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Grenfell Investigation into Potential Land Contamination Impacts

Technical Note 03: Protocol for Initial Soil Sampling Exercises

Royal Borough of Kensington and Chelsea

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	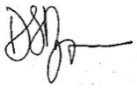		
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Original	16 May 2019	Draft		Liz Philp	Technical Director
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Table of Contents

Figures

Tables

1. Introduction

This technical note sets out AECOM's proposed Sampling Plan for the Stage 1 exploratory soil sampling and pilot study exercises and is based on the objectives of the Sampling Plan set out in AECOM Technical Note 01[1].

The Sampling Plan set out below has been designed to reflect the relevant guidance contained within the following British Standards:

- BS 10175:2011+A2:2017. Investigation of potentially contaminated sites – Code of practice, British Standards Institution Publication. (British Standards Institute, 2017).
- BS ISO 18400-101:2017. Soil quality – Sampling. Part 101: Framework for the preparation and application of a sampling plan, British Standards Institution Publication, 2017 (British Standards Institute, 2017a).
- BS ISO 26367-1:2017. Guidelines for assessing the adverse environmental impact of fire effluents. Part 1: General, British Standards Institution Publication, 2017 (British Standards Institute, 2017b).
- BS ISO 26367-2:2017. Guidelines for assessing the adverse environmental impact of fire effluents. Part 2: Methodology for compiling data on environmentally significant emissions from fires, British Standards Institution Publication, 2017 (British Standards Institute, 2017c).

2. Factors Considered in Design of Plan

In designing the exploratory soil sampling exercise, consideration has been given to the following factors that influence what is incorporated into the Plan:

Table TN03-01. Factors considered in design of Sample Plan

Factor	Comments	Included ? Yes/No
What areas should be tested at Stage 1 and how should they be identified?	Land-uses around the tower include residential properties, schools, recreational/sports buildings/spaces, public open spaces (communal gardens, parks, kitchen gardens), and commercial premises. The Stage 1 exploratory sampling by definition (relative to Stage 2) is limited in scope and should be targeted at areas that enable the objectives for Stage 1 (described in TN01) to be met.	N/A
Should areas targeted be limited to those identified with the highest relative sensitivity?	The land-uses with the highest relative sensitivity, based on the criteria set out in **Table TN03-02** are residential gardens, schools/nurseries, and community kitchen gardens. These land-use areas should be considered in the selection of the areas targeted for Stage 1 sampling, but the selection process should not be constrained to just land-use sensitivity. The additional considerations in the selection process are set out in **Table TN03-02**.	No
Should all sensitive areas be tested at Stage 1?	It is beyond the scope of Stage 1 to test every area. That is the purpose of Stage 2 should it be required.	No

[1] TN01: Finalised specification

Factor	Comments	Included ? Yes/No
Should a subset of these areas be tested?	A sub-set of areas has been identified based on two transects that cross the tower. These transects have been identified based on prevailing wind directions during and immediately after the fire and provides what is considered to be a reasonable number of areas for testing that is consistent with the objectives of Stage 1.	Yes
Should sampling be limited to the immediate vicinity of the tower?	Constraining sampling to the immediate vicinity of the tower (here defined as <200m radius) permits a greater sample density within that area but does not assist with exploring the potential wider spatial extent of the fallout from the fire, which is needed to decide where to test at Stage 2.	No
Should the sampling investigate the potential change in soil concentrations with distance from the tower?	This is considered to be an important factor to address as it will help to decide where to test at Stage 2.	Yes
Should the entire potential debris/smoke particle deposition distance be investigated at Stage 1?	It is not practical to investigate the entire potential plume deposition area (as defined by the Met Office modelling report (Kendall, et al., 2019) at Stage 1.	No
If the entire fallout distance is not included, what sub-distance should be included?	A 1km radius around the tower has been identified as a pragmatic option for Stage 1. It could be a shorter distance; it could be a slightly longer distance. This radius also covers the majority (though not all) of the areas highlighted as of concern during community engagement (reported in detail in TN14[2]). A radius of 1km allows for a higher percentage of the sensitive land use areas within the selected radius to be targeted than would be possible if the radius distance was extended.	N/A
Should the sampling be statistically-based?	Statistically-based sampling (i.e. specifically a systematic grid pattern) is not specifically required as the objective of Stage 1 is not to establish statistical parameters for the soil population in defined areas or zones (e.g. mean, standard deviation etc.). The sampling is targeted rather than non-targeted.	No
Should samples be discrete (single) samples?	Whilst composite or incremental samples are advocated for certain situations, discrete samples better meet the objectives of Stage 1 by providing better information on the potential spatial variability in soil concentrations.	Yes
Should sampling be limited to soil only?	Environmental media potentially affected by fallout from the fire include air, water, and soil. Indirect exposure is also possible from plant uptake from soil and from soil-derived dust, and from direct contact with pieces of debris/char. The Stage 1 scope is limited to soil testing, and the requirement for testing of other media will be considered for Stage 2 (TN18[3]).	Yes
Should all possible fire effluent chemicals be tested for?	It is not practicable to test for all conceivable fire effluents. A sub-set of priority marker chemicals – the COPC – for that effluent mixture has been identified (TN04[4]) that is designed to provide both a reasonable indication of the extent of fallout from the fire and include chemicals of known toxicological concern.	No

[2] TN14: Collated community information
[3] TN18: Stage2/3 design
[4] TN04: Fire chemistry and identification of COPC

Table TN03-02. Factors considered in selecting Sampling Areas

Factor	Details
Land-use sensitivity	Based on sensitivity of receptor (child vs. adult), frequency and duration of exposure, and nature of land-use (activities undertaken and resultant contact with/exposure to soil)
Identified by community as an area of concern	Areas/locations identified during community engagement events in April and/or previous/subsequent notification to the MHCLG community liaison team
Modelled plume deposition area	Areas within modelled extent of smoke plume as modelled by Met Office (Kendall, et al., 2019)
Reported occurrence of fire debris deposition	Areas/locations identified during community engagement events in April and/or previous/subsequent notification to the MHCLG community liaison team
Distance from tower	Potential significance of relationship between distance and particle deposition to be explored at Stage 1 in conjunction with Met Office modelling results (Kendall, et al., 2019)
Ease of accessibility	The Stage 1 exploratory and pilot study sampling exercise is to be undertaken such that it can be viewed/witnessed by the community. Land areas chosen therefore should be easily accessible to the public.

Land-Use	Relative Sensitivity
Residential property with private garden	High
Residential property without private garden	High
School/nursery	High
Community kitchen garden	Moderate to high
Communal or public open space (e.g. residential landscaped areas or public parks)	Moderate
Sports facilities	Moderate to low
Commercial properties	Low

Community kitchen gardens have been assigned a ‘moderate to high’ sensitivity on the basis of the assumption of lower frequency and duration of exposure (closest to allotments Suitable 4 Use Levels (S4ULs) (Nathanail, et al., 2015) or Category 4 Screening Levels (C4SLs) (DEFRA, 2014) land-use assumptions but without the potential for cultivation of such large quantities of produce as a full-scale allotments site) compared to the schools and residential areas. The sensitivity range also indicates uncertainty and variability with the likely exposure at these locations as a group.

The soil data presented by (Stec, et al., 2019) indicates that soil concentrations of COPC might decrease substantially somewhere between 140m and 300m away in a north westerly direction from the Tower. The Met Office report (Kendall, et al., 2019) on the dispersion modelling of the smoke plume from the fire indicates that smoke particle deposition (excludes debris) during the main fire event occurred in a north-westerly direction from the Tower. The authors of that report also state that wind direction changed to a westerly the day after the fire.

Sensitive land-use areas (other than residential properties) that have been identified within the 1km radius are listed in the table below and comprise schools/nurseries, community kitchen gardens and areas of public open space (either communal residential areas or parks). In addition, one privately-owned site with available open space has been identified as a potential sampling location.

