



NFC Homes Limited

Willow Tree Depot, Ditchfield Road

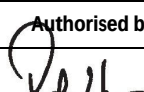
Verification Report



This report has been prepared for **NFC Homes Limited** in accordance with the terms and conditions of appointment for **Willow Tree Depot, Ditchfield Road**. Tweedie Evans consulting Limited (TEC) cannot accept any responsibility for any use of or reliance on the contents by a third party.

Willow Tree Depot, Ditchfield Road

Verification Report

ISSUE RECORD					
Report Reference: 2001015.001.01					
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-	March 2021	-	 Claire Hooley	 Alexandra Flint	 Richard Evans
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TEC is ISO 9001:2015 and ISO 14001:2015 certified by Advanced Certification Limited, a UKAS Accredited Certification Body number 8872 for the scope of Specialist consultancy services across the UK in contaminated land assessment, ground engineering, waste management and construction phase monitoring.

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EXECUTIVE SUMMARY

SITE INFORMATION	Client	NFC Homes Limited
	Site Details	Land off Ditchfield Road, to the east of Yeading in the London Borough of Hillingdon, UB4 9BH
	Proposed Development	The proposed development is understood to comprise redevelopment of the site for residential purposes comprising the construction of 11No. low rise units with associated car parking and private gardens, as detailed within Spires Architects Drawing No. 19.06-200 rev K – Site Plan.
BACKGROUND INFORMATION	Site History	The site comprised a former landfill that received inert waste until the 1990's. The site was subsequently used as a Council depot.
	Previous Assessment	Previous assessments of the site recorded the presence of elevated concentrations of heavy metals, cyanide and PAH's when considering a residential site end use. In addition, the site was classified in accordance with guidance as Characteristic Situation 2 with respect to bulk gases due to consistently elevated CO ₂ in excess of the 5% screening value for a residential site end use.
	Remedial Approach	Full details of recommended remedial requirements with respect to a cover system and ground gas protection are presented within the Remediation Strategy for the site (TEC report 1702005.005.01) and are summarised below: • A large part of the of the site area is to be covered by the footprint of the proposed development buildings or hardstanding, which would remove the identified potential contaminant pathways in relation to site end users. • Where soft landscaping is proposed, TEC recommended that the provision of an engineered cover system, comprising the placement of a geotextile and minimum of 450mm of chemically suitable soil to break the pollutant pathway between underlying contaminated soils and the site end user. • Gas protection measures are considered to include a combination of structural barrier, ventilation and gas resistant membrane.
VERIFICATION STATEMENT		This Verification Report details the remedial cover system works undertaken within the soft landscaped areas across the site and the ground gas protection measures to support compliance with the remediation objectives and criteria detailed within the TEC Remediation Strategy (Ref: 1702005.005.01). Based on the information provided by NFC Homes Limited, it is considered that the remedial measures implemented within the soft landscaped areas and the provision of bulk ground gas protection measures would appropriately mitigate against the potential pollutant linkages previously identified by TEC.

1 INTRODUCTION

1.1 Terms of Reference

- 1.1.1 TEC has been appointed by NFC Homes Limited to prepare a verification report to support the proposed development at Willow Tree Depot, Hayes. All works were undertaken in accordance with our proposal dated 22 January 2020.

