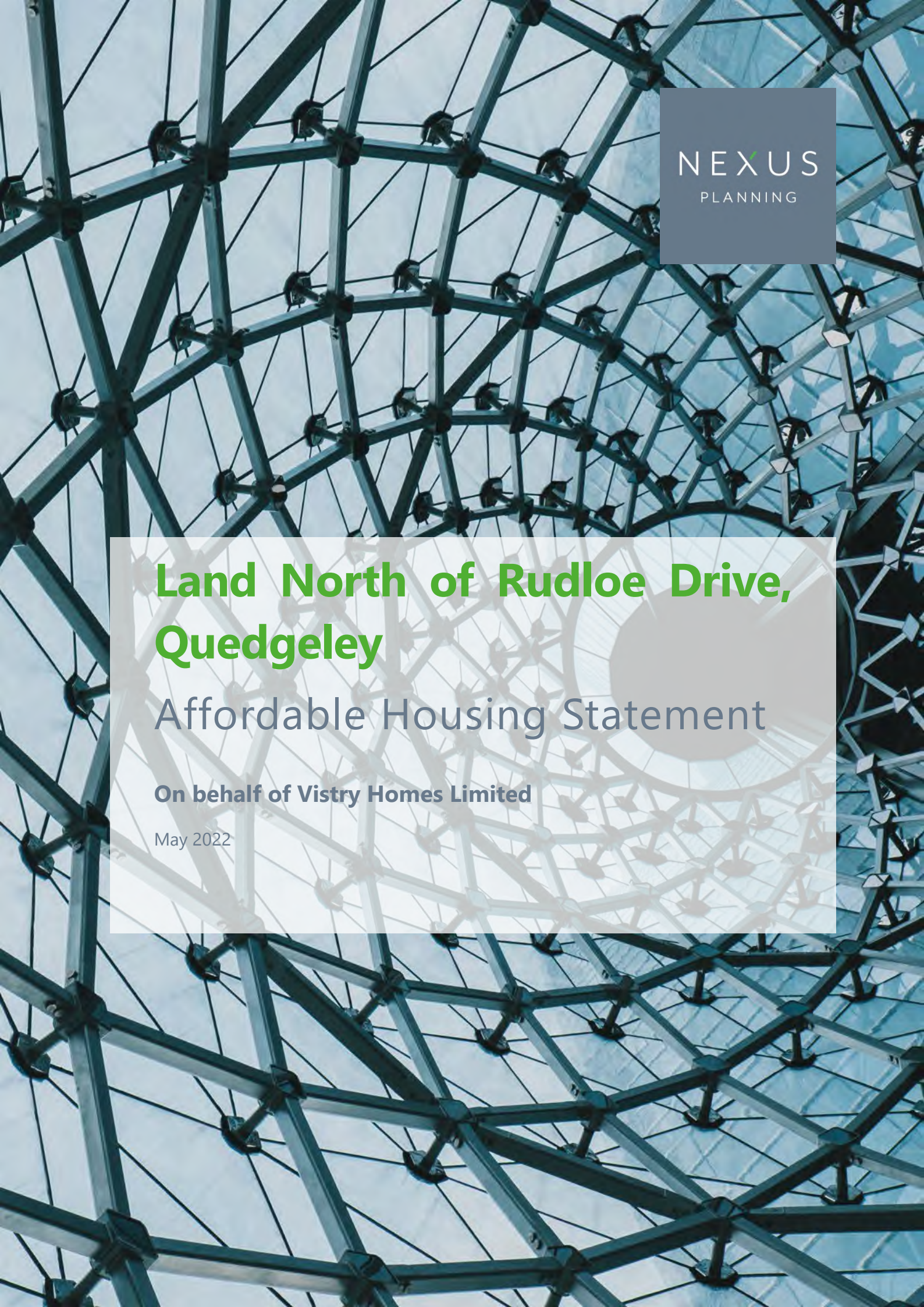


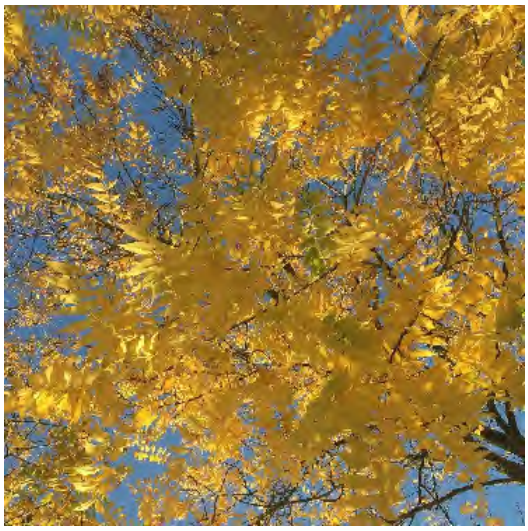
NEXUS PLANNING

Land North of Rudloe Drive, Quedgeley

Affordable Housing Statement

On behalf of Vistry Homes Limited

May 2022



ARBORICULTURAL CONSULTANTS

mhp

[redacted]

Registered Arboricultural Consultant
Chartered Arboriculturist

ARBORICULTURAL SURVEY, IMPACT ASSESSMENT AND PROTECTION PLAN

Relating to :

NEW RESIDENTIAL DEVELOPMENT AND ASSOCIATED INFRASTRUCURE

At:

LAND NORTH OF RUDLOE DRIVE, KINGSWAY, GLOUCESTER

Instructed by:

VISTRY COTSWOLDS

MHP ref: 22037 LAND NORTH OF RUDLOE DRIVE, GLOUCESTER_V1

[redacted]

Institute of Chartered Foresters Registered Consultant

Arboricultural Association Professional Member

AA Registered Consultant

CONTENTS:

Issue record

Date	Version	Notes	Quality check
20.05.2022	V1	Initial issue	MR 20.05.2022

1 INTRODUCTION

1.1 Introduction

1.1.1 My name is Matt Reid. I am a Chartered Arboriculturist and Registered Consultant of the Arboricultural Association and the Institute of Chartered Foresters. I hold the Level 6 Diploma in Arboriculture (ABC Awards) as well as other technical and trade level qualifications. I am also a Professional Member of the Arboricultural Association.

1.1.2 I have worked in the arboricultural industry since 1999. My initial trade and professional experience comprised six years as an arboricultural contractor and climbing arborist. Following this I spent seven years as a local government tree officer. Since 2012 I have worked in private practice as an arboricultural consultant specialising in planning related matters and tree risk management.

1.2 Background

1.2.1 An application for planning permission is to be submitted for new residential development and associated infrastructure on land north of Rudloe Drive, Kingsway, Gloucester; hereafter referred to as 'the site'.

1.3 Instruction and scope

1.3.1 I am instructed by Vistry Costwolds to visit the site and to carry out an assessment of arboricultural features in accordance with British Standards (BS) 5837:2012 'Trees in Relation to Design Demolition and Construction – Recommendations'.

1.3.2 I am to prepare the following information in relation to the proposals:

- Tree survey in accordance with BS5837:2012
- Arboricultural Impacts Assessment
- Tree Protection Plan.

2 GENERAL

2.1 Statutory tree protection and other designations

2.1.1 I have carried out desk-based tree-related constraints checks in relation to the site. These are outlined in *Table 1*.

Statutory tree protection and other designations		
	General summary information	Relevant to site?
Conservation Area[1]	• All trees with a trunk diameter greater than 75mm at 1.5m height are protected in the same way as for TPO (see below). • Six weeks' notice must be given to the Local Planning Authority (LPA) prior to carrying out any tree works so that possible requirement for TPO can be assessed.	No
Tree Preservation Order (TPO)[2]	• It is an offence to cut down, uproot, top or lop, wilfully damage or wilfully destroy relevant trees or woodlands. • Formal permission must be applied for (and granted) by the LPA before carrying out tree works. • Penalties of up to £20K (Magistrates Court) or unlimited fine (Crown Court).	Yes
Timber volume	• Forestry Act 1967 limits felling of volumes of timber in any calendar quarter to 5 cubic metres (m^3) unless a Felling Licence has been issued by the Forestry Commission. • Any felling beyond this threshold may result in prosecution and/or issue of a Restocking Notice	Yes
Ancient woodland[3]	• Ancient Woodland is broadly defined as land that has been continuously wooded since 1600AD. It is irreplaceable habitat and is afforded a high level of protection by the National Planning Policy Framework (NPPF).	No
Ancient/veteran trees[4]	• Broadly defined as trees that are old for their species that have biodiversity, cultural and heritage value. • Like ancient woodland such trees are irreplaceable habitats and are afforded a high level of protection by the National Planning Policy Framework (NPPF).	None recorded

Table 1- statutory tree protection and other designations.

2.2 Limitations

2.2.1 In some instances, I have been unable to access or clearly observe the trunks of trees. Where this is the case, I have done my best to accurately estimate dimensions and tree condition.

2.2.2 Trees are living organisms and self-supporting dynamic structures. Their physiological and

[1] Email communication 28th January 2019
[2] TPO 176 Land to east of A38 Quedgeley, Gloucester
[3] https://magic.defra.gov.uk/magicmap.aspx Accessed 20.05.2022
[4] https://ati.woodlandtrust.org.uk/ Accessed 20.05.2022

structural condition can change rapidly in response to a wide range of biotic/abiotic factors. As such, the findings and recommendations of my tree survey are limited to 24 months from the date of my site visit.

2.3 Wildlife informative

2.3.1 Tree works should not be carried out until a reasonably detailed inspection of relevant trees has been carried out to determine if bat roosts and/or bird nests are present.

2.3.2 It is a criminal offence to intentionally damage/destroy the nest of any wild bird while it is in use or being built. Similarly it is an offence to intentionally/recklessly disturb roosting bats or to damage or destroy a bat roost.

2.3.3 The Arboricultural Association publishes useful advice in relation to trees and nesting birds[5].

2.3.4 Helpful advice with regards to bats and tree work is published by the UK Government[6], the Arboricultural Association[7] and The Bat Conservation Trust[8].

[5] https://www.trees.org.uk/Help-Advice/Public/When-is-the-bird-nest-season
[6] https://www.gov.uk/guidance/bats-protection-surveys-and-licences
[7] https://www.trees.org.uk/Help-Advice/Public/Bats-and-trees-Who-does-what-where
[8] https://www.bats.org.uk/about-bats/where-do-bats-live/bat-roosts/roosts-in-trees

3 ARBORICULTURAL SURVEY

3.1 Site visit

3.1.1 I visited the site on 3rd February 2022.

3.2 Findings

3.2.1 My findings are set out within the survey schedule at **Appendix 1**.

4 TREE CONSTRAINTS

4.1 Tree Quality Assessment

4.1.1 Surveyed trees are represented using colour coding to indicate their quality and thereby suitability for retention. The quality assessment is as follows:

Quality grade	Definition
A	Green: high quality with estimated remaining life expectancy of at least 40 years.
B	Blue: moderate quality with estimated remaining life expectancy of at least 20 years
C	Grey: low quality with estimated remaining life expectancy of at least 10 years
U	Red - unsuitable for retention. Cannot realistically be retained for longer than 10 years

4.2 Below Ground Constraints

4.2.1 In accordance with BS5837:2012, below ground constraints, or Root Protection Areas (RPAs), for the surveyed trees are plotted onto the Tree Survey and Constraints Plan. These are represented as a circle with a broken red line centred on the base of each tree stem with a radius of 12 times stem diameter (measured at 1.5m above ground level.

4.2.2 BS5837:2012, a root protection area (RPA) is defined as "*a layout design tool indicating the minimum area around a tree deemed to contain sufficient roots and rooting volume to maintain the tree's viability, and where the protection of the roots and soil structure should be treated as a priority*". "*The default position* [when considering design layout in relation to RPAs] *should be that structures are located outside the RPAs of trees to be retained*".

4.2.3 Root systems can be damaged in several ways:

- Root severance
- Soil compaction
- Contamination by spilled materials eg cement/diesel.

4.3 Above Ground Constraints

4.3.1 Above ground constraints posed by trees describe the capacity for trees to have an overbearing or dominating effect on new developments; usually post occupancy. Typical above ground constraints include a number or combination of inconveniences including shading, branch spread, perceived fear of tree failure during strong winds and so on. If not adequately considered, above ground constraints can lead to repeated future requests to fell or heavily prune retained and protected trees.

4.3.2 The above ground parts of trees can be damaged in several ways:

- Impact damage through contact with construction site plant
- Inappropriate pruning
- Other factors, for example, heat damage caused by bonfires.

5 ARBORICULTURAL IMPACT ASSESSMENT (AIA) & TREE PROTECTION PLAN (TPP)

5.1 Arboricultural Impact Assessment

5.1.1 A combined AIA and TPP is included at **Appendix 2**.

Tree removals

5.1.2 The plan shows the tree survey and constraints information in relation to the proposed layout and confirms that seven trees and two tree groups must be removed to accommodate the development proposals. All these trees have been approved for removal (subject to appropriate replacement) by outline planning permission.

5.1.3 Four trees that are protected by TPO must be removed. These are summarised below as:

- T9 – a moderate quality, early mature English oak
- T10 – a low quality, early mature English oak
- T11 – a low quality, early mature common beech
- T12 – a moderate quality, early mature common beech.

5.1.4 All the trees marked for removal are relatively insignificant in the wider landscape. The site contains many other significant trees that are to be retained, most notably the trees bordering the internal roads at the west of the site. Overall, I do not consider that the loss of trees will significantly detract from the visual amenities of the area.

5.1.5 Additionally. substantial amounts of new tree planting shall be incorporated into the completed development. In my opinion, as these trees establish and mature they will outweigh the significance of the effect of the required tree removals.

Retained trees

5.1.6 New road surfacing will be required in the vicinity of TPO trees at the western end of the site. In anticipation of potential arboricultural impacts (and subsequent to submission of formal notice to Gloucester City Council) controlled excavations have been carried out at key points to analyse the extent of root encroachment beneath the existing roads. The findings of these investigations were that the trees are rooting preferentially into the green spaces and upto and along the kerb edges of the roads. The findings of these investigations are at **Appendix 3.**

5.1.7 General construction activities will have the potential to impact on retained trees (as explained at Section 4). However, provided that fit for purpose tree protection barriers are put in place prior to the commencement of works and remain in place for the duration of the construction process, I am satisfied that adverse impacts can be reasonably avoided.

5.2 Tree Protection Plan

5.2.1 The Tree Protection element of the plan demonstrates how retained trees can be effectively retained as part of the construction of the proposals.

5.2.2 Locations and specifications of tree protection barriers are provided.

5.2.3 Tree protection barriers must be put in place before any other work is carried out on site and remain in place for the duration of construction works.

6 CONCLUSION

6.1 Conclusion

6.1.1 I conclude that the development proposals are feasible from an arboricultural perspective for the following key reasons:

- No significant trees shall be removed to enable the construction of the proposals.
- Tree protection measures can be put in place to ensure that construction works do not result in damage to the retained trees.
- New tree planting can be carried out that will enhance the arboricultural qualities of the site into the future.

APPENDIX 1 – TREE SURVEY SCHEDULE

TREES

Ref	Common name	Height (m)	Est	Stem dia (mm)	Est	N	Est	E	Est	S	Est	W	Est	Estimated first branch height (m)	1st branch direction	Estimated canopy height (m)	Life stage	Special status	General observations & management recommendations	Struct. cond.	Phys. cond.	ULE	Quality grading	RPA radius (m)	RPA area (m2)	TPO
T1	Cherry	11	#	720	#	6	#	7	#	7	#	6	#	2	S	1	M	None	Dense ivy. Well established with canopy closure with adjacent pear.	Fair	Good	20+	B1	9	234	T16
T2	Pear	11	#	550	#	4	#	4	#	7	#	5	#	3	S	1	M	None	Ivy on stem obscuring unions between three limbs emerging from trunk at 2m	Fair	Fair	20+	B1	7	137	T15
T3	Pear	14	#	550	#	5	#	5	#	5	#	5	#	5	S	5	OM	None	Extensive crown dieback. Unable to access base due to scrub. Very large amounts of deadwood. Probably not viable in context of proposed land use	Poor	Poor	<10	U	7	137	None
T4	Cherry	10	#	680	#	7	#	8	#	10	#	9	#	3	S	2	M	None	Reasonable tree with potential to enhance site. Ganoderma decay fungi at base on SW side. Branch failure on east side at 3m.	Fair	Good	20+	B1	8	209	T27
T5	Cherry	8	#	550	#	8	#	8	#	7	#	7	#	1	N	2	M	None	Surrounded by dense bramble with elder growing close to trunk on north side. Probably a viable tree for retention if surrounding other growth removed. Many stemmed from approximately 1m. Presently an untidy specimen	Fair	Good	20+	B1	7	137	None
T6	Cherry	10	#	280	#	4	#	4	#	4	#	5	#	0.5	W	1	EM	None	Large amounts of sucker growth surrounding base should be removed	Fair	Good	20+	B1	3	35	None
T7	Cherry	13	#	400	#	6	#	6	#	4	#	4	#	3	N	1	EM	None	End tree of group with self-set ash and smaller cherry growing adjacent to trunk on north side. Remove ash tree.	Fair	Good	20+	B1	5	72	None
T8	English oak	15	#	550	#	5	#	6	#	5	#	5	#	1	S	1.5	EM	None	No significant defects and good potential to enhance the development	Good	Good	20+	B1	7	137	G13
T9	English oak	14	#	500	#	6	#	6	#	7	#	6	#	1	S	1	EM	None	No significant defects and good potential to enhance the development	Good	Good	20+	B1	6	113	G13
T10	English oak	5	#	250	#	3	#	4	#	3	#	3	#	0.5	NE	0.5	EM	None	No central leader. Squat rounded form.	Fair	Good	10+	C1	3	28	G13
T11	Common beech	15	#	470	#	8	#	8	#	6	#	6	#	1.5	N	3	EM	None	Previously lost central leader with many stems emerging from trunk at 5m. Localised squirrel damage. Poorly executed previous pruning to remove lower branches. Ingrown planting stake.	Fair	Fair	10+	C1	6	100	G13
T12	Common beech	13	#	300	#	4	#	5	#	5	#	4	#	2	S	0.5	EM	None	Reasonable tree but with intertwined twin leaders emerging at 5m	Fair	Good	20+	B1	4	41	G13

Ref	Common name	Height (m)	Est	Stem dia (mm)	Est	N	Est	E	Est	S	Est	W	Est	Estimated first branch height (m)	1st branch direction	Estimated canopy height (m)	Life stage	Special status	General observations & management recommendations	Struct. cond.	Phys. cond.	ULE	Quality grading	RPA radius (m)	RPA area (m2)	TPO
T13	Removed																									G13
T14	Removed																									None
T15	Walnut	8	#	220	#	4	#	4	#	4	#	4.5	#	2	S	3	EM	None	Smaller tree with good potential	Good	Good	20+	B1	3	22	None
T16	Horse chestnut	22	#	920	#	7	#	9	#	7	#	6	#	4	S	4	M		Avenue tree. Multi stemmed from 2m with included bark union on north side. Further inspection recommended due to potential for large limb loss	Fair	Good	10+	C1	11	383	G11
T17	Horse chestnut	22	#	800	#	7	#	7	#	7	#	7	#	4	N	5	M	None	Avenue tree	Good	Good	20+	B2	10	289	G11
T18	Horse chestnut	20	#	770	#	8	#	7	#	7	#	8	#	3	SE	4	M	None	Avenue tree.	Good	Good	20+	B2	9	268	G11
T19	Cherry	12	#	360	#	6	#	6	#	4	#	5	#	3	N	3	EM	None	Large areas of canker at 2m on trunk north side with considerable occluding growth at edges. Mallet tapping indicates internal decay present. . End tree of avenue but wrong species. Recommend further inspection to assess failure potential.	Fair	Fair	10+	C1	4	59	G12
T20	Horse chestnut	19	#	680	#	6	#	8	#	7	#	7	#	2	SW	4	M	None	Avenue tree	Good	Good	20+	B1	8	209	G7
T21	Horse chestnut	18	#	660	#	6	#	7	#	6	#	6	#	2	S	5	M	None	Avenue tree	Good	Good	20+	B1	8	197	G8
T22	Horse chestnut	16	#	560	#	7	#	6	#	6	#	7	#				M	None	Avenue tree	Good	Good	20+	B1	7	142	G9
T23	Horse chestnut	15	#	590	#	5	#	6	#	5	#	6	#	4	SW	5	EM	None	Lower trunk previously damaged by bleeding canker. Somewhat stunted in comparison to other nearby chestnuts	Fair	Fair	10+	C1	7	157	G10
T24	Horse chestnut	20	#	800	#	9	#	7	#	10	#	7	#	4	N	5	M	None	Moderate amounts of bleeding canker on stems and limbs. Partially included bark union at point trunk divides at 3m.	Fair	Good	20+	B1	10	289	G11
T25	Horse chestnut	18	#	700	#	7	#	6	#	6	#	9	#	5	S	5	M	None	Average for species and age.	Good	Good	20+	B1	8	222	G12
T26	Horse chestnut	23	#	930	#	6	#	7	#	6	#	7	#	5	N	4	M	None	Develops multi stems from 3m	Good	Good	20+	B1	11	391	None
T27	Horse chestnut	15	#	690	#	9	#	7	#	7	#	6	#	4	N	4	M	None	Extensive bark loss on trunk and main limbs. Remove tree and replace.	Poor	Poor	<10	U	8	215	G7
T28	Cherry	12	#	570	#	8	#	7	#	6	#	6	#	2	S	2	M	None	End tree of long linear group of trees following edge between green space and internal road. Mower damage to surface roots.	Good	Good	20+	B1	7	147	G7

Ref	Common name	Height (m)	Est	Stem dia (mm)	Est	N	Est	E	Est	S	Est	W	Est	Estimated first branch height (m)	1st branch direction	Estimated canopy height (m)	Life stage	Special status	General observations & management recommendations	Struct. cond.	Phys. cond.	ULE	Quality grading	RPA radius (m)	RPA area (m2)	TPO
T29	Cherry	10	#	510	#	7	#	7	#	6	#	6	#	2	S	2	M	None	Ganoderma fungal brackets at 0.5m north-west with good reaction wood ribbing to each side. Small amounts of deadwood	Fair	Good	20+	B1	6	118	G7
T30	Cherry	11	#	420	#	5	#	4	#	5	#	6	#	4	W	2	M	None	Bacterial canker at 3m north east. And a metre above at union with branch growing over internal road -internal decay likely to be present. Recommend reduce this branch by 1.5m from tips to reduce lever arm effect. Also remove deadwood >5cm diameter.	Fair	Good	20+	B1	5	80	G7
T31	Cherry	12	#	510	#	6	#	5	#	8	#	8	#	5	W	2	M	None	Small amount of canker on trunk at 3m south. Moderate amounts of deadwood. Mower damage to surface roots.	Good	Good	20+	B1	6	118	G7
T32	Cherry	12	#	540	#	6	#	6	#	8	#	7	#	3	W	2	M	None	1m x 10cm of canker on north side of trunk at 3m	Fair	Good	20+	B1	6	132	G7
T33	Cherry	11	#	350	#	6	#	5	#	6	#	5	#	2.5	SW	2	M	None	Generally free of defects apart from 1m x10cm area of canker on north side of trunk at 2m	Fair	Good	20+	B1	4	55	G7
T34	Cherry	12	#	600	#	8	#	8	#	7	#	8	#	2	SW	2	M	None	Larger specimen compared to other nearby cherries. Reasonable condition other than moderate amounts of deadwood in crown.	Fair	Good	20+	B1	7	163	T13
T35	Cherry	12	#	670	#	7	#	7	#	7	#	7	#	4	W	2	M	None	Area of hollowing with large reaction wood bulges at 2m north side of trunk.	Fair	Good	20+	B1	8	203	G7
T36	Cherry	12	#	570	#	6	#	8	#	7	#	7	#	2	NW	2	M	None	Decay pocket at base of lowest branch west. Small Ganoderma bracket emerging from base on west side.	Good	Good	20+	B1	7	147	G7
T37	Cherry	11	#	730	#	7	#	6	#	7	#	8	#	2	S	2	M	None		Good	Good	20+	B1	9	241	G7
T38	Cherry	11	#	550	#	8	#	7	#	5	#	7	#	2	S	2	M	None	No significant defects	Good	Good	20+	B1	7	137	G7
T39	Cherry	10	#	610	#	7	#	7	#	6	#	8	#	2	E	2	M	None	No significant defects	Good	Good	20+	B1	7	168	G7
T40	Cherry	10	#	600	#	6	#	6	#	7	#	6	#	2	S	2	M	None	Reasonable tree. No significant defects.	Good	Good	20+	B1	7	163	G7
T41	Cherry	10	#	610	#	8	#	6	#	8	#	7	#	2	N	2	M	None	Localised area of canker decay at 3m south at base of branch. Otherwise generally sound with no significant defects.	Good	Good	20+	B1	7	168	G7
T42	Cherry	9	#	450	#	7	#	5	#	6	#	6	#	2	S	2	M	None	Reasonable tree. No significant defects.	Good	Good	20+	B1	5	92	G7
T43	Cherry	9	#	450	#	6	#	6	#	6	#	5	#	2	N	2	M	None	Reasonable tree. No significant defects.	Good	Good	20+	B1	5	92	G7

Ref	Common name	Height (m)	Est	Stem dia (mm)	Est	N	Est	E	Est	S	Est	W	Est	Estimated first branch height (m)	1st branch direction	Estimated canopy height (m)	Life stage	Special status	General observations & management recommendations	Struct. cond.	Phys. cond.	ULE	Quality grading	RPA radius (m)	RPA area (m2)	TPO
T44	Grey poplar	19	#	1050	#	15	#	13	#	13	#	15	#	3	SW	2	M	None	Large prominent tree with spreading form.	Good	Good	20+	B1	13	499	T14

GROUPS

Ref	Common names of woody species present	Estimated average trunk diameter at 1.5m (mm)	Estimated minimum & maximum heights (m)	Estimated average height (m)	Estimated average canopy height (m)	Life stage	Special status	General observations & management recommendations	Struct. cond.	Phys. cond.	ULE	Quality grading	RPA radius from canopy edge (m)	TPO
G1	Common beech, English oak	320	10-12	10	3	EM	None	Well established even-aged tree group. Offsite.	Good	Good	20+	B2	4	G21
G2	Cherry, holly,	100	3-5	4	2	EM	None	Scrubby remnants of previous landscaping on the site. Just one cherry remaining as at 3.02.2022	Fair	Fair	10+	C2	1	None
G3	Elder, cherry laurel, ash, box, stag horn sumach	80	2-6	3	2	EM	None	Scrubby remnants of previous landscaping on the site.	Fair	Fair	10+	C2	1	None
G4	Ash, hawthorn, cononeaster	70	2-5	4	2	EM	None	Scrubby remnants of previous landscaping on the site.	Fair	Fair	10+	C2	1	None
G5	Removed													None
G6	Common lime	160	6-7	6	2	SM	None	Line of roughly evenly spaced and even-aged trees adjacent to public road. Potentially a prominent amenity feature. Would benefit from proactive formative pruning.	Good	Good	40+	A2	2	None
G7	Removed													None
G8	Removed													None
G9	Ash, hawthorn, dogwood, whitebeam, horse chestnut,	70	2-8	4	2	EM	None	Area of recent tree and shrubs planting along with some natural regeneration. Dense and unmanaged.	Fair	Good	10+	C2	1	None

KEY

Assessment criteria	Description
Reference number on plan	T: Tree, G: Group, W: Woodland, H: Hedgerow. This reference is recorded on the Tree Survey and Constraints Plan against the relevant survey item.
Common name (Scientific name)	Common names: normal type. Scientific names where required: italic type in brackets
Heights	Unit: metres (m). Recorded to the nearest half metre for heights upto 10m and to the nearest whole metre for heights above 10m.
Stem diameter	Unit: millimetres (mm). Rounded to the nearest 10mm. Single and multi-stemmed trees are measured at 1.5m above highest ground level or otherwise as in accordance with Annex C, BS5837:2012.
Estimates	Measured tree dimensions are identified by an '-' in the adjacent 'Estimate' column. Where dimensions have been estimated (offsite, or otherwise inaccessible survey items) this is clearly identified by a '#' in the adjacent 'Estimate' column.
Crown spread	Unit: metres (m). Directions refer to the four compass points (north, east, south, west). Dimensions are rounded-up to the nearest half metre for heights up to 10m and to the nearest whole metre for heights above 10m.

Assessment criteria	Description
Estimated average lateral spread	Unit: metres (m). For hedgerows only. An estimate of the average width between branch tips.
Crown clearance height	Unit: metres (m). The existing height above ground level of: • First significant branch and the compass direction of its growth: North (N), North-east (NE), East (E) , South-east (SE) etc. • Canopy (height between branch tips and ground level).
Life stage	Y – young (stake dependent), SM - Semi-Mature (still capable of being transplanted without preparation, up to 30cm girth and not yet sexually mature), EM – Early Mature (not yet having reached 75% of expected mature size), M – Mature (anything else up to normal life expectancy for the species), OM – Over Mature (anything beyond mature and in natural decline), V – Veteran, A - Ancient (any tree displaying characteristics described by the Ancient Tree Forum and referenced by Natural England).
Special status	• None • Veteran: any tree judged to meet criteria as defined by the Ancient Tree Forum • Ancient: any tree judged to meet criteria as defined by the Ancient Tree Forum[1]
General observations and preliminary management recommendations	General observations are recorded in relation to a survey item's structural and/or physiological condition (eg the presence of any decay and physical defect) and /or any preliminary management recommendations that may be appropriate.
Structural condition	• Good: without any observable significant biomechnical structural weaknesses • Fair: with minor biomechanical structural flaws. Some remedial action may be required • Poor:with significant biomechanical weaknesses requiring intervention particularly where risk management is required.
Physiological condition	• Good: no indications of impaired physiological function and in optimum condition for age and species • Fair: with indicators of reduced vitality. Some intervention may be required • Poor: with significantly impaired physiological function for age and species
Remaining contribution	Useful life expectancy, or the length of time a tree's is estimated to be able to make a useful contribution, is expressed in years as: <10, 10+, 20+, 40+.
Quality grading	Assessed in accordance with Table 1, BS5837:2012. Colours relate to depiction on the Tree Constraints Plan. • Category A (Green) Trees of high quality with an estimated remaining life expectancy of 40 years • Category B (Blue) Trees of moderate quality with an estimated remaining life expectancy of at least 20 years. • Category C (Grey) Trees of low quality with an estimated remaining life expectancy of at least 10 years, or young trees with a stem diameter below 150mm. • Category U (Red) Unsuitable for retention. Trees in such a poor condition that they cannot realistically be retained as living trees in the context of the current land use for longer than 10 years. Note - A, B and C trees are also given a sub-category of 1, 2 or 3 which reflects their arboricultural, landscape or cultural and conservation values respectively. Each subcategory has an equal weight, for example an A1 tree has the same retention priority as an A3 tree. More than one sub-category may be applied to a survey item as appropriate.
RPA radius	Root Protection Area (RPA): a layout design tool. Unit: metres (m). Radial distance from tree centre to define a circle that indicates on the Tree Survey Plan the minimum rooting area required to maintain tree's viability. Calculated in accordance with Annex D, BS5837:2012
RPA area	Unit: square metres (m^2). The area of the RPA radius circle described above. Applies only to individual trees.

[1] LONSDALE, D. (Ed). Ancient and other veteran trees: further guidance on management. The Tree Council. London. 2013.

APPENDIX 2 – ARBORICULTURAL IMPACT ASSESSMENT AND TREE PROTECTION PLAN

Key

- Vegetation to be removed / area pruned
- Tree Protection Order (TPO)
- Proposed tree planting
- Tree protection fencing (see Protective Barrier detail)
- Signage 'Construction exclusion zone - No Access'

Quality and Suitability For Retention

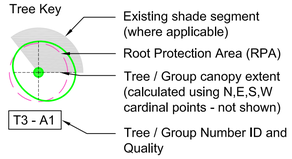
- Category A - High quality and value (Highly desirable for retention)
- Category B - Moderate quality and value (Desirable for retention)
- Category C - Low quality and value (Optional for retention)
- Category U - Poor quality and value (Unsuitable for retention)

Tree number on plan	Common name	Quality grading	RPA radius (m)	TPO reference
T1	Cherry	B1	9	T16
T2	Pear	B1	7	T15
T3	Pear	U	7	None
T4	Cherry	B1	8	T27
T5	Cherry	B1	7	None
T6	Cherry	B1	3	None
T7	Cherry	B1	5	None
T8	English oak	B1	7	G13
T9	English oak	B1	6	G13
T10	English oak	C1	3	G13
T11	Common beech	C1	6	G13
T12	Common beech	B1	4	G13
T13	Removed	None	None	None
T14	Removed	None	None	None
T15	Walnut	B1	3	None
T16	Horse chestnut	C1	11	G11
T17	Horse chestnut	B2	10	G11
T18	Horse chestnut	B2	9	G11
T19	Cherry	C1	4	G12
T20	Horse chestnut	B1	8	G7
T21	Horse chestnut	B1	8	G8
T22	Horse chestnut	B1	7	G9
T23	Horse chestnut	C1	7	G10
T24	Horse chestnut	B1	10	G11
T25	Horse chestnut	B1	8	G12
T26	Horse chestnut	B1	11	None
T27	Horse chestnut	U	8	G7
T28	Cherry	B1	7	G7
T29	Cherry	B1	6	G7
T30	Cherry	B1	5	G7
T31	Cherry	B1	6	G7
T32	Cherry	B1	6	G7
T33	Cherry	B1	4	G7
T34	Cherry	B1	7	T13
T35	Cherry	B1	8	G7
T36	Cherry	B1	7	G7
T37	Cherry	B1	9	G7
T38	Cherry	B1	7	G7
T39	Cherry	B1	7	G7
T40	Cherry	B1	7	G7
T41	Cherry	B1	7	G7
T42	Cherry	B1	5	G7
T43	Cherry	B1	5	G7
T44	Grey poplar	B1	13	T14
G1	Common beech, English oak	B2	As shown on plan	G21
G2	Cherry, holly,	C2	As shown on plan	None
G3	Elder, cherry laurel, ash, box, stag horn sumach	C2	As shown on plan	None
G4	Ash, hawthorn, cononeaster	C2	As shown on plan	None
G5	Removed	None	None	None
G6	Common lime	B2	As shown on plan	None
G7	Removed	None	None	None
G8	Removed	None	None	None
G9	Ash, hawthorn, dogwood, whitebeam, horse chestnut,	C2	As shown on plan	None

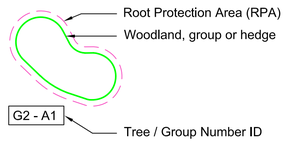
Root Protection Areas (RPA)

Root Protections Areas (RPA) indetified are in accordance with BS5837:2012. RPA's are shown as a pink dashed polyline

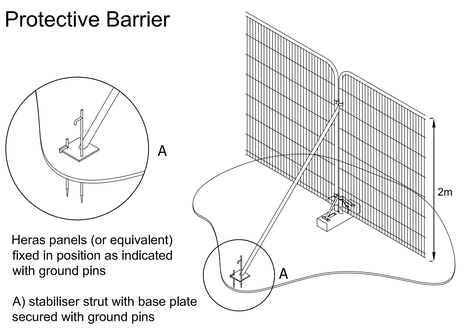
Tree Key



Group / Area / Woodland / Hedgerow Key



Protective Barrier



Heras panels (or equivalent) fixed in position as indicated with ground pins

A) stabiliser strut with base plate secured with ground pins

Notes

1) Survey Date 3rd February 2022.

2) This drawing has been produced to be printed in colour. If you have been given this drawing in monochrome please request a colour version.

3) Do not scale directly from this drawing.

4) This drawing is to be read in conjunction with all other relevant MHP drawings and information supplied by other consultants.