Table TN03-03. Areas identified as potential locations for Stage 1 Sampling

Location Type	Location Name and Distance/Direction from Tower	Comments
Schools	St. Francis Primary School (200m S)	
	Thomas Jones Primary School (300m NE)	
	Oxford Gardens Primary School (300m NW)	
	St. Anne's and Avondale Primary School and Nursery (300m SSE)	
	All Saints Catholic College (700m NNE)	
	Bevington Primary School (950m NE)	
	Burlington Danes School (1,000m NW)	
	Barlby Primary School (1,000m N)	
	Grenfell Creche Under 3s' Centre (200m ENE)	
	Maria Montessori School - Holland Park (900m ENE)	
	Kensington Aldridge Academy (20m NE)	
	Kids on the Green forest school, and Golborne and Maxilla Children's Centre – Forest School On Maxilla Green Westway Trust land (275m N)	
Community Kitchen Gardens	Hurstway, Grenfell, Testerton and Barandon Walks (50m S)	Soil replaced by RBKC in raised beds post fire
	Bramley House (NW)	
	Whitchurch (100m N)	
	Whitstable House (100m NW)	Soil replaced by RBKC in raised beds post fire
	Treadgold House (100m SE)	
	Morland House/Talbot Grove (200m NE)	
	Thomas Darby Court (300m NE)	
	The Grove (300m E)	
	Allom and Barlow (200m E)	
	Henry Dickens Court (300m S)	
	Portland Road (300m SE)	
	Winterbourne House (400m SE)	
	Robinson House (300m NW)	
	Equal People (500m N)	
	20 Kingsbridge Road (750m NW)	
	St Quintin Gardens (500m NW)	
	St Marks Park (750m N)	
Other Public Open Space	Lancaster Green (50m N, W, E)	
	Lancaster West (50m S)	
	Waynflete Square (200m W)	
	Markland House (300m W)	
	Whitstable House and Maxilla Hall (100m N)	

Location Type	Location Name and Distance/Direction from Tower	Comments
	Allom House and Barlow House (200m E)	
	Wesley Square (200m NE)	
	Maxilla Green (300m N)	
	Avondale Park (500m S)	
	Kensington Memorial Park (750m NW)	
Privately-owned Open Space	West London Bowling Club (750m NW)	

It is acknowledged that the list of schools and nurseries is not an exhaustive list: it has been compiled by identifying larger areas of green space on aerial mapping combined with information provided to AECOM by MHCLG and RBKC relating to schools with concerns (TN14) and those located within Notting Dale ward.

Based on all the above, 20 locations with the 1km radius have been chosen as Stage 1 exploratory sampling locations. These locations are identified on **Figure TN03-01**. The locations include a combination of accessible open spaces and community kitchen gardens that meet a combination of one or more of the following:

- Areas close to two transects that run either NW/SE through the Tower, or W/E through the Tower, representing the wind directions on the day of and day after the fire.
- Areas where debris has been reported to have fallen during the fire.
- Areas within the Met Office defined smoke particle deposition plume.
- Areas identified by the public during community engagement events or via community communication channels with MHCLG (TN14).

Private gardens and schools/nurseries, although categorised as high sensitivity, have not been selected as sampling locations for Stage 1. The Stage 1 exploratory sampling is by definition limited in scope and is not designed to answer in full the question of what health risk is posed by concentrations of fire effluent COPC that might be present – that requires greater sampling at these locations and is more appropriately addressed at Stage 2. The selected sampling locations should act as reasonable proxies for nearby residential gardens and schools when informing the Stage 2 sampling design.

3. Sampling Approaches in Previous National or Regional Studies

In deciding what sampling approach to take, a review was made of Defra Science Project SP1008 (Johnson, et al., 2012) on normal background concentrations (NBC) of contaminants in soil in which the authors summarise the sampling and analytical methodologies employed by the soil sampling studies reviewed in that project. These methodologies are summarised in the table below.

Table TN03-04. SP1008 summary of UK soil survey sampling approaches

Study referenced by authors	Sampling depth (cm)	Sampling method
UKSHS	0-5	3 cores per sample collected within a 20m x 20m square
CS (Heywood et al, 2006)	0-8	5 cores 20m apart
Jones et al, 1989	0-5	20 cores
Cousins et al, 1997	0-2.5 and 0-25	Not reported
NSI (McGrath & Loveland, 1992)	0-15	25 cores collected within a 20m square
G-BASE	5-25 (Tellus survey in SW England) 5-20	5 cores collected within a 20m square
London Earth (Johnson, 2011)	0-2 – topsoil 5-20 main sample 35-50 deeper sample	5 cores collected within a 20m square Main sample (5-20cm depth) used for published data

Sources: Technical Guidance Sheet on normal levels of contaminants in English soils: Lead – Supplementary information. Technical Guidance Sheet No. TGS02s, July 2012. Department for Environment, Food and Rural Affairs (Defra), Soils R&D Project SP1008. Defra, 2012 (DEFRA, 2012b).

Technical Guidance Sheet on normal levels of contaminants in English soils: Benzo[a]pyrene – supplementary information. Technical Guidance Sheet No. TGS04s, July 2012. Department for Environment Food and Rural Affairs (Defra), Soils R&D Project SP1008 (DEFRA, 2012a).

Further details for NSI and G-BASE obtained from the UK Soil Inventory website (British Geological Survey, 2019).

The authors of SP1008 state that samples used to calculate the NBCs were collected from the top 15cm of soil, and that if vegetation was present that surface leaf litter layer was not sampled. The authors additionally state that surveys reviewed that targeted the potential effects on soil of airborne pollution generally only collected samples from the top 2cm of the soil profile.

In terms of the guidance contained within British Standards, BS 10175:2011+A2:2017 (British Standards Institute, 2017) section 7.7.2.5 on sampling depths makes reference to a "surface layer" which may vary from surface to 0.5m bgl[5] and "material that could present an immediate exposure hazard might require sampling in the uppermost 0.1m"…"where there are health hazard concerns e.g. in domestic gardens, samples should ..generally comprise shallow and surface strata". In section 8.3.2 on collection of soil samples, an example of "surface samples" is given as "surface to 0.1m depth). Other than this the standard is not prescriptive on sampling depths.

A February 2018 draft of BS ISO 15800 on soil quality - characterisation for human exposure (British Standards Institute, 2018) suggests "*topsoil (first centimetres or decimetres)*" for children playing. It also states that "non-volatile contaminants are expected to be encountered in the first centimetres". It defines relevant depth for dust exposure to be "*very topsoil (0-2cm)*", 0-10cm for "*topsoil*" for ingestion and dermal contact in parks, and 0-35cm for gardens. Whilst this is a draft standard, and could be subject to revision before final publication, the values quoted provide an indication of the views of the authors at the time of drafting.

From the above it is concluded that a sampling strategy that targets the top 5cm of undisturbed soil is appropriate for sampling soil potentially impacted from airborne deposition of fire-related smoke particles and debris where the specific purpose is to identify whether those fire effluent chemicals are present. Sampling across a thicker horizon may be appropriate for exposure scenarios such as gardening where the top 35cm of soil might be regularly turned over, however, in this circumstance it would be expected that the concentration of the fire effluent would be lower as the surface deposition of those effluent chemicals has been mixed and diluted in a greater volume of soil. The counter argument is that the chemicals could have leached down through the soil column in the two years

[5] bgl: below ground level

since the fire; however, the majority of the fire effluents of interest have a very low solubility, so this is unlikely.

4. Exploratory Sampling

The objective of the exploratory soil sampling task is to identify what fire effluent COPC are present in soil and at what concentrations within the geographical area of interest. The detail of the exploratory sampling is provided in the form of a Sampling Plan presented in **Section 6** below.