1.2 Background

- 1.2.1 The site is located off Ditchfield Road, to the east of Yeading in the London Borough of Hillingdon and covers an area of approximately 0.24 hectares with the centre of the site situated at approximate National Grid Reference 512240, 182060. The nearest postcode to the site is UB4 9BH.
- 1.2.2 It is understood that it is proposed to redevelop the site for residential purposes comprising the construction of 11No. low rise units with associated car parking and private gardens, as detailed within Spires Architects Drawing No. 19.06-200 rev K – Site Plan.
- 1.2.3 Previous geoenvironmental and geotechnical assessments for the site have been undertaken by TEC, as detailed within the following reports:
- TEC - Preliminary Geoenvironmental and Geotechnical Assessment; Willow Tree Depot, Ditchfield Road. Prepared for London Borough of Hillingdon. Document reference 1712005.001.01, dated April 2018.
 - TEC – Geoenvironmental and Geotechnical Assessment: Willow Tree Depot, Ditchfield Road. Prepared for London Borough of Hillingdon. Document reference 1712005.002.01A, dated July 2019.
 - TEC – Ground Gas Risk Assessment; Willow Tree Depot, Ditchfield Road. Prepared for London Borough of Hillingdon. Referenced 1702005.004.01, dated January 2019.
- 1.2.4 In addition, a Remediation Strategy has been provided for the site, which is understood to have been approved by London Borough of Hillingdon Council, as follows:
- TEC – Remediation Strategy; Willow Tree Depot, Ditchfield Road. Prepared for London Borough of Hillingdon. Referenced 1702005.005.01, dated July 2019.
- 1.2.5 Full reference should be made to these documents regarding the site conditions and previous assessment works.
- 1.2.6 These verification works are with respect to the placement of an appropriate cover system within soft landscaped areas across the site and the appropriate installation of gas membranes throughout the development and have been undertaken in accordance with LCRM - Land contamination: risk management (Environment Agency, 2020).

2 SITE DESCRIPTION

2.1 Introduction

2.1.1 The Remediation Strategy prepared for the site by TEC details the necessary remedial works required to allow the redevelopment of the site for the proposed residential end use and in particular, details the need for an appropriate cover system in areas of soft landscaping across the site.

2.1.2 Reference to the Remediation Strategy and associated reporting should be made for detailed information.

2.2 Background

2.2.1 During TEC's site walkover survey and initial phase of intrusive works, the site comprised an irregular shaped parcel of land containing a single L-shaped single storey with associated concrete hardstanding used for car parking and loading within the centre, while the rest of the site was laid to soft landscaping. The site was noted to be vacant and the building demolished at the time of the additional intrusive works undertaken in June 2019.

Site History

2.2.2 Potentially contaminative process identified on site included a historic landfill that reportedly received waste until the late 1990's. In addition, the site had been formerly been used as a depot.

Ground Conditions

2.2.3 Intrusive works undertaken by TEC recorded the following ground conditions:

Table 2.1: Generalised Ground Profile

Depth (mbgl)	Encountered Material
0.0 – 3.0 / >4.0	Made Ground: Variable, comprising dark brown, black, greyish-brown clay with a varying sand and gravel content, black gravelly sand and multi-coloured slightly clayey sandy gravel / gravelly sandy clay. Gravel was observed to include red brick, yellow brick, clinker, wood fragments, fabric fragments, ash, glass, ceramic tile, marble tile, metal, plastic, tarmacadam, black carbonaceous material and chert. Occasional cobbles of brick. Organic odour throughout.
3.0/4.0 – >15.0	London Clay Formation: firm becoming stiff and very stiff, medium to high, becoming very high strength, greyish brown / grey slightly gravelly, sandy, silty, clay. Gravel of subangular to subrounded lithorelicts of very stiff clay. Occasional fine selenite crystals throughout. Becoming very stiff below 14.5m depth.

2.2.4 Groundwater was encountered in a number of locations at depths of between 2.0mbgl and 3.0mbgl within the made ground, suggesting the presence of a perched water body within the historic landfill materials across the site.

2.2.5 Following completion of the works, groundwater levels were recorded as part of the ground gas monitoring works. Perched water levels were recorded between 2.4mbgl and 4.72mbgl.

Identified Contamination

2.2.6 Elevated concentrations of heavy metals (arsenic, beryllium and lead), cyanide and PAHs, comprising naphthalene, benzo(b)fluoranthene, benzo(a)pyrene and dibenz(a,h)anthracene, were recorded within the representative samples of made ground encountered on site in relation to a residential site with homegrown produce end use. In addition, asbestos fibres were detected within sampled made ground at 3No. locations.