Scale

0 20 50 100 200

Land North of Rudloe Drive, Gloucester

Arb Impact Assessment & Tree Protection Plan

Revisions: Rev. Date Drawn Checked

Project: Land North of Rudloe Drive, Gloucester

Client: Vistry Cotswolds

Title: Arboricultural Impact Assessment and Tree Protection Plan

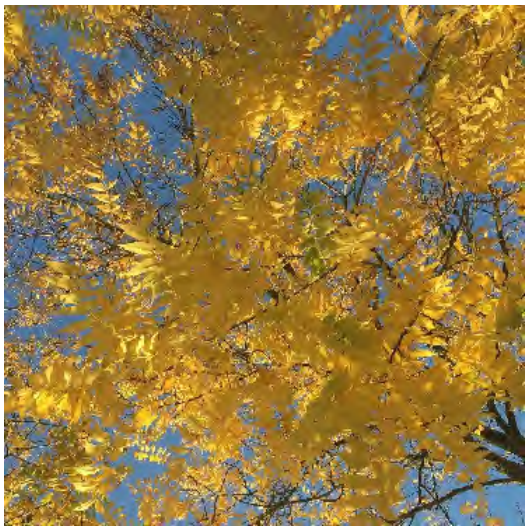
Drawing number: 22037.502 Rev:

Status: FOR INFORMATION

Drawn By:	Checked By:	Date:	Scale @ A1:
GW	MR	19-05-22	1:1000

ARBORICUTURAL CONSULTANTS mhp

APPENDIX 3 – ROOT INVESTIGATIONS



ARBORICULTURAL CONSULTANTS

mhp

[redacted]

Chartered Arboriculturist

TREE ROOT INVESTIGATIONS

For:

INSTALLATION OF NEW HIGHWAYS INFRASTRUCTURE

At:

LAND NORTH OF RUDLOE DRIVE, GLOUCESTER

MHP ref: 22037 LAND NORTH OF RUDLOE DRIVE, GLOUCESTER_ROOTS_INSP_V1

[redacted]

Arboricultural Association
Professional Member
Member No: PRO1665

Institute of Chartered Foresters
Registered Consultant

CONTENTS:

Issue record

Date	Version	Notes
07.02.2022	V1	Initial issue

1 INTRODUCTION

1.1 Introduction

1.1.1 My name is [redacted] I am a chartered arboriculturist with 20 years industry experience. I hold the Level 6 Diploma in Arboriculture (ABC Awards) as well as other technical and trade level qualifications. I am a professional member of both the Arboricultural Association and of the Institute of Chartered Foresters.

1.1.2 I have worked in the arboricultural industry since 1999. My initial trade and professional experience comprised six years as an arboricultural contractor and climbing arborist. Following this I spent seven years as a local government tree officer. Since 2012 I have worked in private practice as an arboricultural consultant specialising in planning related matters and tree risk management.

1.2 Background

1.2.1 Outline planning permission has been granted by Gloucester City Council for residential development (up to 150 dwellings), associated infrastructure, ancillary facilities, open space and landscaping (outline application with all matters reserved) on land to the north of Rudloe Drive, Gloucester; hereafter referred to as 'the site'.

1.2.2 As part of the design of detailed reserved matters a potential source of arboricultural impact has been identified. This is the replacement of existing internal hard surfaces with 'adoptable' Highways standard roads in the vicinity of existing trees that are protected by Tree Preservation Order (TPO).

1.3 Instruction and scope

1.3.1 I am instructed by Vistry Cotswolds to oversee a series of carefully dug trial pits to test for the presence of roots beneath existing hard surfacing next to a several of the larger trees. I am to:

- Communicate with the Gloucester City Council prior to any works being carried out and to explain rationale and methodology.
- Oversee the excavations as they take place and record findings.

- Provide advice as to how to proceed.

1.4 Notification

1.4.1 I emailed GCC on 2nd February (10.43hrs) to provide notification of Vistry's intention to carry out cautious root investigations in proximity to protected trees.

2 FINDINGS

2.1 Site visit

2.1.1 I visited site on 3rd February to oversee the excavations.

2.2 Methodology

2.2.1 Excavations were to the following methodology:

1. Arboriculturist indicates excavation area and explains this methodology.
2. Existing hard surface is broken up and removed.
3. Existing hardcore base is removed gradually
4. Grading back gradually using a toothless bucket and observed by a banksman. Gradually remove subsoil to a depth of approximately 1m.
5. If roots are encountered, stop and expose the rest of the roots at that depth using hand tools.
6. Arboriculturist to photograph and record findings.
7. Backfill the hole and make good the area.

2.3 Locations

2.3.1 Locations of the trial pits are indicated on the plan below:

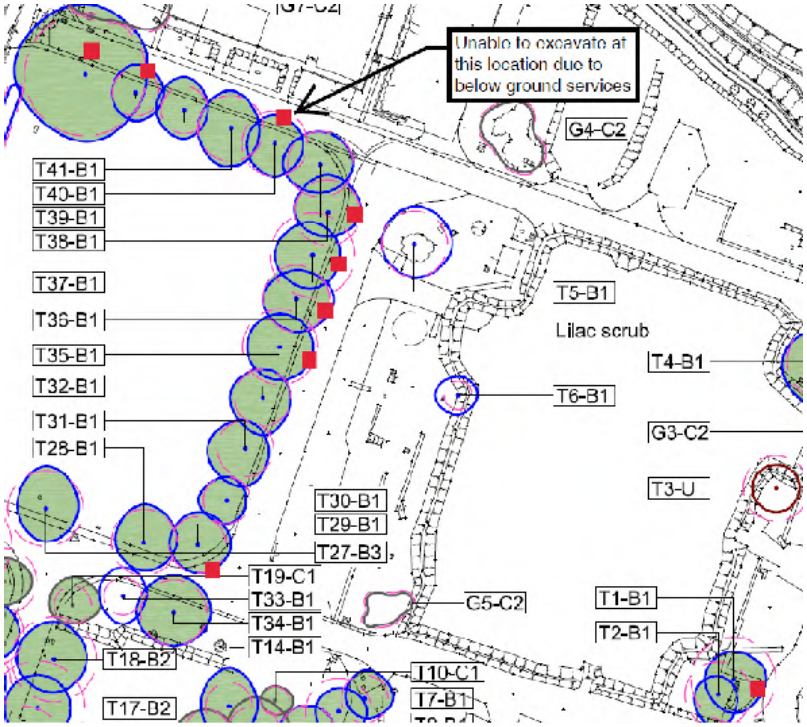


Figure 1 - Location of trial pits

2.4 Tree T29 - cherry

2.4.1 Excavation to a depth of 1.1m. No roots encountered.

2.5 Tree T35 - cherry

2.5.1 Small amounts of root (approx. 20mm diameter) emerging beneath the kerb line at approximately 500mm depth and into the hardcore foundation to approximately 1 metre(m).

2.5.2 No other significant roots in remainder of excavation.

2.6 Tree T36 - cherry

2.6.1 One root (approx. 40mm diameter) beneath and following the line of the kerb.

2.6.2 One root encountered at 500mm depth, approximately 25-30mm diameter.

2.6.3 Excavation concluded at this depth.

2.7 Tree T37 – cherry

2.7.1 Excavation to a depth of 1.1m. No roots encountered.

2.7.2

2.8 Tree T38 - cherry

2.8.1 Excavation to a depth of 1.1m. No roots encountered.

2.9 Tree T43 - cherry

2.9.2 This excavation replaced the planned trial pit next to T40 (below ground services are present at that location).

2.10 Tree T44 – grey poplar

2.10.1 Large root (approximately 150mm diameter at 300mm depth beneath kerb.

2.10.2 Excavation moved further out into road. No roots encountered to depth of 1.1m.

2.11 Tree T1 – Cherry

2.11.1 Excavation to a depth of 1.1m. No roots encountered.

3 COMMENTS

3.1 Road construction

3.1.1 Apart from an area in the vicinity of T43 which is a more modern construction, the present road make-up consists of a capping layer of tarmac over approximately 200mm of reinforced concrete. This lies on top of 250-300mm of cinder/slag, which in turn is above approximately a 400mm layer of large diameter Cotswold stone foundation.

3.1.2 The subsoil beneath generally consists of a heavy clay. However, there is a pocket of sand present in the vicinity of T29.

3.2 Typical root distribution

3.2.1 In my opinion the trial pits indicate that the TPO trees have not developed large volumes of roots beneath the existing road. It seems that that the trees are all preferentially rooting into the grassed area where there is greater availability of nutrients, moisture and scope for gaseous exchange.

3.2.2 Typically roots appear to be encountering the kerb and below parts of the road and massing at this point. In a small amount of cases, roots are beneath the kerb line and in the road foundations. In my opinion, the root of T44 is highly significant and must not be disturbed.

3.3 New road

3.3.1 I understand that the new road is proposed to be positioned 1m into the site from the existing kerb lines.

3.3.2 In my opinion, (with the exception of T44) this will not result in significant arboricultural harm. This is because there is minimal tree root incursion beneath the existing road.

McBains

LHG61841 - May 2022

DESIGN COMPLIANCE STATEMENT

LAND NORTH OF RUDLOE DRIVE QUEDGELEY

Vistry Group

APPROVALS

This document requires the following approvals:

VERSION	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
P1	26.05.2022	MS	PO'R	EC

Signed [redacted]

Dated 26.05.2022

For and on behalf of McBains Limited

History

26.05.2022_D5_P1 Document issued for planning

CONTENTS

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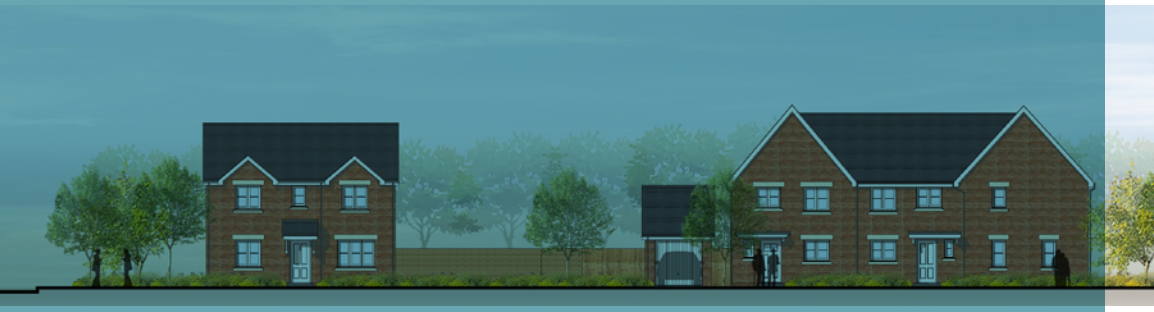
1.0

INTRODUCTION



INTRODUCTION

1.1 PURPOSE OF THIS DOCUMENT

This document is submitted in support of a Reserved Matters Planning Application by Vistry, for land North of Rudloe Drive, Kingsway, Quedgeley, Gloucester.

This application has been prepared in accordance with the Article 9 of the Town and Country Planning (Development Management Procedure) (England) Order along with the principles set out in the Design and Access Statement prepared by Pegasus Urban Design on behalf of Robert Hitchins Ltd.

It supports the Outline Planning permission granted under reference 21/00490/OUT, for a residential development of 150 dwellings, including associated infrastructure, vehicular access, ancillary facilities and landscaping.

The purpose of this statement is to explain;

"*How the proposed development is a suitable response to the site and its setting and demonstrate that it can be adequately accessed by prospective users*" (para.34, Planning Practice Guidance ID 26-034-20140306, March 2014).

KEY:

SITE BOUNDARY

1.1 Aerial view of the site (source Google Earth)

1.1

1.2 SITE LOCATION AND DESCRIPTION

The site lies within the Gloucester City Council ward of Quedgeley Fieldcourt and the Gloucester County Council ward of Kingsway.

The site is situated to the north of Rudloe Drive and to the east of Newhaven Road. The site is comprised of largely flat, open grassland, with the exception of a number of well-established trees on the western and eastern boundaries.

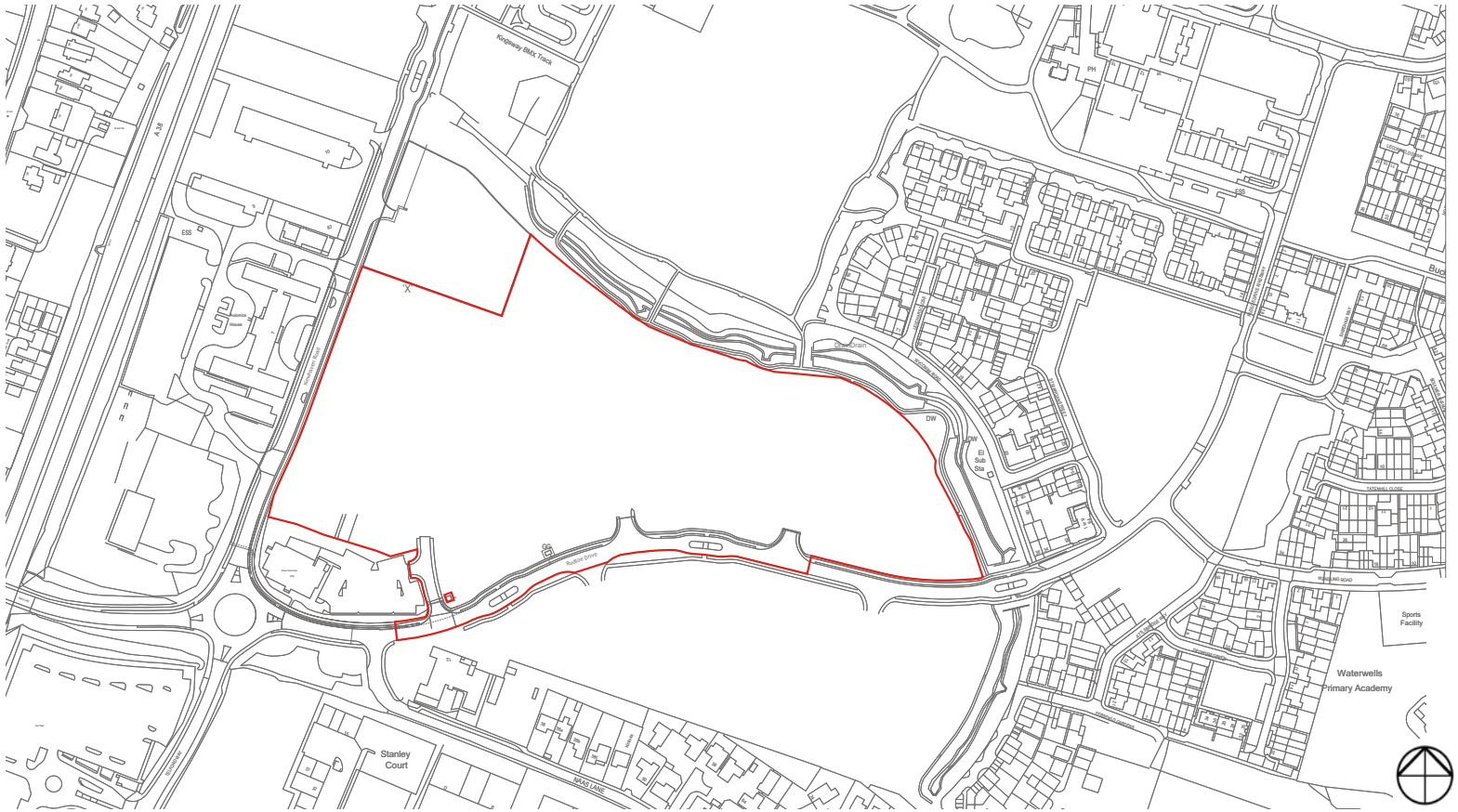
The north-western boundary features a Sustainable Urban Drainage System (SuDS), footpath and fronted by existing dwellings, whilst planning permission has been granted for a development of 80 dwellings to the south of Rudloe Drive.

1.3 PROPOSAL SUMMARY

Reserved Matters approval, pursuant to the grant of Outline Approval reference 15/01149/OUT, is sought for the development of 340 dwellings and associated parking, amenity space and highway and drainage infrastructure.

Provision of 40% affordable homes (135 units), comprising 1 and 2 bedroom flats, 2,3 and 4 bedroom houses.

Provision of 60% market homes (205 units), comprising of 2,3 and 4 bedroom houses.



1.2

KEY:

SITE BOUNDARY

1.2 *Site Location Plan*

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2.0

SITE ANALYSIS

2.1 SITE CONSTRAINTS AND OPPORTUNITIES

This section demonstrates the concept behind the masterplan design evolution, including consultation inputs which have shaped the final submitted layout. The constraints and opportunities highlighted in the Design and Access Statement prepared by Pegasus Urban Design on behalf of Robert Hitchins Ltd. are utilised to inform and structure the development proposals.

The image adjacent demonstrates the development of the scheme through the design process in response to site constraints, planning and pre-application feedback.

An assessment of these factors for opportunities and constraints have informed a potential arrangement for the site.

A positive and constructive pre-planning process took place with Gloucester City Council, covering matters such as:

- Layout and Design
- Highways and parking
- Architectural Design

The layout is designed as a series of traditional perimeter blocks with homes facing outward across the street or public open spaces or backing onto future infrastructure to create enclosed blocks.

SITE ANALYSIS

KEY:

- SITE BOUNDARY
- BLOCK STRUCTURE
- EXTERNAL POS
- POS
- ACCESS TO THE SITE
- RUDLOE DRIVE
- INFROMAL STREET
- CONNECTION TO NEIGHBOURING AREA
- POTENTIAL DRAINAGE OUTFALL
- PEDESTRIAN CONNECTION
- RE-SURFACED ROAD
- POS FRONTAGE
- RUDLOE DRIVE FRONTAGE
- INTERFACE WITH NEWHAVEN ROAD
- EXISTING TREES
- EASEMENT
- END VISTA
- POTENTIAL TO BE A PLAY AREA
- POTENTIAL FOR SUDS
- EXISTING SWALE
- EXISTING SUB-STATION
- EXISTING GAS GOVERNOR
- KEY GROUPING
- SUN PATH

2.1 *Site Constraints and Opportunities*

SITE ANALYSIS

KEY:

KEY:

KEY:

2.2 SITE PHOTOS


1

2


3


4


5


6


7


8


9

1-9 *Site photos*

SITE ANALYSIS


10


11


12

KEY:


13


14


15

KEY:


16


17


18

KEY:

10-18 *Site photos*

SITE ANALYSIS

KEY:


19


20


21

KEY:


22


23


24

KEY:


25


26


27

19-27 *Site photos*

3.0

MASTERPLAN DESIGN

MASTERPLAN DESIGN

3.1 OUTLINE APPROVAL

Outline planning permission for a Residential development of upto 150 dwellings), associated infrastructure, ancillary facilities, open space and landscaping, was granted on 9th July 2021 (LPA Ref: 21/00490/OUT).

3.2 DESIGN EVOLUTION

The layout is based on key principles which provided a framework to create a distinctive place, with a consistent and high-quality standard of design.

These principles have been derived from the site assessment in conjunction with the delivery of a high-quality development which achieves the criteria set out within the NPPF and has evolved as a result of pre-application discussions with GCC and the consultants involved.

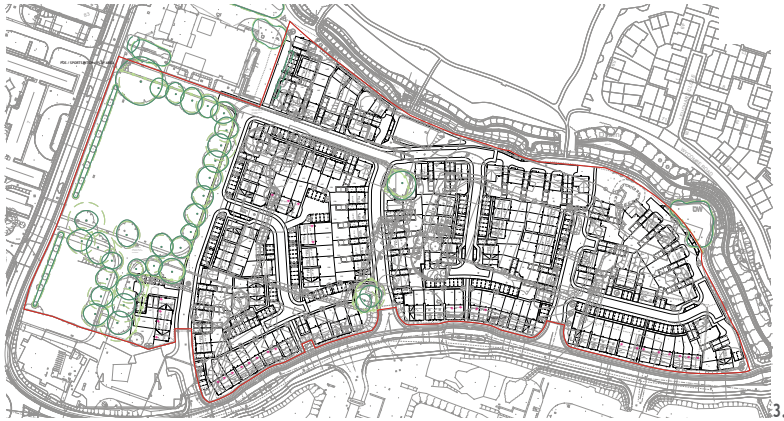
The plans adjacent offer an indication of the varying stages of the design process to show how the proposed development has evolved overtime.

Some of the key amendments being:

- The arrangement of Parking Courtyards readjusted.
- The composition of trees and landscape along Rudloe Drive.
- Incorporation of the existing landscape into the scheme.
- Slight amendments to the road character/block structure.

3.1

3.2



3.3

3.1 *Illustrative Site Layout SK01 - 28.09.2021*

3.2 *Illustrative Site Layout SK06 - 27.01.2022*

3.3 *Illustrative Site Layout SK09 - 03.02.2022*

MASTERPLAN DESIGN

3.4

3.4 *Site Layout Plan*

MASTERPLAN DESIGN

3.4 USE & AMOUNT OF DEVELOPMENT

The proposal comprises of 150 dwellings, including 1 to 4 bedroom houses. The masterplan provides a good mix of accommodation including:

- 1 BED MAISONETTE: 2
- 2 BED HOUSES: 19
- 3 BED HOUSES: 87
- 4 BED HOUSES: 42

3.5 DESIGN CONCEPT

The design concept for the masterplan evolves the principles set out in the Design Access Statement for Rudloe Drive by Pegasus and evolved as a result of pre-application discussions with GCC and the consultants involved.

The principles set the framework to create a distinctive place, with a consistent and high-quality standard of design.

The development will be sensitive to the topography of the site and aims to retain and enhance the sites natural resources.

The proposal applies these principles throughout the development with some addition to them in order to enhance the character of the scheme.

The adjacent diagram demonstrates a number of key principles which help to demonstrate the legible and well-connected approach to the design:

- Hierarchy of street types with distinctive character and surface treatments.
- Softer informal frontages to the open frontages and neighborhood streets within the parcels.
- Strong Active frontage along Rudloe Drive.
- More formal treatments along prominent locations.
- Key groupings and variation in heights that act as visual focal points.
- Permeable layout.

The perimeter blocks are laid out to efficiently complement the site arrangement, and address all the open frontages to the site. The block structure has been developed to encourage pedestrian movement.

Building orientation within the blocks provide surveillance to the streets. Dwellings are generally designed to front onto the higher order streets or to face the public open spaces along the northern and western boundary of the development. At corner locations, the units elevation will be enhanced by adding stone details on doors and windows.

MASTERPLAN DESIGN

KEY:

- SITE BOUNDARY
- BLOCK STRUCTURE
- EXTERNAL POS
- POS
- ACCESS TO THE SITE
- RUDLOE DRIVE
- INFORMAL STREET
- PEDESTRIAN PRIORITISED STREET
- PEDESTRIAN CONNECTION
- CONNECTION TO NEIGHBOURING AREA
- RE-SURFACED ROAD
- END VISTA
- POS FRONTAGE
- RUDLOE DRIVE FRONTAGE
- EXISTING TREES
- ATTENUATION BASIN
- EXISTING SWALE
- KEY GROUPING
- EXISTING SUB-STATION
- EXISTING GAS GOVERNOR

3.5 *Design concept diagram showing proposal*

3.6 STREET STRUCTURE

The overall distribution of major streets illustrated in the Design Access Statement was achieved in our layout, which evolved further through consultation with the planning officers.

The roads have been designed to include the following types:

INFORMAL STREET

These are the main streets which provides access to the development and connects with Rudloe drive. These streets provide a carriageway and a footpath on both sides.

The streets have variations ranging from 4.8m to 5.5m- with a 2m pathway along both ends, apart from where there is no frontage development, the footpath is replaced by a 1m service margin.

PEDESTRIAN PRIORITISED STREET

This street type provides a secondary level of movement around the site, providing connections from the primary road to the rest of the site.

It makes use of shared space design and prioritises people over traffic. These routes reduce vehicle speeds and therefore encourage a larger amount of community interaction.

The width of the shared surface is 4.8m along with 2m service margin on one side.

RE-SURFACED ROAD

This is an existing road which will be re-surfaced and leveled, acting as a shared surface, providing informal parking for the amenity use.

PRIVATE DRIVES

The tertiary streets within the hierarchy are residential lanes. More informal in layout and width, these lanes have been designed to have the lowest visual impact on their surroundings, ensuring areas of hardstanding are reduced and levels of planting are maximised.

MASTERPLAN DESIGN

3.6 *Street Structure diagram showing proposal*

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4.0

BUILT FORM

BUILT FORM

4.1 OVERALL FORM OF DEVELOPMENT

This section provides further detail about the potential form of the proposed development. The following paragraphs describe the character of the development across the site, with an overall approach which is sympathetic to the character of the location.

The built form has evolved from the principles illustrated in the Design Access Statement Document by Pegasus and discussion with the Planning officer and consultants involved, whilst also taking into further consideration the opportunities and constraints presented by the site, particularly to reinforce placemaking principles.

4.2 STOREY HEIGHTS & SCALE

The height and massing of the proposed development varies across the site according to the nature of the public realm to be created. The proposed buildings are primarily two storey in height, with a variety of eaves lines incorporated to help promote variety in the streetscene.

Some buildings at prominent locations, and other locations to break up roof lines are 2.5 storeys in height.

Corner plots are designed with two frontages, often treated as key buildings.

Dwellings shown vary in width and are configured in a full range of typologies. These vary from detached and semi-detached houses to short terraces of houses. Groups and landscaping work together to create well defined streets and spaces which highlight the emphasis on a quality public realm.

The diagram below identifies the storey height design.

KEY:

- 1 STOREY
- 2 STOREYS
- 2.5 STOREYS

4.1 *Storey heights diagram*

4.1

4.3 HOUSING TYPES

The layout has been developed using housing typologies to meet several needs:

1. Townscape: using housing types that contribute to a strong streetscape and high quality of public realm;

2. To meet the requirements of the Section 106 Agreement that accompanies the outline planning permission. The affordable housing is distributed in 4 clusters across the site;

3. To provide a mix of 1, 2, 3 and 4 bedroom homes.

A hierarchy of housing types are included in the masterplan:

1. Smaller two- and three-bedroom homes are largely narrow fronted two storey homes (some 2.5 storey),generally in a semidetached or terraced configuration.

2. Larger three- and four-bedroom homes are generally detached, two storey buildings. They generally include double frontage to assist in the turning of corners at important locations.

4.2 *Affordable tenure plan*

4.4 CHARACTER AREAS

This section provides further detail about how the proposed development has been arranged into a series of prominent frontages,that will aid placemaking and wayfinding within the site area. The prominent frontages include:

- Rudloe Drive Frontage
- POS Frontage

KEY:

POS FRONTAGE

RUDLOE DRIVE FRONTAGE

4.3- *Storey heights diagram showing proposal*

4.3

RUDLOE DRIVE FRONTAGE

proposed This will comprise the dwellings adjacent to Rudloe Drive which connects with the primary accesses into the site and include marker buildings at focal points and key groupings. These dwellings will benefit from the following:

- Carefully massed, in terms of rooflines to respond to the context.

- Built form designed to provide a strong sense of rhythm.

- Typology of primarily semi-detached and detached dwellings.

- Largely two storey development and two and a half storeys on key vista along Rudloe Drive.

- Mix of orange and red brick and re-elevated details in prominent locations.

POS FRONTAGE

This will comprise the dwellings along the POS/Play area facing the public open space on the western boundary and swales on the northern boundary of the site. Units in this area will benefit from the following:

- Dwellings positively arranged along this edge, with a slightly looser built form towards the northern boundary and a denser formation towards the western boundary.

- Mixture of detached and semi-detached dwellings towards the western side and mainly large detached dwellings towards the northern.

- All 2 storeys with a mixture of orange and red brick.

Illustrative Streetscene showing Rudloe Drive frontage

Illustrative Streetscene showing POS frontage

4.4 *Illustrative Streetscene showing Rudloe drive frontage*

4.5 *Illustrative Streetscene showing POS frontage*

4.5 ARCHITECTURAL TREATMENT AND MATERIALS

MATERIALS

IBSTOCK BRUNSWICK FARMHOUSE MIXTURE

BRUNSWICK RED FACING BRICKWORK BY IBSTOCK

RECON STONE DETAIL

RUSSELL GALLOWAY - SLATE GREY

RUSSELL GALLOWAY - COTTAGE RED

BOUNDARIES TREATMENTS

1.8M HIGH RED/BUFF BRICK WALL

1.8M HIGH CLOSE BOARDED FENCING

1.8M HIGH PANEL FENCING

CLIENT: Vistry Group
PROJECT: Land North of Rudloe Drive - Quedgeley
DOCUMENT:RDQUE-MCB-ZZ-ZZ-DR-A-0100-D5-P1_Design Compliance Statement - May 2022 | ©McBains

4.7 *External Materials and Boundary Treatments Plan*

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5.0

DESIGN FOR CRIME PREVENTION

6.0

REFUSE STRATEGY

ACCESS & MOVEMENT

ACCESS & MOVEMENT

The planned site has a movement framework that allows for direct, well-lit access to all units for both pedestrians and vehicles. Rear access to plots will have secure gates enclosed by fence or masonry walls. The development is proposing to utilize shared surfaces in part to enable the residents to take possession of both footpath and roadway. This method will engender a sense of guardianship over the streets by local residents.

STRUCTURE

All properties throughout the development front a defined access route. The number of sides fronting the public realm is reduced and assists in creating ‘active frontages’ which promote natural surveillance. Defensible spaces have also been incorporated into the development as a ‘buffer’ between the dwelling and the highway.

SURVEILLANCE

As previously described the movement framework of the development allows for good natural surveillance. Every opportunity has been taken to avoid ‘inactive frontages’. The well-defined routes reduce areas for potential criminal activity. Any criminal activity would attract attention, and with many overlooking properties and an established sense of guardianship action is more likely to be taken. Car parking is located in areas under natural surveillance from adjoining properties and the use of non-overlooked parking courts has been avoided.

OWNERSHIP

We envisage that the development as designed will promote a sense of ownership, respect, territorial responsibility and community. By designing clearly defined public, semi-private and private spaces we wish to encourage residents and users to generate a sense of ownership and responsibility for their properties and the development, as a whole.

LIGHTING

All adoptable roads will be lit in accordance with a lighting scheme in accordance with GCC requirements. The private mews and parking courtyards will be lit to the LPA’s satisfaction and will be maintained by the relevant RSL or management company. The design of coach lamps and external lighting to individual dwellings plots will also be subject to LPA approval.

MANAGEMENT & MAINTENANCE

It is envisaged that the Local Authority will adopt the majority of the development and will therefore program a regime of high-level cleaning and maintenance. Public Open Spaces will be managed by a private management company. Residents will be responsible for the maintenance of their own respective private property.

ACCESS & MOVEMENT

5.1

5.2

5.1-5.2 *Typical block, showing well defined access and secure private parking and amenity space within*

6.0 REFUSE STRATEGY

The layout has been designed to accommodate the refuse collection requirements of a scheme of apartments and houses. The adjacent diagram is an extract of the submitted Refuse Collection Strategy layout.

HOUSES

Houses will be provided with:

Wheeled bins to the requirement of Gloucester City Council.

A bin storage hardstanding will be provided.

Residents of houses adjacent to the highway will leave their wheeled bins and bags adjacent to the public footway for collection, at the appropriate times.

Residents of houses accessed from private drives, mews and lanes without turning provision, will place their bins at a pre-determined collection point adjacent to the adoptable highway at the appropriate times. These are identified on the collection strategy layout.

Please refer to Engineer's vehicle tracking drawings for further information on turning heads and access requirements.

ACCESS & MOVEMENT

6.1

KEY:

- BIN COLLECTION POINT
- OPERATOR DRAG DISTANCE
- RESIDENT DRAG DISTANCE

6.1 Refuse Strategy Plan


McBains

Rudloe Drive Phase 2, Quedgeley

Vistry Homes Ltd, Cotswolds

Energy and Sustainability Statement

AES Sustainability Consultants Ltd

May 2022

	Author	Date	E-mail address
Produced By:	[redacted]	06.05.2022	[redacted]
Reviewed By:	[redacted]	13.05.2022	[redacted]

Revision	Author	Date	Comment
Initial Issue	[redacted]	13.05.2022	Initial Issue
Revision 1	[redacted]	18.05.2022	Summary of CO_2 saving, proposed approach to condition 19

This statement has been commissioned by Vistry Homes Ltd, Cotswolds to detail the proposed approach to energy and CO_2 reduction to be employed in the development of Rudloe Drive Phase 2, Quedgeley. It should be noted that the details presented, including the proposed specifications, are subject to change as the detailed design of the dwellings progresses, whilst ensuring that the overall commitments will be achieved.

AES Sustainability Consultants

Contents

List of figures & tables

1. Introduction

Preface

1.1. This Energy and Sustainability Statement has been prepared on behalf Vistry Homes Ltd, Cotswolds in support of the reserved matters application for development of the site known as Rudloe Drive Phase 2.

Development Description

1.2. The development site is located on the northern edge of Hardwicke, north of Rudloe Drive, a village 7 km south of the city of Gloucester, within the administrative boundary of Gloucester City Council.

1.3. Outline planning permission was granted in July 2021 (ref: 21/00490/OUT) for:

'Residential development (up to 150 dwellings), associated infrastructure, ancillary facilities, open space and landscaping. (Outline Application with all matters Reserved)"

1.4. The proposals for Rudloe Drive Phase 2 would deliver 150 dwellings across a mix of one to four bed detached, semi-detached, and terraced houses. The proposed site layout is shown in Figure 1.

Purpose and Scope of the Statement

1.5. The statement has been prepared to address Condition 18 of the outline planning permission (ref: 21/00490/OUT) as well as relevant national and local policies relating to sustainable development, including relevant policies within the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011-2031.

1.6. Future changes to national guidance affecting the application of these policies have additionally been reviewed, together with an examination of how the proposed strategy aligns with the revised Part L 2021 standards.

Figure 1. Proposed Site Layout

2. Planning Policy and Conditions

Local Planning Policy

2.1. This statement will address relevant policies within the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011-2031 relating to sustainable design and construction, in particular Policy SD3: Sustainable Design and Construction:

Policy SD3: Sustainable Design and Construction

1. Development proposals will demonstrate how they contribute to the aims of sustainability by increasing energy efficiency, minimising waste and avoiding the unnecessary pollution of air, harm to the water environment, and contamination of land or interference in other natural systems. In doing so, proposals (including changes to existing buildings) will be expected to achieve national standards

2. All development will be expected to be adaptable to climate change in respect of the design, layout, siting, orientation and function of both buildings and associated external spaces. Proposals must demonstrate that development is designed to use water efficiently, will not adversely affect water quality, and will not hinder the ability of a water body to meet the requirements of the Water Framework Directive;

3. All development will be expected to incorporate the principles of waste minimisation and re-use. Planning applications for major development must be accompanied by a waste minimisation statement, which demonstrates how any waste arising during the demolition, construction and subsequent occupation of the development will be minimised and sustainably managed

4. To avoid unnecessary sterilisation of identified mineral resources, prior extraction should be undertaken where it is practical, taking into account environmental acceptability and economic viability relating both to extraction of the mineral(s) and subsequent implementation of the non-minerals development of the site

5. Major planning applications must be submitted with an Energy Statement that clearly indicates the methods used to calculate predicted annual energy demand and associated annual Carbon Dioxide (CO2) emissions.

2.2. The statement will also address the proposals for the generation of energy from renewable resources, as outlined in Policy INF5: Renewable Energy/Low Carbon Energy Development:

Policy INF5: Renewable Energy/Low Carbon Energy Development

6. Proposals for the generation of energy from renewable resources, or low carbon energy development (with the exception of wind turbines), will be supported, provided the wider environmental, social or economic benefits of the installation would not be outweighed by a significant adverse impact on the local environment, taking into account the following factors:

    - The impact (or cumulative impact) of the scheme, including any associated transmission lines, buildings and access roads, on landscape character, local amenity, heritage assets or biodiversity.
    - Any effect on a protected area such as The Cotswolds AONB or other designated areas such as the Green Belt.
    - Any unacceptable adverse impacts on users and residents of the local area, including emissions, noise, odour and visual amenity.

7. Proposals are more likely to be supported when they demonstrate:

    - That they have been designed and sited so as to minimise any adverse impacts on the surrounding area.
    - Benefits arising directly from the scheme to the local economy, the community and achievement of national targets.
    - The feasibility and cost-effectiveness of removing any installation and re-instatement of the site in future years.
    - The net gain of carbon savings, taking into account carbon use through manufacturing and installation of the technology.

This policy contributes towards achieving Objectives 1, 3, 4 and 6

2.3. The statement will also address the proposals for dwelling to be fitted with Electric Vehicle Charging Points, as outlined in policy SD4: Design Requirements

Policy SD4: Design Requirements

New development should be designed to integrate, where appropriate, with existing development, and prioritise movement by sustainable transport modes, both through the application of legible connections to the wider movement network, and assessment of the hierarchy of transport modes set out in Table SD4a below. It should:

- Be well integrated with the movement network within and beyond the development itself
- Provide safe and legible connections to the existing walking, cycling and public transport networks;
- Ensure accessibility to local services for pedestrians and cyclists and those using public transport
- Ensure links to green infrastructure;
- Incorporate, where feasible, facilities for charging plug-in and other ultra-low emission vehicles;
- Be fully consistent with guidance, including that relating to parking provision, set out in the Manual for Gloucestershire Streets and other relevant guidance documents in force at the time.