The exploratory sampling is not designed to provide a detailed characterisation of any one area, therefore the sampling point at each location should be selected randomly. In order to assist in the design of the Stage 2 investigation two samples should be taken from each area to provide some evidence of spatial variability in soil concentrations, and duplicate samples should be taken in accordance with the requirements of British Standard BS10175 (British Standards Institute, 2017). The intended sampling areas are shown in **Figure TN03-01** and **Figure TN03-02**.

5. Pilot Study

The pilot study is to target a single parcel of land and investigate that land in a systematic way and in more detail than the exploratory sampling. The chosen area for the pilot study sampling is Waynflete Square. It is an area of public open space within a residential setting where it is reported that debris fell in this area during the fire, it is within 200m of the Tower, and it is in a north-westerly direction, consistent with the wind direction on the day of the fire.

The pilot study soil sampling will consist of a systematic 20 metre sampling grid. Samples will be taken in the same way as for the exploratory sampling, i.e. at a depth of 0-5cm. Additional samples will be taken at a depth of 10-15cm to explore the possibility of changes in COPC concentrations with depth. Eight additional samples will be taken in one grid square in a radial pattern from the central sample to explore the possibility of COPC concentration variation on a smaller scale. The intended sampling grid is shown in **Figure TN03-03**.

A 20m grid has been selected because it provides sufficient sample numbers for the purposes of the pilot trial and it is consistent with the guidelines for grid spacing set out in British Standard BS 10175 (British Standards Institute, 2017). This standard states that typical grid spacing for exploratory investigations varies from 25m to 50m, with denser grid spacings between 10m to 25m for detailed investigations.

6. BS ISO 18400-101 Sampling Plan

The content of the Stage 1 Sampling Plan presented in **Table TN03-05** to **Table TN03-09** below reflects the suggested items listed in Annex A of BS ISO 18400-101 (British Standards Institute, 2017a).

Table TN03-05. Stage 1 Sampling Plan

Item	Details	Reference/Supporting Information
General Information		
Aim of investigative programme	The complete investigative programme, which includes Stage 1 and Stage 2 (and further Stages as necessary), aims to assess to what extent the soil environment has been contaminated by fire effluents as a result of the fire at the Tower in 2017, and whether an unacceptable risk to human health (as defined by Part 2A of the Environmental Protection Act 1990 (Crown, 1990)) is associated with that contamination. It is not expected that these aims will be achieved at the end of Stage 1.	AECOM Technical Note 01
Objective for Stage 1 sampling	Provide sufficient soil samples for subsequent analytical testing that creates a dataset of soil concentrations that can be used to inform the design of the Stage 2 investigation, and subsequent health risk assessment. Specifically, assist in the determination of the spatial extent of the required Stage 2 investigation, the method of sampling, and the COPC that require testing, and allow comparison of data collected during Stage 1 to published soil generic assessment criteria and published background/baseline soil concentrations.	AECOM Technical Note 01
Quality assurance/quality control	Use of AECOM approved laboratory in accordance with AECOM policy and procedure for the appointment of sub-contractors. Use of a United Kingdom Accreditation Service (UKAS) accredited laboratory that participates in national laboratory proficiency testing schemes (AISS, CONTEST and AQUACHECK) where possible. Use of UKAS accredited methods where possible. Use of MCERTs accredited methods where possible. Use of surrogate recovery for organic analysis. Adoption of duplicate sample and duplicate sample extract analysis as per Annex D of BS10175:2011+A2:2017 (British Standards Institute, 2017). Sample containers, preservation (chemical/temperature), sample volume, and holding times as per USEPA QA manual 2016 (U.S. Environmental Protection Agency Analytical Services Branch, 2016). Request of laboratory method validation data where UKAS accreditation for the method is unavailable.	
Information on soil material		
Site details	The “site” for the purposes of Stage 1 is defined as the investigation area around Grenfell Tower and includes mixed urban land-use up to a 1km radius from the Tower.	
History of site / origins of soil	Variable dependent on specific area being sampled.	
Soil types expected	Topsoil and variable made ground including reworked natural with inclusions of anthropogenic material and predominantly anthropogenic materials.	
Land access arrangements	To be arranged by MHCLG.	

Item	Details	Reference/Supporting Information
Type of samples to be collected	Discrete, disturbed, surface, and sub-surface soil samples to a maximum depth of 0.15m.	
Sampling Methodology		
Sampling approach and type of sampling	Sampling areas have been identified based on the factors detailed in **Table TN03-02**. Simple random surface soil samples to be taken (2 no.) from each area at a depth of 0-0.05m. In one area only, regular systematic samples to be taken on a 20m x20m square grid pattern at two different depths of 0-0.05m and 0.10-0.15m. This grid pattern sampling in one area is referred to hereafter as the 'pilot study'.	Figure TN03-01 Figure TN03-02 Figure TN03-03
Sample areas	To be confirmed during site reconnaissance (described in TN15)	Figure TN03-01
Sub-population to be sampled	All surface soil samples will be soil taken from the top 0.05m of soil across a sample area of 0.25m x 0.25m. Deeper soil samples will be taken at depths of 0.15m for the pilot study only.	AECOM project-specific soil sampling protocol and summary of sampling approaches taken for UK soil surveys and guidance in British Standards
Sampling technique	Hand dug	
Place and point of sampling	To be confirmed during site reconnaissance (described in TN15)	Table TN03-06
Date and time of sampling	To be confirmed	
Person/organisation undertaking sampling	AECOM	
Sampling equipment to be used	Hand-held stainless-steel trowels	AECOM project-specific soil sampling protocol (**Appendix TN03-A**)
Sampling scheme/pattern	Individual random samples except in one area where samples to be taken on a 20m x20m square grid	AECOM project-specific soil sampling protocol (**Appendix TN03-A**)
Number of increments/samples to be collected	Samples to be single increments. Twenty sampling areas identified (see **Figure TN03-01**), 19 of the areas to have 2 no. samples taken (exploratory samples), one of these areas (Waynflete Square) to have 26 no. samples taken (pilot study samples). 8 no. duplicate samples to be taken from randomly selected areas.	**Figure TN03-01** **Figure TN03-02** **Figure TN03-03**
Increment/sample size	Sample size dictated by laboratory analytical requirements and to be confirmed by laboratory when testing request and dispatch of sample containers is arranged.	
Requirements for in-site determinations	None required	

Item	Details	Reference/Supporting Information
Sample code methodology	Unique location code GTCS 1-xx using a simple sequential numbering system to identify the samples (01, 02, 03 etc.) in the Stage 1 sampling. GTCS 1 has been selected as a short form to represent 'Grenfell Tower Contamination, Soil, Stage 1'.	
Safety precautions	As stipulated in the safety, health and environment (SHE) plan for the sampling works.	AECOM project-specific SHE Plan
Sub-sampling		
Procedure for sub-sampling	Volatile organic compound (VOC) sample vials to be filled with minimum sample disturbance. Duplicates for VOCs will be discrete samples. Duplicates for remaining low volatility contaminants to be achieved using cone and quartering method.	AECOM project-specific soil sampling protocol (**Appendix TN03-A**)
Packaging, preservation, storage and transport requirements		
Packaging	Use laboratory specified packaging in accordance with laboratory method.	**Table TN03-06** and AECOM project-specific soil sampling protocol (**Appendix TN03-A**)
Preservation	As specified by laboratory method.	**Table TN03-06** and AECOM project-specific soil sampling protocol (**Appendix TN03-A**)
Storage	Use laboratory supplied cool boxes. Cool boxes to be kept chilled with ice and stored out of the sun whilst on-site. Samples to be stored for the minimum time necessary and shipped once-daily to the laboratory.	AECOM project-specific soil sampling protocol (**Appendix TN03-A**)
Transport	Use laboratory supplied courier. Collection of samples to be arranged daily.	AECOM project-specific soil sampling protocol (**Appendix TN03-A**)
Analytical Laboratory		
Company details	Exova Jones Environmental Ltd (Exova[6]), Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA, UKAS Accreditation No. 4225.	
Analysis required	Refer to **Table TN03-08**.	**Table TN03-08**

[6] During the Stage 1 project, Exova was in the process of being acquired by, and changing its name to Element. Hence, chain of custody forms, or laboratory certificates, or other related documentation presented in later Technical Notes showing the laboratory name as Element, are equivalent to Exova.