Gas Risk Assessment

- 2.2.7 An organic odour was recorded within encountered made ground materials and Total Organic Carbon (TOC) of up to 7.0% was recorded within encountered materials.
- 2.2.8 A total of 7No. ground gas monitoring visits undertaken from wells installed across the site recorded methane concentrations to be below the limit of detection of the instrument (i.e. 0.0%v/v). Notwithstanding this, maximum stable concentrations of carbon dioxide of between 6.2%v/v and 8.3%v/v were recorded (i.e. above the current screening value for a high sensitivity end use of 5%).
- 2.2.9 On the basis of gas screening values, the maximum recorded gas concentrations and the identified sources, the site would be characterised as Characteristic Situation 2 (<0.7l/hr) in accordance with BS8485:2015.

2.3 Risk Appraisal Summary

- 2.3.1 Based upon the findings of the TEC report (ref: 1704020.002.01 Rev A) and conceptual understanding of the site in relation to its proposed end use, the main potential Significant Pollutant Linkages identified were considered to be:
- Human health (future site end users and construction workers) – exposure to contaminants and asbestos fibres within made ground at the site via the ingestion, dermal contact and inhalation pathways; and
 - Human health (proposed structures and future site users) – migration, ingress and inhalation of ground gases.

3 REMEDIATION STRATEGY SUMMARY

3.1 Introduction

3.1.1 The conceptual model developed for the site identified the following relevant pollutant linkages (RPL) with respect to the proposed development:

- | | |
|------|---|
| RPL1 | Chronic risk to site end users via exposure to the contaminants of potential concern (including asbestos fibres) in areas of proposed soft landscaping through the inhalation, ingestion and dermal pathways; |
| RPL2 | Acute risk to construction workers and future maintenance workers during the groundworks via exposure to contaminants of potential concern in the made ground through the inhalation, ingestion and dermal pathway; and |
| RPL3 | Chronic risk to site end users through migration (e.g. along potential preferential pathways), ingress and accumulation / inhalation of carbon dioxide. |

3.2 Scope of Remedial Works

3.2.1 Full details of recommended remedial requirements are presented within the Remediation Strategy for the site (1712005.005.01), while a summary for each RPL is presented below:

RPL1

- Based upon the proposed development layout, much of the site is to be covered by hardstanding including the building footprints, paved areas etc. Where present, such hardstanding would remove the identified potential contaminant pathways in relation to site end users.
- Where soft landscaping is proposed, a suitable cover system, comprising the placement of an appropriate geotextile separation layer overlain by a suitable cover thickness, comprising topsoil and subsoil in accordance with the requirements of BS3882:2015 'Specification for Topsoil' and BS8601:2013 'Specification for Subsoil and Requirements for Use'. Consequently, consolidated minimum thicknesses of 450mm will be required within the general soft landscaped (grassed) areas, 600mm in areas of shrub and 900mm in areas of tree planting. The depth of topsoil spread should not normally exceed 300mm with the remainder of the rooting depth being made up of suitable (loosened) subsoil.

RPL2

- Given the potential ACM noted within the underlying ground materials, site clearance/preparation works should take full regard to the presence of asbestos containing materials as per current guidance (e.g. CL:AIRE (2016) Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance).
- The adoption of good brownfield working practices, including good site welfare and hygiene facilities and the provision of appropriate Personal Protective Equipment (PPE), would be considered sufficient to mitigate against potential residual risk from the other CoCs identified.
- Full site maintenance procedures and risk assessments should be documented and implemented to ensure that future maintenance workers are protected from potential residual risk during possible exposure to materials beneath the capping layer.

RPL3

- Based on the site characterisation and the type of buildings proposed to be developed, ground gas protection measures will be required and a combination of measures should be utilised to meet the minimum gas protection score of 3.5 for the proposed residential properties, as outlined within BS 8485:2015+A1:2019.

4 VERIFICATION

4.1 Background

- 4.1.1 This section provides evidence of the verification of the gas protection measures and the cover system placed within the rear garden areas of the site to mitigate the identified risks to future site end users.