2. Detailed requirements of masterplans and design briefs, should the Local Planning Authority consider they are required to accompany proposals, are set out in Table SD4d. These requirements are not exhaustive.

Planning Conditions

2.4. Outline planning permission for the development was granted in July 2021 under application reference 21/00490/OUT. This statement will address Conditions 18 and 19, extracted below:

Condition 18

Reserved Matters applications shall be accompanied by an Energy Statement that clearly sets out the predicted annual energy demand from the development and associated annual carbon dioxide emissions, and demonstrates how the development contributes to the aims of sustainability by increasing energy efficiency. The application shall include clear details of any proposed measures including detailing any external facilities on the submitted plans and/or associated documents.

Reason: To assess the contribution to sustainable design and construction.

Condition 19

The development hereby permitted shall not be first occupied until the proposed dwellings have been fitted with an electric vehicle charging point. The charging points shall comply with BS EN 62196 Mode 3 or 4 charging and BS EN 61851 and Manual for Gloucestershire Streets. The electric vehicle charging points shall be retained for the lifetime of the development unless they need to be replaced in which case the replacement charging points shall be of the same specification or a higher specification in terms of charging performance.

Reason: To promote sustainable travel and healthy communities.

National Planning Policy Framework

2.5. On the 20th July 2021, the Government published the revised National Planning Policy Framework (NPPF), which sets out the Government's planning policies for England and how these are expected to be applied. At the heart of the NPPF is a presumption in favour of sustainable development

2.6. Chapter 14 of the NPPF outlines its energy and climate change policies. New development should be planned in ways that:

- avoid increased vulnerability to the range of impacts arising from climate change…
- can help to reduce greenhouse emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.

2.7. In determining planning applications, local planning authorities should expect new developments to:

- comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable
- take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.

2.8. This chapter also outlines the requirement of Local Plans to take account of climate change over the longer term, including factors such as flood risk, coastal change, water supply and changes to biodiversity and landscape. The key focus of the NPPF is to support local and regional planning authorities.

Current and Future National Policy Standards

2.9. Government policy in relation to the energy performance of buildings has been evolving over the past decade, following government commitments to reduce the emission of greenhouse gases – particularly CO_2. This obligation was enshrined in the Climate Change Act 2008, which commits the UK to achieving a mandatory 80% reduction in the UK's CO_2 emissions by 2050, compared with 1990 levels.

2.10. In 2016, the UK government ratified the Paris Agreement, which provides a framework for governments to pursue the target of limiting global warming below 2°C.

2.11. In June 2019, the Government announced it had set a new net zero greenhouse gas emission target for the UK by 2050, compared with the previous target of at least 80% reduction from 1990 levels.

2.12. The built environment has a key role to play in delivering on these international commitments, as it accounts for approximately a third of overall CO_2 emissions. These commitments have been translated into national policies within the built environment driven by, amongst other mechanisms, the EU Energy Performance of Buildings Directive and the 2012 Energy Efficiency Directive.

2.13. Following the introduction of the 2013 edition of Building Regulations Part L, the successive updates now require regulated CO_2 emissions levels from new build domestic buildings to be approximately 30% lower than 2006 levels.

2.14. The Government proposes that the Building Regulations are the appropriate mechanism to drive future standards with respect to energy consumption, with local authorities able to apply the optional requirements of the national technical standards with respect to water consumption and space.

2.15. As an acknowledgement of the challenge to the built environment in meeting future 'net zero' targets, the Government published the next revision to the Building Regulations Approved Document L1A (Part L) in December 2021.

2.16. The uplift to Part L 2021 will incorporate:

Higher Standards for Carbon Dioxide Emissions

2.17. The CO_2 emissions requirement is set at a 31% improvement on Part L 2013, expected to be met through a combination of efficient heating systems, improved fabric standards and on-site renewable energy generation.

Higher Standards for Fabric Energy Efficiency

2.18. The Building Regulations control thermal insulation requirements through setting an upper limit on space heating demand. These requirements will be further improved in Part L 2021, meaning that insulation standards will need to be improved.

Introduction of Primary Energy Demand Compliance Metric

2.19. The regulations will introduce a primary energy demand compliance metric. This is in order to align the regulations with the amended EU Energy Performance of Building Directive (2018), which states:

> "The energy performance of a building shall be expressed by a numeric indicator of primary energy use in kWh/ (m^2.y) for the purpose of both energy performance certification and compliance with minimum energy performance requirements."

2.20. Primary energy is an expression of the energy content available in a fuel / fuel source which has not undergone any conversion or transformation process. Individual factors are assigned to all fuel types to take account of upstream processes and energy use – e.g., mains electricity has a higher factor due to the additional transformation and distribution processes that the energy undergoes before it reaches the home, compared with gas where the fuel is burned directly within the dwelling.

2.21. Dwellings will therefore be assessed based on their primary energy consumption in a similar way to current carbon compliance.

Revised Transitional Arrangements

2.22. Revised transitional arrangements will apply once the new regulatory standards are introduced. Dwellings will now need to be covered by the building notice, initial notice, or full plans before July 2022 and individual plots commenced prior to July 2023 in order to continue under Part L 2013. Registration or commencement falling after these dates means that dwellings will be required to meet Part L 2021 standards.

Proposed Approach

2.23. Due to the development timescales, it is considered that a portion of the development is likely to fall under current Part L 2013 and a portion under Part L 2021.

2.24. In recognition of these variables, this Energy and Sustainability Statement has considered the likely impact of future Building Regulations requirements. With respect to carbon reduction, the dwellings built to meet Part L 2021 will deliver a >31% reduction compared with current regulatory standards, thereby satisfying the requirements as set out in the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011-2031 and Condition 18 of the outline planning permission (ref: 21/00490/OUT).

2.25. The development will achieve these carbon reductions through higher fabric standards and low carbon and renewable energy systems being installed to offset emissions and reduce fuel bills for residents.

2.26. This statement provides an indicative fabric specification and a strategy which would enable the dwellings to meet these higher standards, with the precise strategy to achieve this being subject to change as detailed design of the dwellings is progressed.

2.27. With regard to condition 19, mode 3 charging points will be provided to proposed dwellings through dedicated wall boxes with control electronics built in. Where possible these will be positioned within garages, where plot parking is provided these will be positioned on the external gable wall adjacent to the driveway. For houses and maisonettes with front parking, where possible, the charging points will be positioned on the front elevation, adjacent to the front door.

2.28. Additional sustainable construction considerations are additionally addressed, including overheating risk, climate resilience, waste and water consumption.

3. Energy and CO_2 Reduction Strategy

3.1. As shown in Table 1, the CO_2 reduction standards contained within Part L were increased in 2010 and 2013, reducing the 'Target Emission Rate' (TER) by approximately 25% and a further 6% (9% for non-residential) respectively, requiring substantial improvements to thermal insulation and heating services, or a significant increase in on-site renewable energy provision.

3.2. The 2021 uplift to the regulations will require a further 31% reduction in emissions, delivering dwellings with emissions levels less than half of homes built to L1A 2006 standards.

Table 1. CO_2 Emissions improvements from successive Part L editions

Building Regulations	CO_2 emissions improvements
L1A 2006	-
L1A 2010	**25%**
L1A 2013	**6%**
L1A 2021	**31%**

Energy Reduction Strategy – Fabric First

3.3. It is proposed that the energy demand reduction strategy for the development incorporates further improvements beyond a Part L compliant specification and initially concentrates finance and efforts on reducing energy demand as the first stage of the Energy Hierarchy (Figure 2).

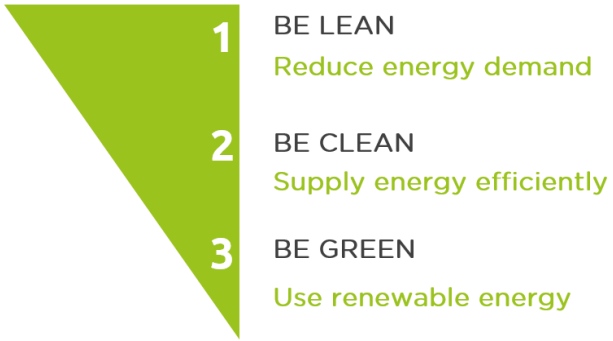

Figure 2. The Energy Hierarchy

Be Lean – reduce energy demand

3.4. The design of a development - from the masterplan to individual building design - will assist in reducing energy demand in a variety of ways, with a focus on minimising heating, cooling and lighting loads. Key considerations include:

- Building orientation – maximise passive solar gain and daylight
- Building placement – control overshading and wind sheltering
- Landscaping – control daylight, glare and mitigate heat island effects
- Building design – minimise energy demand through fabric specification

Be Clean – supply energy efficiently

3.5. The design and specification of building services to utilise energy efficiently is the next stage of the hierarchy, taking into account:

- High efficiency heating and cooling systems
- Ventilation systems (with heat recovery where applicable)
- Low energy lighting
- High efficiency appliances and ancillary equipment

Be Green – use low carbon / renewable energy

3.6. Low carbon and renewable energy systems form the final stage of the energy hierarchy and can be used to directly supply energy to buildings, or offset energy carbon emissions arising from unavoidable demand. This may be in the form of:

- Low carbon fuel sources – e.g., biomass
- Heat pump technologies
- Building scale renewable energy systems
- Small-scale heat networks
- Development-scale heat networks

3.7. As this hierarchy demonstrates, designing out energy use is weighted more highly than the generation of low-carbon or renewable energy to offset unnecessary demand. Applied to the development, this approach is referred to as 'fabric first' and concentrates finance and efforts on improving U-values, reducing thermal bridging, improving airtightness, and installing energy efficient ventilation and heating services.

3.8. This approach has been widely supported by industry and government for some time, particularly in the residential sector, with the Zero Carbon Hub[1] and the Energy Savings Trust[2] having both stressed the importance of prioritising energy demand as a key factor in delivering resilient, low energy buildings.

3.9. The benefits to prospective homeowners of following the Fabric First approach are summarised in Table 2.

Table 2. Benefits of the Fabric First approach

	Fabric energy efficiency measures	Bolt-on renewable energy technologies
Energy/CO_2/fuel bill savings applied to all dwellings	✓	×
Savings built-in for life of dwelling	✓	×
Highly cost-effective	✓	×
Increases thermal comfort	✓	×
Potential to promote energy conservation	✓	✓
Minimal ongoing maintenance / replacement costs	✓	×
Significant disruption to retrofit post occupation	✓	×

Building Regulations Standards – Fabric Energy Efficiency

3.10. In addition to the CO_2 reduction targets, the importance of energy demand reduction was further supported by the introduction of a minimum fabric standard into Part L1A 2013, based on energy use for heating and cooling a dwelling. This is referred to as the 'Target Fabric Energy Efficiency' (TFEE), and expressed in kWh/m²/year.

3.11. This standard enables the decoupling of energy use from CO_2 emissions and serves as an acknowledgement of the importance of reducing demand, rather than simply offsetting CO_2 emissions through low carbon or renewable energy technologies.

3.12. The TFEE is calculated based on the specific dwelling being assessed with reference values for the fabric elements contained within Approved Document L1A. These reference values are described as 'statutory guidance' as opposed to mandatory requirements, allowing full flexibility in design approach and balances between different aspects of dwelling energy performance to be struck so that the ultimate goal of achieving the TFEE is met.

[1] Zero Carbon Hub, Zero Carbon Strategies for tomorrow's new homes, Feb 2013

[2] Energy Savings Trust, Fabric first: Focus on fabric and services improvements to increase energy performance in new homes, 2010

3.13. These standards will be tightened under Part L 2021, The proposed approach and indicative construction specifications are set out in the following sections of this Strategy.

Fabric Standards

3.14. In order to ensure that the energy demand of the development is reduced, the dwellings have been designed to minimise heat loss through the fabric wherever possible. Table 3 details the proposed fabric specification of the major building elements, with the first column in this table setting out the Part L1A 2013 and Part L1A 2021 limiting fabric parameters in order to demonstrate the potential improvements.

Table 3. Proposed Construction Specification – Main Elements

	Part L1a 2013 Limiting Fabric Parameters	Part L1a 2021 Limiting Fabric Parameters	Indicative Specification
External wall – u-value	0.30 W/m²K	0.26 W/m²K	0.20 – 0.23 W/m²K
Party wall – u-value	0.20 W/m²K	0.20 W/m²K	0.00 W/m²K
Plane roof – u-value	0.20 W/m²K	0.16 W/m²K	0.11 W/m²K
Ground floor – u-value	0.25 W/m²K	0.18 W/m²K	0.12 – 0.17 W/m²K
Windows – u-value	2.00 W/m²K	1.60 W/m²K	1.20 – 1.40 W/m²K
Doors – u-value	2.00 W/m²K	1.60 W/m²K	1.1 W/m²K
Air Permeability	10.00 m³/h.m² at 50 Pa	8.00 m³/h.m² at 50 Pa	4.00 – 5.00 m³/h.m² at 50 Pa
Thermal Bridging	Y = 0.150 (default)	Y = 0.150 (default)	Y = ≤ 0.040 (estimated)

Thermal Bridging

3.15. The significance of thermal bridging as a potentially major source of fabric heat losses is increasingly understood. Improving the U-values for the main building fabric without accurately addressing the thermal bridging will not achieve the desired energy and CO_2 reduction targets.

3.16. The specification seeks to minimise unnecessary bridging of the insulation layers, with avoidable heat loss therefore being reduced wherever possible. Accurate calculation of these heat losses forms an integral part of the SAP calculations undertaken to establish energy demand of the dwellings, and as such thermal modelling will be undertaken to assess the performance of all main building junctions.

Energy Efficient Heating and Lighting

3.17. Heat generation and distribution systems will be designed to give the occupants a high level of control over their use, encouraging and allowing energy-efficient behaviour. High efficiency combi boilers should be installed to properties to eliminate the need for hot water cylinders where feasible. Primary pipework should be fully insulated.

3.18. Internal lighting will be low energy wherever possible. External security and space lighting should be low energy and fitted with PIR and daylight sensors where appropriate.

3.19. Where necessary, units will be installed with Waste Water Heat Recovery (WWHR) systems. WWHR retrieves thermal energy from hot water used in a shower before it disappears down the drain. This happens through a heat exchanger, in which cold mains water is passed around a copper waste pipe to gain a temperature rise, before continuing to the boiler 'pre heated'. This in turn relieves the workload of the boiler, reducing energy demand.

3.20. Where necessary, units will be installed with a Flue Gas Heat Recovery (FGHR) system. FGHR recovers waste heat from flue gases. The recovered heat is used to preheat the cold water entering the boiler, decreasing the energy required to warm the water up to the required level.

Passive Design Measures and Overheating Risk Mitigation

3.21. Glazing will be specified with a solar transmittance value (g-value) to strike the balance between useful solar gain in the winter and unwanted solar gain in the summer.

3.22. Where feasible, dwellings will be fitted with high-efficiency combination boilers, removing the need for hot water cylinders which would lose useful heat to the dwelling at the rate of around 1.5kWh/day, or circa 550kWh over the course of a year.

3.23. Due to these measures to reduce internal heat gain, natural ventilation provided through window openings and the opportunity for cross ventilation will allow sufficient air exchange rates to purge any heat build-up. Active cooling systems are therefore not proposed.

3.24. By following these principles, the development will be designed to build in resilience to a potentially changing climate over the lifetime of the buildings and minimise overheating risk,

which can be exacerbated by the drive to build better insulated, more airtight homes if not considered within the design and construction process.

Air Leakage

3.25. After conductive heat losses through building elements are reduced, convective losses through draughts are the next major source of energy wastage. The proposal adopts an airtightness standard of < 4.00 - 5.00$m^3/h.m^2$ at 50Pa, with pressure testing of all dwellings to be undertaken on completion to confirm that the design figure has been met.

Provisions for Energy-Efficient Operation of the Dwelling

3.26. The occupant of the dwelling should be provided with all necessary literature and guidance relating to the energy efficient operation of fixed building services. Currently it is assumed that all dwellings will be provided with modern gas-fired heating systems.

4. Low Carbon and Renewable Energy

4.1. A range of technologies have been assessed for potential incorporation into the scheme in accordance with Regulation 25A of the Building Regulations and to assess the systems which may be applicable on site to future Regulatory standards.

Combined Heat and Power (CHP) and District Energy Networks

4.2. A CHP unit is capable of generating heat and electricity from a single fuel source. The electricity generated by the CHP unit is used to displace electricity that would otherwise be supplied from the national grid, with the heat generated as effectively a by-product utilised for space and water heating. However, the reduced emissions from the national grid due now means that CHP systems will not deliver CO_2 savings.

4.3. In addition, the economic and technical viability of a CHP system is largely reliant on a consistent demand for heat throughout the day to ensure that it operates for over 5000 hours per year. Heat demand from mainly residential schemes is not conducive to efficient system operation, with a defined heating season and intermittent daily profile, with peaks in the morning and the evening. For this reason, the use of a CHP system is considered unfeasible for this development.

4.4. There are currently no heat networks which extend near the proposed development. High network heat losses associated with distribution to individual houses, as opposed to large high-rise apartment blocks and commercial developments mean that a new heat network to serve the area is not considered viable or an environmentally preferred option.

4.5. The adjacent Countryside development discounts heat network solutions on the same basis, therefore there is no potential for a combined network serving both developments.

Wind Power

4.6. Locating wind turbines adjacent to areas with buildings presents a number of potential obstacles to deployment. These include the area of land onsite required for effective operation, installation and maintenance access, environmental impact from noise and vibration, visual impact on landscape amenity and potential turbulence caused by adjacent obstacles, including the significant amount of woodland on and around the development.

4.7. A preliminary examination of the BERR wind speed database indicates that average wind speeds at 10m above ground level are around 4.50m/s [3]. Wind turbines at this site are therefore unlikely to generate sufficient quantities of electrical energy to be cost effective[4]. For these reasons wind power is not considered feasible.

Building Scale Systems

4.8. The remaining renewable or low carbon energy systems considered potentially feasible are at a building scale. These are as follows;

- Individual biomass heating
- Solar thermal
- Solar photo-voltaic (PV)
- Air Source Heat Pumps (ASHPs)
- Ground Source Heat Pump (GSHPs)

4.9. The advantages and disadvantages of these technologies are evaluated in Tables 4-8.

[3] NOABL Wind Map (http://www.rensmart.com/Weather/BERR)

[4] CIBSE TM38:2006. Renewable energy sources for buildings.

Table 4. Individual biomass heating feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Potential to significantly reduce CO_2 emissions as the majority of space and water heating will be supplied by a renewable fuel • Decreased dependence on fossil fuel supply	• A local fuel supply is required to avoid increased transport emissions • Fuel delivery, management and security of supply are critical • Space is required to store fuel, a thermal store and plant • A maintenance regime would be required even though modern systems are relatively low maintenance • Building users or a management company must be able to ensure fuel is supplied to the boiler as required. • Local environmental impacts potentially include increased NO_x and particulate emissions
Estimated costs and benefits	
• Cost £2,000 upwards for a wood-pellet boiler, not including cost of fuel • Not eligible for RHI payments as new-build properties	
Conclusions	
Biomass heating is considered technically feasible in large dwellings provided sufficient space can be accommodated for fuel supply, delivery and management however air quality concerns mean that it is not considered appropriate.	

Table 5. Solar thermal systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Mature and reliable technology offsetting the fuel required for heating water (typically gas) • Solar thermal systems require relatively low maintenance • Typically, ~50% of hot water demand in dwellings can be met annually	• Installation is restricted to favourable orientations on an individual building basis • The benefit of installation is limited to the water heating demand of the building • Safe access must be considered for maintenance and service checks • Buildings need to be able to accommodate a large solar hot water cylinder • Distribution losses can be high if long runs of hot water pipes are required • Visual impact may be a concern in special landscape designations (e.g. AONB)
Estimated costs and benefits	
• Cost £2,000 - 5,000 for standard installation • Not eligible for RHI payments as new-build properties • Ongoing offset of heating fuel, minimal maintenance requirements	
Conclusions	
Solar thermal systems are considered technically feasible on all buildings with suitable roof orientations.	

Table 6. Solar photovoltaic systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• The technology offsets the high carbon content of grid supplied electricity used for lighting, pumps and fans, appliances and equipment • Mature and well proven technology that is relatively easily integrated into building fabric • Adaptable to future system expansion • Solar resource is not limited by energy loads of the dwelling as any excess generation can be transferred to the national grid • PV systems generally require very little maintenance • Service and maintenance requirement minimal, and 2-3 storey buildings should not require significant additional safety measures (mansafe systems etc) for roof access	• Poor design and installation can lead to lower than expected yields (e.g. from shaded locations) • Installation is restricted to favourable orientations • Feed in Tariff support mechanism has been discontinued • Safe access must be considered for maintenance and service checks • Visual impact may be a concern in special landscape designations (e.g. AONB) or conservation areas • Reflected light may be a concern in some locations
Estimated costs and benefits	
• Cost £1,500 upwards (1kWp+) and scalable • Ongoing offset of electricity fuel costs, minimal maintenance requirements	
Conclusions	
PV panels are considered technically feasible for all buildings with suitable roof orientations. The relatively low cost, carbon saving potential and limited additional impacts mean that PV is considered a feasible option for this development.	

Table 7. Air Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 250% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings • With grid decarbonisation will be a low carbon heating source in future	• Air source heat pumps are powered by electricity, with a significantly higher unit price than gas, leading to potentially increased running costs • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved. Users must be educated in how heat pump systems should be operated for optimal efficiency • Air source heat pump plant should be integrated into the building design to mitigate concerns regarding the visual impact of bolt-on technology • Noise in operation may be an issue particularly when operating at high output
Estimated costs and benefits	
• Cost £5,000 - £7,000 for standard installation • Not eligible for RHI payments as new-build properties	
Conclusions	
Air source heat pumps are technically feasible for the buildings in this scheme. However, the capital and running cost increases in comparison to a gas baseline means that they are not considered a preferred low carbon technology at this stage.	

Table 8. Ground Source Heat Pump systems feasibility appraisal

Potential Advantages	Risks & Disadvantages
• Heat pumps are relatively mature technology providing heat using the reverse vapor compression refrigeration cycle • Heat pumps are a highly efficient way of providing heat using electricity, with manufacturers reporting efficiencies from 320% • Can be of increased benefit where cooling is also required, therefore particularly relevant to commercial buildings • With grid decarbonisation will be a low carbon heating source in future	• Low temperature heating circuits (underfloor heating) would be required to maximise the efficiency of heat pumps • A hot water cylinder would also be required for both space and water heating • Ground source heat pumps are powered by electricity with a significantly higher unit price than gas, leading to potentially increased running costs • It is critical that heat pump systems are designed and installed correctly to ensure efficient operation can be achieved • Ground source heat pumps either require significant land to incorporate a horizontal looped system or significant expense to drill a bore hole for a vertical looped system
Estimated costs and benefits	
• Cost circa £10,000+ • Running cost linked to COP of heat pump, circa 3.0 equates to 66% reduction vs electricity or around 5-6p/kWh (higher than mains gas) • Additional costs to upgrade electricity infrastructure currently unknown	
Conclusions	
Ground source heat pumps are considered technically feasible for buildings in this scheme. However, the cost and difficulty associated with vertical boreholes at this site means that they are not considered a preferred low carbon technology at this stage.	

Summary

4.10. Following this feasibility assessment, it is considered that as biomass heating systems would require significant storage space for fuel as well as regular deliveries at different times to all dwellings, they are not appropriate for this development.

4.11. Roof-mounted systems are therefore likely to be most suited to the development:

- Solar thermal systems to dwellings that have space to incorporate a hot water cylinder and a suitable roof orientation.
- Solar photovoltaic modules to dwellings that have suitable roof orientations.

4.12. It is considered that solar PV systems are most appropriate in meeting a significant proportion of energy demand without introducing additional energy loss through larger hot water cylinders. These will be installed to south and east/west facing roof pitches, with the specific units and system sizes to be assessed when bringing forward designs for each phase of development as required.

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5. As-Designed Performance

5.1. It is expected that a proportion of the development will be built to current Part L 2013 and a proportion to Part L 2021. It will be ensured as design progresses that revised calculations will be undertaken on a plot-by-plot basis under the relevant Part L to accurately represent the final CO_2 emissions of the development.

5.2. Through following the strategy described, the dwellings built under Part L 2013 Building Regulations will significantly reduce energy demand and consequent CO_2 emissions beyond a Part L compliant level of performance through improvements to the dwelling fabric.

5.3. Table 9 provides an overview of the typical as-designed CO_2 emissions of the sample dwellings assessed under Part L 2013 to with the proposed fabric first strategy applied.

Table 9. Sample dwelling as-designed CO_2 emissions (Part L 2013)

House Type	Part L 2013 Target CO_2 Emissions ($kgCO_2/yr$)	As-Designed CO_2 Emissions ($kgCO_2/yr$)	Reduction %
2 Bed End Terrace	1,560	1,544	1.01
3 Bed End Terrace	1,763	1,714	2.78
4 Bed Detached	2,037	2,022	0.74
2 Bed Mid Terrace	1,364	1,299	4.76
3 Bed End Terrace	1,630	1,608	1.32
3 Bed Semi Detached	1,628	1,581	2.86
4 Bed Detached	2,151	2,142	0.42

5.4. Table 10 demonstrates the site-wide savings over and above the Part L 2013 compliant baseline that will be delivered.

Table 10. Site-wide as-designed energy demand and CO_2 emissions after fabric measures (Part L 2013)

	CO_2 Emissions ($kgCO_2/yr$)	
Part L compliant (Part L 2013)	258,864	
After fabric measures (Part L 2013)	254,721	
	$kgCO_2/yr$	%
Total site-wide savings	4,143	1.60

Future Regulations – Part L 2021

5.5. Through following the strategy described, the dwellings built under Part L 2021 will deliver a >31% reduction compared with current regulatory standards. These carbon reductions will be achieved through higher fabric standards, and the use of Waste Water Heat Recovery systems (WWHR), Flue Gas Heat Recovery systems (FGHR), and the use of solar PV systems.

5.6. Using Beta SAP software (final version still pending release at time of writing), a sample range of dwellings have been assessed under Part L 2021 to establish the baseline CO_2 emissions of the dwellings that will be constructed under Part L 2021, with the proposed fabric strategy applied to provide an overview of the typical as-designed CO_2 emissions. The results of these calculations are shown in Table 11.

Table 11. Sample dwelling as-designed CO^2 emissions (Part L 2021)

House Type	Part L 2021 Target CO_2 Emissions ($kgCO_2/yr$)	As-Designed CO_2 Emissions ($kgCO_2/yr$)	Reduction %
2 Bed End Terrace	963	922	4.23
3 Bed End Terrace	1,129	1,090	3.39
4 Bed Detached	1,199	1,174	2.11
2 Bed Mid Terrace	836	791	5.45
3 Bed End Terrace	985	953	3.27
3 Bed Semi Detached	1,041	1,006	6.28
4 Bed Detached	1,251	1,157	7.55

6. Sustainable Design

6.1. This section sets out details of additional resource efficiency and sustainable design principles to be applied at the development.

Materials

6.2. The impacts of construction materials range from the depletion of natural resources to the greenhouse gas emissions and water use associated with their manufacture and installation.

6.3. Within the development choices will be made in order to reduce the consumption of primary resources and using materials with fewer negative impacts on the environment, including but not limited to the following;

- Use fewer resources and less energy through designing buildings more efficiently
- Specify and select materials and products that strike a responsible balance between social, economic and environmental factors
- Incorporate recycled content, use resource-efficient products and give due consideration to end-of-life uses
- Influence, specify and source increasing amounts of materials which can be reused and consider future deconstruction and recovery
- All insulating materials will have a Global Warming Potential (GWP) of < 5 in manufacture and installation.
- All materials used in construction will be responsibly sourced, with certification obtained wherever possible. Materials with a low environmental impact as per the BRE Green Guide will be preferred.

Waste

6.4. Sending waste to landfill has various environmental impacts, such as the release of local pollution, ecological degradation and methane emissions, in addition to exacerbating resource depletion. Waste in housing comes from two main streams; construction waste and domestic waste during occupation.

Household waste

6.5. In this respect regard has been given to the policy advice contained in the NPPF together with the Council's current guidance to ensure that the new dwellings are provided with adequate storage facilities for both waste and recyclable materials.

6.6. Gloucester City Council currently operates domestic waste collection services through which households are able to recycle materials including paper and cardboard, plastic bottles and food containers, tins, glasses and metal foils, together with garden waste.

Construction waste

6.7. The construction process will be managed to effectively and appropriately monitor and manage construction site waste. Target benchmarks for resource efficiency will be set in accordance with best practice – e.g., m^3 of waste per $100m^2$ / tonnes waste per m^2.

6.8. Wherever possible materials will be diverted from landfill through re-use on site, reclamation for re-use, returned to the supplier where a 'take-back' scheme is in place or recovered and recycled using an approved waste management contractor.

Electrical Vehicle Charging Points

6.9. There is a government ambition for all new cars to be effectively zero emission by 2035. The 'Road to Zero' strategy set out a £1.5b package of support for the transition. A number of initiatives are already in place including grants, as well as road tax and vehicle excise duty exemptions.

6.10. It is recognised that there is a need to ensure that the development is adaptable to accommodate a future shift in personal transportation to electric vehicles, to promote sustainable transport and to minimise air pollution. As Electric Vehicle (EV) ownership increases, developers have an increasing responsibility to provide EV charging points for occupants.

6.11. The development will ensure adequate provision of electric vehicle charging points, satisfying condition 19 of the outline permission (Ref: 21/00490/OUT).

6.12. Further technical details of the charger along with locations will be provided at the appropriate time as preparation for the development progresses.

Water Conservation

6.13. In line with Policy SD3 and current Building Regulations, water use will be managed effectively throughout the development through the incorporation of appropriate efficiency measures.

6.14. Water efficiency measures including the use of efficient dual flush WCs, low flow showers and taps and appropriately sized baths will be encouraged with the aim to limit the use of water during the operation of the development to limit water use.

6.15. Table 12 shows how the development could achieve a total water consumption of 125 litres/occupier/day for the intended specification, in line with current regulatory standards.

Table 12. Typical Water Demand Calculation

Installation Type	Unit of measure	Capacity/ flow rate	Litres/Person/Day
WC (dual flush)	Full flush (l)	4	5.84
	Part flush (l)	2.6	7.70
Taps (excluding kitchen taps)	flow rate (l/min)	5	9.48
Bath	Capacity to overflow (l)	181	19.91
Shower	Flow rate (l/min)	8	34.96
Kitchen sink taps	Flow rate (l/min)	3.8	12.03
Calculated Use			111.6
Normalisation Factor			0.91
Total Internal Consumption (L)			101.5
External Use			5.0
Building Regulations 17.K			106.5

AES Sustainability Consultants

7. Conclusions

7.1. This Energy and Sustainability Statement has been prepared by AES Sustainability Consultants Ltd on behalf of Vistry Homes Ltd, Cotswolds to detail the proposed approach to sustainable construction to be employed at the development known as Rudloe Drive Phase 2, Quedgeley.

7.2. The development site is located on the northern edge of Hardwicke, north of Rudloe Drive, a village 7 km south of the city of Gloucester, within the administrative boundary of Gloucester City Council. The proposals would deliver 150 dwellings across a mix of one to four bed detached, semi-detached, and terraced houses

7.3. The statement has been prepared to address Condition 18 of the outline planning permission (ref: 21/00490/OUT) as well as relevant national and local policies relating to sustainable development, including 'Policy SD3: Sustainable Design and Construction' and 'Policy SD4: Design Requirements' of the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011-2031.

7.4. Due to the development timescales, it is considered that a portion of the development is likely to fall under current Part L 2013 and a portion under Part L 2021.

7.5. In recognition of these variables, this Energy and Sustainability Statement has considered the likely impact of future Building Regulations requirements. With respect to carbon reduction, the dwellings built to meet Part L 2021 will deliver a >31% reduction compared with current regulatory standards, thereby satisfying the requirements as set out in the Gloucester, Cheltenham and Tewkesbury Joint Core Strategy 2011-2013 and Condition 18 of the outline planning permission (ref: 21/00490/OUT).

7.6. The statement sets out a fabric first approach to sustainable construction, demonstrating that decisions about the built form, orientation and design as well as improvements in insulation specification, a reduction in thermal bridging, unwanted air leakage paths and further passive design measures will reduce energy demand in line with the Energy Hierarchy.

7.7. A range of potentially appropriate technologies have been assessed for feasibility in delivering further reductions as required by future Regulatory standards, concluding that solar PV constitutes both the preferred and viable technology for this site.

7.8. The statement additionally addresses further sustainable construction considerations, including overheating risk, climate resilience, waste and water consumption.

7.9. Part of the scheme will be built under Part L 2013 Building Regulations, providing an estimated overall CO_2 saving of 1.6% above current regulatory standards. The remainder of the development will be built to Part L 2021 Building Regulations and will provide a >31% improvement over Part L 2013. These standards will be achieved through improved fabric standards combined with the use of solar PV.

VISTRY GROUP

PROPOSED RESIDENTIAL DEVELOPMENT,
RUDLOE DRIVE, QUEDGELEY

Landscape Specification & Management Plan

May 2022 | LA5530-LSMP-01

Placemaking for life

Quality Assurance

ISO 9001 & 14001 Registered Firm

IDP Landscape Ltd is a practice of Chartered Landscape Architects and a registered company with the Landscape Institute. This report has been prepared in accordance with the Guidelines for Landscape and Visual Impact Assessment 3rd Edition, and the opinions expressed within it are those of qualified Landscape Architects, whose professional judgement is relied upon.

Managing Director: Kevin Charsley BA Hons DipLA CMLI *(Chartered Member of the Landscape Institute)*

Registered Address: 27 Spon Street, Coventry, CV1 3BA **Company number: 08781793**
Telephone: [redacted] | **Email:** [redacted] | **Website:** www.weareidp.com

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TABLE OF CONTENTS

For detailed soft landscape design refer to:

Soft Landscape Proposals LA5530-001; 002; 003 and 004

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1.0 INTRODUCTION

1.1. IDP Landscape Ltd are appointed by Vistry Group (Cotswolds) to provide the landscape specification management plan for the proposed housing development on land off Rudloe Drive, Quedgeley. The development is subject to outline planning approval (Application Reference: 21/00490/OUT) and planning conditions which require the submission of details of planting and maintenance schedules. This report is intended to discharge condition 13 which is attached to the outline planning approval.

1.2. This LSMP will include long term objectives for the landscape scheme, management responsibilities, and appropriate maintenance schedules etc. for all landscape areas in line with the condition. The maintenance schedules for this site cover a 5-year period, although it is anticipated that it will remain in place for ongoing maintenance by those responsible for the long-term management of the site.

1.3. Best practise working procedures will be adhered to at all times during the construction works, and key works will be undertaken by fully trained operatives. A copy of this management plan will be kept on site where it would be available at all times.

1.4. For detailed soft landscape plans refer to Soft Landscape Proposals LA5530-001; 002, 003 and 004.

2.0 CONTRACTOR SCOPE OF WORKS

2.1. All planting works will be carried out by the Landscape Contractor in accordance with the approved drawings and implemented in accordance with the phased programme of implementation.

2.2. The soft landscape areas for this phase of implementation are illustrated on the Soft Landscape Proposals LA5530-001; 002, 003 and 004. All areas of public open space should be implemented and maintained as per this document while other construction works are ongoing. This would aid establishment of green infrastructure on site and minimise losses through vandalism. The remaining areas of soft landscaping can come forwards when construction works on site are complete.

2.3. The main contractor is responsible for the preliminary external works package to include:

- Site clearance works including areas of existing vegetation which is necessary and agreed.
- Erection of protective fencing to all existing trees, hedges and structural vegetation as shown on the Tree Protection Plan.
- Soil stripping and stock piling as necessary in accordance with BS3882:2015
- Removal of subsoil as necessary.
- Preparation of sub-grade and main excavation works.

2.4. For the implementation of the soft landscape scheme, the Landscape Contractor is responsible for the following:

- Supply, delivery and storage of the specified plants as listed in the approved landscape drawings.
- Preparation of the subsoil to all planting areas and tree pits.
- Supply and delivery of the approved topsoil, and confirmation of the soil analysis and amelioration.
- Topsoil spreading, grading and profiling.
- Drainage medium to tree pits.
- Carrying out of all planting works including associated works.
- Carrying out of seeding and/or turfing to grass areas.

- 12 months rectification period and maintenance post Practical Completion for trees and planted areas.

The Landscape Contractor should report to the Landscape Architect/Contract Administrator where necessary for clarifications on this specification.