Item	Details	Reference/Supporting Information
Chain of custody requirements	As per laboratory requirements.	AECOM project-specific soil sampling protocol (**Appendix TN03-A**) and example chain of custody (**Appendix TN03-B**)
Sub-contracted laboratories	Sub-contracted laboratories identified are Marchwood and RPS	

Table TN03-06. Exploratory Sample Locations

Sample Location Area	Sample Area ID number	Unique sample code	Sample type	Rationale
Within cordon	N/A	GTCS101	Surface soil (<0.05m below ground level (bgl)), discrete disturbed sample	Provide understanding of COPC concentrations in surface soil within cordon surrounding Tower.
	N/A	GTCS102	Surface soil (<0.05m bgl), discrete disturbed sample	
	N/A	GTCS103	Surface soil (<0.05m bgl), discrete disturbed sample	
	N/A	GTCS104	Surface soil (<0.05m bgl), discrete disturbed sample	
	N/A	DUP01 (duplicate of GTCS101)	Surface soil (<0.05m bgl), discrete disturbed sample	
Bramley House communal garden	1	GTCS 1 – 25	Surface soil (<0.05m bgl), discrete disturbed sample	Directly outside cordon in direction of smoke plume. Community engagement identified debris and testing requested.
		GTCS 1 – 26	Surface soil (<0.05m bgl), discrete disturbed sample	
Communal open space at Whitstable House	2	GTCS 1 – 27	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume. Community engagement requested testing.
		GTCS 1 – 28	Surface soil (<0.05m bgl), discrete disturbed sample	
Waynflete Square (also proposed location for pilot study)	3	included in table TN03-07 below	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume
		included in table TN03-07 below	Surface soil (<0.05m bgl), discrete disturbed sample	
Communal open space at Markland House	4	GTCS 1 – 31	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume but off-centre
		GTCS 1 - 32	Surface soil (<0.05m bgl), discrete disturbed sample	
Community garden areas along Darfield Way	5	GTCS 1 – 33	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume. Community engagement identified debris and sensitive land use, and requested testing.
		GTCS 1 – 34	Surface soil (<0.05m bgl), discrete disturbed sample	

Sample Location Area	Sample Area ID number	Unique sample code	Sample type	Rationale
Robinson House	6	GTCS 1 – 35	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume. Community engagement identified debris in proximity, and requested testing.
		GTCS 1 – 36	Surface soil (<0.05m bgl), discrete disturbed sample	
St Quintin Community Kitchen Gardens	7	GTCS 1 – 29	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume. Community engagement identified debris and requested testing.
		GTCS 1 – 30	Surface soil (<0.05m bgl), discrete disturbed sample	
St. Quintin's Roundabout	8	GTCS 1 – 41	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume.
		GTCS 1 – 42	Surface soil (<0.05m bgl), discrete disturbed sample	
Kensington Memorial Park (St Marks Park)	9	GTCS 1 – 37	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume. Community engagement identified debris and sensitive land use, and requested testing.
		GTCS 1 – 38	Surface soil (<0.05m bgl), discrete disturbed sample	
West London Bowling Club	10	GTCS 1 – 39	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of smoke plume. Community engagement identified debris, sensitive and historic land use, and requested testing.
		GTCS 1 – 40	Surface soil (<0.05m bgl), discrete disturbed sample	
Lancaster West Walkways communal gardens	11	GTCS 1 – 05	Surface soil (<0.05m bgl), discrete disturbed sample	Location within 100m of Tower but in opposite direction to plume. Community engagement identified debris, sensitive and historic land use, and requested testing.
		GTCS 1 – 06	Surface soil (<0.05m bgl), discrete disturbed sample	
Communal garden at Treadgold House	12	GTCS 1 – 07	Surface soil (<0.05m bgl), discrete disturbed sample	Location along transect in opposite direction to smoke plume. Community engagement requested testing.
		GTCS 1 – 08	Surface soil (<0.05m bgl), discrete disturbed sample	
Community kitchen garden at Portland Road	13	GTCS 1 – 17	Surface soil (<0.05m bgl), discrete disturbed sample	Local background/baseline location. Community engagement requested testing in the vicinity.
		GTCS 1 – 18	Surface soil (<0.05m bgl), discrete disturbed sample	
Communal space at Avondale Park	14	GTCS 1 – 23	Surface soil (<0.05m bgl), discrete disturbed sample	Local background/baseline location. Community engagement requested testing in nearby residential area.
		GTCS 1 – 24	Surface soil (<0.05m bgl), discrete disturbed sample	
Community garden at Henry Dickens Estate	15	GTCS 1 – 19	Surface soil (<0.05m bgl), discrete disturbed sample	Local background/baseline location. Community engagement requested testing.
		GTCS 1 – 20	Surface soil (<0.05m bgl), discrete disturbed sample	

Sample Location Area	Sample Area ID number	Unique sample code	Sample type	Rationale
Avondale Park	16	GTCS 1 – 21	Surface soil (<0.05m bgl), discrete disturbed sample	Local background/baseline location. Community engagement identified sensitive and historic land use, and requested testing.
		GTCS 1 – 22	Surface soil (<0.05m bgl), discrete disturbed sample	
Open space at Verity Close	17	GTCS 1 – 09	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of wind on day after the fire. Community engagement requested testing. Sensitive land use and debris reported in close proximity
		GTCS 1 – 10	Surface soil (<0.05m bgl), discrete disturbed sample	
Communal open space at Morland House	18	GTCS 1 – 11	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of wind on day after the fire
		GTCS 1 – 12	Surface soil (<0.05m bgl), discrete disturbed sample	
Communal open space at Allom House and Barlow House	19	GTCS 1 – 13	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of wind on day after the fire. Community engagement identified debris and requested testing.
		GTCS 1 – 14	Surface soil (<0.05m bgl), discrete disturbed sample	
Camelford Walk communal open space	20	GTCS 1 – 15	Surface soil (<0.05m bgl), discrete disturbed sample	Location in direction of wind on day after the fire. Community engagement reported debris and sensitive land uses in the area.
		GTCS 1 – 16	Surface soil (<0.05m bgl), discrete disturbed sample	

Table TN03-07. Pilot Study Sample Locations

Sample Location Area	Sample Area ID number	Unique sample codes	Sample type	Rationale
Waynflete Square	3	GTCS 1 – 43 to GTCS 1 – 59 inclusive	17x surface soil (<0.05m bgl), discrete disturbed sample	As per objective of pilot study; to target a single parcel of land and investigate that land in a systematic way and in more detail than the exploratory sampling to explore more localised lateral and vertical spatial variability in soil concentrations
		GTCS 1 – 43 to GTCS 1 – 51 inclusive	9x sub-surface (0.10-0.15m bgl) discrete disturbed sample	

The proposed sampling layout for the pilot study is shown on **Figure TN03-03**. The final precise sampling locations are shown in TN15, Figure TN15-04.

The analytical methods outlined below reflect the COPC identified by the fire chemistry evidence review (TN04[7]). The objective of selecting these methods for Stage 1 is to provide sufficient evidence for the selection of the most appropriate analytical methods to be carried forward to Stage 2.