4.2 Cover System

- 4.2.1 The areas laid to soft landscaping and hard surfacing within the rear garden areas are presented in Spires Architects Drawing titled "Rev K – Site Plan".

Hardstanding

- 4.2.2 Areas of hardstanding present onsite outside the building footprint are depicted in Spires Architects Drawing titled "Rev K – Site Plan". The areas of hardstanding comprise a combination of brindle permeable concrete block paving and buff concrete paving slabs, the placement of which are detailed within Appendix A. While it is understood the placement of hardstanding within Plots 6-10 is not yet complete, photographic evidence has been provided depicting prepared areas ready for completion and it is understood this is due to be complete by the end of the month. It is considered that the provided surface cover in these areas is sufficient to remove the identified potential contaminant pathways in relation to site end users in such areas.

Soft Landscaping

- 4.2.3 Verification photographs provided by NFC Homes Limited are presented in Appendix A.

Waste Certificates

- 4.2.4 Waste certificates provided by NFC Homes indicate that 192No loads of soil was removed from site between 16 March 2020 and 02 February 2021 by LTS grab Hire Ltd, A1 Grab Hire Ltd and Go Green Ltd. The corresponding certificates are presented in Appendix B.

Topsoil Chemical Quality

- 4.2.5 The imported topsoil materials are recorded to have been supplied by Springbridge Direct Ltd and are reported to have been delivered to site by LTS Grab Hire Ltd and L&R Transport Ltd (Appendix C).
- 4.2.6 The imported topsoil (Multipurpose Topsoil) was tested by Eurofins Chemtest Ltd on 12 March 2020 and 24 December 2020 (ref: 20-07249-1 and 20-34138-1 – Appendix C). The attached test reports indicate all determinands to be below the relevant Importation Criteria detailed within the TEC Remediation Strategy for the site. In addition, the reports indicate the tested material is compliant with multipurpose range topsoil detailed within BS3882.

Delivery Certificates

- 4.2.7 Delivery certificates provided by NFC Homes indicate that 35No. loads (totalling approximately 525m³) of topsoil, understood to have been used within the cover system, were supplied by LTS Grab Hire Ltd and L&R Transport Ltd between 20 April 2020 and 02 February 2021 at the site. The transfer notes together with the associated dispatch notes for the Multipurpose Topsoil are presented within Appendix D and are summarised below in Table 4.1 below.

Table 4.1: Topsoil Delivery Summary

Delivery Date	Delivery Ticket Numbers	No of Loads	Total m ³ Delivered
20.04.2020	2642	1	15
21.04.2020	2079, 2089, 2647,	3	45

Delivery Date	Delivery Ticket Numbers	No of Loads	Total m ³ Delivered
12.05.2020	049,	1	15
13.05.2020	054, 058,	2	30
14.05.2020	1911	1	15
18.05.2020	1774	1	15
18.01.2021	4331, 4334	2	30
19.01.2021	4337, 4340, 4343, 6143	4	60
22.01.2021	4071, 6162, 6167, 6168, 6169	5	75
25.01.2021	4073, 4231, 4235, 4364	4	60
26.01.2021	4076, 4245, 4368, 4426,	4	60
27.01.2021	4429,	1	15
29.01.2021	4436	1	15
01.02.2021	01335 (L & R Transport)	1	15
02.02.2021	4083, 4085, 4087, 4737	4	60
TOTAL		35	525

Client Supplied Information

- 4.2.8 Following the placement of geotextile and cover materials, verification pits are understood to have been excavated by the groundworkers on behalf of NFC Homes Limited in February and March 2021 and photographs provided showing the thickness of the cover materials (Appendix A). The photographs provided indicate placement of approximately 450mm to 600mm at the sampling locations understood to be situated within the front and rear gardens of Plots 1 to 10.