3.0 LANDSCAPE SPECIFICATION

GENERAL

3.1. All plants should be supplied in accordance with BS 3936 Specification for Nursery Stock and the HTA 'National Plant Specification'. Delivery and handling of all plant material to be in accordance with BS 3936: Part 1, Part 4, Part 5. All planting is to be undertaken in accordance with BS 4428 Code of Practice for General Landscape Operations.

3.2. Excavation for planting beds and subsequent planting should not take place during periods of bad weather, if the ground is waterlogged or frozen to avoid damaging the soil structure.

3.3. The Landscape Contractor should be aware of the proximity to underground services, overhead cables, buildings and boundaries prior to planting operations.

3.4. The Landscape Contractor should minimise tracking over the site or storage of materials prior to planting to avoid damage to the existing soil conditions.

3.5. All existing trees and vegetation to be retained within the site should be protected in accordance with BS 5837 (2012) Trees in Relation to Design, Demolition and Construction. Refer to Arboriculturalist's drawings for details of tree protection and methods of construction close to retained trees.

3.6. Except where otherwise specified, all materials and workmanship shall be in accordance with appropriate British Standards.

PREPARATION

3.7. **Site clearance:**

3.7.1. Remove rubbish, concrete, metal, glass, decayed vegetation and contaminated topsoil.

3.7.2. Remove stones with any dimension exceeding 75 mm.

3.7.3. Remove material containing toxins, pathogens or other extraneous substances harmful to plant, animal or human life.

3.7.4. Clear any scrub and vegetation to ground level by flail mowing and remove arisings; retain and protect trees indicated on drawings.

3.7.5. Large roots: Grub up and dispose of without undue disturbance of soil and adjacent areas.

3.8. **Subsoil:**

3.8.1. In areas where subsoil is retained for required profiles and levels this should be in accordance with BS 8601 '*Specification for subsoil*' and requirements for use.

3.8.2. When loosening:

- Light and non-cohesive subsoils: When ground conditions are reasonably dry, loosen thoroughly to a depth of 300 mm.
- Stiff clay and cohesive subsoils: When ground conditions are reasonably dry, loosen thoroughly to a depth of 450 mm.
- Rock and chalk subgrades: Lightly scarify to promote free drainage.
- Wet conditions: Do not loosen subsoils.
- Compacted areas: Ripped and de-compacted to promote free drainage.

3.8.3. Immediately before spreading topsoil, remove stones larger than 50 mm.

3.8.4. Remove from site and arisings, contaminants and debris and builders rubble.

3.9. **Topsoil:**

3.9.1. Existing topsoil stock-pilled on site should be sampled in accordance with BS 3882 *'Specification for Topsoil'*, to ensure it is suitable for the intended use.

3.9.2. Where imported topsoil is used the Landscape Contractor should ensure that the topsoil supplier provides the topsoil specification in accordance with BS 3882. Documentation for all imported topsoil should be submitted at handover.

3.9.3. A report detailing soil analyst's recommendations should be submitted to the client with any recommendations from the soil analyst for soil amelioration and/or soil handling to be approved by the client or client's representative.

3.9.4. Topsoil should be stored in heaps in an appropriate location in accordance with BS 3882. Formation should be loose tip and shape from the side only, without running machinery on the heap at any time. Where necessary it should be fenced and covered to avoid contamination and compaction.

3.10. **Topsoil handling:**

3.10.1. Do not contaminate topsoil with:

- Subsoil, stone, hardcore, rubbish or material from demolition work.
- Other grades of topsoil.

3.10.2. Keep multiple handling to a minimum. Use or stockpile topsoil immediately after stripping.

3.10.3. Wet conditions: Handle topsoil in the driest condition possible. Do not handle during or after heavy rainfall or when it is wetter than the plastic limit less 3%, to BS 1377-2.

3.11. **Topsoil depths:** Shrub/grass areas should not exceed 300mm. Suitable (loosened) subsoil should provide the remainder of the minimum rooting depths. The minimum rooting depths should be as follows:

- 450mm for grass (150mm of topsoil)
- 600mm for shrubs and native hedgerows (300mm of topsoil)
- Tree pits as specified (refer to section below)

3.12. **Spreading topsoil:**

3.12.1. Carry out spreading activities in accordance with BS 3882.

3.12.2. Temporary roads/ surfacing: Remove before spreading topsoil.

3.12.3. Layers:

- Gently firm each layer before spreading the next.
- Ensure correct planting depth is achieved after firming and settlement

3.12.4. Crumb structure: Do not compact topsoil. Preserve a friable texture of separate visible crumbs wherever possible.

3.12.5. Soil levels should be 50mm lower than adjacent kerbs and paving after settlement, and not less than 150mm below DPC of adjoining buildings.

3.13. **Fertiliser:**

3.13.1. Prior to cultivation, apply organic soil ameliorant for all grassed areas and shrub beds to a depth of 150mm, at a reasonable rate.

3.13.2. A suitable fertilizer should be applied to proposed areas of seeding/ turfing 3-5 days before final cultivation according to manufacturer's instructions.

3.13.3. A suitable fertilizer should be applied generally to proposed planting areas immediately before final cultivation.

3.13.4. Fertiliser should be spread evenly in traverse directions.

3.13.5. Fertiliser must not be used on proposed areas of Wildflower seeding.

3.14. **Weed Control:** Use herbicide to supress perennial weeds if necessary, no more than 2 weeks prior to final cultivation.

SEEDING/ TURFING

3.15. **Turfing:**

3.15.1. Extents of areas to be turfed to be determined by client.

3.15.2. Timing: Autumn or early winter.

3.15.3. Cultivated turf for all grassed areas should be Rowlawn Medallion or equivalent, produced on a well-drained sandy loam.

3.15.4. Following cultivation operations lay turf with minimum possible delay after lifting. If delay occurs, lay turf out on topsoil and keep moist. Stacking height should be maximum of 1m. Dried out or deteriorated turf should not be used.

3.15.5. Lay turf preferably along a straight side in a row, butting closely end to end. On subsequent rows, stagger the joints in brickwork fashion. Do not leave gaps between the turf.

3.15.6. Use planks laid on previously laid turf. Do not walk on prepared bed or newly laid turf.

3.16. **Seeding general:**

3.16.1. Timing: Between March and October, where possible in calm weather conditions. In areas prone to waterlogging preferably before late autumn.

3.16.2. Seeds to be purchased fresh for each growing season and where possible be of local provenance. Suggested supplier Emorsgate (Tel: 01553 829028), or similar approved. Refer to soft landscape drawings LA5530-001 to 004 for specifications.

3.16.3. Seeding shall be repeated as necessary until an evenly distributed dense sward is established over the seeded area to the satisfaction of the Contract Administrator. The Landscape Contractor should allow for protection and cutting of all grass areas until this is achieved.

3.17. **Amenity grass:**

3.17.1. Specification: EG22C Strong lawn mixture with clover or similar approved sown at a rate of 25g/m^2.

3.17.2. Following cultivation operations detailed above seed shall be spread evenly at the rates specified

in two equal sowings in transverse directions.

3.17.3. After sowing the ground should be lightly raked or harrowed and subsequently firmed with a lightweight roller.

3.18. **Grass & Wildflower meadow:**

3.18.1. Specification: Emorsgate EM10 Tussock mixture or similar approved sown at a rate of 4gm^2.

3.18.2. Prior to seeding, ensure seed bed is free of perennial weeds using herbicide where necessary in accordance with section 3.11 and cultivating in accordance with 3.13. Pesticides used near or within waterbodies should be checked by the contractor for suitability.

3.18.3. Prior to seeding the soil will be brought to a fine tilth in accordance with 3.13. The base of the SuDS features should be left undisturbed to avoid conflict with its functionality. Following an even distribution of seed the area is to be lightly harrowed.

3.19. **Wetland meadow:**

3.19.1. Specification: Emorsgate EP1 Pond edge mixture or similar approved sown at a rate of 4gm^2.

3.19.2. Prior to seeding, ensure seed bed is free of perennial weeds using herbicide where necessary in accordance with section 3.11 and cultivating in accordance with 3.13. Pesticides used near or within waterbodies should be checked by the contractor for suitability.

3.19.3. Prior to seeding the soil will be brought to a fine tilth in accordance with 3.13. The base of the SuDS features should be left undisturbed to avoid conflict with its functionality. Following an even distribution of seed the area is to be lightly harrowed.

PLANTING

3.20. **Times of year for planting**

- Deciduous trees and shrubs: Late October to late March.
- Conifers and evergreens: September/ October or April/ May.
- Herbaceous plants (including marginal): September/ October or March/ April.
- Container grown plants: At any time if ground and weather conditions are favourable.
- Watering and weed control: Provide as necessary.
- Dried bulbs, corms and tubers: September/ October.
- Green bulbs: After flowering in spring.
- Wildflower plugs: Late August to mid-November or March/ April.

- Aquatic plants: May/ June or September/ October.

3.21. **Plants/ Tree general:**

3.21.1. Condition: Materially undamaged, sturdy, healthy and vigorous.

3.21.2. Appearance: Of good shape and without elongated shoots.

3.21.3. Hardiness: Grown in a suitable environment and hardened off.

3.21.4. Health: Free from pests, diseases, discoloration, weeds and physiological disorders.

3.21.5. Budded or grafted plants: Bottom worked.

3.21.6. Root system and condition: Balanced with branch system.

- Standard: The relevant parts of BS 3936.

3.21.7. Species: True to name.

3.21.8. Origin/ Provenance: British grown.

3.21.9. Definition: Origin and Provenance have the meaning given in the National Plant Specification.

3.22. **Container grown plants/ trees:**

3.22.1. Growing medium: With adequate nutrients for plants to thrive until permanently planted.

3.22.2. Plants: Centred in containers, firmed and well watered.

3.22.3. Root growth: Substantially filling containers, but not root bound, and in a condition conducive to successful transplanting.

3.22.4. Hardiness: Grown in the open for at least two months before being supplied.

3.22.5. Containers: With holes adequate for drainage when placed on any substrate commonly used under irrigation systems.

3.23. **Labelling and information:**

- General: Provide each plant/ tree or group of plants/ trees of a single species or cultivar with supplier's labelling to BS 3936 for delivery to site, showing:

- Full botanical name.
- Total number.
- Number of bundles.
- Part bundles.
- Supplier's name.
- Employer's name and project reference.

- Plant specification, in accordance with scheduled National Plant Specification categories.

3.24. **Plant handling, storage transport and planting:**

3.24.1. Standards to be kept in line with CPSE Code of Practice for 'Handling and Establishing Landscape Plants, Parts I, II and III.

3.24.2. Protect plants from frost.

3.24.3. Handle plants with care. Protect from mechanical damage and do not subject to shock, e.g. by dropping from a vehicle.

3.25. **Planting Shrub/Herbaceous:**

3.25.1. Timing: Late October to late March. Or where container grown at any time where weather conditions are favourable.

3.25.2. Following cultivation, weed control and fertilizer operations described above plants should be laid out as per the Planting Plans.

3.25.3. In accordance with BS 4428 planting holes should be approximately 150 mm wider than the root spread. The shrubs should be set in the holes so that the soil level, after settlement, will be at the original root collar level on the stem of the shrub.

3.25.4. The holes should be backfilled to half their depth and should be firmed by treading. The remainder of the topsoil should then be returned and again firmed by treading

3.26. **Planting Bulbs:**

3.26.1. Timing: To be planted in the appropriate season to a depth of approximately 3x the bulb diameter. Bases to have contact with the topsoil at the bottom of the holes.

3.27. **Planting Hedgerows:**

3.27.1. Specification: for locations and specification refer to Planting Plans

3.27.2. Timing: Late October to late March.

3.27.3. Following cultivation, weed control and fertilizer operations described above hedgerow plants are to be planted into a trench with a minimum depth of 400mm and a width of between 600-750mm.

3.27.4. Plants to be set out evenly with consideration given for an even spread of species where a hedgerow mix is specified.

3.27.5. All shrubs specified as part of the native hedgerow mix are to be protected from rabbit damage

by using Tubex 'Shelterguards' 75cm or similar approved, secured using stakes and ties.

3.28. **Planting Trees:**

3.28.1. If planting is not carried out immediately after delivery, root balled trees should be placed close together and the ball or container should be covered with sand or moist peat to prevent drying out and freezing in accordance with BS 4428.

3.28.2. Tree pit excavations should be at least twice the diameter of the root spread and 1.5 times the depth of the roots to be planted.

3.28.3. Break up subsoil to the sides of the pit and replace excavated subsoil with topsoil.

3.28.4. Ensure trees are planted at the original root collar soil depth by observing the soil mark on the stem.

3.28.5. Backfill soil around the tree and lightly firm to ensure close contact with the roots.

3.28.6. Underground guying: refer to approved drawings for details.

3.28.7. Root barriers: refer to approved drawings for details. As a minimum, a 600mm deep barrier should be installed where the rootball is within 2 m of a building foundation or within 3 m of an existing underground service route.

3.29. **Tree Stakes:**

3.29.1. Stakes to be minimum 50mm diameter, 1800mm length and softwood, peeled chestnut, larch or oak, straight, free from projections and large or edge knots and with pointed lower end.

3.29.2. Extra heavy standards trees to be secured in position using two stakes, a cross bar and adjustable tree ties made of PVC or rubber in accordance with figure 8 in BS 4428.

3.29.3. Prior to planting stakes to be driven into position on the prevailing windward side of the tree as close to the tree as possible but ensuring clearance of the root ball to a minimum depth of 300mm below the bottom of the pit. Following planting pin stakes with cross bar and attach ties where centre of cross bar and tree meet.

3.30. **Trees in hard surfacing:**

3.30.1. Tree guards to be installed to protect stem from external damage. Products should be agreed with the client and indicated on tree pit details. As a minimum the tree guard should be 1.8 m high x 600 mm diameter in steel and fixed to tree grille as per manufacturers specification.

3.30.2. Ensure that protection methods do not impede natural movement of trees or restrict growth.

3.30.3. A suitable steel tree grille should be installed to the size and specification agreed, and fixed to tree grille as per manufacturers specification.

3.31. **Mulching:**

3.31.1. Clear all weeds and water soil thoroughly prior to mulching.

3.31.2. Spread medium grade bark of 100% recycled content to BS EN ISO 14021, free of pests, disease, fungus and weeds.

3.31.3. The minimum depth should be 50 mm over all planted areas.

3.31.4. Finished level of mulch should be 30 mm below adjacent grassed or paved areas.

3.32. **Watering:**

3.32.1. During establishment of grass areas ensure that sufficient water is applied using a fine rose sprinkler to maintain healthy growth.

3.32.2. Thoroughly water completed turf immediately after laying. Check that water has penetrated into the soil below.

3.32.3. Thoroughly water areas of shrub and tree planting following planting.

3.33. **Failures of planting:**

3.33.1. Defects due to materials or workmanship not in accordance with the Contract: Plants/ trees/ shrubs that have failed to thrive.

- Exclusions: Theft or malicious damage after completion.
- Rectification: Replace with equivalent plants/ trees/ shrubs.

3.33.2. Replacements: To match size of adjacent or nearby plants of same species or match original specification, whichever is the greater.

3.33.3. Timing of making good: During the next suitable planting season.

4.0 MANAGEMENT OBJECTIVES

4.1. The overall objective of this plan is to maintain a high quality and appropriate landscape setting to the development, enhance ecological value, and ensure elements within it are managed to complement the development and its general appearance, and the end users of the site.

4.2. The landscape areas will be sympathetically managed to create a variety of habitats as part of the proposed landscape scheme and its ongoing maintenance, will increase the value of the site generally, and will provide suitable green infrastructure throughout the site in the long term to provide positive links with the surrounding area.

4.3. The site currently is former military facility that is currently under-going phased residential development, located to the south of Gloucester City. The development's main access is off Rudloe Drive. The site contains limited number of existing trees, the most valuable of which are retained as part of the development.

4.4. An important aim of this management plan is to prescribe works which will maintain or enhance habitats and features of benefit to wildlife known to be present within the local area, as well as providing general enhancements for the wider benefit of local flora and fauna. The ecological assessment submitted with the outline application did not identify the need for any further specific species surveys but proposed a series of enhancement measures to the benefit of local wildlife and result in an overall gain in biodiversity.

Management Objectives

4.5. The general objectives for landscape areas are to:

- apply best practice to all horticultural and ecological operations;
- ensure the establishment and future sustained growth of all plants, trees, hedges, grass, and wildflower areas;
- create new habitat areas as part of the benefits of the proposal to enhance wildlife value and species diversity through careful management;
- introduce structural diversity within the existing woodland areas;
- ensure good horticultural practice in the long-term health and vitality of all trees, shrubs and hedges to promote healthy and vigorous growth;
- manage the range of grasslands proposed to the benefit of potential amphibian and invertebrate populations;
- ensure the consistent control of weeds and invasive species;
- provide protection against pests and diseases as appropriate;
- ensure the replacement of defective plant material;

- review opportunities for enhancing planted areas and replacing worn-out areas of planting where appropriate, in line with the original design aspirations.

5.0 MANAGEMENT RESPONSIBILITIES

5.1. For the purpose of this document the following terms and responsibilities are defined as follows;

a) *The Developer* – Vistry Group who are responsible for the development of the site.

b) *The Landscape Contractor* – A sub-contractor who is responsible for implementing the landscape scheme to the approved drawings and will be instructed directly by the Developer. The Landscape Contractor will be liable for any failures to the planting and for the replacement planting during the rectification period.

c) *The Management Company* – The company who will be responsible for the upkeep and ongoing maintenance of the landscape areas following completion and handover from the Landscape Contractor. The Management Company will be responsible for any replacement planting required after the rectification period.

5.2. The respective open space and landscaped/ecological areas will be offered to the Parish Council for adoption. If they accept then an appropriate commuted sum to cover future maintenance costs will be paid to them. Should there be any areas not transferred to the Parish Council then a new Limited company (the Management Company) will be formed and incorporated to own and manage the Management Company areas. Initially the Directors of the company will be Vistry Group. At the point of each plot sale, every household becomes a shareholder of the company and covenant to abide by various obligations and restrictions in relation to the Management Company areas and importantly covenant to pay the annual Management Company service charge to cover the annual maintenance costs. At the end of the development, Vistry Group resigns and the Directorship of the company is transferred to the residents. Once the relevant areas have been laid out, Vistry Group will initially maintain the areas but will within a short period hand the maintenance responsibility over to the managing agents acting on behalf of the Management Company.

6.0 LANDSCAPE MANAGEMENT CLAUSES

GENERAL

6.1. These clauses should be read in conjunction with the proposed landscape scheme to enable the appropriate ongoing management and maintenance of planted areas.

6.2. All landscape maintenance operations, where they do not conflict with ecology operations, should be in accordance with BS 4428:1989 *'Code of practice for general landscape operations'* (excluding hard surfaces). Ongoing landscape maintenance operations are to be in accordance with sound ecological principles, and where relevant to be in accordance with BS 7370-4:1993 *'Grounds Maintenance Recommendations for maintenance of soft landscape'* (other than amenity turf).

6.3. It is intended that the landscape scheme will be implemented by a Landscape Contractor appointed by Vistry Group, and upon completion will hand over the ongoing maintenance responsibilities of each landscaped area to the Management Company.

6.4. The Management Company will be responsible for the maintenance of all landscaped areas during the life of the development. The rectification period shall be for 12 months, after which the Management Company is liable for any failures and necessary replanting.

6.5. Generally, the management company is responsible for the following:

- **Watering:** Ensure water supply is available for necessary application to wet to field capacity, as necessary for the continued thriving of all planting.
- **Litter and debris:** Collect and remove from site all extraneous litter or debris found in those planted areas included within the maintenance responsibilities.
- **Leaving the site in a good condition:** Removing any soil or arisings from hard surfaces. Ensure protection of existing grassed areas during maintenance operations. Do not place excavated or imported materials directly on grass.
- **Dead plants**: During the rectification period replacement planting is the responsibility of the landscape contractor. In the subsequent years this will be the responsibility of the management company.
- **Weather damage**: Plants which have been subject to frost heave or wind rock and are therefore struggling to establish.

TREE WORK

6.6. General

6.6.1. A pre-commencement site meeting shall be held prior to any works commencing on site, to agree all approved processes with: the Arboricultural Consultant, the tree works contractor, and the main contractor. This meeting could be used to formally agree the methods of work, position of site offices, material storage, compounds, parking and tree protection measures prior to commencement of the development and the associated clearance work.

6.6.2. All permitted or approved tree works shall be carried out to the highest standards, based on British Standard 3998:2010 'Recommendations for Tree Work' and current best practice. To ensure standards are met it is recommended that a contractor from the Approved List of the Arboricultural Association be used (01242 522152, www.trees.org.uk). Under no circumstances shall site personnel undertake any tree pruning operations.

6.6.3. All tree surgery works should be carried out prior to the erection of protective fencing and before site preparation works are started.

6.6.4. Before any tree works commence, a schedule should be submitted to the main contractor to agree any tree works that become apparent during the construction process. Refer to Arboricultural Implications Assessment and Tree Protection Method Statement for full details of tree works. Works should ideally be carried out during the tree's dormant period.

6.6.5. Notice should be given of any defective, diseased, unsafe or weak parts of trees in addition to those scheduled for attention.

6.7. Supervision

6.7.1. On-going arboricultural site monitoring for the duration of the proposed development will be carried out by the Arboricultural Consultant at pre-determined and agreed time intervals, and governed by the type, timing, location and intensity of site works.

6.7.2. A site visit report will be provided listing the efficiency of the tree protection measures, any defects requiring rectification or other relevant comments relating to the management of the tree stock. The report will be provided to the client, and the main contractor/site manager.

6.8. **Removing trees, shrubs and hedges**

6.8.1. The Arboricultural Method Statement & Tree Protection Plan by Hayden's (approved under Condition 13) should be referred to for details of the agreed tree removals and works to retained trees. All works should be carried out to standards BS 3998, Soft Landscape Proposal drawings 101-103 and Health & Safety Executive (HSE)/ Arboricultural and Forestry Advisory Group Safety Leaflets.

6.8.2. The contractor should check for below and above ground services and give notice if they may be affected.

6.8.3. Arboricultural work shall not be carried out during the bird nesting season, i.e., 1st March to 31st August.

AMENITY GRASS AREAS

6.9. **General**

6.9.1. Grassed areas should be maintained for a healthy vigorous sward, free from disease, fungal growth, discolouration, scorch or wilt.

6.9.2. Ornamental lawns should be maintained reasonably free from moss, excessive thatch, weeds, frost heave, worm casts and mole hills.

6.10. **Grass Cutting**

6.10.1. Before mowing, remove litter, rubbish and debris and deposit off-site.

6.10.2. The height of the first cut should be 40 mm once the initial growth has reached 75 mm. Maintain general grass areas between 50 and 75 mm. All arisings should be removed from the surface.

6.10.3. Ensure a neat and even finish, without surface rutting, compaction or damage to grass. Leave neat and well-defined edges. Neatly trim around obstructions, especially trees where damage to bark etc. should be prevented.

6.10.4. Adjoining hard areas should be swept clear and arisings removed.

6.10.5. Apply liquid fertilizer approved by the Authorised Officer in mid- June prior to forecasted rainfall in line with manufacturers recommendations. Hand watering prior to application required where no rainfall is forecast.

6.11. **Bulbs and corms in grassed areas**

6.11.1. Do not cut the grass areas containing bulbs before flowering.

6.11.2. Delay mowing bulbs in the lawn up to six to eight weeks after flowering has finished. Cut to the height of adjoining lawn areas and remove all arisings.

MEADOWGRASS AREAS

6.12. **General**

6.12.1. The peripheral grassland habitats proposed to the site boundaries will be maintained to promote a healthy sward and create variety of heights and flowers through a phased mowing approach.

6.12.2. Future management prescriptions pertaining to retained and created grassland habitats will be carefully devised to promote animal and plant diversity, and carefully managed and enhanced for invertebrates/amphibians if found.

6.12.3. The areas of proposed meadow grassland are shown on the planting plans LA4305-100F, 101F, 102F and 103F.

6.13. **General Cutting**

6.13.1. The Management Company shall be responsible for following the cutting regime that varies the number of cuts in different parts of the grassland and/or the varying the height of cutting across the area. The developing wildflower turf meadow and wetland grassland should be cut once in the first year, and then through specific cutting regimes as outlined below.

6.13.2. Cutting regimes should leave random areas unmown and allowed to develop to a tall sward height to provide foraging and places of shelter for wildlife and ecology purposes. It is possible to leave field margins unmown for 1 year to further aid wildlife.

6.13.3. The application of fertiliser or herbicide on these areas should be avoided, and all cuttings within the area left in-situ up to 7 days. Elsewhere the cuttings shall be removed directly following a cut.

6.14. **Cutting regime (Grass and Wildflower Mix EM10: Tussock Mix)**

6.14.1. Newly laid meadow turf to be mown twice a year to a height of 25-50mm, cuttings to be left for 1 to 2 days after mowing or strimming, then raked and removed. This will control annual weeds and help maintain balance between faster growing grasses and slower developing wild flowers.

6.14.2. Once established tussock grassland requires minimal maintenance. Unwanted perennial weeds (docks, thistles) may need control by selective scything before seeding. To control scrub and bramble development, tussock areas may need cutting every 2-3 years between October and February. For wildlife this cutting is best done on a rotational basis so that no more than half the

area is cut in any one year leaving part as an undisturbed refuge.

6.15. **Cutting regime (Emorsgate EP1 Pond Edge Mixture)**

6.15.1. Newly sown meadows to be mown regularly throughout the first year of establishment to a height of 40-60mm, removing cuttings if dense. This will control annual weeds and help maintain balance between faster growing grasses and slower developing wild flowers.

6.15.2. In subsequent years, to achieve a variation in structure, cut back and remove short sections of vegetation every 2-3 years in rotation. Remove vegetation in wedge shaped sections. Vegetation removal to be carried out in September to November to minimise disruption to wildlife.

6.15.3. To ensure that their seed will germinate, it may be necessary to over-seed with an appropriate seed mix to increase the floral diversity, especially where there are bare patches.

SHRUBS/TREES/HEDGES

6.16. **General**

6.16.1. Maintain a weed free area around each tree and shrub, minimum diameter the larger of 1m or the surface of the original planting pit.

6.16.2. Remove dead flower heads, fallen leaves, litter and debris and deposit off-site in order to maintain a tidy and clean appearance to the shrub areas.

6.16.3. Fork over beds to keep soil loose, with gentle cambers and no hollows. Do not reduce depth or effect of mulch.

6.16.4. Where grass edges meet planting beds, trim grass edges and remove arisings.

6.16.5. Refirm plants/trees around the base until firmly bedded following strong winds and other disturbances.

6.16.6. Check and adjust/refix tree guards, stakes and ties or replace defective elements, allowing for growth and to prevent chafing.

6.17. **Pruning generally**

6.17.1. Pruning should be carried out in accordance with good horticultural and arboricultural practice.

6.17.2. When pruning, make cuts above and sloping away from an outward facing healthy bud, angled so that water will not collect on cut area.

6.17.3. Thin, trim and shape each specimen appropriately to species, location, season, and stage of growth, leaving a well-balanced natural appearance.

6.17.4. Remove growth encroaching onto grassed areas, paths, roads, signs, sightlines and road lighting luminaires annually.

6.17.5. Prune ornamental shrubs to encourage healthy and bushy growth and desirable ornamental features e.g. flowers, fruit, autumn colour, stem colour.

6.17.6. Remove suckers by cutting back level with the source stem or root.

6.18. **Pruning flowering species of shrubs and roses**

6.18.1. Time of year:

- Winter flowering shrubs: Spring
- Shrubs flowering between March and July: Immediately after the flowering period
- Shrubs flowering between July and October: Back to old wood in winter
- Rose bushes: Early spring to encourage basal growths and a balanced, compact habit

6.19. **Pruning new hedges**

6.19.1. Allow rapidly establishing hedges to reach planned height as quickly as possible.

6.19.2. Trim back lateral branches moderately.

6.19.3. Cut back slowly establishing hedges hard in June and September to encourage bushy growth down to ground level.

6.19.4. Allow the hedge to reach planned dimensions only by gradual degrees, depending on growth rate and habit.

6.20. **Formative pruning of young trees**

6.20.1. Ensure that the type and timing of pruning operations suit the plant species.

6.20.2. Do not prune during the late winter/ early spring sap flow period.

6.20.3. Crown prune by removing dead branches and reducing selected side branches by one third to preserve a well-balanced head and ensure the development of a single strong leader. Whips or feathered trees should not be pruned until established.

6.20.4. Remove duplicated branches and potentially weak or tight forks. In each case cut back to live wood.

6.21. **Pruning of existing / established new trees**

6.21.1. Ensure that the type and timing of pruning operations suit the plant species.

6.21.2. Pruning of mature and/or well-established trees should be avoided unless absolutely necessary from a structural or health and safety concern.

6.21.3. Crown lifting can be carried out by shortening or removing lower branches. Living branches must be retained on at least two thirds of the total tree height after crown lifting.

6.21.4. If crown reduction is required, reduce the crown by pruning out entire branches at their points of origin from the trunk or another branch at least three times the diameter of the branch to be removed. Make the cuts outside the branch collar to ensure the wound will heal. *Do not 'top' mature or established trees.*

6.21.5. Do not prune during the late winter/ early spring sap flow period.

6.21.6. Arboricultural work shall not be carried out during the bird nesting season, ie. 1st March – 31st August.

6.22. **Climbing plants**

6.22.1. When pruning, remove excess growth, to ensure that signs, light fittings, doors and windows are kept clear at all times.

6.22.2. Insecure growth: Attach to supporting wires or structures using 1 mm diameter black plastics coated steel wire.

6.22.3. Supporting structures: Check and repair as necessary.

6.23. **Dead and diseased plants/trees**

6.23.1. Remove within one week of notification.

6.23.2. Replace plants/trees in the next scheduled round of replacement planting.

6.24. **Removal of dead plant material**

6.24.1. At the end of the growing season, check all shrubs/trees/hedges and remove all dead foliage, dead wood, and broken or damaged branches and stems.

6.25. **Reinstatement of shrub/ herbaceous areas**

6.25.1. In the presence of mulch/ matting materials, carefully move to one side and dig over the soil, leaving it fit for replanting.

6.25.2. Use pit and plants to original specification or to match the size of adjacent or nearby plants of the same species, whichever is the greater.

6.25.3. Apply slow-release fertilizer at rate shown by manufacturer's recommendations.

6.26. **Weed control generally**

6.26.1. Ensure weed cover is less than 5% at all times, and no weed to exceed 100 mm high.

6.26.2. Remove the minimum quantity of soil, and disturb plants, bulbs and mulched surfaces as little as possible.

6.26.3. Rake the area to a neat, clean condition and reinstate mulch to original depth.

6.26.4. Use suitable foliar acting herbicide to kill regrowth. Allow recommended period for herbicide to take effect before clearing dead weeds.

6.27. **Soil aeration**

6.27.1. Where compacted soil surfaces arise, prick up with fork to aerate the soil of root areas and break the surface crust.

6.27.2. Do not damage plants and their roots.

6.28. **Maintenance of mulch**

6.28.1. Thickness of mulch to be a minimum of 50 mm in general shrub areas, 75mm at the base of hedges, 100mm at the base of trees.

6.28.2. Areas of mulch to be topped up twice per year.

6.28.3. Mulch spill on adjacent areas should be cleared of debris and returned to the planted area.

6.28.4. Remove weeds growing on or in mulch by hand weeding.

6.29. **Fertilizer for Shrubs/Hedges/Trees**

6.29.1. Slow-release organic granular fertilizers applied during February or March, spreading evenly at a rate as recommended by the manufacturer.

6.30. **Planting**

6.30.1. New trees, hedgerow and shrub planting will include native species, especially berry bearing and/or nectar producing to benefit foraging birds and bats.

6.30.2. Hedgerows and garden hedgerow boundaries will provide nesting habitat.

6.30.3. Garden gates will be raised to allow hedgehog and other small mammals access into gardens for foraging opportunities.

6.30.4. Open space grassland will be managed for the benefit of biodiversity, with low intensity seasonal timing for maintenance cuts that allow plants to flower and set seed which in turn will benefit wildlife including invertebrates, a prey source for bats and birds and offer places of shelter for wildlife ecology purposes.

6.30.5. The SuDS attenuation basin within the POS of the site will be dry for most of the year. The design of the basin will provide grassland habitat of varying topography that is of value to bats, birds reptiles and invertebrates.

HARD LANDSCAPE AREAS/FENCING

6.31. **Hard surfaces and gravel areas**

6.31.1. Apply a suitable foliar acting or residual herbicide to manage weed growth. Allow recommended period for herbicide to take effect before clearing arisings.

6.31.2. Remove litter, leaves and other debris from all hard surfaces.

6.31.3. Remove mud, silt and debris from surface gutters and channels.

6.31.4. Empty traps and flush clean drainage gullies.

6.31.5. Rake over any gravel areas and remove weeds, litter, leaves and debris, and level off.

6.31.6. Repair paving areas in accordance with the original paving specification or BS 7370-2, clause 4.12.

6.31.7. Stain removal in accordance with BS 7370-2, table 4.

6.32. **Timings**

6.32.1. Layout of the POS to be completed and transferred to the Parish Council prior to 80% occupation (65th dwelling).

6.32.2. Installation of furniture to be completed and transferred to the Parish Council prior to 80% occupation (65th dwelling).

PLAY AREAS AND EQUIPMENT

6.33. **Timings**

6.33.1. Layout of the POS to be completed and transferred to the Parish Council prior to 80% occupation.

6.33.2. Installation of play equipment to be completed and transferred to the Parish Council prior to 80% occupation.

6.34. **Play surfaces**

6.34.1. Regular checking of rubber safety matting to ensure that it is fixed securely with no humps or trip hazards. Provide extra pegs if necessary.

6.34.2. Where required, replace any displaced matting and top up with new soil and seed to match existing as necessary.

6.34.3. Remove leaves, litter, debris and other objects from the play area.

6.35. **Play equipment**

6.35.1. Regular visual checking of all specialised play equipment and non-prescriptive play elements (including natural features such as boulders and logs etc).

6.35.2. If required, ROSPA should provide inspections to ensure approved safety of play equipment and spaces in line with recommended guidance for the prevention of accidents.

6.36. **Defects**

6.36.1. Where defects occur, areas are to be cordoned off immediately to ensure safety, with repairs / replacement undertaken at the earliest opportunity using materials to match those originally specified. Manufacturer's guidance should be followed for specific equipment.

7.0 MAINTENANCE AND MANAGEMENT ONGOING

7.1.1. The following table indicates the ongoing maintenance operations to be carried out in year 1 in the period between practical completion and the end of the rectification period.