Table TN03-08. Analytical Methods

Analyte/Group (refer to TN04 for details)	Testing Rationale	Laboratory	Laboratory Method	Detection Limit (mg/kg unless specified)	UKAS Accredited Method?	Sample Handling
Metals {Al(50), As(0.5), Ba(1), Be(0.5), Cd(0.1), Cr(0.5), Cu(1), Hg(0.1), Ni(0.7), Pb(5), Se(1), V(1), Zn(5), WSB (0.1), Cr VI (0.3), Cr III (0.5)}	Evidence based on research following World Trade Center collapse (described in TN04) and metals are included as a COPC in BS ISO 26367-1:2017. Guidelines for assessing the adverse environmental impact of fire effluents. (British Standards Institute, 2017b). Aluminium included as Grenfell Tower cladding panels were an aluminium composite material	EXOVA	Modified US EPA Method 200.7, 6010B and BS EN ISO 11885:2009. Aqua Regis extract ICP-OES / Kone Analyser. 1g dried and ground sample.	In brackets alongside metal in analyte column.	Y	Brown glass jar (260ml)
VOCs (US EPA target list (US Government, 2012) plus tentatively identified compounds)	VOCs such as benzene released during combustion of carbon-based materials	EXOVA	Headspace GC-MS - modified USEPA 8260. 5g as received sample, 2g salt, made up to 10ml with deionised water	Target list – 1-30µg/kg TICs – 100µg/kg	Y (for 48 of 61 target list compounds)	Brown glass vial (74ml)
SVOCs (US EPA target list (US Government, 2012) plus tentatively identified compounds)	SVOCs released during combustion of carbon-based materials	EXOVA	GC-MS – modified USEPA 8270 on DCM extract	Target list – 10µg/kg Phthalates and TICs – 100µg/kg	Y (for 16 of 59 target list compounds)	Brown glass jar (260ml)

[7] TN04: Fire chemistry and identification of COPC

Analyte/Group (refer to TN04 for details)	Testing Rationale	Laboratory	Laboratory Method	Detection Limit (mg/kg unless specified)	UKAS Accredited Method?	Sample Handling
PAHs (US EPA priority 16 (US Government, 2012) plus coronene)	PAHs released during combustion of carbon-based materials	EXOVA	GC-MS. Solvent extraction on as received sample. In house method modified USEPA 8270. End over end solvent extraction of solid sample using 5g sample and 10ml DCM	0.02 – 0.07	Y (for 15 of 16 target compounds)	Brown glass jar (260ml)
SVOC forensic scan	Ability to identify a wider range of semi-volatile organic compounds that might have been released during the combustion of carbon-based materials, including 7,12-dimethylbenzo(a)anthracene.	EXOVA	Semi volatile scan by GC-MS. Extracted from as received sample. Longer run-time capable of detecting alkylated and halogenated PAHs, and heavier PAHs	NA	N	Brown glass jar (260ml)
PCB 7 (Dutch 7 congeners: 101,118,138,153,180,28,52)	Linked to combustion of carbon-based materials (including chlorinated plastics)	EXOVA	Modified US EPA method 8270 by GC MS. End over end extraction from as received sample.	0.005 per congener	Y	Brown glass jar (260ml)
PCB (WHO12) 12 congeners: 77,81,105,114,118,123,126,156, 157,167,169,189	Linked to combustion of carbon-based materials (including chlorinated plastics)	Marchwood	Sub-contracted. USEPA 1613 using solvent extraction followed by chromatographic clean-up and High Resolution GCMS Micromass Ultima Autospec instrumentation.	Variable Typically 0.2 – 1 ng/kg	Y	Brown glass jar (260ml)
Chlorinated Dioxins and furans	Linked to combustion of carbon-based materials (including chlorinated plastics)	Marchwood	Sub-contracted. USEPA 1613 using solvent extraction followed by chromatographic clean-up and High Resolution GCMS Micromass Ultima Autospec instrumentation.	Variable Typically 0.2 – 1 ng/kg	Y	Brown glass jar (260ml)
Brominated Dioxins and furans	Linked to the combustion of carbon-based materials (including brominated flame retardants)	Marchwood	Sub-contracted BSEN 1948 part 2 & 3 utilising solvent extraction techniques followed by chromatographic clean-up and High Resolution GCMS using Thermo Scientific Dual Focus Spectrometer (DFS).	Variable Typically 0.2 – 1 ng/kg	Y	Brown glass jar (260ml)
Organophosphorus flame retardants	Marker compounds for organophosphorus-based flame retardants	RPS	tris(1-chloro-2-propyl) phosphate TCPP and tris(2-ethylhexyl) phosphate by solid: liquid extraction and analysis by GC-MS	0.1 – 0.8	N	Brown glass jar (260ml)

Analyte/Group (refer to TN04 for details)	Testing Rationale	Laboratory	Laboratory Method	Detection Limit (mg/kg unless specified)	UKAS Accredited Method?	Sample Handling
Brominated flame retardants (PBDEs: 2,2',4,4',6-pentabromodiphenyl ether, 2,2',3,4,4',5'-hexabromodiphenyl ether, 2,2',4,4',5,5'-hexabromodiphenyl ether, 2,2',4,4',5,6'-hexabromodiphenyl ether, 2,2',4-tribromodiphenyl ether, 2,4,4'-tribromodiphenyl ether, 2,2',4,4'-tetrabromodiphenyl ether, 2,3',4,4'-tetrabromodiphenyl ether, 2,2',3,4,4'-pentabromodiphenyl ether, 2,2',4,4',5-pentabromodiphenyl ether, 2,2',3,4,4',5',6-heptabromodiphenyl ether)	Type of flame retardants of known health concern	RPS	Analysis by solid: liquid extraction and analysis by GC-MS	0.1	N	Brown glass jar (260ml)
Polybrominated biphenyls (PBBs): hexabromobiphenyl (2,2',4,4',5,5'-) (PBB 153) 4,4'-dibromobiphenyl (PBB 15) 2,2',5-tribromobiphenyl (PBB 18) 2,2'-dibromobiphenyl (PBB 4) tetrabromobiphenyl (3,3',5,5'-) (PBB 80)	Brominated fire retardant described in TN04	RPS	Analysis by solid: liquid extraction and analysis by GC-MS	0.5	N	Brown glass vial (74ml)
Tetrabromobisphenol A	Brominated fire retardant described in TN04	RPS	Solvent extraction into Methanol and analysis by LC-MS/MS	0.5	N	Brown glass vial (74ml)
hexabromocyclododecane (1,2,5,6,9,10-)	Brominated fire retardant described in TN04	RPS	Solvent extraction into Methanol and analysis by LC-MS/MS	0.1	N	Brown glass vial (74ml)

Analyte/Group (refer to TN04 for details)	Testing Rationale	Laboratory	Laboratory Method	Detection Limit (mg/kg unless specified)	UKAS Accredited Method?	Sample Handling
Isocyanates	COPC from combustion of foam-based insulation materials	EXOVA	No available commercial laboratory method for soil identified to date. Intention is to develop a LCMS method based on ISO17734-1:2013 for air samples and US EPA method CTM-036a for the extraction of cyanates from soil. Will identify most but not all isocyanates identified in TN04 on fire chemistry as below Isocyanic acid Methyl isocyanate Ethyl isocyanate Propyl isocyanate Hexamethylene di-isocyanate Toluene-2,4-diisocyanate Toluene-2,6-diisocyanate Methylene-bis-(phenylisocyanate)	0.25 – 0.5	N	Brown glass jar (260ml)
Cyanides (total, free and thiocyanate)	Linked to release and environmental fate of isocyanates	EXOVA	Modified US EPA method OIA-1667 by flow injection / Skalar. Extracted with 1M NaOH by orbital shaker on as received sample.	Total – 0.5 Free – 0.5 Thiocyanate – 0.6	Y	Brown glass jar (260ml)
Asbestos	COPC from building fabric	EXOVA	Optical microscopy HSG 248 and SCA Blue Book.	Presence/ absence screen	Y	1 kg (950ml) white plastic tub
Synthetic Vitreous Fibres (SVF) / Man-made Mineral Fibres (MMMF)	COPC from combustion of foam-based insulation products	EXOVA	Optical microscopy	In-house screen, no quantification.	N	1 kg (950ml) white plastic tub (combined for asbestos above)
TOC	Measure of total organic carbon in soil. Used to predict phase partitioning of organic substances in soil	EXOVA	Modified BS 7755-3:1995 by Eltra TOC. Dried and ground, washed with HCl and deionised water.	0.02%	Y	Brown glass jar (260ml)