4.3 Gas Protection Measures

- 4.3.1 NFC Homes Limited have provided Gas Membrane Validation Report, provided by Phoenix Geotechnical Ltd for Plots 1 – 10 Ditchfield Road, Hayes (Appendix E). This indicate that Juta GP1 membrane system has been installed in accordance with the manufacturers recommended installation procedures and their Certification Quality Standard Procedures.

5 VERIFICATION STATEMENT

- 5.1.1 TEC has been appointed by NFC Homes Limited to prepare a verification report to support the development at Willow Tree Depot, Ditchfield Road.
- 5.1.2 This Verification Report details the remedial cover system works undertaken within the front and rear garden areas and the ground gas protection measures to support compliance with the remediation objectives and criteria detailed within the TEC Remediation Strategy (Ref: 1702005.005.01).
- 5.1.3 Based on the information provided by NFC Homes Limited, it is considered that the remedial measures implemented within the front and rear garden areas would appropriately mitigate against the potential pollutant linkages previously identified by TEC.
- 5.1.4 In addition, based on the information provided by NFC Homes Limited, it is understood that the gas membranes have been installed in accordance with guidance and manufacturers specification and would appropriately mitigate against the potential pollutant linkages previously identified by TEC.

TEC

FIGURES AND DRAWINGS



K	21.08.20	Reverted Back Revision H, Plot 1 Coordinated
J	05.08.20	Plots 1, 9 & 10 Forecourt & Parking Arrangement Amended
H	01.05.20	Foul Drainage Overlay, Rotary Dryer, Plot 1 EV Point Amended
G	26.04.20	Foul Drainage Overlay
F	19.03.20	Plot 1 Car Parking Dimensions
E	18.03.20	Plot 1 Carport Overlay, & Car Parking, Binstore & Landscape Amended
D	02.03.20	Base Floor Plans Updated
C	20.02.20	Finished Floor Levels, Existing Site Perimeter Levels & Retaining Wall
B	06.02.20	Planting & Trees, Hard Landscape Materials, Lighting Details Added
A	21.01.20	Ecology Coordinated

Revisions	
Client	NFC Homes Ltd.

Project
Residential Development
Willow Tree Depot
Ditchfield Road
Hayes, London
UB4 9RU

Status
Construction
Date
2020.01.13

Scale
1:100
Size
A1

Title
Site Plan
Number
19.06-200
Revision
K

Spires Architects
9 Monks Way | Reading | RG30 3DP
Tel: 07495 529905

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Key:

Note:
REFER TO DRAWING 19.06-201 FOR SHRUB / TREE PLANTING SCHEDULE

WILLOW TREE OPEN SPACE
1.5m HIGH METAL RAILINGS
MATCH / REUSE EXISTING

WILLOW TREE OPEN SPACE
ACCESS GATE REPOSITIONED
MATCH / REUSE EXISTING

Appendix A

Verification Photographs

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 1: General site view.



Photograph 2: General site view.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 3: General site view.



Photograph 4: General site view.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 5: General site view.



Photograph 6: General site view.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 7: General site view.



Photograph 8: General site view.



Photograph 9: Verification pit advanced within front garden of Plot 3.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 10: Verification pit advanced within front garden of Plot 3.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 11: Verification pit advanced within front garden of Plot 3.



Photograph 12: Verification pit advanced within rear garden of Plot 10.



Photograph 13: Verification pit advanced within rear garden of Plot 10.



Photograph 14: Verification pit advanced within rear garden of Plot 4.



Photograph 15: Verification pit advanced within rear garden of Plot 4.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 16: Verification pit advanced within rear garden of Plot 7.



Photograph 17: Verification pit advanced within rear garden of Plot 7.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 18: View of the placement of hardstanding within Plots 1-5.



Photograph 19: View of the placement of hardstanding within Plots 1-5.



Photograph 20: View of the placement of hardstanding within Plots 1-5.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 21: View of the placement of hardstanding within Plots 1-10.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 22: View of the placement of hardstanding within Plots 1-5.



Photograph 23: View of the placement of hardstanding within Plots 1-5.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 24: View of the placement of hardstanding within Plots 1-5.