Maintenance Operations Year 1	Timing of operations (January to December)											
	J	F	M	A	M	J	J	A	S	O	N	D
General Operations												
Fertiliser: Apply as deemed necessary to top 50mm of soil in accordance with manufacturer's instructions. Replace dislodged mulch materials.			x	x								
Watering: At regular intervals during spring and summer months following planting. Additional watering during dry spells as required.	As required and approved.											
Dead and diseased plants: Remove within one week of notification. Replace plants in the next scheduled round of replacement planting. Replacement plants to original specification or to match the size of adjacent or nearby plants of the same species, whichever is the greater. Apply slow release fertilizer at rate shown to manufacturer's recommendations.	As required and approved.											
Weed control generally: Ensure weed cover is less than 5% at all times, and no weed to exceed 100 mm high. Where manual weed control using hand tools has proved unsuccessful use suitable residual herbicide to manufacturer's instructions.	As required and approved											
Mulch: To all areas of shrub, tree and hedgerow planting to the required depths, twice per year. Remove weeds growing within the mulch by hand.				x						x		
Clearance of fallen leaves: Leaf litter to be composted offsite. Twice a month or as required.										x	x	x
Litter picking: Emptying and cleaning of litter bins. Contents disposed of off-site.	Weekly or as necessary											
Snow/ice removal: Excessive snow to be removed from plants to avoid damage. Gritting to hard surfaces to be non-toxic, biodegradable and eco-friendly.	As required and approved											
Amenity Grass												
Initial cut: Prior to mowing remove litter, stones and debris and deposit off-site. Cut to 40mm once the initial growth has reached 75mm. Bare areas and those that have failed to thrive are to be reseeded/re-turfed as required. Generally weekly mow during growing season.			x	x	x	x	x	x	x	x		
Wildflower/ Meadow Grass (EM10)												
Cutting regime: Mow meadow area to height of 25-50mm twice a year.						x			x			
Weed control: Control of pernicious weeds by spot application of herbicide as advised by manufacturer.							x	x	x	x		
Watering: Initial watering after completion of turf laying and for the first two weeks of establishment.	As required and approved.											
Wetland Meadow (Emorsgate EP1 Pond Edge mixture)												

Maintenance Operations Year 1	Timing of operations (January to December)											
	J	F	M	A	M	J	J	A	S	O	N	D
Cutting regime: Once established mow grass to height of 50mm once a month in the growing season and remove arisings							x	x	x	x		
Weed control: Control of pernicious weeds by spot application of herbicide as advised by manufacturer.							x	x	x	x		
Shrubs/ Herbaceous												
Litter and debris: Remove dead flower heads, fallen leaves and debris.	As required and approved											
Weed control: Maintain weed free area with a minimum diameter of 1m around each plant.	As required and approved											
Native Hedgerows												
Stakes and Ties: Adjusted each year to allow for growth.	As required											
Existing hedgerows: Cut back to encourage bushy growth.	x	x	x							x	x	x
Existing and proposed trees												
Stakes and Ties: Adjusted each year to allow for growth. Removed when tree has sufficiently established to support itself, usually after 2 years.	As required											
Existing Trees: All trees to be checked to ensure healthy growth and safety. Pruning as required in accordance with BS 3998.	As required											
Crown lifting/thinning: Ensure a clearance of 2.5m above footpaths/roadways to maintain sightlines. Ensure footpaths and routes are clear from obstructions. In subsequent years thinning may be required in accordance with BS3998.	As required and approved											
Monitoring: Remove dead, diseased or dying trees, fungal growths, fruiting bodies, climbing plants and any other foreign objects.	Monthly											
Play Areas												
Safety: Following completion a RoSPA inspection will be carried out to ensure safety of the scheme in accordance with recommended guidance for the prevention of accidents.	End of defects liability period											
Monitoring: Regular visual checking of all play equipment and tightening/adjustments to fixings and fittings in accordance with manufacturer's instructions. Where defects occur, areas are to be immediately fenced off and repairs are to be made at the earliest opportunity.	Monthly											
Hard surfaces and gravel areas												
Weed control to hard surfaces: Apply herbicide to hard surfaces at the start of the growing season or as required.			x	x								
Clean hard surfaces: Remove litter, leaves and other debris from all hard surfaces. Where necessary repair paving areas in accordance with the original paving specification. Remove any stains in accordance with BS 7370-2, table 4.	As required and approved											
Clean drains: Remove mud, silt and debris from surface gutters and channels. Empty traps and flush clean drainage gullies.	As required and approved											
Maintain gravel areas: Rake over any gravel areas and remove weeds, litter, leaves and debris, and level off.	As required and approved											

7.2. The following table indicates the ongoing maintenance operations to be carried out following the end of the rectification period.

Ongoing Maintenance Operations Years 2-5	Timing of operations (January to December)											
	J	F	M	A	M	J	J	A	S	O	N	D
General operations												
Fertiliser: Apply as deemed necessary to top 50mm of soil in accordance with manufacturer's instructions. Replace dislodged mulch materials.			x	x								
Watering: At regular intervals during spring and summer months following planting. Additional watering during dry spells as required.	As required and approved.											
Dead and diseased plants: Remove within one week of notification. Replace plants in the next scheduled round of replacement planting. Replacement plants to original specification or to match the size of adjacent or nearby plants of the same species, whichever is the greater. Apply slow release fertilizer at rate shown to manufacturer's recommendations.	As required and approved.											
Weed control generally: Ensure weed cover is less than 5% at all times, and no weed to exceed 100 mm high. Where manual weed control using hand tools has proved unsuccessful use suitable residual herbicide to manufacturer's instructions.	As required and approved											
Mulch: To all areas of shrub, tree and hedgerow planting to the required depths, twice per year. Remove weeds growing within the mulch by hand.				x						x		
Clearance of fallen leaves: Leaf litter to be composted offsite. Twice a month or as required.										x	x	x
Litter picking: Emptying and cleaning of litter bins. Contents disposed of off-site.	Weekly or as necessary											
Snow/ice removal: Excessive snow to be removed from plants to avoid damage. Gritting to hard surfaces to be non-toxic, biodegradable and eco-friendly.	As required and approved											
Amenity Grass												
Routine cut: Prior to mowing remove litter, stones and debris and deposit off-site. Generally, a weekly mow during growing season, and monitor growth to ensure height doesn't exceed 75mm. Mow to a height of 25-30mm and remove arisings offsite. Reseeding and turfing to areas that have failed as necessary.			x	x	x	x	x	x	x	x		
Wildflower/ Meadow Grass (EM10)												
Cutting regime: Once established, cut no more than one half every 2/3 years between Oct-Feb on a rotational basis.	x	x								x	x	x
Weed control: Control of pernicious weeds by spot application of herbicide as advised by manufacturer.				x	x							
Wetland Meadow (Emorsgate EP1 Pond Edge mixture)												
Cutting regime: Cut short wedge shaped sections every 2/3 years between Sept-Feb on a rotational basis.									x	x	x	

Ongoing Maintenance Operations Years 2-5	Timing of operations (January to December)											
	J	F	M	A	M	J	J	A	S	O	N	D
Weed control: Control of pernicious weeds by spot application of herbicide as advised by manufacturer.				x	x							
Ornamental Grasses												
Depending upon the species grasses are to be cut back/ trimmed.			x	x	x							
Shrubs/ Herbaceous												
Litter and debris: Remove dead flower heads, fallen leaves and debris.	As required and approved											
Weed control: Maintain weed free area with a minimum diameter of 1m around each plant.				x								
Pruning:												
Winter flowering shrubs			x	x								
Shrubs flowering between March and July								x				
Shrubs flowering between July and October: Back to old wood in winter.											x	x
Removal of dead plant material: At the end of the growing season, check all shrubs and remove all dead foliage, dead wood, and broken or damaged branches and stems.										x		
Native Hedgerows												
Stakes and Ties: Adjusted each year to allow for growth.	As required											
Pruning: Cut back in winter to encourage bushy growth and achieve planning height and width.	x	x	x							x	x	x
Ornamental Hedgerows												
Pruning: Cut back in winter to encourage busy growth and achieve planning height and width.	x	x	x							x	x	x
Existing and proposed trees												
Existing Trees: All trees to be checked to ensure healthy growth and safety. Pruning as required in accordance with BS 3998.												
Crown lifting/thinning: Ensure a clearance of 2.5m above footpaths/roadways to maintain sightlines. Ensure footpaths and routes are clear from obstructions.	As required and approved											
Monitoring: Remove dead, diseased or dying trees, fungal growths, fruiting bodies, climbing plants and any other foreign objects.	Monthly											
Thinning: Where the density of cover has increased such that their growth is restricting that of other species. Where possible felled species should be left in situ to provide invertebrate habitat.	As required and approved											
Play Areas												

Ongoing Maintenance Operations Years 2-5	Timing of operations (January to December)											
	J	F	M	A	M	J	J	A	S	O	N	D
Monitoring: Regular visual checking of all play equipment and tightening/adjustments to fixings and fittings in accordance with manufacturer's instructions. Where defects occur areas are to be immediately fenced off and repairs are to be made at the earliest opportunity.	Monthly											
Hard surfaces and gravel areas												
Weed control to hard surfaces: Apply herbicide to hard surfaces at the start of the growing season or as required.			x	x								
Clean hard surfaces: Remove litter, leaves and other debris from all hard surfaces. Where necessary repair paving areas in accordance with the original paving specification. Remove any stains in accordance with BS 7370-2, table 4.	As required and approved											
Clean drains: Remove mud, silt and debris from surface gutters and channels. Empty traps and flush clean drainage gullies.	As required and approved											
Maintain gravel areas: Rake over any gravel areas and remove weeds, litter, leaves and debris, and level off.	As required and approved											

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IDP LANDSCAPE
27 SPON STREET
COVENTRY CV1 3BA

[redacted]

www.weareidp.com

LFAcoustics
consulting engineers

NOISE ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT ON LAND NORTH OF RUDLOE DRIVE, KINGSWAY, GLOUCESTER

VISTRY HOMES LTD

MAY 2022

LF Acoustics Ltd
Pond Farm
7 High Street
Pulloxhill, Beds
MK45 5HA

[redacted]

Registered in England
Company Reg: 8434608

NOISE ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT ON LAND NORTH OF RUDLOE DRIVE, KINGSWAY, GLOUCESTER

VISTRY HOMES LTD

MAY 2022

Status	Prepared By	Date
1.0	[redacted]	20/5/22

CONTENTS

1. Introduction

LF Acoustics Ltd have been appointed by Vistry Homes Ltd to undertake a noise assessment for a proposed residential development of 150 dwellings on land to the north of Rudloe Drive, Kingsway.

Outline Planning Permission for the Proposed Development was granted by Gloucester City Council on 9th July 2021, subject to Conditions (Application Ref. 21/00490/OUT). Conditions 9 and 10 relate to noise and are reproduced below, for reference.

Condition 9

Reserved matters applications shall be accompanied by details , OR

Prior to the commencement of above ground development, details of façade and glazing design for all buildings with frontage to Rudloe Drive (or to be defined on a plan) shall be submitted to and approved in writing by the Local Planning Authority, to demonstrate that internal noise level criteria from BS8233:2014 (or subsequent equivalent replacement standard) for residential use within that phase can be achieved. No residential unit for which measures are identified as required within the approved details shall be occupied until those measures have been implemented in full.

Condition 10

Reserved matters applications shall be accompanied by a report setting out the mitigation measures to be adopted in the development to mitigate the impact of the public house use on the living conditions of future occupants of the development, including a Noise Report establishing that the noise levels within properties would meet the applicable standards.

This report presents an assessment of the noise levels within the Proposed Development and provides details of the mitigation measures to be incorporated to address the requirements of the Conditions.

Planning permission has also recently been granted for a builders' merchants to be located on land to the west of the Proposed Development (Application Ref. 21/00846/FUL). Consideration of noise from this land use has also been considered, to ensure the noise mitigation measures incorporated into that development ensure an acceptable living standard within the adjacent dwellings.

The following section of this report provides a brief description of the Standards and guidance applicable to this development. Section 3 provides a description of the site, its surroundings and an illustrative layout upon which this assessment has been based. Section 4 presents the results of a noise monitoring exercise, carried out to determine the existing noise levels across the site. Section 5 presents an assessment of the noise levels against relevant standards and guidance. Recommendations for mitigation measures to ensure a satisfactory noise environment is achieved are also discussed within this section. Finally, Section 6 provides a summary of the report and recommendations.

2. Applicable Standards and Guidance

2.1. A description of the noise units referred to in this report is provided in Appendix A.

2.2. National Planning Policy Framework

The National Planning Policy Framework (NPPF), revised in July 2021 [1], sets out the Government's planning policies for England and how these should be applied. It provides a framework upon which locally-prepared plans for housing and other development can be produced.

The purpose of the planning system is to contribute to the achievement of sustainable development and at the heart of the Framework is a presumption in favour of sustainable development.

With regards noise, the NPPF advises that local planning policies and decisions should contribute to and enhance the natural and local environment by:

- preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels noise pollution.
- mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development (including cumulative effects) – and avoid noise giving rise to significant adverse impacts on health and the quality of life;
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.3. British Standard BS 8233

BS 8233 [2] recommends design aims for noise levels to be achieved in new buildings and is the most appropriate guidance in defining applicable noise levels within the proposed development. The Standard was updated in 2014 to better reflect the requirements of the NPPF in terms of impact classifications and achieving the recommended guidance values, seeks to ensure that the occupants would not be subject to any significant adverse impacts, to ensure compliance with the requirements of the NPPF.

For residential properties, the guidance recommends the following design aims for the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods:

- 35 dB $L_{Aeq,T}$ within living rooms and bedrooms during the daytime period;
- 40 dB $L_{Aeq,T}$ within dining areas / rooms during the daytime period;
- 30 dB $L_{Aeq,T}$ within bedrooms at night; and
- 50 – 55 dB $L_{Aeq,T}$ within gardens and patios during the daytime.

With regards internal noise levels, the Standard advises:

"Where development is considered necessary or desirable, external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved."

Where the above limits require windows to be closed to maintain the standard of noise, there needs to be appropriate alternative ventilation provided that does not compromise the façade insulation or resulting noise level.

For outdoor amenity spaces, it is recognised in the Standard that these guideline values may not be achievable in all circumstances. Where development might be desirable, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, the development should be designed to achieve the lowest practicable levels, but should not be prohibited. Given that there is a need for the development, it is considered in this situation, that this relaxation could be applied, providing the lowest practicable levels have been achieved.

2.4. World Health Organisation Guidelines

The WHO guidance [3] provides guidance of a similar nature to BS 8233, although the emphasis is more on health effects associated with noise. The document recommends internal and external noise levels to provide an acoustic environment conducive to un-interrupted speech and sleep. The WHO guidance is summarised below for information purposes.

- It will be important to consider the maximum noise levels and number of noisy events.
- Satisfactory protection should be provided to avoid sleep disturbance, annoyance and speech communication interference.
- Recommended internal noise levels in bedrooms are given as 30 dB $L_{Aeq,T}$ for continuous noise and 45 dB $L_{Amax,F}$ for single events, during the night-time period.

2.5. British Standard BS 4142

BS 4142 [4] is the British Standard for rating and assessing noise of a commercial or industrial nature and is relevant to the noise associated with the operation of the plant at the neighbouring public house.

BS 4142 is a comparative standard in which the estimated noise levels from the proposed development are compared to the representative / typical background noise level from existing uses.

BS 4142 relates the likelihood of adverse impact to the difference between the Rating Level of the noise being assessed and the background noise level.

The background noise level is the L_{A90} noise level, usually measured in the absence of noise from the source being assessed, but may include other existing industrial or commercial sounds. The background noise levels should generally be obtained from a series of measurements each of not less than 15 minute duration.

The Rating Level of the noise being assessed is defined as its L_{Aeq} noise level (the 'specific noise level'), with the addition of appropriate corrections should the noise exhibit a marked impulsive and/or tonal component or should the noise be irregular enough in character to attract attention. The extent of the correction is dependent upon the degree of tonality or character in the noise

and is determined either by professional judgement, where the plant is not operational at present, or by measurement.

During the daytime, the specified noise levels are determined over a reference time interval of 1 hour, with a 15 minute reference period adopted when assessing night-time noise.

If the Rating Level of the noise being assessed exceeds the background level by 10 dB or more BS 4142 advises that there is likely to be an indication of a significant adverse impact, depending upon context. A difference between background level and Rating Level of around 5 dB is likely to be an indication of an adverse impact, depending upon context. The lower the Rating Level is, relative to the background noise level, the less likely the specific source will have an adverse or significant adverse impact. Where the Rating Level does not exceed the background noise level is an indication of a low impact, depending upon context

2.6. ProPG: Planning and Noise

Professional planning guidance on planning and noise was published in May 2017 [5]. The guidance seeks to provide a recommended approach to the management of noise within the planning system in England. The guidance has been prepared jointly between the Association of Noise Consultants, The Institute of Acoustics and the Chartered Institute of Environmental Health with the aim of providing a coherent approach to achieving the requirements of the NPPF.

At present, the guidance principally relates developments where noise is principally influenced by transportation sources, although it does include consideration of commercial where it is audible but not the dominant noise source.

The guidance advocates a systematic, proportionate, risk based, 2-stage approach, encouraging early consideration of noise within the design process for new residential developments:

- Stage 1 provides an initial noise risk assessment of the development site;
- Stage 2 provides systematic consideration of four key elements: demonstrating a good acoustic design process; observing internal noise level guidelines; undertaking an external amenity area noise assessment; and consideration of other relevant issues.

The initial risk assessment should identify the risk of adverse effects from noise and identifying whether the site poses a negligible, low, medium or high risk. The level of risk does not determine whether a site may be unsuitable for development, but highlights an increasing requirement for noise to be considered within the design of the development and the likelihood of a need for specific noise mitigation measures.

For a Stage 2 assessment, upon which basis this report has been prepared, the guidance refers to BS 8233 with respect of achieving an acceptable internal noise environment and within gardens.

Internally, the guidance recommends that the targets within BS 8233 are adopted as an aim. Expanding upon the guidance within BS 8233, for internal noise environments It is stated:

"Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels

exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form."

Within external amenity areas, the guidance reflects BS 8233, as follows:

"These guideline values (i.e. a level of between 50 – 55 dB L_{Aeq}) may not be achievable in all circumstances where development might be desirable. In such a situation, development should be designed to achieve the lowest practicable noise levels in these external amenity spaces."

ProPG additionally provides guidance upon acceptable maximum noise levels within bedrooms at night to minimise the potential for sleep disturbance. The guidance recommends that a level of 45 dB $L_{Amax,F}$ is normally exceeded more than 10 times a night. However, where it is not reasonably practicable to achieve this guideline then the judgement of acceptability will depend not only upon the maximum noise levels but also other factors such as source, number, distribution, predictability and regularity of noise events.

2.7. Approved Document O

Approved Document O to the Building Regulations was published in December 2021 and comes into force during June 2022. The document provides the requirements within dwellings to minimise the potential solar gains and to provide adequate means to remove heat from the indoor environment.

ADO requires excess heat to be removed by the following means:

- Opening windows;
- Ventilation louvres in external walls;
- A mechanical ventilation system; and
- A mechanical cooling system.

The building should be designed to remove excessive heat by passive means as far as reasonably practical.

With regards to noise, ADO requires the following:

In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).

Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.

- 40dB $L_{Aeq,T}$, averaged over 8 hours (between 11pm and 7am).
- 55dB L_{AFmax}, more than 10 times a night (between 11pm and 7am).

It is recognised in a recent document published by the CIEH [6] that the criteria contained within ADO are not reflected in the older AVO Guide (which will need to be updated). The CIEH document advises that the internal criteria within the AVO Guide, and presented in the previous sub-section, which indicates acceptable internal noise levels, should not be used, with the AVO

Guide now only used for practical guidance on noise control measures. The limits specified above within ADO should therefore be used when determining the requirement for any assisted ventilation requirements.

3. Site Description and Development Proposals

The proposed residential development would be located on land to the north of Rudloe Drive, Kingsway.

It is proposed to construct a residential development of 150 dwellings on the site. The proposed development layout is indicated on Figure 1.

The A38 runs to the west of the proposed development, approximately 200 metres from the western site boundary. This road is within a cutting as it passes the site and is additionally screened from the proposed dwellings by buildings constructed alongside the A38. Traffic was also audible travelling along Newhaven Road, which also runs to the west of the site.

The southern boundary is adjacent to Rudloe Drive. This road carries local traffic into the main development area. Traffic flows along this road are gradually increasing, as more homes within the development are being completed. Consideration of this has been taken into account by assessing the noise levels along Rudloe Drive on the basis of 2024 flows with the development completed.

There are existing residential properties to the east, located along Rudloe Drive, with planning permission also having been granted for residential development on land to the south, directly opposite the Proposed Development.

The Rose Tree Farm Public House is located to the south west of the Proposed Development, along Rudloe Drive. Noise associated with the operation of the Public House has the potential to generate audible levels of noise at the proposed dwellings and has been considered within this report to address the requirements of Condition 10.

Planning permission has recently been granted for a builders' merchants on land to the east of Kingsway, as indicated on Figure 1. This development would be adjacent to the proposed dwellings within the north western area of the proposed development. A noise assessment was prepared to accompany the planning application for the builders' merchants and mitigation measures proposed, which would ensure acceptable living conditions within the proposed residential development, based upon an assessment of the indicative layout prepared to accompany the outline application. An updated assessment of the noise attributable to the operation of the builder's merchants has been made based upon the final layout for the residential development, to ensure that the noise levels remain acceptable.

4. Noise Monitoring

4.1. Unattended Noise Surveys

Unattended noise monitoring was carried out at two positions within the application site between Wednesday 6th and Friday 8th March 2019.

Weather conditions during the survey were mixed, remaining generally dry with light to moderate winds. There was a period of rain observed during Thursday afternoon, which was noted to increase the noise levels, attributable to water on the surrounding roads. The noise levels monitored during this period were considered to represent reasonable worst case conditions.

Two Rion NL-52 Class 1 Sound Level Meters were used for the survey, fitted with Rion WS-15 Class 1 outdoor microphone protection. The instruments were calibrated before and after the exercise using a Rion NC-74 Class 1 Acoustic Calibrator. The sound level measured on the instruments with the calibrator applied read 94.0 dB(A) on both occasions.

The instruments were configured to monitor noise levels over contiguous 5 minute periods for the duration of the survey, which enabled maximum noise levels associated with particular events to be identified and a comparison with the attended noise measurements to be made. In addition, the instruments were fitted with an NX-42WR Waveform Recording Option Cards, which enabled sample audio data to be captured every 10 minutes throughout the survey, enabling the principal noise sources to be identified.

One instrument was positioned along the southern boundary midway within the site and set back approximately 25 metres from Rudloe Drive.

The second instrument was positioned along the south western boundary of the site at a position representative of the closest proposed dwelling to the Rose Tree Farm Public House.

At each position, the microphone was set freefield and at a height of 1.3 metres above local ground level.

The monitoring positions are indicated on Figure 1.

The results of the surveys have been analysed into hourly periods for reporting purposes using the Rion AS-60 Data Management Software with the tabulated hourly data provided in Appendices B and C. Figures 2 and 3 provide a summary of the hourly noise levels in graphical form.

The noise levels have been analysed to provide the overall day and night-time levels, as indicated in the following tables.

Day	Period Free-field Noise Level [dB]			
	Daytime (07:00 – 23:00)		Night-time (23:00 – 07:00)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Wednesday 6/3/19	55.7*	52.6*	49.7	43.5
Thursday 7/3/19	56.6	53.2	48.4	42.9

Notes * Daytime Period includes levels measured between 09:00 – 23:00 hours Wednesday and 07:00 – 09:00 Friday

Table 4.1 Period Noise Levels Monitored at Unattended Survey Position U1, Centrally Along Rudloe Drive

Day	Period Free-field Noise Level [dB]			
	Daytime (07:00 – 23:00)		Night-time (23:00 – 07:00)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
Wednesday 6/3/19	54.8*	51.9*	47.7	43.0
Thursday 7/3/19	55.2	52.1	48.1	42.5

Notes * Daytime Period includes levels measured between 09:00 – 23:00 hours Wednesday and 07:00 – 09:00 Friday

Table 4.2 Period Noise Levels Monitored at Unattended Survey Position U2, Adjacent to Rose Tree Farm P.H.

4.2. Attended Noise Surveys

To supplement the unattended noise surveys and to determine the noise levels at the properties to be constructed closest to Rudloe Drive, additional attended noise monitoring was carried out at two positions during the morning of Wednesday 6th March 2019, concurrent with the unattended noise surveys.

The measurements were made using two Rion NL-52 Class 1 Sound Levels, which were calibrated before and after the exercise using a Rion NC-74 Class 1 Acoustic Calibrator. At each position, the instrument was set freefield with the microphone at a height of 1.2 metres above the ground.

One instrument was positioned along the southern site boundary at the eastern end of the site, at a distance of 15 metres from the kerb, with the second instrument positioned centrally along the southern boundary at a distance of 12 metres from the kerb of Rudloe Drive.

The monitoring positions are indicated on Figure 1.

The results of the monitoring are provided in Appendix D, which additionally contains an analysis against the unattended survey data to determine the equivalent day and night-time noise levels, which are provided below.

Position	Period Free-field Noise Level [dB]			
	Daytime (07:00 – 23:00)		Night-time (23:00 – 07:00)	
	L_{Aeq}	L_{A90}	L_{Aeq}	L_{A90}
S1 – Eastern End of Rudloe Drive (15m from kerb)	60	53	53	43
S2 – Centrally along Rudloe Drive (12m from kerb)	58	54	51	44

Table 4.3 Period Noise Levels Monitored at Attended Survey Positions

4.3. Discussion of Noise Environment

Noise levels within the application site are principally influenced by road traffic on the surrounding roads and in particular, the A38, which was a major noise source throughout the day and night-time periods.

Traffic travelling along Rudloe Drive was clearly audible, although the flow of traffic along the road was light. It was observed that the traffic was generally travelling slower towards the western end of the road, whilst the vehicles negotiated the corners and traffic calming measures, which resulted in marginally lower noise levels compared to the eastern end of the site.

It was clear, however, that the principal influence on the noise environment was attributable to traffic travelling along the A38.

Noise from plant located to the rear of the Rose Tree Farm Public House was not audible at the position of the proposed dwellings to be located at the western end of the site above the general level of road traffic. Vehicles arriving and leaving the car park of the public house were audible, in particular the closing of car doors and engines starting and whilst these activities had minimal influence on the overall noise levels at the proposed dwellings, consideration has been given to these sources when assessing the noise environment at dwellings within this part of the site.

No noise was evident from inside the premises during the survey period. The Public House is a family pub, principally food orientated. The Premise Licence for the pub includes the potential for live music events, which is often included when premises apply for licences, to avoid having to apply for temporary licences, should they ever hold an event.

The Public House was contacted by Vistry Homes during April / May 2022 to gain an understanding of any music events held at the pub. The managers advised that they never held any such events, as the premises were a food orientated family pub and that the noise within the pub was generally low for dining. On this basis, it has been considered appropriate to assess the operation of the pub on the basis of the current operation.

5. Assessment of Noise Levels

5.1. Assessment of Road Traffic Noise from A38

The Proposed Development would be over 200 metres from the A38 and effectively screened from the road by the buildings alongside the road and the fact that the road is within a cutting.

The results of the noise survey and observations made whilst on site during the survey period, indicated that noise levels at the western end of the development from this source were low, typically of the order of or below 55 dB L_{Aeq} during the daytime periods.

Undertaking an initial Stage 1 assessment in accordance with the ProPG guidance on this basis indicates that there would be a negligible risk from noise from this source, with no adverse effects likely. Standard construction techniques would therefore be sufficient to meet the requirements of BS 8233 internally. The provision of the proposed 1.8 metre high boundary fences around the gardens of the properties, would reduce noise levels within garden areas to a maximum between 50 – 55 dB $L_{Aeq,\ 16\ hour}$ and thus meet the requirements of BS 8233.

5.2. Assessment of Noise Levels from Traffic Using Rudloe Drive

As indicated on Figure 1, the proposed dwellings are to be constructed at a similar distance from the kerb of Rudloe Drive to dwellings recently completed and occupied along the road to the east. The closest properties would be constructed between 5 – 6 metres from the kerb.

Traffic travelling along Rudloe Drive is the main source of noise within the southern half of the proposed development. As discussed previously, traffic flows along Rudloe Drive are gradually increasing as the main development progresses and more properties are completed.

It has therefore been considered appropriate to base the current assessment upon future traffic flows along Rudloe Drive and calculate the noise levels at the properties alongside the road.

The transport assessment which has been prepared to support the planning application indicated the following AADT traffic flows along the road:

- 2019 Base – 12311 west of access / 11471 east of access; and
- 2024 Base + Proposed Development - 14337 west of access / 12446 east of access.

Utilising these figures, calculations of the road traffic noise levels have been made using the CRTN calculation methodology [6] to determine the increase in road traffic noise levels along the road, which indicates a small change of 0.7 dB(A) to the west of the development access and 0.4 dB to the east of the access.

On this basis, the following noise levels have been calculated for the proposed dwellings to be constructed closest to Rudloe Drive (5 metres from the kerb).

Position	Period Free-field $L_{Aeq,T}$ Noise Level [dB]			
	Daytime (07:00 – 23:00)		Night-time (23:00 – 07:00)	
	Noise Measurement Position	Closest Property (5m from Kerb)	Noise Measurement Position	Closest Property (5m from Kerb)
East of Development Access (15m from kerb)	61	64	54	57
West of Development Access	59	62	52	55

Table 5.1 Future Noise Levels at Closest Dwellings to be Constructed Along Rudloe Drive

During the night-time periods, consideration has also been given to the maximum noise levels generated by passing traffic. Typical maximum noise levels from passing cars would be typically 70 dB $L_{Amax,F}$, with maximum noise levels from HGVs up to 80 dB $L_{Amax,F}$.

Initial calculations of the noise levels within the properties fronting onto Rudloe Drive have been calculated on the basis of the provision of standard 4-16-4 thermal double glazed unit (providing a sound reduction of 31 dB R_{W-4CTR}), with good quality trickle vents used, with an indirect air path.

The facades of the properties would be of standard brick construction, comprising external brick, with 100mm insulation, 100mm aircrete block internally and finished with 12.5mm plasterboard. This construction will provide a sound reduction in excess of 50 dB and on this basis, the main consideration would be associated with the provision of appropriate glazing and vents.

The calculations on this basis, indicate internal noise levels within rooms facing onto the road, assuming windows closed, of 34 dB $L_{Aeq,\,16\,hour}$ daytime / 27 dB $L_{Aeq,\,8\,hour}$ night-time, with maximum noise levels of up to 49 dB $L_{Amax,F}$ attributable to passing HGV traffic. The details of the calculations are provided in Appendix D.

BS 8233 recommends internal noise levels of 35 dB $L_{Aeq,\,16\,hour}$ daytime / 30 dB $L_{Aeq,\,8\,hour}$ night-time, within habitable rooms, which would be achieved through a standard construction. However maximum noise levels within bedrooms would be above the 45 dB $L_{Amax,F}$ limit recommended within ProPG and WHO guidelines of 45 dB $L_{Amax,F}$.

Glazing with a minimum acoustic specification of 36 dB R_{W-5Ctr}, will be installed within the windows to habitable rooms in the facades highlighted on Figure 4. In addition, windows to these rooms will be fitted with acoustically treated background ventilators, with a minimum performance of 40 dB $D_{n,e,w-1Ctr}$, assuming the vents fully open to provide the required background ventilation.

The provision of this mitigation would provide a sound reduction of 34 dB(A), with the following internal noise levels calculated within the properties based upon this specification:

- 29 dB $L_{Aeq,\,16\,hour}$ daytime;
- 22 dB $L_{Aeq,8\,hour}$ night-time; and
- Maximum noise levels overnight typically < 45 dB $L_{Amax,F}$.

Consideration to the requirements of Approved Document O has also been considered for the dwellings fronting onto Rudloe Drive. ADO requires consideration of the overheating effects within the dwellings and requires consideration of additional ventilation where noise levels within bedrooms overnight exceed 40 dB $L_{Aeq, 8\ hour}$ and 55 dB $L_{Amax,F}$ assuming windows open.

Research undertaken by Napier University, indicate a partially open window providing adequate ventilation into the rooms would provide a sound reduction of 17 dB(A) between the external façade level and noise levels internally [7]. Taking this reduction into account, ambient noise levels within the bedrooms facing onto the road would be up to 40 dB $L_{Aeq, 8\ hr}$, with maximum noise levels anticipated to exceed the 55 dB $L_{Amax,F}$ criterion.

As it would not be possible to provide cross ventilation into the bedrooms, assisted ventilation would be provided within the bedrooms fronting onto Rudloe Drive to meet the requirements of ADO.

The additional glazing and ventilation to be installed within the facades of properties facing onto Rudloe Drive would ensure that the requirements of BS 8233, Condition 9 and ADO were achieved.

5.3. Assessment of Noise from Operation of the Rose Tree Farm Public House

As indicated in the previous section, noise attributable to any external plant and equipment located to the rear of the public house was not audible at a position representative of the closest proposed dwellings within the south western corner of the proposed development. Given the inaudibility of any plant noise would be a positive indication of a low impact, when assessed against the requirements of BS 4142 and thus the operation of any plant to the rear of the public house would be unlikely to result in any adverse noise impacts at the dwellings.

As discussed previously, whilst the Public House Premises Licence includes allowance for live music, it is understood from the management that it is a family pub, principally providing a food service and never holds any live music events. On this basis, it is appropriate to assess the noise levels attributable to the operation of the pub on the basis of the current operations.

The proposed layout indicated on Figure 1, indicates that the closest dwelling (Plot 134) would be constructed 12 metres from the closest parking bays within the car park (a small increase in the separation distance compared to the indicative layout assessed at the outline application stage), although the majority of the spaces would be over 25 metres from the properties.

The final layout has also taken the Public House into account by orientating the adjacent properties to be side onto the car park, thus ensuring there was no direct line of sight from windows to habitable rooms onto the vehicles parked.

Whilst vehicle movements within the car park would be unlikely to result in any adverse noise impacts upon future occupants of the neighbouring properties during the daytime periods, consideration has been given to vehicles leaving at the end of the evening.

Given the nature of the public house, it is likely that the majority of the customers would visit to eat, with the majority of the vehicles leaving before 10pm. However, there will be a number of vehicles leaving after this time, including staff and there is a potential for activity within the car park typical until around midnight.

In order to assess the noise levels attributable to the movements within the car park, calculations of the noise levels attributable to doors closing and vehicles driving off have been made on the basis of vehicles parked centrally within the car park and closest to the proposed dwellings.

The calculations, presented in Appendix D, indicate ambient (L_{Aeq}) noise levels of between 41 – 47 dB $L_{Aeq,\ 15\ minute}$ assuming one vehicle departing every five minutes. This level of noise is lower than associated with the general road traffic in the surrounding area and thus unlikely to result in any adverse noise impacts.

Consideration has also been given to the maximum noise levels attributable the car doors opening and closing and vehicles driven off, which indicates levels of between 66 – 72 dB $L_{Amax,F}$ at the closest dwelling.

As indicated above, it is likely that the majority of vehicles would leave during the late evening period, however, there are vehicles which leave later. Assuming windows closed, maximum noise levels internally would be reduced to a standard below 45 dB $L_{Amax,F}$ and thus seek to minimise any adverse noise impacts when assessed against the relevant standards for bedrooms.

With windows open, maximum noise levels would be in excess of 45 dB $L_{Amax,F}$ at the closest dwellings. Given that only a small number of vehicles would be likely to depart after 23:00 hours, with typically less than 10 events, it is considered that any potential adverse noise impacts would be minimal.

However, to ensure an acceptable standard of noise is maintained within the dwellings adjacent to the Public House, bedrooms to Plots 124 and Plots 134, which are closest to the car park, would be fitted with the same high specification glazing and assisted ventilation, as to be provided for the dwellings along Rudloe Drive.

5.4. Assessment of Noise from the Operation of the Builders' Merchants

Planning permission for a builders' merchants has recently been granted on land to the west of this development.

As indicated previously, a noise assessment was prepared to accompany the planning application for that development, which, based upon an indicative layout for the residential development, demonstrated that a satisfactory noise environment would be achieved within the dwellings with appropriate boundary mitigation and no adverse impacts identified when assessed against the requirements of BS 4142. Conditions were imposed in the planning permission for the builders' merchant, which ensures that the proposed boundary mitigation to be constructed along the residential boundary is provided and maintained for the duration of the use. Further conditions ensure that non-tonal reversing signals are fitted to vehicles operating within the yard and limit the operational hours to between 07:00 – 19:00 Mondays to Saturdays and 10:00 – 16:00 hours on Sundays / Bank Holidays.

The layout of the residential development has been revised from that indicated on the indicative layout and it has therefore been considered appropriate to provide an updated assessment of the noise levels at the closest dwellings.

The final layout provides an improvement in the design over that proposed at outline stage. It is now proposed to provide parking on the land between the builders' merchants and the dwellings, which would ensure that the dwellings are constructed 12 metres from the boundary. Furthermore, a terrace of houses is now proposed, which would front onto the parking area. The gardens would be to the rear of the properties, thus further from the builders' merchants and effectively screened by the property facades.

The results of the revised calculations, using the same source data and assumptions as presented in the noise assessment to accompany the planning application for the builders' merchants, based upon the final residential layout are presented on Figure 5.

The calculations indicate the same noise levels as predicted previously and, on this basis, a revised assessment has been made against the requirements of BS 4142.

Description	Noise Level [dB]
Calculated Noise Level at Dwelling [dB $L_{Aeq, T}$]	45
Character Correction	3
Rating Level [dB $L_{Aeq, 1\ hour}$]	48
Background Level [dB L_{A90}]	52
Excess Over Background	-4
Likelihood of Impact	Indication of Low Impact

Table 5.2 Initial BS 4142 Assessment – Closest Proposed Dwelling

The calculations and initial assessment of potential impacts indicates that the noise levels attributable to the operation of the builders' merchant, would result in rating noise levels below the prevailing background noise levels at the surrounding proposed properties. On this basis, the operation of the builders' merchants would therefore not result in any adverse noise impacts.

Consideration has also been given to the noise levels within the gardens of the adjacent properties. The calculations indicate a level below 35 dB $L_{Aeq, 1\ hr}$, thus substantially below the guideline value recommended within BS 8233 as representing an acceptable noise environment with gardens. On this basis, noise levels attributable the operation of the builders' merchant at the neighbouring properties would be acceptable and not result in any adverse noise impacts.

6. Summary

LF Acoustics Ltd were appointed to undertake a noise assessment for a proposed residential development on land to the north of Rudloe Drive, Kingsway, Gloucester.