Analyte/Group (refer to TN04 for details)	Testing Rationale	Laboratory	Laboratory Method	Detection Limit (mg/kg unless specified)	UKAS Accredited Method?	Sample Handling
Asbestos quantification (where required/ requested)	COPC from building fabric	EXOVA	PCM (Phased Contrast Microscopy) and discriminating techniques as outlined in HSE contract report 83/96 Respirable fibres can be calculated from this method but must be requested at time of scheduling	0.001% by weight	Y	1 kg (950ml) white plastic tub

Table TN03-09. Sample and Testing Schedule

Sample Type	Sample Number	Analytical Suites
Cordon sample	5 samples (including one duplicate)	Metals, PAH-17, VOCs + TICs, SVOCs, total cyanide, TOC, asbestos screen, dioxins & furans, dioxin-like PCBs
Exploratory sample	38 samples (2 random samples from 19 locations)	as per Table TN03-08
Pilot study sample	26 samples (9 locations on 20m grid interval with 2 sampling depth intervals, plus 8 locations in closer proximity to one of the 9 wider grid locations at one sampling depth only)	as per Table TN03-08
Duplicate sample*	8 samples taken at random from any of the samples in the exploratory or pilot. Sample split by laboratory results in 3 x 8 (24) additional samples for analysis	as per Table TN03-08

*Considerations for duplicate samples:

- Duplicate sampling will be as described in (British Standards Institute, 2017)[8].
- This recommends a minimum of eight duplicate samples selected at random to allow for the estimates of uncertainty.
- Duplicates to be a separate sample from the same sampling hole.
- The two samples to then be sub-sampled twice by the laboratory, providing a total of four samples for analysis.
- Data analysis to be based on CL:AIRE Research Project (RP4) (Taylor, et al., 2007).

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[8] Annex D.

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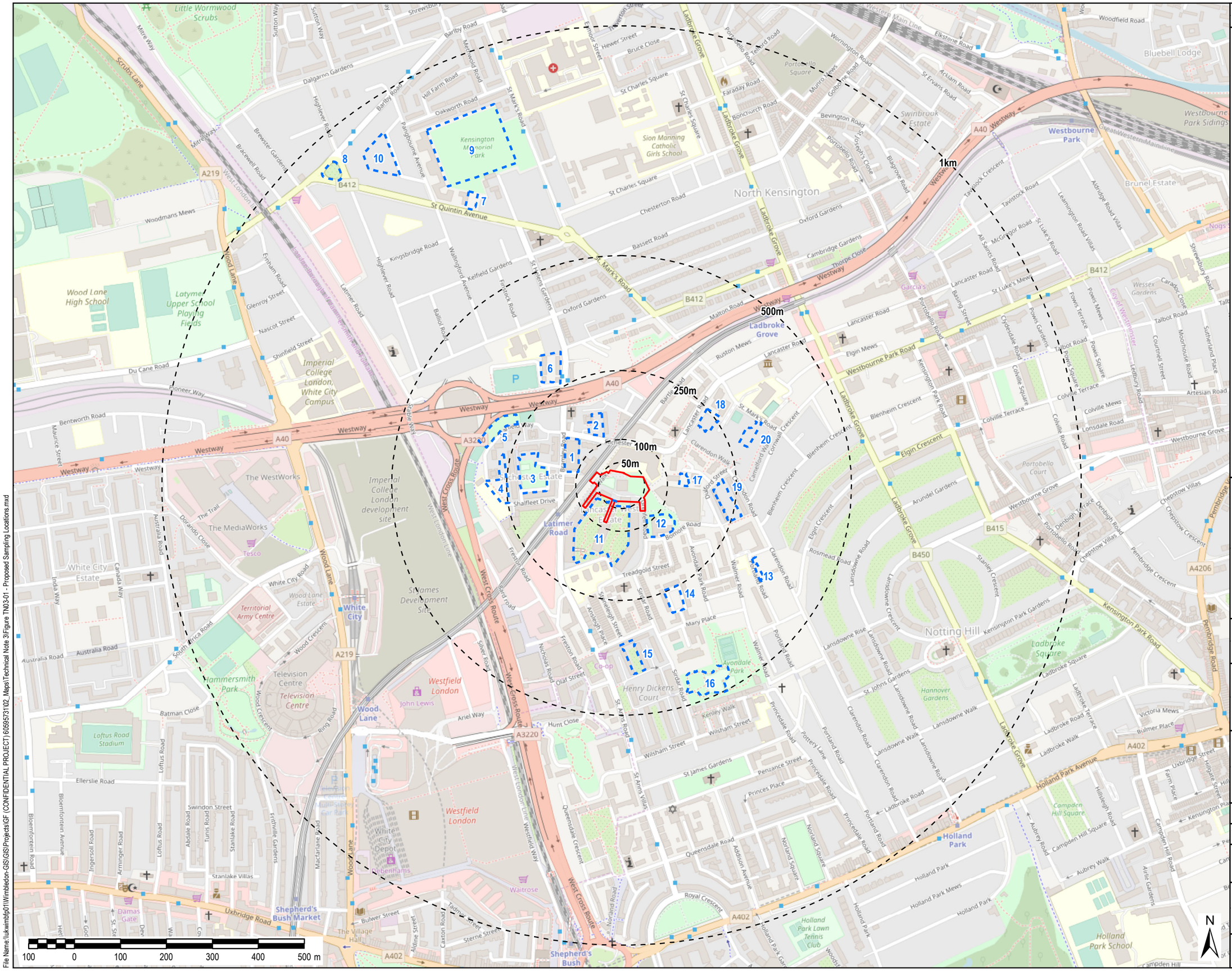
Figures



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LEGEND

- Tower Cordon
- Radial Distance from Tower
- Proposed Sampling Areas

1 - Bramley House Communal Garden
2 - Communal Open Space at Whitstable House
3 - Waynefleet Square (Also Proposed Location for Pilot Study)
4 - Communal Open Space at Markland House
5 - Community Gardens Areas Along Darfield Way
6 - Robinson House
7 - St. Quintin Community Kitchen Garden
8 - St. Quintin's Roundabout
9 - Kensington Memorial Park (St. Marks Park)
10 - West London Bowling Club
11 - Lancaster West Walkways Communal Gardens
12 - Communal Garden at Treadgold House
13 - Community Kitchen Garden and Portland Road
14 - Communal Space at Avondale Park
15 - Communal Garden at Henry Dickens Estate
16 - Avondale Park
17 - Open Space at Verity Close
18 - Communal Open Space at Morland House
19 - Communal Open Space at Allom House and Barlow House
20 - Communal Open Space at Camelford Walk

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
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Drawing Title
PROPOSED SAMPLING AREAS