Photograph 25: View of Plots 6-10 prior to the placement of hardstanding.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 26: View of Plots 6-10 prior to the placement of hardstanding.



Photograph 27: View of Plots 6-10 prior to the placement of hardstanding.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 28: View of Plots 6-10 prior to the placement of hardstanding.



Photograph 29: View of Plots 6-10 prior to the placement of hardstanding.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

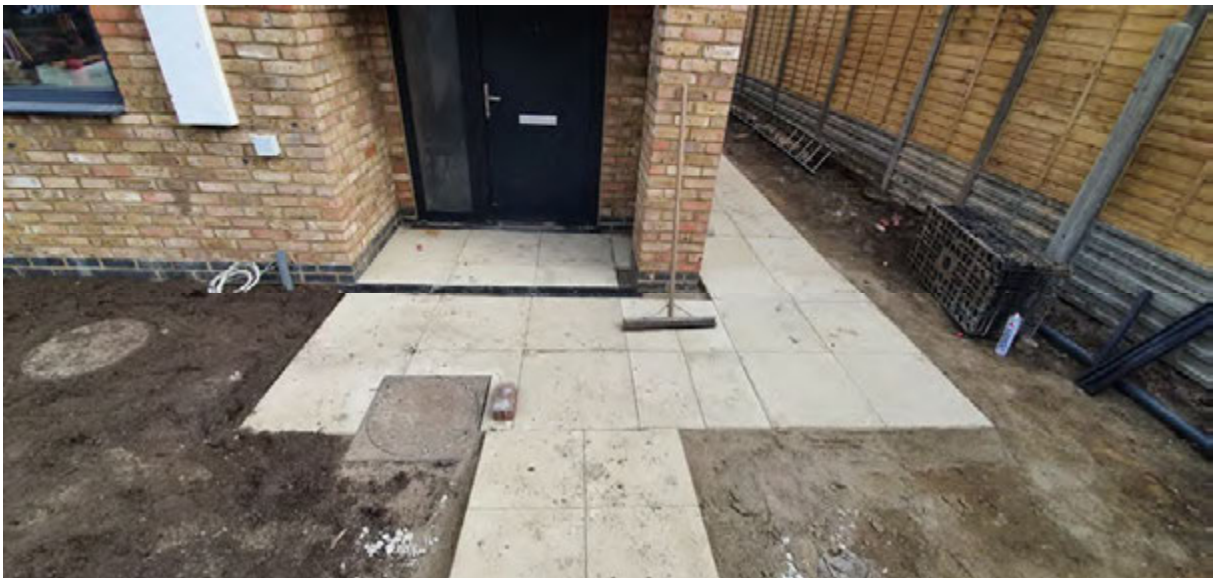


Photograph 30: View of the placement of hardstanding within Plots 6-10.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 31: View of the placement of hardstanding within Plots 6-10.



Photograph 32: View of the placement of hardstanding within the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 33: View of the placement of hardstanding within the front of the properties.



Photograph 34: View of the placement of hardstanding within the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 35: View of the placement of hardstanding within the front of the properties.



Photograph 36: View of the placement of hardstanding within the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 37: View of the placement of hardstanding within the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 38: Placement of soft landscaping to the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 39: Placement of soft landscaping to the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 40: Placement of soft landscaping to the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 41: Placement of soft landscaping to the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs



Photograph 42: Placement of soft landscaping to the front of the properties.

Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

Plot 10 – Rear



Plot 9 - Rear



Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

Plot 8 – Rear



Plot 7 – Rear



Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

Plot 6 – Rear



Plot 5 – Rear



Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

Plot – 4 Rear



Plot 3 – Rear



Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

Plot 2 – Rear



Plot 1 – Rear



Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

Plot 1 – Front



Plot 2 – Front



Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

Plot 3 – Front



Plot 4 – Front



Willow Tree Depot, Ditchfield Road– Client Supplied Photographs

Plot 5 Front



Plot 6 – Front