Outline planning permission has been granted for the development, subject to conditions relating to noise, requiring further assessments of the road traffic noise and noise associated with the operation of The Rose Tree Farm public house, detailing the noise mitigation measures to be incorporated into the design of the dwellings.

Noise levels within the site are influenced by a mix of noise sources, including traffic travelling along the A38 and Rudloe drive and associated with vehicles accessing the car park of the Rose Tree Farm Public House.

Whilst clearly audible throughout the day, noise from traffic using the A38 to the west was found to be low and standard construction techniques would ensure a good standard of noise within the dwellings from this source.

The main source of noise was identified to be associated with traffic travelling along Rudloe Drive. An assessment of the noise levels at proposed dwellings adjacent to the road has been made on the basis of future road traffic flows, with the development completed. To ensure a satisfactory noise environment within dwellings fronting onto Rudloe Drive, habitable rooms with windows facing onto the road would be fitted with higher specification glazing and acoustically treated vents. In addition, bedrooms with windows facing onto the road would have assisted ventilation to meet the requirements of ADO.

Consideration has also been given to the use of the Rose Tree Farm Public House. The public house is a family pub, providing mainly a food service and thus generating low levels of noise. Noise from vehicles using the car park was identified to be the main source of noise likely to affect the neighbouring properties. Whilst vehicle movements within the car park would be unlikely to result in adverse noise impacts, vehicles leaving during the late evening period have the potential to impact upon the occupants of the closest dwellings. To ensure an acceptable standard of noise is achieved within the neighbouring dwellings, higher specification glazing, acoustic vents and assisted ventilation within the bedrooms would be provided within the two adjacent properties.

Planning permission has recently been granted for a builders' merchants on land to the west of the development. Mitigation measures were incorporated into the design of the builders' merchants to ensure their operations did not adversely impact upon the residential development. A revised assessment has been made, based upon the final layout for the proposed development, which indicates that the noise levels would be no worse than assessed for the builders' merchants planning application, thus ensuring that their operation would not result in adverse noise effects.

With appropriate mitigation measures for dwellings alongside Rudloe Drive and the public house, noise levels within the development would be satisfactory and fully comply with the requirements of Conditions 9 and 10 of the outline planning permission, BS 8233 and the NPPF.

References

1. Ministry of Housing, Communities and Local Government. National Planning Policy Framework. July 2021.

2. British Standards Institute. Guidance on Sound Insulation and Noise Reduction for Buildings. BS 8233. 2014.

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5. ANC / Institute of Acoustics / Chartered Institute of Environmental Health. ProPG: Planning and Noise. Professional Practice Guidance on Planning & Noise. New Residential Development. May 2017.

6. Department of Transport / Welsh Office. Calculation of Road Traffic Noise. The Stationary Office. 1988.

7. The Building Performance Centre. School of the Built Environment. Napier University. NANR116: 'Open / Closed Window Research'. Sound Insulation Through Ventilated Domestic Windows. April 2007.

Figures

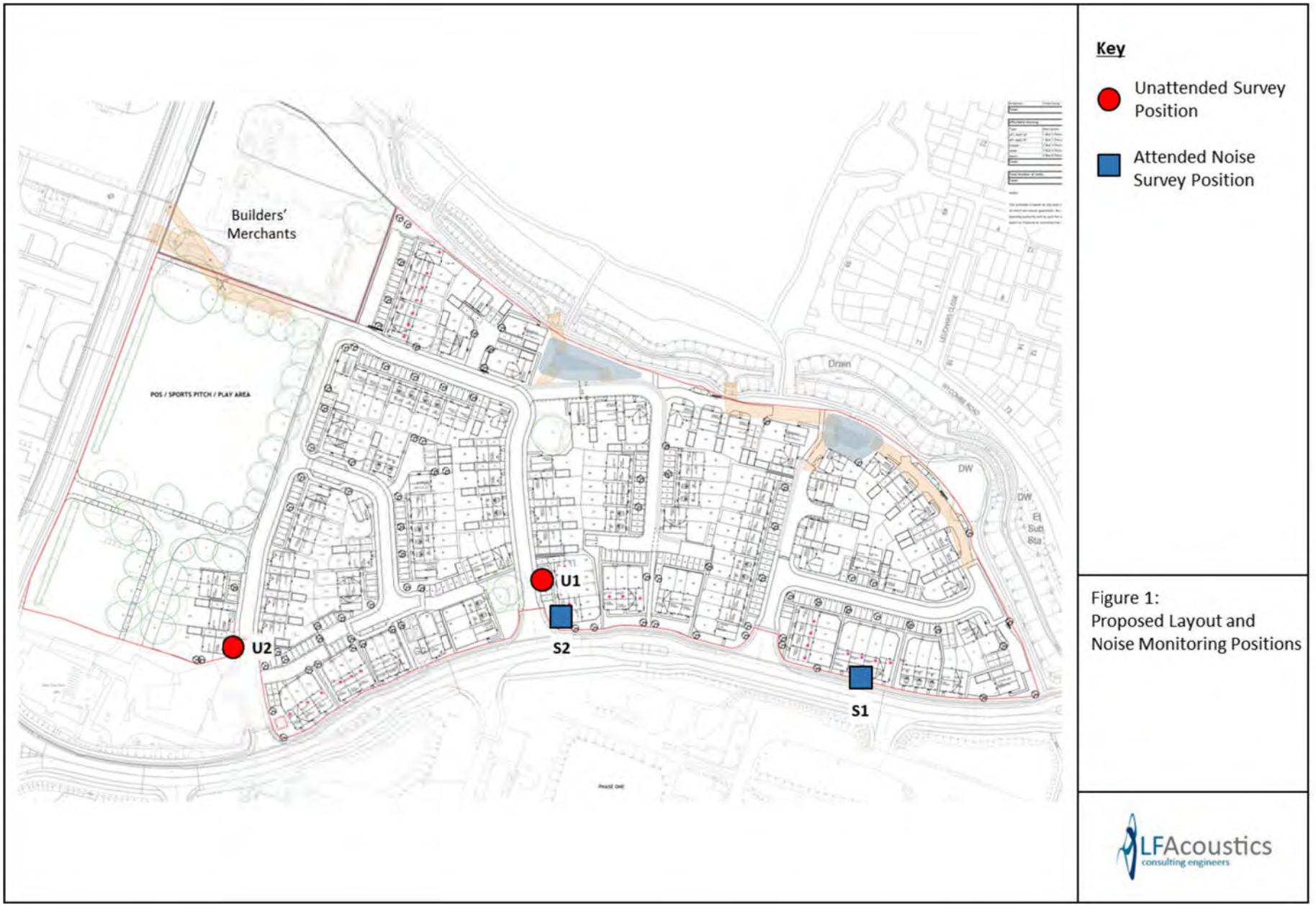

Figure 1:
Proposed Layout and Noise Monitoring Positions

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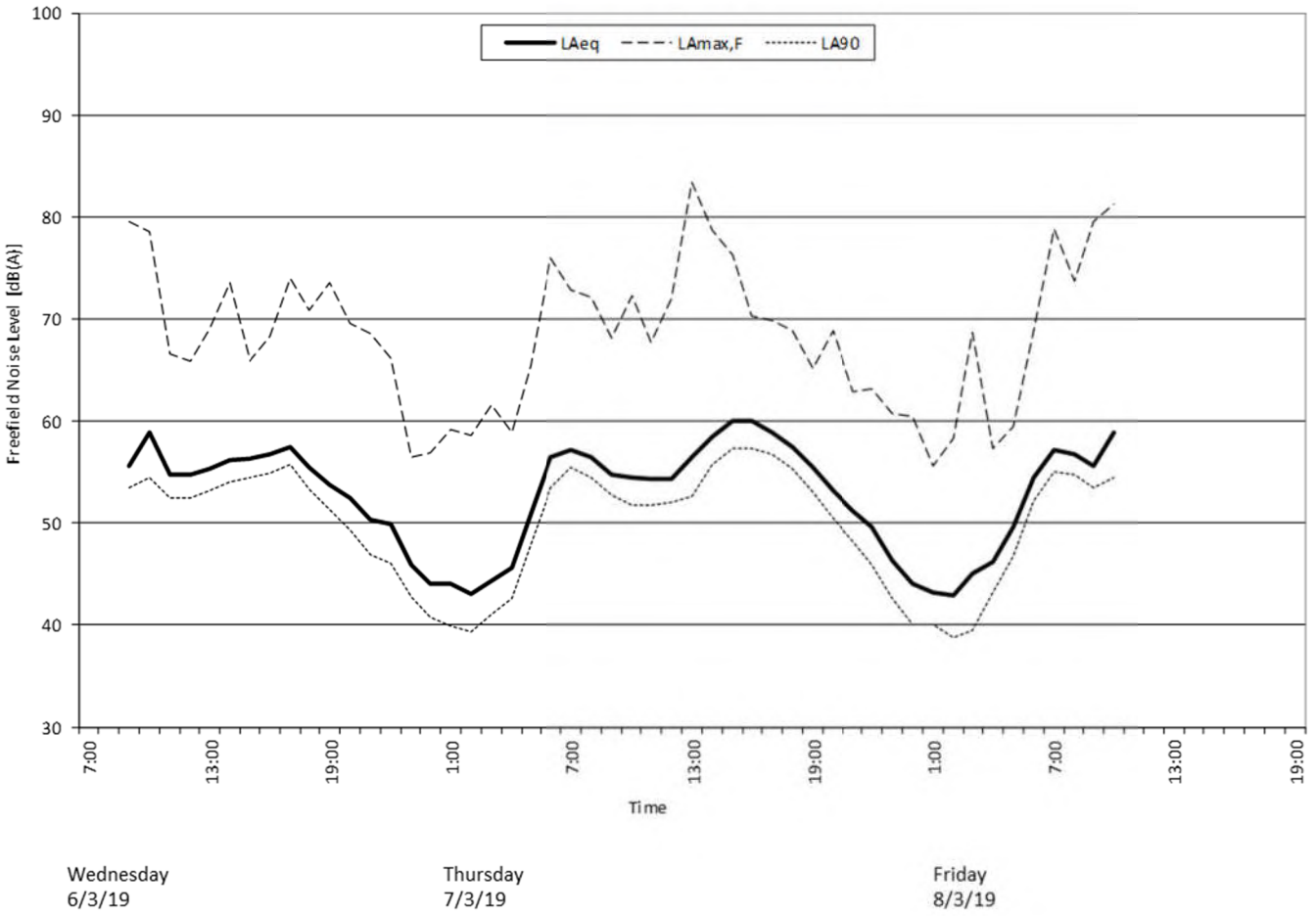

Figure 2:
Unattended Noise Survey Results - Position U1

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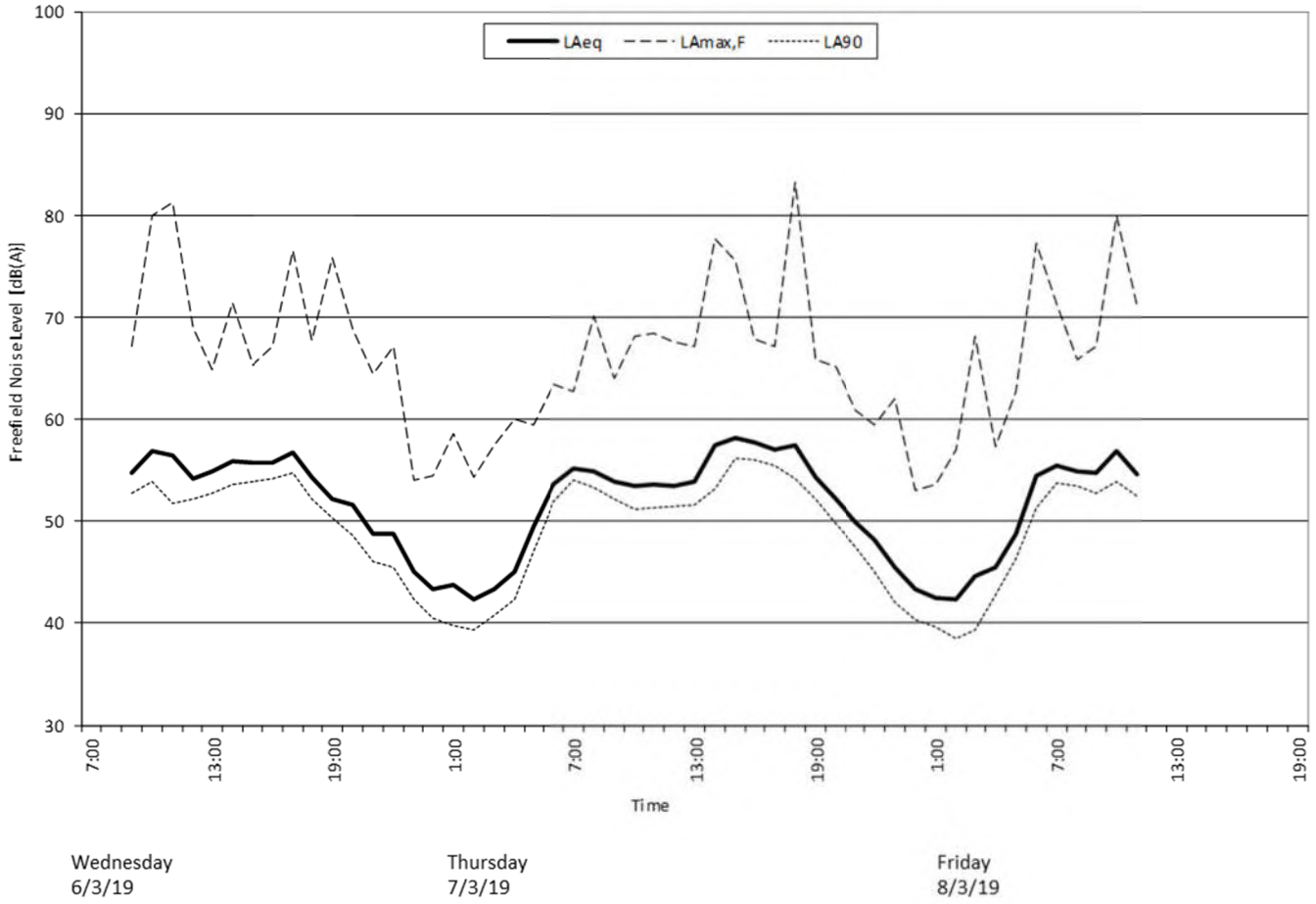

Figure 3:
Unattended Noise Survey Results - Position U2

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Key

- Windows in Façade to be Fitted with High Specification Glazing / Acoustic Vents Bedrooms to have Assisted Ventilation
- Bedroom Windows in Façade to be Fitted with High Specification Glazing / Acoustic Vent and have Assisted Ventilation

Figure 4:
Dwellings to be Provided with Additional Noise Mitigation

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Figure 5:
Calculated Noise Levels
From Builders' Mechant

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Appendix A
Noise Units

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable, a 5 dB change is generally considered to be clearly discernible and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness.

A-Weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system. All the measurement results referred to in this report are A-weighted.

Units Used to Describe Time-Varying Noise Sources (L_{Aeq}, L_{A90} and L_{Amax})

Instantaneous A-weighted sound pressure level is not generally considered as an adequate indicator of subjective response to noise because levels of noise usually vary with time.

For many types of noise the Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is used as the basis of determining community response. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise which is present even during the quietest part of the measurement period.

The L_{Amax} is the maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax,F}$, or Fast, is averaged over 0.125 of a second.

Appendix B
Results of Unattended Noise Survey
Position U1 – Centrally 25m from Rudloe Drive

Proposed Residential Development on Land North of Rudloe Drive, Kingsway
Results of Noise Measurements Carried Out Between
6 - 8 March 2019

Equipment Used: Rion NL-52 Class 1 Sound Level Meter (Serial No. 01021287)
Location: U1 - 25m from Kerb of Rudloe Drive
All Levels; Fast, Freefield, Mic Height 1.3 metres.

Date	Start Period	Measured Noise Levels [dB]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Wednesday	9:00	55.6	79.6	56.8	53.5
06/03/2019	10:00	58.9	78.6	59.2	54.4
	11:00	54.7	66.6	56.2	52.5
	12:00	54.7	65.9	56.3	52.5
	13:00	55.3	69.0	56.9	53.2
	14:00	56.2	73.6	57.6	54.0
	15:00	56.3	65.8	57.7	54.4
	16:00	56.7	68.3	57.9	54.9
	17:00	57.5	74.0	58.9	55.7
	18:00	55.4	70.8	56.6	53.3
	19:00	53.8	73.6	55.4	51.3
	20:00	52.4	69.6	53.9	49.3
	21:00	50.3	68.6	52.0	46.9
	22:00	49.9	66.2	51.9	46.0
	23:00	45.9	56.5	47.8	42.7
Thursday	0:00	44.0	56.9	46.1	40.8
07/03/2019	1:00	44.0	59.2	46.2	39.9
	2:00	43.0	58.6	45.3	39.4
	3:00	44.3	61.6	46.0	41.0
	4:00	45.6	58.8	47.3	42.6
	5:00	50.9	65.4	52.2	47.9
	6:00	56.5	76.0	57.3	53.5
	7:00	57.1	72.8	58.1	55.4
	8:00	56.4	72.1	57.8	54.5
	9:00	54.8	68.2	56.3	52.8
	10:00	54.5	72.3	56.1	51.8
	11:00	54.3	67.7	56.0	51.8
	12:00	54.3	72.0	56.0	52.0
	13:00	56.4	83.4	57.3	52.6
	14:00	58.5	78.7	60.2	55.7
	15:00	60.0	76.3	61.9	57.3
	16:00	60.0	70.3	61.8	57.3
	17:00	58.8	69.9	60.4	56.8
	18:00	57.5	68.9	59.1	55.3
	19:00	55.5	65.1	57.2	53.0
	20:00	53.2	68.8	55.0	50.4
	21:00	51.2	62.8	53.1	48.2
	22:00	49.6	63.2	51.7	45.9
	23:00	46.3	60.7	48.7	42.6
Friday	0:00	44.0	60.4	46.3	40.1
08/03/2019	1:00	43.2	55.6	45.4	40.0
	2:00	42.9	58.3	45.2	38.7
	3:00	45.1	68.7	46.4	39.5
	4:00	46.2	57.3	47.9	43.2
	5:00	49.6	59.5	51.0	46.8
	6:00	54.4	68.9	55.8	52.2

Proposed Residential Development on Land North of Rudloe Drive, Kingsway
Results of Noise Measurements Carried Out Between
6 - 8 March 2019

Equipment Used: Rion NL-52 Class 1 Sound Level Meter (Serial No. 01021287)
Location: U1 - 25m from Kerb of Rudloe Drive
All Levels; Fast, Freefield, Mic Height 1.3 metres.

Date	Start Period	Measured Noise Levels [dB]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Friday	7:00	57.2	78.9	58.2	55.0
08/03/2019	8:00	56.7	73.7	57.9	54.8
	9:00	55.6	79.6	56.8	53.5
	10:00	58.9	81.2	59.2	54.4

Appendix C
Results of Unattended Noise Survey
Position U2 – Boundary with The Rose Tree Farm Public House

Proposed Residential Development on Land North of Rudloe Drive, Kingsway
Results of Noise Measurements Carried Out Between
6 - 8 March 2019

Equipment Used: Rion NL-52 Class 1 Sound Level Meter (Serial No. 00231656)
Location: U2 - Representative of Closest Property to Rose Tree Farm PH
All Levels; Fast, Freefield, Mic Height 1.3 metres.

Date	Start Period	Measured Noise Levels [dB]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Wednesday	9:00	54.7	67.1	56.0	52.7
06/03/2019	10:00	56.9	79.9	58.4	53.9
	11:00	56.5	81.2	56.1	51.8
	12:00	54.1	69.0	55.6	52.2
	13:00	54.9	64.8	56.6	52.7
	14:00	55.9	71.4	57.2	53.6
	15:00	55.8	65.3	57.2	53.9
	16:00	55.8	67.2	57.0	54.1
	17:00	56.7	76.6	58.0	54.8
	18:00	54.3	67.7	55.5	52.2
	19:00	52.2	75.9	53.3	50.3
	20:00	51.6	68.8	52.6	48.6
	21:00	48.8	64.4	50.3	46.1
	22:00	48.8	67.1	50.3	45.5
	23:00	45.0	54.0	46.8	42.4
Thursday	0:00	43.3	54.5	45.4	40.5
07/03/2019	1:00	43.8	58.6	45.9	39.8
	2:00	42.4	54.3	44.4	39.3
	3:00	43.3	57.5	45.1	40.7
	4:00	45.1	60.0	46.8	42.3
	5:00	49.5	59.5	50.8	47.0
	6:00	53.6	63.5	54.6	51.9
	7:00	55.1	62.7	56.1	54.0
	8:00	54.9	70.1	56.0	53.3
	9:00	53.9	64.0	55.3	52.1
	10:00	53.5	68.1	55.2	51.2
	11:00	53.6	68.4	55.3	51.3
	12:00	53.5	67.6	55.0	51.5
	13:00	53.9	67.1	55.5	51.6
	14:00	57.5	77.7	58.3	53.2
	15:00	58.1	75.5	59.8	56.2
	16:00	57.7	67.8	59.0	56.0
	17:00	57.0	67.2	58.2	55.4
	18:00	57.5	83.3	56.9	54.1
	19:00	54.3	65.9	55.8	52.1
	20:00	52.2	65.2	53.7	49.8
	21:00	49.9	60.8	51.5	47.4
	22:00	48.2	59.5	50.2	45.0
	23:00	45.5	62.0	47.5	42.0
Friday	0:00	43.4	53.0	45.5	40.4
08/03/2019	1:00	42.5	53.6	44.5	39.6
	2:00	42.3	57.0	44.4	38.5
	3:00	44.6	68.1	45.7	39.3
	4:00	45.4	57.3	47.0	42.7
	5:00	48.8	62.7	50.1	46.3
	6:00	54.5	77.3	55.4	51.3

Proposed Residential Development on Land North of Rudloe Drive, Kingsway
Results of Noise Measurements Carried Out Between
6 - 8 March 2019

Equipment Used: Rion NL-52 Class 1 Sound Level Meter (Serial No. 00231656)
Location: U2 - Representative of Closest Property to Rose Tree Farm PH
All Levels; Fast, Freefield, Mic Height 1.3 metres.

Date	Start Period	Measured Noise Levels [dB]			
		L_{Aeq}	L_{Amax}	L_{A10}	L_{A90}
Friday	7:00	55.4	71.3	56.4	53.7
08/03/2019	8:00	54.9	65.9	55.9	53.5
	9:00	54.7	67.1	56.0	52.7
	10:00	56.9	79.9	58.4	53.9
	11:00	54.6	71.2	56.1	52.4

Appendix D
Results of Attended Noise Measurements

Proposed Residential Development on Land North of Rudloe Drive, Kingsway
Results of Attended Noise Measurements made on 6 March 2019

Equipment Used: Rion NL-52 Class 1 Sound Level Analysers, Calibrated with Rion NC-74 Class 1 Acoustic Calibrator

		FREEFIELD Sample Measurement Results				FREEFIELD Unattended Measurement Results				Difference			
Location	Start **Time**	L_{Aeq}	$L_{Amax,F}$	L_{A10}	L_{A90}	L_{Aeq}	$L_{Amax,F}$	L_{A10}	L_{A90}	L_{Aeq}	L_{A90}		
S1	09:35	59.0	72.5	62.8	53.3	55.0	65.2	56.3	53.1	4.0	0.2		
15m from Kerb of Rudloe Drive	09:40	60.2	70.8	64.4	53.8	55.6	62.9	57.1	53.8	4.6	0.0		
Eastern End	09:45	59.8	77.7	63.4	53.4	55.7	66.6	56.9	53.8	4.1	-0.4		
1.2m Height	09:50	60.2	69.1	64.4	54.2	56.6	73.3	57.9	54.8	3.6	-0.6		
	09:55	60.0	69.5	63.7	54.3	57.7	79.6	58.3	54.4	2.3	-0.1		
	10:00	60.5	74.7	64.4	53.5	55.4	63.4	56.7	53.5	5.1	0.0		
	10:05	60.5	75.3	64.6	53.6	56.3	74.6	57.9	53.5	4.2	0.1		
	10:10	60.2	74.1	64.2	53.9	56.8	72.0	58.9	54.1	3.4	-0.2		
	10:15	59.3	73.9	62.8	54.3	56.9	70.4	58.5	54.6	2.4	-0.3		
	10:20	61.0	72.4	64.6	55.0	56.8	66.6	58.6	54.4	4.2	0.6		
	10:25	60.1	71.2	63.3	54.3	55.8	77.0	59.8	54.0	4.3	0.3		
	10:30	59.6	70.0	62.6	54.9	54.5	70.2	59.6	53.5	5.1	1.4		
		60.1				**56.2**		**Average Difference =**		**3.9**	**0.1**	60	53
S2	09:40	57.8	67.1	60.1	54.4	55.6	62.9	57.1	53.8	2.2	0.6		
12m from Kerb of Rudloe Drive	09:45	57.2	72.0	59.0	54.3	55.7	66.6	56.9	53.8	1.5	0.5		
Central	09:50	57.8	63.6	59.8	54.8	56.6	73.3	57.9	54.8	1.2	0.0		
1.2m Height	09:55	58.5	69.5	60.8	55.0	57.7	79.6	58.3	54.4	0.8	0.6		
	10:00	58.3	67.0	60.7	54.5	55.4	63.4	56.7	53.5	2.9	1.0		
	10:05	58.2	66.7	60.4	54.3	56.3	74.6	57.9	53.5	1.9	0.8		
	10:10	59.1	79.3	61.7	54.7	56.8	72.0	58.9	54.1	2.3	0.6		
	10:15	58.6	67.9	60.9	55.4	56.9	70.4	58.5	54.6	1.7	0.8		
	10:20	59.6	69.8	62.2	55.1	56.8	66.6	58.6	54.4	2.8	0.7		
	10:25	58.5	69.3	60.6	55.6	55.8	77.0	59.8	54.0	2.7	1.6		
	10:30	57.2	60.8	58.9	56.1	54.5	70.2	59.6	53.5	2.7	2.6		
	10:35	56.5	65.2	58.2	54.5	54.3	71.6	55.4	52.0	2.2	2.5		
		58.2				**56.1**		**Average Difference =**		**2.0**	**1.0**	58	51

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Appendix E
Calculations

Proposed Residental Development on Land to North of Rudloe Drive
Calculated Noise Levels from Vehicles Using Car Park

18-May-2022

Receptor: Closest Property (Plot 134)
Height 4 m

Predicted Freefield Noise Levels	Ref Level @10m	Index	No./ 15 min	Source Ht	Dist S-R (Horiz)	Barrier Ht	Dist S-B (Horiz)	Distance Attenuation	CRTN Barrier Attenuation	Overall Attenuation	Façade Correction	**Façade LAeq,T Level [dB]**	**Façade LAeq,T Total [dB]**
Closest Parking Spaces													
LAeq, 15 minutes													
Car Door	64.6	SEL	6	0.5	12			-1.9	-0.1	-2.0	2.5	**43.3**	
Start Up and Pulling Out	66.2	SEL	3	0.5	12			-1.9	-0.1	-2.0	2.5	**41.9**	
Driving Off	66.1	SEL	3	0.5	12			-1.9	-0.1	-2.0	2.5	**41.8**	**47.2**
LAmax,F													
Car Door	71.7	LAmax,F		0.5	12			-1.9	-0.1	-2.0	2.5	**72.2**	
Start Up and Pulling Out	70.3	LAmax,F		0.5	12			-1.9	-0.1	-2.0	2.5	**70.8**	
Driving Off	64.3	LAmax,F		0.5	12			-1.9	-0.1	-2.0	2.5	**64.8**	**72.2**
Furthest Parking Space													
LAeq, 15 minutes													
Car Door	64.6	SEL	6	0.5	25			-8.0	-0.1	-8.1	2.5	**37.2**	
Start Up and Pulling Out	66.2	SEL	3	0.5	25			-8.0	-0.1	-8.1	2.5	**35.8**	
Driving Off	66.1	SEL	3	0.5	25			-8.0	-0.1	-8.1	2.5	**35.7**	**41.1**
LAmax,F													
Car Door	71.7	LAmax,F		0.5	25			-8.0	-0.1	-8.1	2.5	**66.1**	
Start Up and Pulling Out	70.3	LAmax,F		0.5	25			-8.0	-0.1	-8.1	2.5	**64.7**	
Driving Off	64.3	LAmax,F		0.5	25			-8.0	-0.1	-8.1	2.5	**58.7**	**66.1**

Proposed Residential Development at Rudloe Drive, Kingsway
Calculation of Internal Noise Levels

Position : Dwellings Fronting onto Rudloe Drive

Prepared By: LPJ - 18/5/22 **STANDARD GLAZING & VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	2
Sew	Sf-Swi	8
Srr	Area of Ceiling	10
S	Sf+Srr	20
A0	Ref Absorption Area	10

			Overall A-Wtd	1/3 Octave Band Leq 125	250	500	1000	2000	
Source Level	Leq FF	A	**64**	63	58	57	62	54	
Window Vent	Dn,e			35	35	34	36	34	Trickle Vent Direct Air Path
		B		0.00016	0.00016	0.00020	0.00013	0.00020	
Glazing	Rwi			19	16	35	45	50	Standard Glazing 4-20-4
		C		0.00126	0.00251	0.00003	0.00000	0.00000	
Wall	Rew			41	45	45	54	58	
		D		3.177E-05	1.265E-05	1.265E-05	1.592E-06	6.34E-07	
Ceiling	Rrr			24	34	40	45	49	
		E		0.0019905	0.0001991	0.00005	1.581E-05	6.295E-06	
	10Log (B+C+D+E)			-24.635238	-25.403508	-35.326502	-38.351702	-36.840671	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			2.5963731	1.5490196	0.9691001	0.9691001	1.2493874	
	Leq,2			44.2	37.5	25.6	27.4	21.5	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAeq,2			28.2	28.5	22.6	27.4	22.5	

	Day	Night
LAeq, Internal	**34**	**27**
Reduction	**-30**	

Proposed Residential Development at Rudloe Drive, Kingsway
Calculation of Internal Noise Levels

Position : Dwellings Fronting onto Rudloe Drive

Prepared By: LPJ - 9/11/17 **IMPROVED GLAZING & VENTS**

Sf	Facade Area (inc Window)	10
Swi	Window Area	2
Sew	Sf-Swi	8
Srr	Area of Ceiling	10
S	Sf+Srr	20
A0	Ref Absorption Area	10

			Overall	1/3 Octave Band Leq					
			A-Wtd	125	250	500	1000	2000	
Source Level	Leq FF	A	64	63	58	57	62	54	
Window Vent	Dn,e			43	43	39	40	48	Acoustically Treated Trickle Vent Indirect Air Path
		B		0.00003	0.00003	0.00006	0.00005	0.00001	(Munster Joinery)
Glazing	Rwi			27	32	42	43	37	SGG Glass 34 dB RW+Ctr
		C		0.00020	0.00006	0.00001	0.00001	0.00002	
Wall	Rew			41	45	45	54	58	
		D		3.177E-05	1.265E-05	1.265E-05	1.592E-06	6.34E-07	
Ceiling	Rrr			24	34	40	45	49	
		E		0.0019905	0.0001991	0.00005	1.581E-05	6.295E-06	
	10Log (B+C+D+E)			-26.484173	-35.230847	-38.797389	-41.401673	-44.5835	
	A (Furnished)			11	14	16	16	15	
	10*log (S/A)			2.5963731	1.5490196	0.9691001	0.9691001	1.2493874	
	Leq,2			42.3	27.7	22.2	24.4	13.8	
	A-Weighting			-16.0	-9.0	-3.0	0.0	1.0	
	LAeq,2			26.3	18.7	19.2	24.4	14.8	

	Day	Night
LAeq, Internal	**29**	**22**

Reduction **-34.2**

DATE:	**22 May 2022**
DESIGNER:	**EDS**
PROJECT No:	**433**
PROJECT NAME:	**Quedgeley 2**

LIGHTING REALITY

Designed to lighting Class P4

Outdoor Lighting Report

Layout Report

General Data

Dimensions in Metres Angles in Degrees
Grid Origin 381122.5m x 213249.1m
Area 403.9m x 226.9m
Sample Spacing 1.62m x 1.49m

Luminaires

Luminaire A Data

Supplier	Urbis Schreder
Type	AMPERA MINI 5112 Flat glass 16 OSLON SQUARE GIANT@500mA WW
Lamp(s)	16 OSLON SQUARE GIANT@500mA WW 730 230V
LampFlux(klm)/Colour	3.11 WW 3000K/70
File Name	AMPERA MINI 5112 16 OSLON SQUARE GIANT 500mA WW 730 26.1W 414272 Fla...
Maintenance Factor	0.86
Imax70,80,90(cd/klm)	526.2, 139.6, 0.0
No. in Project	25

Layout

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
1ex	A	381171.22	213261.72	6.00	14.00	0.00	0.00	0.40			
2	A	381164.46	213299.95	6.00	10.00	0.00	0.00	0.40			
3	A	381167.41	213331.32	6.00	358.00	0.00	0.00	0.40			
4	A	381185.70	213362.15	6.00	163.00	0.00	0.00	0.40			
5	A	381201.80	213382.97	6.00	251.00	0.00	0.00	0.40			
6	A	381219.60	213365.76	6.00	76.00	0.00	0.00	0.40			
7	A	381232.91	213339.31	6.00	186.00	0.00	0.00	0.40			
8	A	381231.30	213310.40	6.00	108.00	0.00	0.00	0.40			
9	A	381202.44	213411.53	6.00	161.00	0.00	0.00	0.40			
10	A	381204.92	213442.54	6.00	250.00	0.00	0.00	0.40			
11	A	381245.48	213426.55	6.00	256.00	0.00	0.00	0.40			
12	A	381278.72	213414.78	6.00	252.00	0.00	0.00	0.40			
13	A	381289.20	213380.16	6.00	178.00	0.00	0.00	0.40			
14	A	381283.14	213345.79	6.00	10.00	0.00	0.00	0.40			
15ex	A	381286.68	213314.22	6.00	1.00	0.00	0.00	0.40			
16	A	381321.69	213414.18	6.00	272.00	0.00	0.00	0.40			
17	A	381349.05	213392.28	6.00	176.00	0.00	0.00	0.40			
18	A	381347.15	213359.54	6.00	178.00	0.00	0.00	0.40			
19	A	381342.45	213340.34	6.00	84.00	0.00	0.00	0.40			
20	A	381387.28	213307.53	6.00	331.00	0.00	0.00	0.40			

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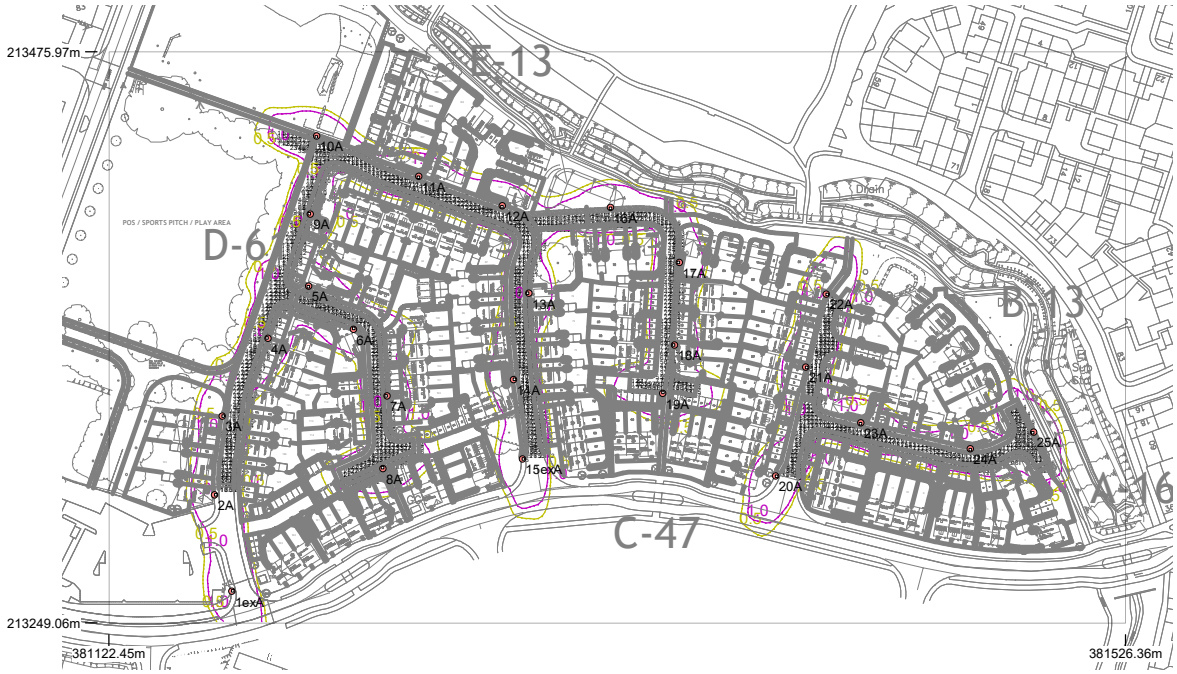
Layout Continued