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FIGURE TN03-01

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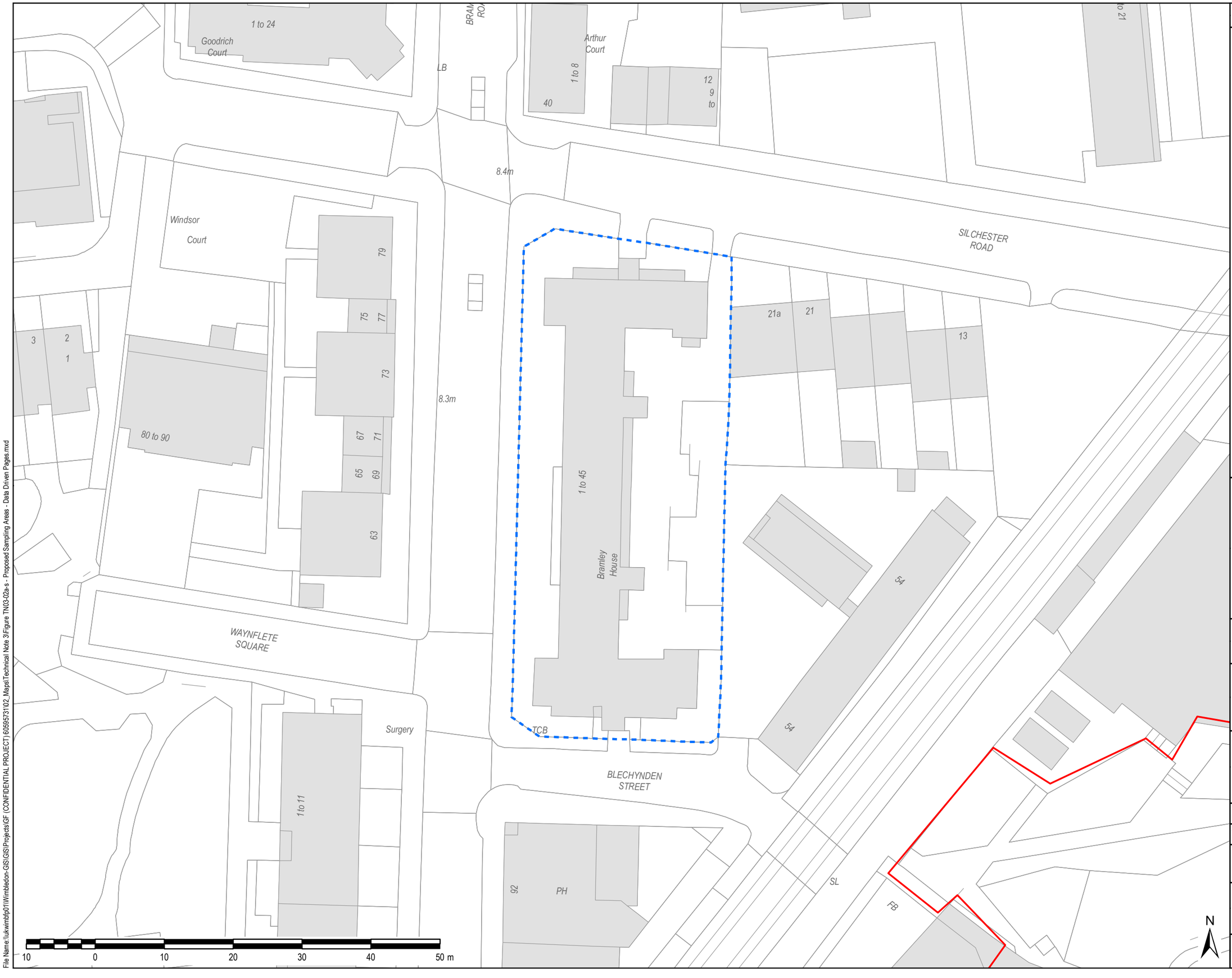

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LEGEND

- Tower Cordon
- Proposed Sampling Area

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Drawing Title
BRAMLEY HOUSE COMMUNAL GARDEN (AREA 1) PROPOSED SAMPLING AREA

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FIGURE TN03-2A

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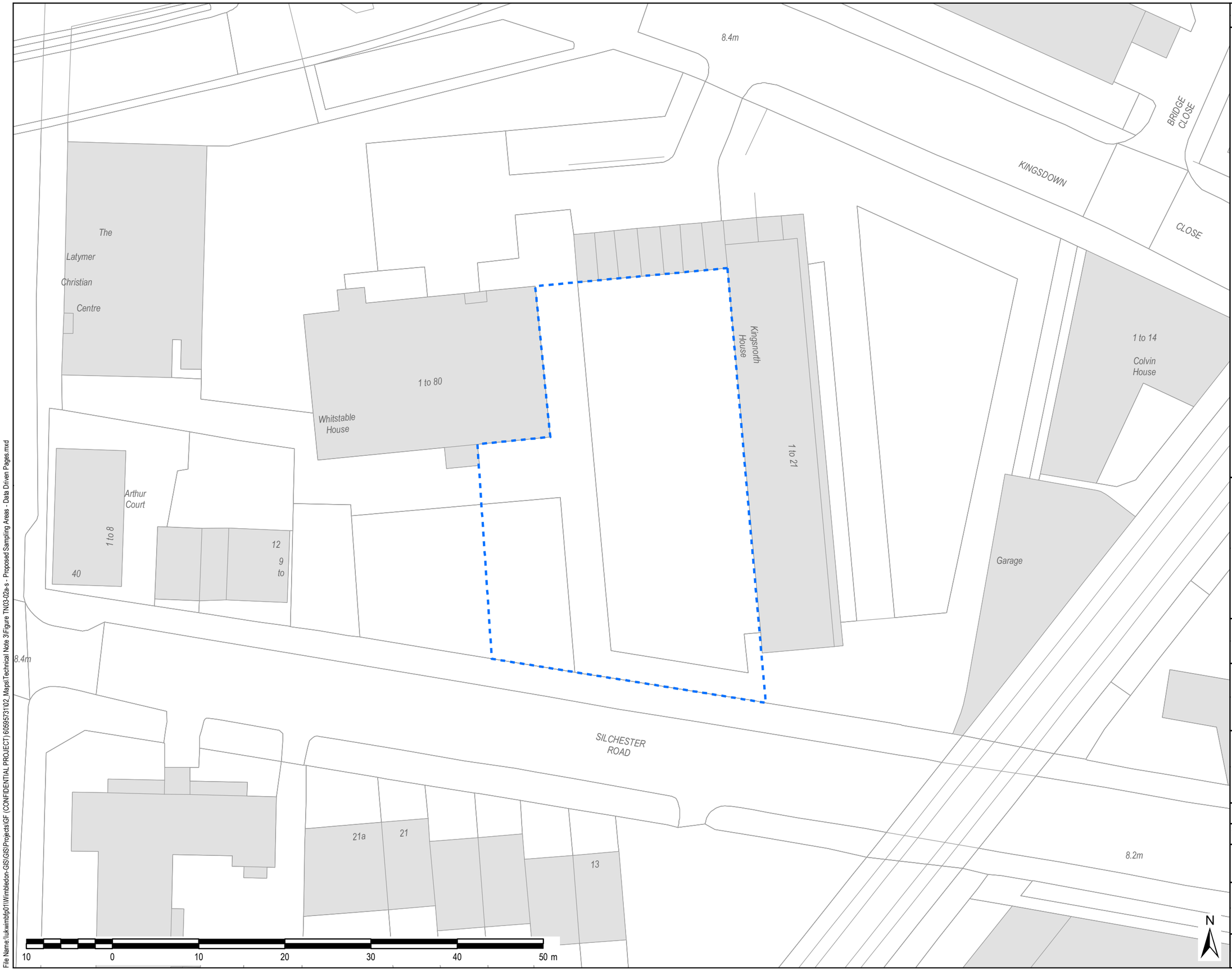

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Proposed Sampling Area

Client
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Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
COMMUNAL OPEN SPACE AT WHITSTABLE HOUSE (AREA 2) PROPOSED SAMPLING AREA