ID	Type	X	Y	Height	Angle	Tilt	Cant	Out-reach	Target X	Target Y	Target Z
21	A	381399.21	213350.71	6.00	347.00	0.00	0.00	0.40			
22	A	381407.30	213379.75	6.00	344.00	0.00	0.00	0.40			
23	A	381421.15	213328.68	6.00	252.00	0.00	0.00	0.40			
24	A	381464.60	213318.38	6.00	261.00	0.00	0.00	0.40			
25	A	381489.71	213324.93	6.00	209.00	0.00	0.00	0.40			

Horizontal Illuminance (lux)

Grid 1



Results

Eav	4.61
Emin	1.08
Emax	15.77
Emin/Emax	0.07
Emin/Eav	0.23

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	0.000
M5-60 (mm)	18.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.350	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.000		

Designed with Level Soffits

Time Area Diagram for Surface Network 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.453	4-8	0.175

Total Area Contributing (ha) = 0.628

Total Pipe Volume (m^3) = 19.325

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	44.212	0.243	181.9	0.093	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	10.345	0.057	181.5	0.119	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	9.017	0.050	180.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	10.058	0.050	201.2	0.073	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	19.529	0.100	195.3	0.062	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	16.012	0.200	80.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	59.645	0.650	91.8	0.082	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	14.467	0.065	222.6	0.108	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.63	22.600	0.093	0.0	0.0	0.0	1.16	82.2	12.6
1.001	50.00	5.78	22.357	0.212	0.0	0.0	0.0	1.16	82.3	28.7
1.002	50.00	5.91	22.300	0.212	0.0	0.0	0.0	1.17	82.5	28.7
1.003	50.00	6.06	22.250	0.285	0.0	0.0	0.0	1.10	78.1	38.6
1.004	50.00	6.35	22.200	0.347	0.0	0.0	0.0	1.12	79.3	47.0
1.005	50.00	6.47	22.100	0.347	0.0	0.0	0.0	2.27	361.6	47.0
2.000	50.00	5.61	22.800	0.082	0.0	0.0	0.0	1.64	116.1	11.1
2.001	50.00	5.84	22.150	0.190	0.0	0.0	0.0	1.05	74.2	25.7

Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.002	7.107	0.035	203.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	19.638	0.100	196.4	0.063	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.004	7.231	0.050	144.6	0.028	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	5.377	0.050	107.5	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.007	9.891	0.100	98.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.002	50.00	5.94	22.085	0.190	0.0	0.0	0.0	1.10	77.7	25.7
2.003	50.00	6.24	22.050	0.253	0.0	0.0	0.0	1.12	79.1	34.3
2.004	50.00	6.31	21.950	0.281	0.0	0.0	0.0	1.69	268.5	38.1
1.006	50.00	6.51	21.900	0.628	0.0	0.0	0.0	2.35	663.9	85.0
1.007	50.00	6.63	21.850	0.628	0.0	0.0	0.0	1.31	52.3«	85.0

Manhole Schedules for Surface Network 1

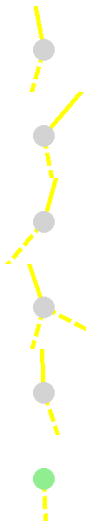
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1	24.306	1.706	Open Manhole	1350	1.000	22.600	300				
S2	24.196	1.839	Open Manhole	1200	1.001	22.357	300	1.000	22.357	300	
S3	24.095	1.795	Open Manhole	1350	1.002	22.300	300	1.001	22.300	300	
S4	24.009	1.759	Open Manhole	1350	1.003	22.250	300	1.002	22.250	300	
S5	23.914	1.714	Open Manhole	1350	1.004	22.200	300	1.003	22.200	300	
S6	23.700	1.600	Open Manhole	1350	1.005	22.100	450	1.004	22.100	300	
S7	24.368	1.568	Open Manhole	1350	2.000	22.800	300				
S8	23.726	1.576	Open Manhole	1350	2.001	22.150	300	2.000	22.150	300	
S9	23.477	1.392	Open Manhole	1350	2.002	22.085	300	2.001	22.085	300	
S10	23.370	1.320	Open Manhole	1350	2.003	22.050	300	2.002	22.050	300	
S11	23.700	1.750	Open Manhole	1350	2.004	21.950	450	2.003	21.950	300	
S12	23.700	1.800	Open Manhole	1500	1.006	21.900	600	1.005	21.900	450	
								2.004	21.900	450	
S13	23.700	1.850	Open Manhole	1350	1.007	21.850	225	1.006	21.850	600	
S14	22.186	0.436	Open Manhole	0		OUTFALL		1.007	21.750	225	

Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S1	381343.052	213345.022	381343.052	213345.022	Required	
S2	381345.941	213389.140	381345.941	213389.140	Required	
S3	381346.537	213399.469	381346.537	213399.469	Required	
S4	381344.110	213408.153	381344.110	213408.153	Required	
S5	381334.636	213411.530	381334.636	213411.530	Required	
S6	381317.265	213420.454	381317.265	213420.454	Required	
S7	381290.994	213325.621	381290.994	213325.621	Required	
S8	381285.704	213385.031	381285.704	213385.031	Required	

Manhole Schedules for Surface Network 1

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S9	381289.704	213398.934	381289.704	213398.934	Required	
S10	381288.385	213405.917	381288.385	213405.917	Required	
S11	381301.116	213420.871	381301.116	213420.871	Required	
S12	381303.056	213427.836	381303.056	213427.836	Required	
S13	381301.356	213432.938	381301.356	213432.938	Required	
S14	381300.914	213442.819			No Entry	



PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	300	S1	24.306	22.600	1.406	Open Manhole	1350
1.001	o	300	S2	24.196	22.357	1.539	Open Manhole	1200
1.002	o	300	S3	24.095	22.300	1.495	Open Manhole	1350
1.003	o	300	S4	24.009	22.250	1.459	Open Manhole	1350
1.004	o	300	S5	23.914	22.200	1.414	Open Manhole	1350
1.005	o	450	S6	23.700	22.100	1.150	Open Manhole	1350
2.000	o	300	S7	24.368	22.800	1.268	Open Manhole	1350
2.001	o	300	S8	23.726	22.150	1.276	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	44.212	181.9	S2	24.196	22.357	1.539	Open Manhole	1200
1.001	10.345	181.5	S3	24.095	22.300	1.495	Open Manhole	1350
1.002	9.017	180.3	S4	24.009	22.250	1.459	Open Manhole	1350
1.003	10.058	201.2	S5	23.914	22.200	1.414	Open Manhole	1350
1.004	19.529	195.3	S6	23.700	22.100	1.300	Open Manhole	1350
1.005	16.012	80.1	S12	23.700	21.900	1.350	Open Manhole	1500
2.000	59.645	91.8	S8	23.726	22.150	1.276	Open Manhole	1350
2.001	14.467	222.6	S9	23.477	22.085	1.092	Open Manhole	1350

PIPELINE SCHEDULES for Surface Network 1

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
2.002	o	300	S9	23.477	22.085	1.092	Open Manhole	1350
2.003	o	300	S10	23.370	22.050	1.020	Open Manhole	1350
2.004	o	450	S11	23.700	21.950	1.300	Open Manhole	1350
1.006	o	600	S12	23.700	21.900	1.200	Open Manhole	1500
1.007	o	225	S13	23.700	21.850	1.625	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
2.002	7.107	203.1	S10	23.370	22.050	1.020	Open Manhole	1350
2.003	19.638	196.4	S11	23.700	21.950	1.450	Open Manhole	1350
2.004	7.231	144.6	S12	23.700	21.900	1.350	Open Manhole	1500
1.006	5.377	107.5	S13	23.700	21.850	1.250	Open Manhole	1350
1.007	9.891	98.9	S14	22.186	21.750	0.211	Open Manhole	0

Free Flowing Outfall Details for Surface Network 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	S14	22.186	21.750	21.750	0	0

Simulation Criteria for Surface Network 1

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000	Cv (Summer)	0.750
Return Period (years)	5	Ratio R	0.350	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S13, DS/PN: 1.007, Volume (m³): 3.8

Unit Reference	MD-SHE-0195-2000-1250-2000	Sump Available	Yes
Design Head (m)	1.250	Diameter (mm)	195
Design Flow (l/s)	20.0	Invert Level (m)	21.850
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	225
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1500
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.250	20.0	Kick-Flo®	0.858	16.7
Flush-Flo™	0.391	20.0	Mean Flow over Head Range	-	17.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.8	0.600	19.5	1.600	22.5	2.600	28.4	5.000	38.9	7.500	47.3
0.200	18.2	0.800	17.9	1.800	23.8	3.000	30.4	5.500	40.7	8.000	48.8
0.300	19.8	1.000	18.0	2.000	25.0	3.500	32.7	6.000	42.4	8.500	50.3
0.400	20.0	1.200	19.6	2.200	26.2	4.000	34.9	6.500	44.1	9.000	51.7
0.500	19.8	1.400	21.1	2.400	27.3	4.500	36.9	7.000	45.7	9.500	53.0

Storage Structures for Surface Network 1

Tank or Pond Manhole: S13, DS/PN: 1.007

Invert Level (m) 21.850

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	65.0	1.600	328.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	S1	15 Winter	1	+0%	100/15 Summer				22.676	-0.224	0.000	0.14		10.9	OK
1.001	S2	15 Winter	1	+0%	30/15 Summer				22.483	-0.174	0.000	0.37		22.7	OK
1.002	S3	15 Winter	1	+0%	30/15 Summer				22.427	-0.173	0.000	0.37		22.5	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Level Exceeded
1.000	S1	
1.001	S2	
1.002	S3	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.003	S4	15 Winter	1	+0%	30/15 Summer				22.398	-0.152	0.000	0.48		29.5	OK
1.004	S5	15 Winter	1	+0%	30/15 Summer				22.353	-0.147	0.000	0.51		35.4	OK
1.005	S6	15 Winter	1	+0%	100/15 Summer				22.211	-0.339	0.000	0.14		35.4	OK
2.000	S7	15 Winter	1	+0%	100/30 Winter				22.860	-0.240	0.000	0.09		9.6	OK
2.001	S8	15 Winter	1	+0%	30/15 Winter				22.268	-0.182	0.000	0.33		20.3	OK
2.002	S9	15 Winter	1	+0%	30/15 Winter				22.209	-0.176	0.000	0.36		20.1	OK
2.003	S10	15 Winter	1	+0%	30/15 Summer				22.179	-0.171	0.000	0.38		26.2	OK
2.004	S11	30 Winter	1	+0%	30/15 Winter				22.145	-0.255	0.000	0.14		24.3	OK
1.006	S12	30 Winter	1	+0%	30/30 Winter				22.143	-0.357	0.000	0.16		53.3	OK
1.007	S13	30 Winter	1	+0%	1/15 Summer				22.141	0.066	0.000	0.45		19.7	SURCHARGED

PN	US/MH Name	Level Exceeded
1.003	S4	
1.004	S5	
1.005	S6	
2.000	S7	
2.001	S8	
2.002	S9	
2.003	S10	
2.004	S11	
1.006	S12	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Level Exceeded
1.007	S13	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	S1	15 Winter	30	+0%	100/15 Summer				22.846	-0.054	0.000	0.31		24.2	OK
1.001	S2	15 Winter	30	+0%	30/15 Summer				22.794	0.137	0.000	0.84		51.7	SURCHARGED
1.002	S3	15 Winter	30	+0%	30/15 Summer				22.712	0.112	0.000	0.84		51.5	SURCHARGED

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

PN	US/MH Name	Level Exceeded
1.000	S1	
1.001	S2	
1.002	S3	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.003	S4	60 Winter	30	+0%	30/15 Summer				22.702	0.152	0.000	0.71		43.6	SURCHARGED
1.004	S5	60 Winter	30	+0%	30/15 Summer				22.643	0.143	0.000	0.77		52.7	SURCHARGED
1.005	S6	30 Winter	30	+0%	100/15 Summer				22.550	0.000	0.000	0.27		68.1	OK
2.000	S7	15 Winter	30	+0%	100/30 Winter				22.895	-0.205	0.000	0.21		23.4	OK
2.001	S8	60 Winter	30	+0%	30/15 Winter				22.681	0.231	0.000	0.42		25.8	SURCHARGED
2.002	S9	60 Winter	30	+0%	30/15 Winter				22.664	0.279	0.000	0.41		22.9	SURCHARGED
2.003	S10	60 Winter	30	+0%	30/15 Summer				22.655	0.305	0.000	0.44		30.4	SURCHARGED
2.004	S11	60 Winter	30	+0%	30/15 Winter				22.578	0.178	0.000	0.19		31.4	SURCHARGED
1.006	S12	60 Winter	30	+0%	30/30 Winter				22.539	0.039	0.000	0.22		74.2	SURCHARGED
1.007	S13	60 Winter	30	+0%	1/15 Summer				22.537	0.462	0.000	0.46		20.0	SURCHARGED

PN	US/MH Name	Level Exceeded
1.003	S4	
1.004	S5	
1.005	S6	
2.000	S7	
2.001	S8	
2.002	S9	
2.003	S10	
2.004	S11	
1.006	S12	

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

PN	US/MH Name	Level Exceeded
1.007	S13	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	S1	15 Winter	100	+40%	100/15 Summer				23.590	0.690	0.000	0.54		41.2	SURCHARGED
1.001	S2	15 Winter	100	+40%	30/15 Summer				23.498	0.841	0.000	1.55		95.0	SURCHARGED
1.002	S3	15 Winter	100	+40%	30/15 Summer				23.354	0.754	0.000	1.51		93.0	SURCHARGED

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

PN	US/MH Name	Level Exceeded
1.000	S1	
1.001	S2	
1.002	S3	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
1.003	S4	120 Winter	100	+40%	30/15 Summer				23.249	0.699	0.000	0.85		51.8
1.004	S5	120 Winter	100	+40%	30/15 Summer				23.167	0.667	0.000	0.91		62.6
1.005	S6	120 Winter	100	+40%	100/15 Summer				23.076	0.526	0.000	0.25		62.3
2.000	S7	60 Winter	100	+40%	100/30 Winter				23.264	0.164	0.000	0.20		22.3
2.001	S8	60 Winter	100	+40%	30/15 Winter				23.246	0.796	0.000	0.84		51.9
2.002	S9	60 Winter	100	+40%	30/15 Winter				23.170	0.785	0.000	0.91		51.3
2.003	S10	120 Winter	100	+40%	30/15 Summer				23.158	0.808	0.000	0.64		43.8
2.004	S11	120 Winter	100	+40%	30/15 Winter				23.075	0.675	0.000	0.29		48.5
1.006	S12	120 Winter	100	+40%	30/30 Winter				23.068	0.568	0.000	0.32		109.6
1.007	S13	120 Winter	100	+40%	1/15 Summer				23.066	0.991	0.000	0.46		20.0

PN	US/MH Name	Status	Level Exceeded
1.003	S4	SURCHARGED	
1.004	S5	SURCHARGED	
1.005	S6	SURCHARGED	
2.000	S7	SURCHARGED	
2.001	S8	SURCHARGED	
2.002	S9	SURCHARGED	
2.003	S10	FLOOD RISK	
2.004	S11	SURCHARGED	
1.006	S12	SURCHARGED	

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

PN	US/MH Name	Status	Level Exceeded
1.007	S13	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 4

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	0.000
M5-60 (mm)	18.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.350	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.000		

Designed with Level Soffits

Time Area Diagram for Surface Network 4

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.113	4-8	0.072

Total Area Contributing (ha) = 0.185

Total Pipe Volume (m³) = 3.100

Network Design Table for Surface Network 4

« - Indicates pipe capacity < flow

Network Design Table for Surface Network 4

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	13.393	0.089	150.5	0.035	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	6.886	0.046	149.7	0.035	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	3.871	0.050	77.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	14.107	0.925	15.3	0.115	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	9.158	0.061	150.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.004	37.020	0.249	148.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.005	8.910	0.340	26.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.21	23.185	0.035	0.0	0.0	0.0	1.06	42.3	4.7
1.001	50.00	5.32	23.096	0.070	0.0	0.0	0.0	1.07	42.4	9.5
1.002	50.00	5.35	23.050	0.070	0.0	0.0	0.0	1.79	126.4	9.5
2.000	50.00	5.07	24.000	0.115	0.0	0.0	0.0	3.37	133.9	15.6
1.003	50.00	5.47	23.000	0.185	0.0	0.0	0.0	1.28	90.5	25.1
1.004	50.00	6.22	22.939	0.185	0.0	0.0	0.0	0.82	14.5«	25.1
1.005	50.00	6.30	22.690	0.185	0.0	0.0	0.0	1.97	34.9	25.1

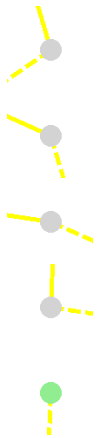
Manhole Schedules for Surface Network 4

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S33	24.808	1.623	Open Manhole	1350	1.000	23.185	225				
S34	24.800	1.704	Open Manhole	1350	1.001	23.096	225	1.000	23.096	225	
S35	24.435	1.385	Open Manhole	1050	1.002	23.050	300	1.001	23.050	225	
4	25.000	1.000	Open Manhole	1050	2.000	24.000	225				
S36	24.557	1.557	Open Manhole	1050	1.003	23.000	300	1.002	23.000	300	
								2.000	23.075	225	
S37	24.460	1.521	Open Manhole	1350	1.004	22.939	150	1.003	22.939	300	
S38	23.867	1.177	Open Manhole	1350	1.005	22.690	150	1.004	22.690	150	
S39	22.863	0.513	Open Manhole	0		OUTFALL		1.005	22.350	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S33	381409.338	213376.613	381409.338	213376.613	Required	
S34	381417.336	213387.356	381417.336	213387.356	Required	

Manhole Schedules for Surface Network 4

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S35	381423.014	213391.251	381423.014	213391.251	Required	
S36	381421.910	213394.961	381421.910	213394.961	Required	
S37	381413.547	213398.693	381413.547	213398.693	Required	
S38	381376.943	213404.225	381376.943	213404.225	Required	
S39	381377.329	213413.126			No Entry	



PIPELINE SCHEDULES for Surface Network 4

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S33	24.808	23.185	1.398	Open Manhole	1350
1.001	o	225	S34	24.800	23.096	1.479	Open Manhole	1350
1.002	o	300	S35	24.435	23.050	1.085	Open Manhole	1050
2.000	o	225	4	25.000	24.000	0.775	Open Manhole	1050
1.003	o	300	S36	24.557	23.000	1.257	Open Manhole	1050
1.004	o	150	S37	24.460	22.939	1.371	Open Manhole	1350
1.005	o	150	S38	23.867	22.690	1.027	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	13.393	150.5	S34	24.800	23.096	1.479	Open Manhole	1350
1.001	6.886	149.7	S35	24.435	23.050	1.160	Open Manhole	1050
1.002	3.871	77.4	S36	24.557	23.000	1.257	Open Manhole	1050
2.000	14.107	15.3	S36	24.557	23.075	1.257	Open Manhole	1050
1.003	9.158	150.1	S37	24.460	22.939	1.221	Open Manhole	1350
1.004	37.020	148.7	S38	23.867	22.690	1.027	Open Manhole	1350
1.005	8.910	26.2	S39	22.863	22.350	0.363	Open Manhole	0

Free Flowing Outfall Details for Surface Network 4

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.005	S39	22.863	22.350	22.350	0	0

Simulation Criteria for Surface Network 4

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	18.000	Cv (Summer)	0.750
Return Period (years)	5	Ratio R	0.350	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Surface Network 4

Hydro-Brake® Optimum Manhole: S36, DS/PN: 1.003, Volume (m³): 2.1

Unit Reference	MD-SHE-0091-4000-1260-4000	Sump Available	Yes
Design Head (m)	1.260	Diameter (mm)	91
Design Flow (l/s)	4.0	Invert Level (m)	23.000
Flush-Flo™	Calculated	Minimum Outlet Pipe Diameter (mm)	150
Objective	Minimise upstream storage	Suggested Manhole Diameter (mm)	1200
Application	Surface		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.260	4.0	Kick-Flo®	0.777	3.2
Flush-Flo™	0.379	4.0	Mean Flow over Head Range	-	3.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.9	0.600	3.8	1.600	4.5	2.600	5.6	5.000	7.6	7.500	9.2
0.200	3.7	0.800	3.2	1.800	4.7	3.000	6.0	5.500	8.0	8.000	9.5
0.300	4.0	1.000	3.6	2.000	5.0	3.500	6.4	6.000	8.3	8.500	9.8
0.400	4.0	1.200	3.9	2.200	5.2	4.000	6.9	6.500	8.6	9.000	10.1
0.500	3.9	1.400	4.2	2.400	5.4	4.500	7.2	7.000	8.9	9.500	10.3

Storage Structures for Surface Network 4

Tank or Pond Manhole: S36, DS/PN: 1.003

Invert Level (m) 23.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	44.8	0.301	77.0	0.601	114.3	0.901	156.8	1.201	204.3	1.500	256.7
0.101	55.0	0.401	88.9	0.701	127.9	1.001	172.0	1.301	221.2		
0.201	65.7	0.501	101.3	0.801	142.1	1.101	187.9	1.401	238.8		

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	S33	15 Winter	1	+0%	30/60 Winter				23.236	-0.174	0.000	0.11		4.2	OK
1.001	S34	60 Winter	1	+0%	30/15 Winter				23.189	-0.132	0.000	0.14		4.4	OK
1.002	S35	60 Winter	1	+0%	30/30 Summer				23.188	-0.162	0.000	0.07		4.1	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

PN	US/MH Name	Level Exceeded
1.000	S33	
1.001	S34	
1.002	S35	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
2.000	4	15 Winter	1	+0%					24.051	-0.174	0.000	0.12		13.7	OK
1.003	S36	60 Winter	1	+0%	30/15 Winter				23.187	-0.113	0.000	0.06		3.7	OK
1.004	S37	60 Winter	1	+0%					22.991	-0.098	0.000	0.26		3.7	OK
1.005	S38	60 Winter	1	+0%					22.724	-0.116	0.000	0.12		3.7	OK

PN	US/MH Name	Level Exceeded
2.000	4	
1.003	S36	
1.004	S37	
1.005	S38	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	S33	120 Winter	30	+0%	30/60 Winter				23.449	0.039	0.000	0.09		3.1	SURCHARGED
1.001	S34	120 Winter	30	+0%	30/15 Winter				23.447	0.126	0.000	0.20		6.0	SURCHARGED
1.002	S35	120 Winter	30	+0%	30/30 Summer				23.446	0.096	0.000	0.09		5.8	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

PN	US/MH Name	Level Exceeded
1.000	S33	
1.001	S34	
1.002	S35	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
2.000	4	15 Winter	30	+0%					24.082	-0.143	0.000	0.29		33.6	OK
1.003	S36	120 Winter	30	+0%	30/15 Winter				23.445	0.145	0.000	0.06		4.0	SURCHARGED
1.004	S37	60 Winter	30	+0%					22.993	-0.096	0.000	0.28		4.0	OK
1.005	S38	60 Winter	30	+0%					22.726	-0.114	0.000	0.13		4.0	OK

PN	US/MH Name	Level Exceeded
2.000	4	
1.003	S36	
1.004	S37	
1.005	S38	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 18.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status OFF
Analysis Timestep Fine DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	S33	120 Winter	100	+40%	30/60 Winter				23.798	0.388	0.000	0.16		5.9	SURCHARGED
1.001	S34	240 Winter	100	+40%	30/15 Winter				23.796	0.475	0.000	0.24		7.2	SURCHARGED
1.002	S35	240 Winter	100	+40%	30/30 Summer				23.795	0.445	0.000	0.12		7.1	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

PN	US/MH Name	Level Exceeded
1.000	S33	
1.001	S34	
1.002	S35	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 4

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
2.000	4	15 Winter	100	+40%					24.116	-0.109	0.000	0.52		60.7	OK
1.003	S36	240 Winter	100	+40%	30/15 Winter				23.794	0.494	0.000	0.06		4.0	SURCHARGED
1.004	S37	240 Winter	100	+40%					22.993	-0.096	0.000	0.28		4.0	OK
1.005	S38	360 Summer	100	+40%					22.726	-0.114	0.000	0.13		4.0	OK

PN	US/MH Name	Level Exceeded
2.000	4	
1.003	S36	
1.004	S37	
1.005	S38	

Quedgeley 2 - Street Lighting Schedule 433/101 (Drawing 433/001)
24th May 2022

Unit Ref	Lighting Design Class	Column Height	Column Manufacturer	Column Model Number/Order Code	Lantern Mounting	Lantern Tilt	Door Lock	Planting Depth	Lantern Manufacturer/Model	Colour Temperature	No. of LEDs	Lantern Shield Kit	RAL Colour	Lantern Code	Matrix Code	Drive Current	Lantern Guarantee Period	LED Driver	NEMA Socket	Central Management System CMS	Dimming Time	Dim to Light Output	Lantern UMSUG Code	Lantern Wattage	Double Pole Isolator	Fuse	Lantern to Isolator Cabling	Paint Specification	Column Paint Colour	Electrical Service Type	Highway/Private Ownership	Maintenance Company Details (if not to be adopted)	Column Setback Requirements
1A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
2A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
3A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
4A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
5A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
6A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
7A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
8A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
9A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
10A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
11A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
12A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
13A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
14A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	Y	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
15A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Setback 0.8m from edge of carriageway
16A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
17A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
18A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
19A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
20A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
21A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath
22A	P4	6M	CU Phosco	Quote to GCC Standard Spec	Post Top	0 Degrees	8mm Allen bolt with anti vandal centre pin	1.0M	Urbis Ampera Mini	3000K (Warm White)	16	N	7040	5112	414272	500mA	12 Years	Philips Xitanium	7 Pin	Telensa 5 Pin - GPS Enabled Product Code T2E1N-G-3	00:00 - 05:30am	30%	41 0026 0012 077	26	Lucy Trojan Midi THM0014962, complete with 6mm² brown & blue tails, plus 6mm² earth lead	6A - BS88 MD Fuse	7.25m of 3 core 1.5mm² circular flex H05VV-F temperature range -15°C to + 70°C	Dacrylite 2 Pack Factory pre painted or SIKA	BS12.B.21 (Light Green)	Direct DNO (WPD)	Highway	N/A	Back of footpath

Land North of Rudloe Drive, Quedgeley

Submission Schedule

Last Updated: 27th May 2022

Title	Reference	Prepared by
Covering Letter	27th May 2022	Nexus
Affordable Housing Statement	May 2022	Nexus
Waste Minimisation Statement	May 2022	Nexus
CIL Additional Information Form	27th May 2022	Nexus
Design Compliance Statement	May 2022	McBains
Site Location Plan	RDQUE MCB ZZ ZZ DR A 0201 P1	McBains
Site Layout Plan	RDQUE MCB ZZ ZZ DR A 0230 P1	McBains
Materials and Boundaries Plan	RDQUE MCB ZZ ZZ DR A 0231 P1	McBains
Surface Finishes Plan	RDQUE MCB ZZ ZZ DR A 0232 P1	McBains
Parking Strategy Plan	RDQUE MCB ZZ ZZ DR A 0233 P1	McBains
Affordable Tenure Plan	RDQUE MCB ZZ ZZ DR A 0234 P1	McBains
Adoptable Management Plan	RDQUE MCB ZZ ZZ DR A 0235 P1	McBains

Submission Schedule continued

Title	Reference	Prepared by
Refuse Strategy Plan	RDQUE MCB ZZ ZZ DR A 0236 P1	McBains
Illustrative Streetscenes	RDQUE MCB ZZ ZZ DR A 0250 P1	McBains
Housetype Plans and Elevations - Knightley	RDQUE MCB ZZ ZZ DR A 0105 P1	McBains
Housetype Plans and Elevations - Knightley	RDQUE MCB ZZ ZZ DR A 0106 P1	McBains
Housetype Plans and Elevations - Elmslie	RDQUE MCB ZZ ZZ DR A 0107 P1	McBains
Housetype Plans and Elevations - Elmslie	RDQUE MCB ZZ ZZ DR A 0108 P1	McBains
Housetype Plans and Elevations - Leverton	RDQUE MCB ZZ ZZ DR A 0109 P1	McBains
Housetype Plans and Elevations - Pembroke	RDQUE MCB ZZ ZZ DR A 0110 P1	McBains
Housetype Plans and Elevations - Mylne	RDQUE MCB ZZ ZZ DR A 0111 P1	McBains
Housetype Plans and Elevations - Becket	RDQUE MCB ZZ ZZ DR A 0112 P1	McBains
Housetype Plans and Elevations - Becket	RDQUE MCB ZZ ZZ DR A 0113 P1	McBains
Housetype Plans and Elevations - Becket	RDQUE MCB ZZ ZZ DR A 0114 P1	McBains
Housetype Plans and Elevations - Cartwright	RDQUE MCB ZZ ZZ DR A 0115 P1	McBains
Housetype Plans and Elevations - Alwin	RDQUE MCB ZZ ZZ DR A 0116 P1	McBains

Submission Schedule continued

Title	Reference	Prepared by
Housetype Plans and Elevations - Alwin	RDQUE MCB ZZ ZZ DR A 0117 P1	McBains
Housetype Plans and Elevations - Alwin	RDQUE MCB ZZ ZZ DR A 0118 P1	McBains
Housetype Plans and Elevations - Alwin	RDQUE MCB ZZ ZZ DR A 0119 P1	McBains
Housetype Plans and Elevations - Aldridge	RDQUE MCB ZZ ZZ DR A 0120 P1	McBains
Housetype Plans and Elevations - Harford	RDQUE MCB ZZ ZZ DR A 0121 P1	McBains
Housetype Plans and Elevations - AF1 Maisonette	RDQUE MCB ZZ ZZ DR A 0140 P1	McBains
Housetype Plans and Elevations - Asher	RDQUE MCB ZZ ZZ DR A 0141 P1	McBains
Housetype Plans and Elevations - Asher	RDQUE MCB ZZ ZZ DR A 0142 P1	McBains
Housetype Plans and Elevations - Asher	RDQUE MCB ZZ ZZ DR A 0143 P1	McBains
Housetype Plans and Elevations - Cooper	RDQUE MCB ZZ ZZ DR A 0144 P1	McBains
Housetype Plans and Elevations - Cooper	RDQUE MCB ZZ ZZ DR A 0145 P1	McBains
Housetype Plans and Elevations - Speirs	RDQUE MCB ZZ ZZ DR A 0146 P1	McBains
Housetype Plans and Elevations - Speirs	RDQUE MCB ZZ ZZ DR A 0147 P1	McBains

Submission Schedule continued

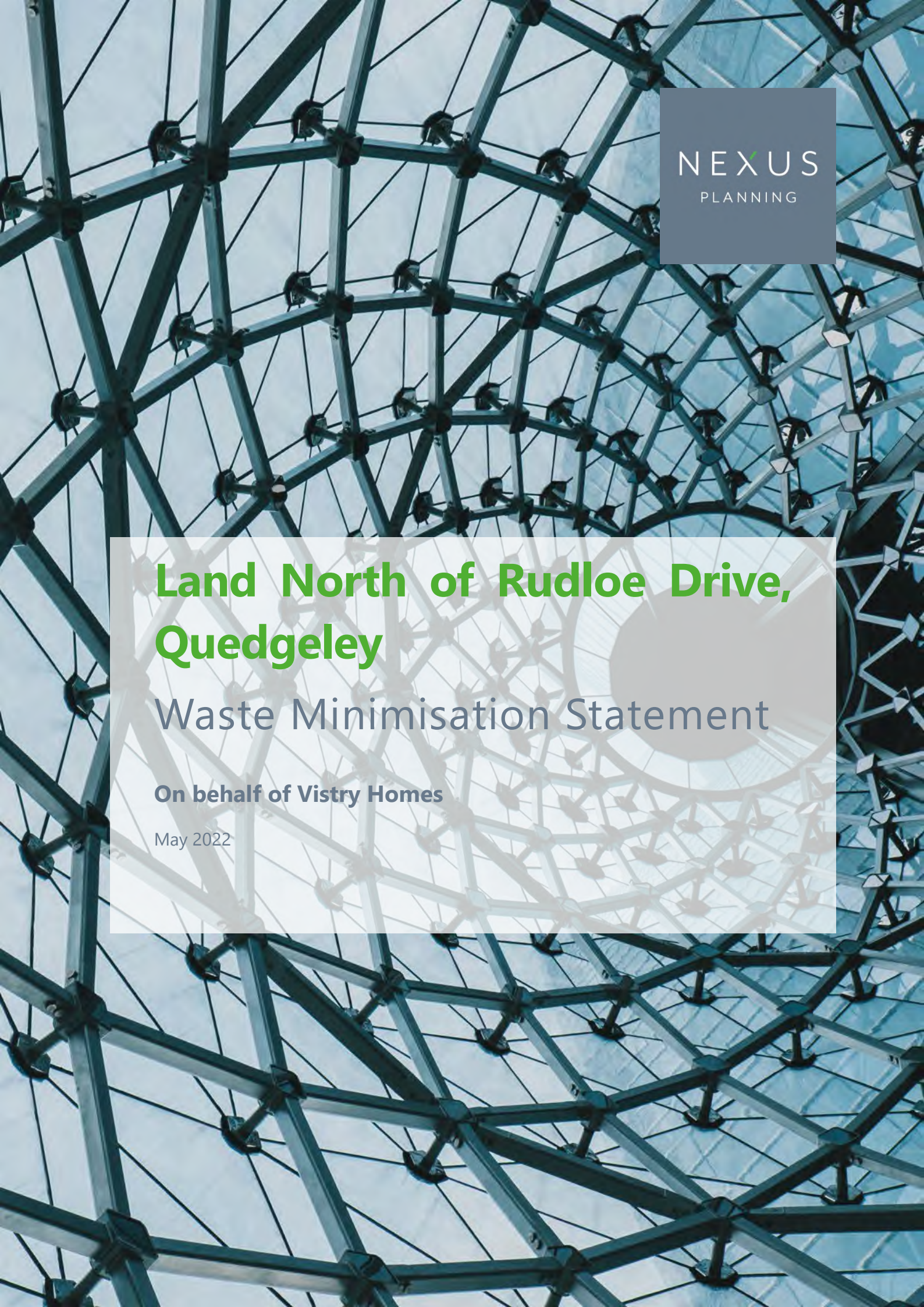
Title	Reference	Prepared by
Housetype Plans and Elevations - Asher	RDQUE MCB ZZ ZZ DR A 0148 P1	McBains
Single and Double Garages	RDQUE MCB ZZ ZZ DR A 0160 P1	McBains
Single and Double Garages - Plots 30, 31, 55	RDQUE MCB ZZ ZZ DR A 0161 P1	McBains
Visibility Assessment	22-0196-SK01C	Rappor
Onsite Swept Path Analysis - Refuse Vehicle	22-0196-SP01C	Rappor
Onsite Swept Path Analysis - Fire Tender	22-0196-SP02C	Rappor
Onsite Swept Path Analysis - Panel Van	22-0196-SP03C	Rappor
Onsite Swept Path Analysis - Estate Car	22-0196-SP04C	Rappor
General Arrangement	LA5530-001	IDP
Planting Plan 1 of 3	LA5530-002	IDP
Planting Plan 2 of 3	LA5530-003	IDP
Planting Plan 3 of 3	LA5530-004	IDP
Landscape Specification & Management Plan	LA5530-LSMP-01	IDP
Energy and Sustainability Statement	May 2022	AES Sustainability Consultants Ltd
Arboricultural Survey, Impact Assessment and Protection Plan	22037 LAND NORTH OF RUDLOE DRIVE, GLOUCESTER_V1	MHP Arboriculture

Submission Schedule continued

Title	Reference	Prepared by
Noise Assessment	May 2022	LFAcoustics
External Levels (Sheet 1 of 3) (RDQUE-PJA-XX-D2-Y-0100-00)	RDQUE-PJA-XX-D2-Y-0100-00	PJA
External Levels (Sheet 2 of 3) (RDQUE-PJA-XX-D2-Y-0101-00)	RDQUE-PJA-XX-D2-Y-0101-00	PJA
External Levels (Sheet 3 of 3) (RDQUE-PJA-XX-D2-Y-0102-00)	RDQUE-PJA-XX-D2-Y-0102-00	PJA
Drainage Strategy (Sheet 1 of 3) (RDQUE-PJA-XX-D2-Y-0103-00)	RDQUE-PJA-XX-D2-Y-0103-00	PJA
Drainage Strategy (Sheet 2 of 3) (RDQUE-PJA-XX-D2-Y-0104-00)	RDQUE-PJA-XX-D2-Y-0104-00	PJA
Drainage Strategy (Sheet 3 of 3) (RDQUE-PJA-XX-D2-Y-0105-00)	RDQUE-PJA-XX-D2-Y-0105-00	PJA
S38 Agreement Plan (RDQUE-PJA-XX-D2-Y-0300-00)	RDQUE-PJA-XX-D2-Y-0300-00)	PJA
S104 Agreement Plan (RDQUE-PJA-XX-D2-Y-0401-00)	RDQUE-PJA-XX-D2-Y-0401-00	PJA
Flood Routing Plan (RDQUE-PJA-XX-D2-Y-0402-00)	RDQUE-PJA-XX-D2-Y-0402-00	PJA
Area Contribution Plan (RDQUE-PJA-XX-D2-Y-0405-00)	RDQUE-PJA-XX-D2-Y-0405-00	PJA
Storm Sewer Design (Network 1) (22.05.27)	22.05.27	PJA
Storm Sewer Design (Network 4) (22.05.27)	22.05.27	PJA
Street Lighting Layout	433_001	EDS Limited

Submission Schedule continued

Title	Reference	Prepared by
Street Lighting Schedule	433_101	EDS Limited
Outdoor Lighting Report	433-201	EDS Limited



NEXUS PLANNING

Land North of Rudloe Drive, Quedgeley

Waste Minimisation Statement

On behalf of Vistry Homes

May 2022

Contents

Appendices

1. Introduction

1.1 This Waste Minimisation Statement has been prepared on behalf of Vistry Homes Limited to support a reserved matters submission for 150 dwellings, public open space and infrastructure on Land North of Rudloe Drive, Quedgeley.

2. Context

Planning Policy and Guidance

National Planning Policy Framework – July 2021 (NPPF)

2.1 Paragraph 8 of the NPPF advises that achieving sustainable development means that the planning system has three overarching objectives; an economic objective, a social objective and an environmental objective. The environmental objective is to (my emphasis):

> *"protect and enhance our natural, built and historic environment; including making effective use of land, improving biodiversity, using natural resources prudently, minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy"*

Gloucestershire Waste Core Strategy - November 2012 (WCS)

2.2 The WCS was adopted in November 2012. Policy WCS2 (Waste Reduction) states:

> *"All development will be expected to incorporate the principles of waste minimisation and re-use. Planning applications for 'major' development must be supported by a statement setting out how any waste arising during the demolition, construction and subsequent occupation of the development will be minimised and managed.*
>
> *Specifically the statement will include measures to:*
>
> - *Minimise, re-use and recycle waste;*
> - *Minimise the use of construction materials particularly primary materials;*
> - *Minimise the pollution potential of unavoidable waste; and*
> - *Dispose of waste that cannot be re-used or recycled in an environmentally acceptable manner."*

Gloucester, Cheltenham and Tewkesbury Joint Core Strategy - November 2017 (JCS)

2.3 The JCS was adopted in December 2017. Policy SD3 (Sustainable Design and Construction) states:

> *"Planning applications for major development must be accompanied by a waste minimisation statement, which demonstrates how any waste arising during the demolition,*

construction and subsequent occupation of the development will be minimised and sustainably managed."

Emerging Gloucester City Plan 2011 - 2031 (GCP)

2.4 The GCP was submitted to the Secretary of State for Examination in November 2020. Following the examination hearing sessions held in May / June 2021 the Inspector issued a letter in August 2021 which advised that the GCP as submitted is unsound, but that it can be made sound through 'Main Modifications. At the time of writing a consultation on the Main Modifications is taking place and will run until 4th July 2022. As set out in the pre-application response issued by the Council has decided that the emerging policies of the plan can be afforded limited to moderate weight decision.

2.5 Policy A1 (Effective and Efficient Use of Housing, Land and Buildings) advises that proposals for residential development should:

"Provide adequate, well designed, appropriately located and accessible bin storage areas"

Waste & Recycling Storage and Collection Guidance for New Residential Developments in Gloucester City – February 2020

2.6 This guidance note details the kerbside waste services currently provided to properties within the City and sets out the waste and recycling storage / collection requirements for new developments.

Outline Planning Permission

2.7 Outline planning permission[1] for up to 150 dwellings on Land North of Rudloe Drive, Quedgeley was granted by the Council on 9th July 2021. The permission is subject to twenty-three planning conditions, one of which is waste related and requires the submission of a Construction Method Statement prior to the commencement of development (Condition 21). The Statement must set out, amongst other requirements, the location(s) at which waste will be stored during the construction phase.

[1] Local Planning Authority Reference: 21/00490/OUT.

3. Proposed Waste Minimisation Strategy

3.1 The proposed waste minimisation strategy for the site, based on the requirements of Policy WCS2 (Waste Reduction) of the Gloucestershire Waste Core Strategy (November 2012), is described below.

Requirement 1: Minimise, re-use and recycle waste

Construction Phase

3.2 The Vistry Homes Waste Management Standard Operating Procedure (SOP) is included at **Appendix 1** and details the approach that should be taken in respect of waste on their construction sites. It confirms that site management teams should adopt the following waste hierarchy:

- *"Reduce - adopting site practices that reduce the potential to generate waste, e.g. secure storage of raw materials and avoidance of over ordering practices*
- *Reuse - using a product or material more than once in its original form, for its original purpose or for an alternative, with or without reconditioning, e.g. reusing wood pallets or returning empty toner cartridges*
- *Recycle - recovering value from a product or material that would otherwise be discarded, e.g. use of secondary aggregates or chipping plant matter for landscaping purposes*
- *Disposal - discarding wastes either by incineration or landfilling"*

3.3 The SOP also confirms that a Site Waste Management Plan (SWMP) should be completed and maintained during construction. In this respect Vistry Homes has prepared a guidance note which explains how to set up, update and monitor a SWMP (**Appendix 2**).

Operational Phase

3.4 The Council's note on 'Waste & Recycling Storage and Collection Guidance for New Residential Developments in Gloucester City' (February 2020) details the refuse and recycling collection service that is currently provided to homes the City. It comprises:

- Houses are provided with a 240 litre black wheelie bin for general refuse. HMO's and flats are provided with a 1,100 litre communal bin (one bin per eight properties). These bins are collected fortnightly.

- Houses are provided with up to four 55 litre green kerbside boxes for dry recyclable waste (paper, cans, empty aerosols, glass, card and plastic bottles etc) which are collected weekly. HMO's and flats are provided with a communal bin (240 litre or 360 litre) that is collected fortnightly.
- Houses are provided with a 23 litre green caddy for food waste. HMO's and flats are provided with a 140 litre communal bin. These bins are collected weekly.

3.5 The Council also offers an opt-in, charged for service, for garden waste. Subscribers are provided with a 240 litre brown wheelie bin that is collected fortnightly.

3.6 Each property within the proposed development is provided with a designated storage area for the above bins. The area is large enough to allow for the bins to be opened and closed with without having to reposition them, and will be hard paved to allow the bins to be easily moved to the kerbside collection point. Details of the storage areas are set out on the following plans which form part of the reserved matters submission:

- Site Layout Plan (RDQUE-MCB-ZZ-ZZ-DR-A-0230-D5-P1)
- Refuse Strategy Plan (RDQUE-MCB-ZZ-ZZ-DR-A-0236-D5-P1)

Requirement 2: Minimise the use of construction materials particularly primary materials

Construction Phase

3.7 The Vistry Homes Project Environmental Design SOP is included at **Appendix 3** and details how environmental issues should be considered during the design process. It states that:

"any consultant, company or organisation employed by Vistry Group to prepare a design should review and implement, where practicable, the use of 'best available techniques' and whole life costing approaches to ensure designs:

- *Are efficient in their use of natural resources*
- *Consider wider global environmental responsibilities for resource use and waste reduction*
- *Nurture positive enhancement for users and the wider community*
- *Our commitment to future homes standard."*

Operational Phase

3.8 Not applicable.

Requirement 3: Minimise the pollution potential of unavoidable waste

Construction Phase

3.9 The Vistry Homes Waste Management SOP at **Appendix 1** confirms that specialist contractors are used to remove hazardous waste streams and that when selecting the contractors, consideration is given to their past environmental track record (e.g. previous environmentally related prosecutions).

Operational Phase

3.10 Not applicable.

Requirement 4: Dispose of waste that cannot be re-used or recycled in an environmentally acceptable manner

Construction Phase

3.11 The Vistry Homes Waste Management SOP at **Appendix 1** advises site management teams that they need to ensure that proposed disposal locations are legally allowed to accept the waste being produced.

Operational Phase

3.12 As set out above each property will be provided with a 240 litre black wheelie bin for general refuse that is collected on fortnightly basis.

4. Conclusion

4.1 This Statement has been prepared with reference to the requirements of Policy WCS2 (Waste Reduction) of the Gloucestershire Waste Core Strategy (November 2012). It demonstrates that Vistry will minimise waste through both the construction and operational phases of the development.

Appendix 1

SHE Standard Operating Procedure - (SOP)

Title:	**Waste Management**
Document Reference:	VG-SOP-SHE-40
Relevant Standard(s):	GE700 – Section E: Environment, Sub-section 10: Waste and material management Section F: Specialist Activities, Sub-section 6: House building

Purpose:
This procedure sets out the arrangements for the identification, management and control of environmental issues on Vistry Group developments and controlled premises.

Scope:
This procedure sets the minimum standards by which Vistry Group, its employees and contracted parties of all tiers are continually tasked to achieve.

General Standards:
There are a wide range of waste types, many of which have the potential to cause pollution if they are ineffectively controlled and they escape. There are additional potential liabilities with wastes that relate to their off-site transport and disposal which, if not done correctly and in accordance with the statutory provisions, could lead to both environmental impairment and criminal liabilities.

There are essentially three types of waste that are produced from our activities:

- Inert waste is effectively, but not entirely, uncontaminated soils and stone, ceramics, concrete, masonry and brick rubble, minerals, etc.
- Non-hazardous waste is effectively, but not entirely, wood and other organic materials, plastics, paper, cardboard, etc.
- Hazardous waste is effectively any substance listed as hazardous in the List of Wastes Regulations, e.g. oils and chemicals that are used on construction sites, including waste oils, oily sludges, sealants, pesticides, wood preservative, paints, contaminated packaging and containers, batteries and asbestos.

Vistry Group's Waste Carrier/Broker Licence is located on DUG.

During completion of the Initial Site Appraisal VG-FM-SHE-009, the site management teams should assess whether:

- There are any dumped or fly-tipped wastes on the proposed construction site
- There is any evidence of any residual biological agents, e.g. pigeon droppings or rodents
- Significant amounts of waste are likely to be produced
- There is sufficient space available for effective segregation of the anticipated waste streams.

Where there is potential for construction activities to generate significant amounts of waste, Technical Teams should ensure that relevant commercial provisions are established during the identification of environmental risks and opportunities conducted during the bid/tender stages of the project.

Planning of Construction Site Activities:
Where risk assessments and consultations determine that construction wastes are to be generated, the Technical Team should define and document suitable, adequate and effective mitigation control measures (refer to Environmental Risk Action Plan within the Environmental Aspects & Impacts Register VG-FM-SHE-029).

Site management teams should adopt the following waste hierarchy in the development of appropriate mitigation control measures (that may be contained within a Site Waste Management Plan (SWMP) VG-FM-SHE-108) to reduce the amount of waste sent to landfill as well as reducing waste disposal costs:

- Reduce - adopting site practices that reduce the potential to generate waste, e.g. secure storage of raw materials and avoidance of over ordering practices
- Reuse - using a product or material more than once in its original form, for its original purpose or for an alternative, with or without reconditioning, e.g. reusing wood pallets or returning empty toner cartridges
- Recycle - recovering value from a product or material that would otherwise be discarded, e.g. use of secondary aggregates or chipping plant matter for landscaping purposes
- Disposal - discarding wastes either by incineration or landfilling

Dry recyclables, comprising glass, metal, paper, cardboard and plastic should be 100% segregated from other waste types within offices and construction sites.

Consideration should be given to the use of the CL:AIRE Code of Practice (England and Wales only) as well as Quality Protocols developed during the planning phase, which, if effectively implemented, allow materials to be reused without the need for an Environmental Permit/Waste Management Licence or Exemption. See VG-SOP-SHE-20 Land Use Management for further information.

Prior to undertaking the reuse or recycling of a waste generated during construction activities (including arisings), the operations management team should consult with SHE department and the EA/NRW at the earliest opportunity, as to the need for an Environmental Permit/Waste Management Licence or Exemption.

Site Waste Management Plans (SWMPs):
All projects, where the Business Unit is the Principal Contractor, should complete and maintain a SWMP (refer to VG-GN-SHE-012). During the development of a SWMP, the site management team should ensure that:

- Design teams address opportunities for reducing waste disposal as well as optimising material reuse and the use of secondary and recycled materials
- Material procurement practices are effectively addressed, e.g. ordering correct material quantities to avoid wastage and ensuring that packaging is reduced or recycled
- Proposed waste contractors hold valid Waste Brokers and/or Waste Carriers Licenses, by accessing the EA/NRW public register database
- When selecting waste contractors, consideration is given to their past environmental track record, e.g. previous environmentally related prosecutions.
- Proposed disposal locations are legally allowed to accept the waste being produced
- Specialist contractors are used to remove hazardous waste streams
- Environmental Permits/Waste Management Licences or Exemptions are obtained if waste materials are brought on site for reuse purposes or are being removed from site to be reused at another site and that all conditions of the Permit/Licence or exemption are met
- Copies of relevant Environmental Permits/Waste Management Licences or Exemptions are retained.

All projects, where the Business Unit is not the Principal Contractor, should record the quantities of waste generated on a monthly basis by completion of a Site Waste Data Sheet, which is located within the SWMP - refer to VG-FM-SHE-108. For guidance on the completion of the SWMP, refer to VG-GN-SHE-012.

Waste Disposal Sites:
The site management team should ensure that facilities being proposed for disposal or treatment of the company's wastes are properly licensed or are legally exempt to accept those wastes. This may be achieved by obtaining a copy of the disposal sites' Environmental Permit/Waste Management Licence or exemption to ensure that the facility is licensed to accept the specified waste types and quantities being generated.

Site Notification (Wales):
Sites that produce more than 500kg of hazardous waste in a twelve-month period should register (notify) with Natural Resources Wales (NRW) before the waste is produced. The site management team should ensure that any site producing more than 500kg of hazardous waste per year is registered. Each Premises Manager should ensure that any company managed office producing more than 500kg of hazardous waste per year is registered.

Where sites/offices have been registered as a hazardous waste producer, these notifications should be renewed annually with NRW, if hazardous wastes are still being produced.

Contractors and Suppliers:
Throughout project activities, no contractor may use the Business Unit's waste storage facilities without permission from the site management team. Whenever a contractor disposes of waste or uses a waste disposal contractor which has not been appointed by the Business Unit for that construction site, the site management team should:

- Verify the validity of the relevant Waste Brokers/Carriers' Licence(s)
- Verify that wastes are to be deposited at facilities licensed to take that type and quantity of waste
- Retain copies of completed non-hazardous waste transfer notes
- Retain copies of completed hazardous waste consignment notes

- Ensure an Environmental Permit/Waste Management Licence or Exemption is obtained, where relevant, e.g. for waste materials incorporated back onto land, such as subsoil or topsoil taken by a local farmer.

Where required, a Vistry Waste Transfer note is available – VG-FM-SHE-094. If multiple waste removals are required (i.e., series of wagon or skip loads) it is permissible to have one waste transfer note (season ticket) for all of the waste removals for a maximum period of 12 months as long as the following remains constant:

- Type of waste does not change between loads
- Waste carrier does not change between loads
- Waste disposal site does not change between loads.

The site management team should ensure that relevant requirements of this standard are communicated to contractors as being mandatory requirements.

Work Practices:

The site management team should ensure waste produced and stored on-site is:

- Adequately identified and described, i.e. labelled
- Appropriately segregated and stored
- Transferred to appropriate persons (both transport and disposal)
- Appropriately treated and/or disposed.
- Cover plasterboard skips (refer to VG-GN-SHE-035)

For further guidance, please also refer to Site Waste Management Plan VG-GN-SHE-012 and Waste Exemption VG-GN-SHE-016.

Responsibilities matrix

R= Responsible **A**= Accountable **C**= Consulted **I**= Informed

		Managing Director	Ops/Build Director	Contracts Manager	Project/Site Manager	Technical	Commercial	Land	Sales	HR	Customer Services	SHE Team	Premises Manager	Contractor
Stage 1 Planning	Initial Site Appraisal VG-FM-SHE-009 completed considering waste factors	A	C	C	C	R						C		
	Develop the Project Environment Plan – VG-FM-SHE-068, Environmental Aspect and Impact Register – VG-FM-SHE-029 & environmental constraints plan	A	I	I		R	I							
	During pre-construction phase, if it is envisaged that significant amounts of waste are going to be produced this should be assessed when completing the Environmental Aspects & Impacts Register VG-FM-SHE-029	A	C	C	C	R	C					C		
	Waste hierarchy used to develop mitigation control measures and included in the Site Waste Management Plan (SWMP) VG-FM-SHE-108. See also VG-GN-SHE-012		I	A	R	C	C					C		C
	Sites that produce more than 500kg of hazardous waste in a 12-month period should register with NRW and renew annually		I	A	R	C						C		
Stage 2 Operational	Verify waste carrier licenses and waste disposal site licenses and permits			A	R		C					I		C
	Set up suitable waste area including adequate waste segregation and secure, designated hazardous waste areas, cover plasterboard skips and ensure all skips have appropriate waste stream signage			A	R							I		
	Review/update VG-FM-SHE-068, VG-FM-SHE-029 & environmental constraints plan every 2 months	A	I	I	R	C						C		
	Prior to reuse or recycling of a waste, consult with SHE department & EA/NRW to determine the need for Environmental Permit/Waste Management Licence or Exemption. See VG-GN-SHE-016		I	A	R		I					C		
	Check and retain copies of all non-hazardous waste transfer notes and hazard waste consignment notes			A	R		I					I		C
END	Review documentation in line with this SOP. Continue SHE Monitoring	**All Affected Parties**												

Appendix 2

Guidance Note – (GN) – Site Waste Management Plan

This document has been prepared to explain how to set up, update and monitor a Site Waste Management Plan (SWMP) in Vistry Group. All Vistry Group projects, irrespective of size, are required to complete a SWMP and report quantities of waste produced.

SWMP Overview

VG-FM-SHE-108 Site Waste Management Plan is self-explanatory. The initial set up of the SWMP is the responsibility of the Contracts / Project Manager.

All subcontractors working on site must be identified and detailed within the SWMP. Contractors producing their own waste and removing waste from site or by others are of particular importance.

Waste Hierarchy – MUST be considered!

Update, Monitor & Review

The plan must be updated by the site team throughout the life of the project. Waste streams and quantities must be monitored and reviewed, and action taken where there is deviation from the plan.

All duty of care All duty of care information must be retrievable for any inspection. This includes waste carrier license, full copy of the disposal license and our internal Waste Transfer Note (where applicable).

A post project review should be carried out to determine if the plan was complied with, if there were any deviations and why, if it was fit for purpose and, what improvements can be carried over onto the next plan.

Training

Your BU SHE Manager/Advisor can provide some basic training on how to complete the SWMP, simply contact them and make the necessary arrangements or, if you require more detailed training you can arrange to attend the ½-day duty of care course; simply book through DUG https://vistry.oak.com/Home/Index/671a92de-822f-4442-a730-a5c100c25642

Appendix 3

SHE Standard Operating Procedure - (SOP)

Title:	**Project Environmental Design**
Document Reference:	VG-SOP-SHE-30
Relevant Standard(s):	GE700 – Section E: Environment, Sub-section 2: Site environment management systems Section F: Specialist Activities, Sub-section 6: House building

Purpose:
This procedure sets out the arrangements for the identification, management and control of environmental issues on Vistry Group developments and controlled premises

Scope:
This procedure sets the minimum standards by which Vistry Group, its employees and contracted parties of all tiers are continually tasked to achieve.

General Standards
The consideration of environmental issues in the design process is fundamental in achieving our sustainable development commitments; consequently, the following should be adopted whenever a consultant, company or organisation is employed by Vistry Group to develop a project design.

Any consultant, company or organisation employed by Vistry Group to prepare a design should review the completed Initial Site Appraisal VG-FM-SHE-009, contract documentation (including the design brief), outputs from any tender/estimating risk assessments and any survey works (e.g. ground investigation surveys, ecological surveys, etc.) that have been conducted, to enable potential environmental risks and/or opportunities at the design stage to be identified and documented.

Thereafter, any consultant, company or organisation employed by Vistry Group to prepare a design should define and document the measures proposed to effectively manage the identified environmental risks and/or opportunities.

Any consultant, company or organisation employed by Vistry Group to prepare a design should consider the adoption of best practicable environmental performance measures, as appropriate, throughout the design life of the project (i.e. construction, occupation, maintenance and demolition).

Additionally, any consultant, company or organisation employed by Vistry Group to prepare a design should review and implement, where practicable, the use of 'best available techniques' and whole life costing approaches to ensure designs:

- Are efficient in their use of natural resources
- Consider wider global environmental responsibilities for resource use and waste reduction
- Nurture positive enhancement for users and the wider community
- Our commitment to future homes standard.

Any consultant, company or organisation employed by Vistry Group to prepare a design should propose, where appropriate, environmentally beneficial design solutions for clients' consideration.

Planning of Construction Site Activities
Any consultant, company or organisation employed by Vistry Group to prepare a design should ensure that the project design complies with statutory regulatory requirements.

Contractors and Suppliers
The Technical Team should ensure that any consultant, company or organisation employed by Vistry Group to prepare a design is competent, i.e. they hold relevant professional qualification(s) and a demonstrable track record of experience. Records to demonstrate these competencies should be retained by the site management team.

Work Practices
The Technical Team should ensure that any change or modification to the project design is reviewed from an environmental perspective by:

- Ensuring that the environmental risks and opportunities identified during the design phase are reviewed and modified; and
- Ensuring that measures defined and documented during the design phase to manage the identified environmental risks and opportunities are reviewed and modified.

Records to demonstrate that these reviews have been undertaken should be retained by the Technical Team for the duration of the project.

Also, any consultant, company or organisation employed by a Business Unit to prepare a design should:

- Review the Initial Site Appraisal (VG-FM-SHE-009), contract documentation, outputs from any tender/estimating risk assessments and any survey works that have been conducted to enable potential environmental risks and/or opportunities to be identified and documented.
- Define and document the measures proposed to effectively manage the identified environmental risks and/or opportunities.
- Consider adopting best practicable environmental and/or sustainability performance measures, as appropriate, throughout the design life of the project.
- Review and implement, where practicable, the use of 'best available techniques' and whole life costing approaches to ensure designs are:
  - Efficient in their use of natural resources.
  - Consider wider global environmental responsibilities for resource use and waste reduction.
  - Nurture a positive enhancement for users and the wider community.
  - Propose, where appropriate, environmentally beneficial design solutions for consideration by the company.

Technical Teams should discuss cost effective design opportunities with clients, where appropriate, to enhance and/or optimise environmental and/or sustainability performance.

Design Teams should consider the impacts and implications to the environment surrounding the proposed project location to ensure that any potential adverse impacts are minimised as much as practically possible. Specifically, Design Teams should, where applicable, consider:

- ***Agriculture and forestry***. Designs should minimise the impact on agricultural and forestry resources.
- ***Air quality.*** Designs should minimise the impact of airborne emissions during construction and operational phases on the environment, people and businesses.
- ***Community and socio-economic effects.*** Designs should avoid any adverse impact during construction and operational phases on people, their employment and the communities in which they live.
- ***Contaminated Land.*** Designs should minimise the requirement for disturbance, removal or disposal of contaminated land.
- ***Cultural Heritage.*** Designs should avoid disturbance, damage or disruption to known cultural heritage assets.
- ***Ecology.*** Designs should minimise the impact during construction and operational phases on ecological resources. Additionally, designs should incorporate measures to enhance local ecological resources and support, where applicable, BAPs (i.e., Species Action Plans, Habitat Action Plans and Local Biodiversity Action Plans).
- ***Landscape and Visual.*** Designs should avoid any adverse impact on character of local landscapes and townscapes as well as opportunities for the reuse and/or recycling of spoil.
- ***Noise and Vibration.*** Designs should minimise the impact of construction and operational noise and vibration on sensitive receptors.
- ***Surface and Groundwater.*** Designs should minimise the impact of construction and operational phases on water bodies e.g., surface and ground waters.
- ***Traffic and Transport.*** Designs should avoid any adverse impact during construction and operational phases upon local traffic, pedestrians and other users of roads, footpaths, bridleways and byways.

	Responsibilities matrix **R**= Responsible **A**= Accountable **C**= Consulted **I**= Informed	Managing Director	Ops/Build Director	Contracts Manager	Project/Site Manager	Technical	Commercial	Land	Sales	HR	Customer Services	SHE Team	Premises Manager	Contractor
Stage 1 Planning	Ensure any designers or consultant are competent and have been assessed by CQMS	A				R	C							C
	Ensure designers and consultants are provided with all available information including VG-FM-SHE-009 to allow for suitable consideration of environmental aspects of the design	A				R	C							I
	Any consultant, company or organisation employed to prepare a design should consider the adoption of best practicable environmental performance measures, as appropriate	A				R								C
	Any consultant, company or organisation employed to prepare a design should review and implement, where practicable, the use of 'best available techniques' and whole life costing approaches	A				R								C
	Consider the impacts and implications to the environment surrounding the proposed project location to ensure that any potential adverse impacts are minimised as much as practically possible.	A	C	C	C	R						C		
	Any consultant, company or organisation employed to prepare a design should ensure the design complies with statutory regulatory requirements.	A				R								C
	Any consultant, company or organisation employed to prepare a design should review and implement, where practicable, the use of 'best available techniques' and whole life costing approaches	A				R								C
	Ensure that any change or modification to the project design is reviewed from an environmental perspective	A	C	C	C	R								C
END	Review documentation in line with this SOP. Continue SHE Monitoring	**All Affected Parties**												

Nexus Planning

Bristol

707 The Programme Building
7th and 8th Floor
1 All Saints Street
Bristol BS1 2LZ

nexusplanning.co.uk

Contents

Appendices

1. Introduction

1.1 This Affordable Housing Statement has been prepared on behalf of Vistry Homes Limited to support a reserved matters submission for 150 dwellings, public open space and infrastructure on Land North of Rudloe Drive, Quedgeley.

2. Context

Planning Policy

National Planning Policy Framework – July 2021 (NPPF)

2.1 Paragraph 63 of the NPPF confirms that, where a need for affordable housing is identified, planning policies should specify the type of affordable housing required. The various types of affordable housing that are available are defined in Annex 2 of the NPPF and comprise:

> *"a) Affordable housing for rent: meets all of the following conditions: (a) the rent is set in accordance with the Government's rent policy for Social Rent or Affordable Rent, or is at least 20% below local market rents (including service charges where applicable); (b) the landlord is a registered provider, except where it is included as part of a Build to Rent scheme (in which case the landlord need not be a registered provider); and (c) it includes provisions to remain at an affordable price for future eligible households, or for the subsidy to be recycled for alternative affordable housing provision. For Build to Rent schemes affordable housing for rent is expected to be the normal form of affordable housing provision (and, in this context, is known as Affordable Private Rent).*
>
> *b) Starter homes: is as specified in Sections 2 and 3 of the Housing and Planning Act 2016 and any secondary legislation made under these sections. The definition of a starter home should reflect the meaning set out in statute and any such secondary legislation at the time of plan-preparation or decision-making. Where secondary legislation has the effect of limiting a household's eligibility to purchase a starter home to those with a particular maximum level of household income, those restrictions should be used.*
>
> *c) Discounted market sales housing: is that sold at a discount of at least 20% below local market value. Eligibility is determined with regard to local incomes and local house prices. Provisions should be in place to ensure housing remains at a discount for future eligible households.*
>
> *d) Other affordable routes to home ownership: is housing provided for sale that provides a route to ownership for those who could not achieve home ownership through the market. It includes shared ownership, relevant equity loans, other low cost homes for sale (at a price equivalent to at least 20% below local market value) and rent to buy (which includes a period of intermediate rent). Where public grant funding is provided, there should be*

provisions for the homes to remain at an affordable price for future eligible households, or for any receipts to be recycled for alternative affordable housing provision, or refunded to Government or the relevant authority specified in the funding agreement."

2.2 Paragraph 65 of the NPPF states that where major development involving the provision of housing is proposed, planning policies and decisions should expect at least 10% of the homes to be available for affordable home ownership, unless this would exceed the level of affordable housing required in the area, or significantly prejudice the ability to meet the identified affordable housing needs of specific groups.

Gloucester, Cheltenham and Tewkesbury Joint Core Strategy - November 2017 (JCS)

2.3 The JCS was adopted in December 2017. The key policies in respect of affordable housing are:

- Policy SD11 (Housing Mix and Standards): Housing development will be required to provide an appropriate mix of dwelling sizes, types and tenures in order to contribute to mixed and balanced communities and a balanced housing market.
- Policy SD12 (Affordable Housing): There is a requirement for forty percent (40%) affordable housing provision on non-strategic sites within the Tewkesbury Borough administrative area. Where possible, affordable housing should be provided onsite and be seamlessly integrated and distributed throughout the development.

Emerging Gloucester City Plan 2011 - 2031 (GCP)

2.4 The GCP was submitted to the Secretary of State for Examination in November 2020. Following the examination hearing sessions held in May / June 2021 the Inspector issued a letter in August 2021 which advised that the GCP as submitted is unsound, but that it can be made sound through 'Main Modifications. At the time of writing a consultation on the Main Modifications is taking place and will run until 4th July 2022. As set out in the pre-application response issued by the Council has decided that the emerging policies of the plan can be afforded limited to moderate weight decision.

2.5 Policy A6 (Accessible and Adaptable Homes) of the emerging Local Plan[1] states that 4% of the affordable housing component of every housing development should meet Building Regulations requirement M4 (3) 'wheelchair user dwellings'

[1] For the purposes of this Statement the term 'emerging Local Plan' means the 'Gloucester City Plan 2011 - 2031 with Modifications' published in April 2022.

Outline Planning Permission

2.6 Outline planning permission[2] for up to 150 dwellings on Land North of Rudloe Drive, Quedgeley was granted by the Council on 9th July 2021. The permission is subject to a signed Section 106 Agreement (dated 2nd July 2021) relating to Affordable Housing and Public Open Space. The obligations relating to affordable housing are set out below.

Quantum

2.7 Twenty percent (20%) of the total dwellings are to be provided as affordable housing units.

Tenure

2.8 Sixty-six percent (66%) of the affordable housing units are to be provide as Affordable Rented Units and thirty-four percent (34%) of the affordable housing units are to be provided as Shared Ownership Units.

Mix and Size

2.9 Unless otherwise agreed with the Council the affordable housing units are to be provided in accordance with the following mix:

House Type	Affordable Rent	Shared Ownership	Total
1 bedroom 2 person flat @ 50 sqm (min)	2	0	2
2 bedroom 4 person flat @ 70 sqm (min) or 2 bedroom 4 person house @ 79 sqm (min)	10	5	15
3 bedroom 6 person house @ 93 sqm (min)	6	4	10
4 bedroom 8 person house @ 106 sqm (min)	2	1	3
Total	**20**	**10**	**30**

Distribution

2.10 Each cluster of affordable housing is not to exceed eight (8) units unless otherwise agreed in writing by the Council.

[2] Local Planning Authority Reference: 21/00490/OUT.

Appearance

2.11 The affordable housing units are to be generally indistinguishable in appearance from the open market units and be tenure blind.

Accessibility

2.12 A minimum if one (1) affordable unit shall be constructed to Part M Category 3b and a minimum of five (5) affordable units shall be constructed to Part M Category 2.

3. Proposed Affordable Housing Provision

3.1 A copy of the Affordable Tenure Plan from the reserved matters submission is included at **Appendix 1**. As described below the proposals are fully compliant with the obligations set out in the Section 106 Agreement dated 2nd July 2021.

Quantum

3.2 The proposals include 30 affordable dwellings. This constitutes twenty percent (20%) of the total development (150 dwellings) and therefore accords with the requirements of the Section 106 Agreement.

Tenure

3.3 The proposals include twenty (20) Affordable Rented units and ten (10) Shared Ownership units. This accords with the requirement in the Section 106 Agreement to provide six percent (66%) of affordable

Mix and Size

3.4 The proposed affordable mix is set out in the table below and is in full accordance with the Section 106 Agreement.

House Type	Affordable Rent	Shared Ownership	Total
1 bedroom 2 person flat @ 50 sqm (min)	2	0	2
2 bedroom 4 person flat @ 70 sqm (min) or 2 bedroom 4 person house @ 79 sqm (min)	10	5	15
3 bedroom 6 person house @ 93 sqm (min)	6	4	10
4 bedroom 8 person house @ 106 sqm (min)	2	1	3
Total	**20**	**10**	**30**

3.5 The sizes of the affordable units are set out in the table below. They accord with the minimum sizes set out in the Section 106 Agreement.

House Type	Minimum Size (Section 106 Agreement)	Reserved Matters Units
1 bedroom 2 person ground floor maisonette	50 sqm	58 sqm
1 bedroom 2 person first floor maisonette	50 sqm	68 sqm
2 bedroom 4 person house	79 sqm	80 sqm

House Type	Minimum Size (Section 106 Agreement)	Reserved Matters Units
3 bedroom 6 person house	93 sqm	95 sqm
4 bedroom 8 person house	106 sqm	106 sqm

Distribution

3.6 The affordable housing units have been seamlessly integrated and distributed throughout the development and are in clusters of no more than eight (8).

Appearance

3.7 The affordable housing units have been designed to be generally indistinguishable in appearance from the open market units and be tenure blind.

Accessibility

3.8 The proposals include the following level of provision:

- One (1) unit has been designed to meet Part M Category 3b (Plot 138).
- Five (5) units have been designed to meet Part M Category 2 (Plots 12 to 16).

3.9 This level of provision accords with the requirements of the Section 106 Agreement.

4. Conclusion

4.1 The reserved matters submission for the Land North of Rudloe Drive, Quedgeley has been prepared in accordance with the obligations set out in the Section 106 Agreement dated 2nd July 2021. The key points are summarised below:

- Twenty (20%) of the development is provided as affordable housing.
- Sixty-six percent (66%) of affordable units are provided as Affordable Rent and thirty-four percent (34%) are provided as Shared Ownership.
- The mix of the affordable units is in full accordance with the Section 106 Agreement.
- The sizes of the affordable units accord with the requirements of the Section 106 Agreement.
- The affordable housing units have been seamlessly integrated and distributed and are in clusters of no more than eight (8).
- The affordable housing units have been designed to be generally indistinguishable in appearance from the open market units and be tenure blind.
- One (1) unit has been designed to meet Part M Category 3b, while five (5) units have been designed to meet Part M Category 2.

Appendix 1

Notes:
The contractor must verify all dimensions on site before commencing any work on shop drawings, do not scale from this drawing
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KEY:

- Affordable Rent
- Shared ownership

POS / SPORTS PITCH / PLAY AREA

NEWHAVEN ROAD

WYCOMBE ROAD

LEUCHARS CLOSE

ST MANGAN STREET

FERSFIELD GARDENS

Drain

DW

DW

El Sub Sta

TALL DENSE VEGETATION

TALL DENSE VEGETATION

Rose Tree Farm

Kinloss

P1	Issued for planning	23.05.2022
Revision	Amendment	Date

KK/VS	SC	EC
Drawn by	Reviewed by	Approved by
61841	MAY 2022	1:500 @ A0
MCB Number	Date Created	Scale

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Client
Vistry Group

Project
LAND NORTH RUDLOE DRIVE
QUEDGELEY

Drawing Title
AFFORDABLE TENURE PLAN

ARCHITECTURE

Drawing / Document Reference										Status
RDQUE	MCB	ZZ	ZZ	DR	A	0234	D5	P1
Project Ident	Originator	Zone	Level	Type	Discipline	Number	Suitability	Revision

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Nexus Planning

Bristol

707 The Programme Building
7th and 8th Floor
1 All Saints Street
Bristol BS1 2LZ

nexusplanning.co.uk