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FIGURE TN03-2B

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Proposed Sampling Area

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Project Title

GRENFELL PART 2A ASSESSMENT

Drawing Title

COMMUNAL OPEN SPACE AT MARKLAND HOUSE (AREA 4) PROPOSED SAMPLING AREA

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FIGURE TN03-2C

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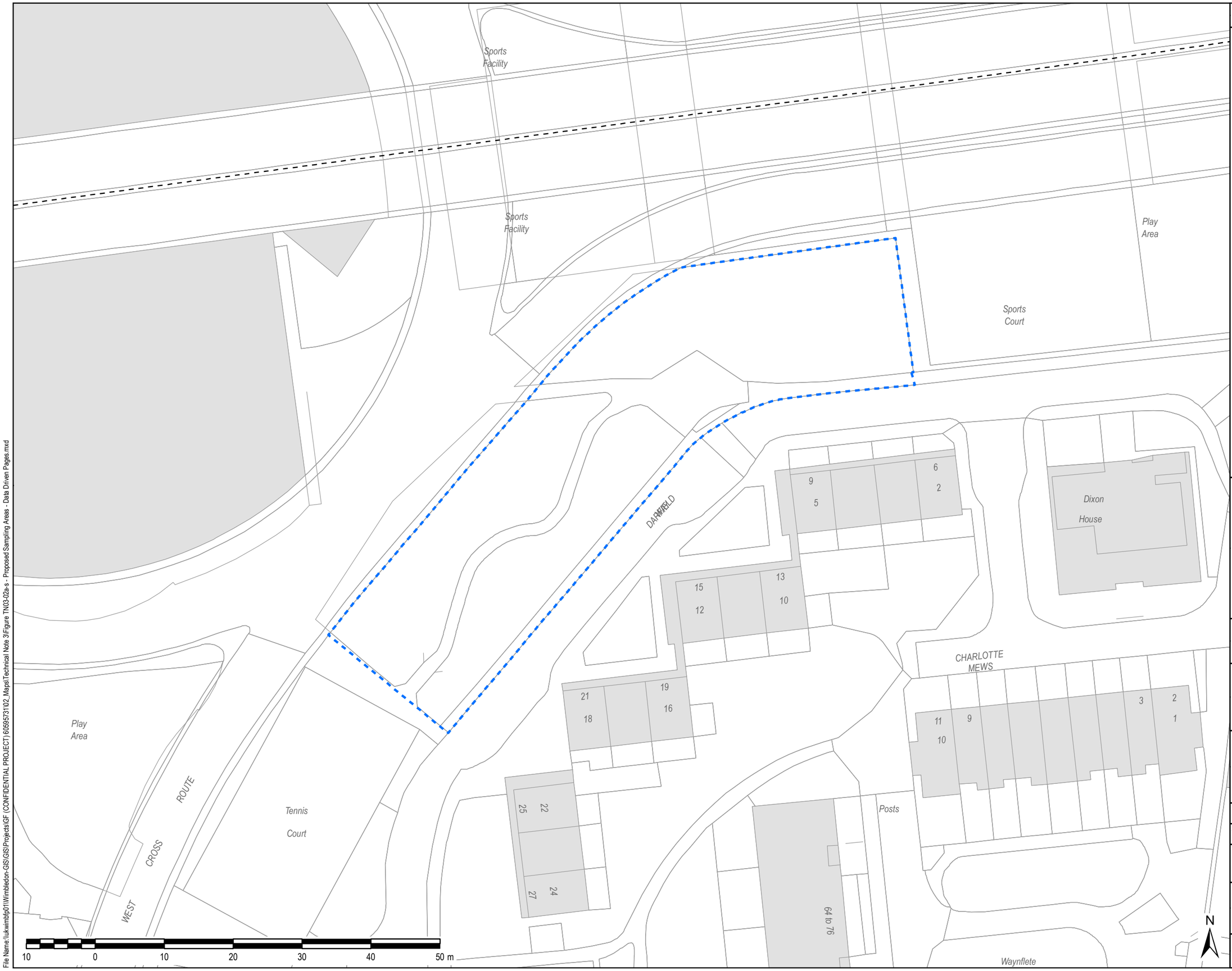

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Project Title
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Drawing Title
COMMUNITY GARDENS AREAS ALONG DARFIELD WAY (AREA 5) PROPOSED SAMPLING AREA

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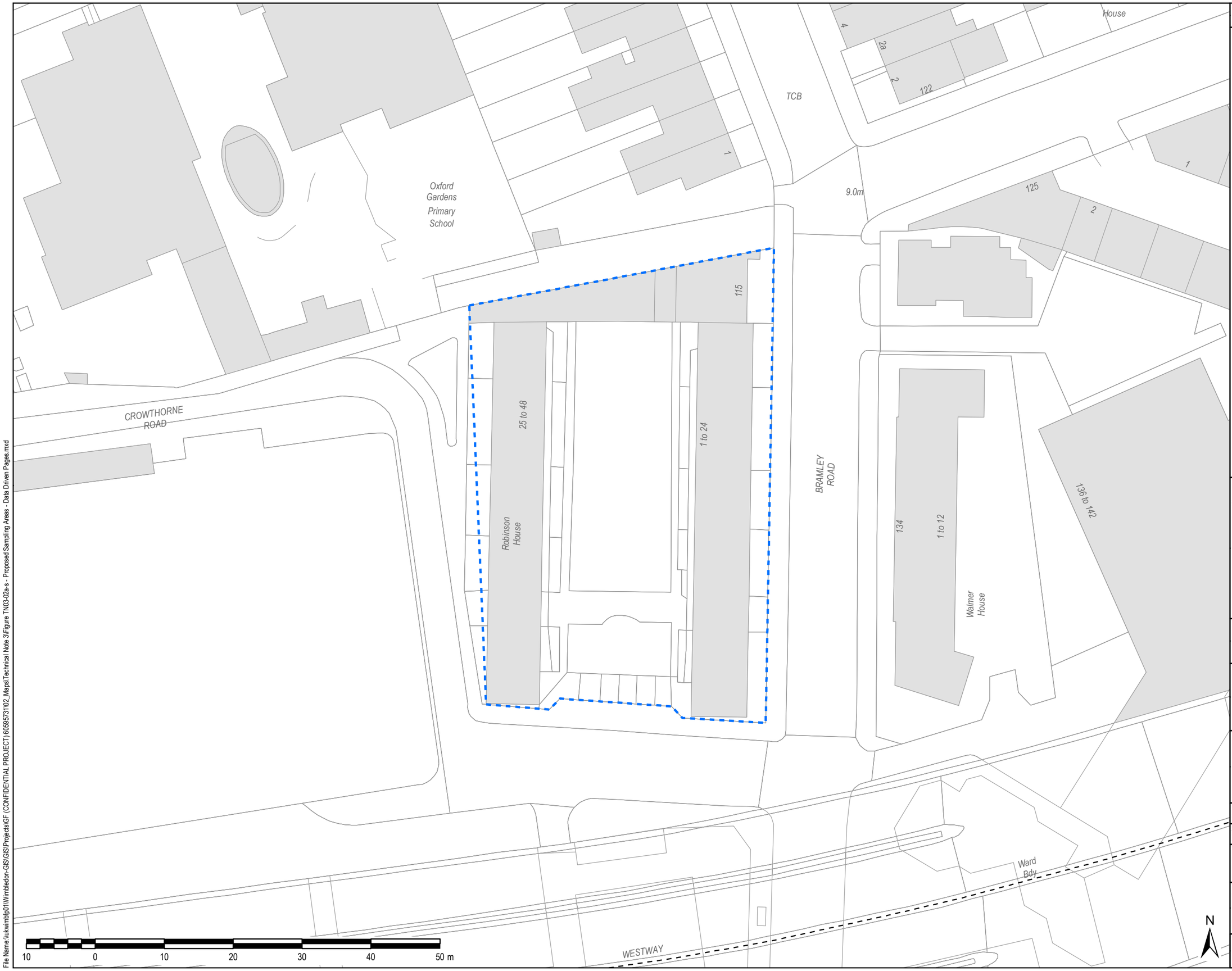

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ROBINSON HOUSE
(AREA 6)
PROPOSED SAMPLING AREA

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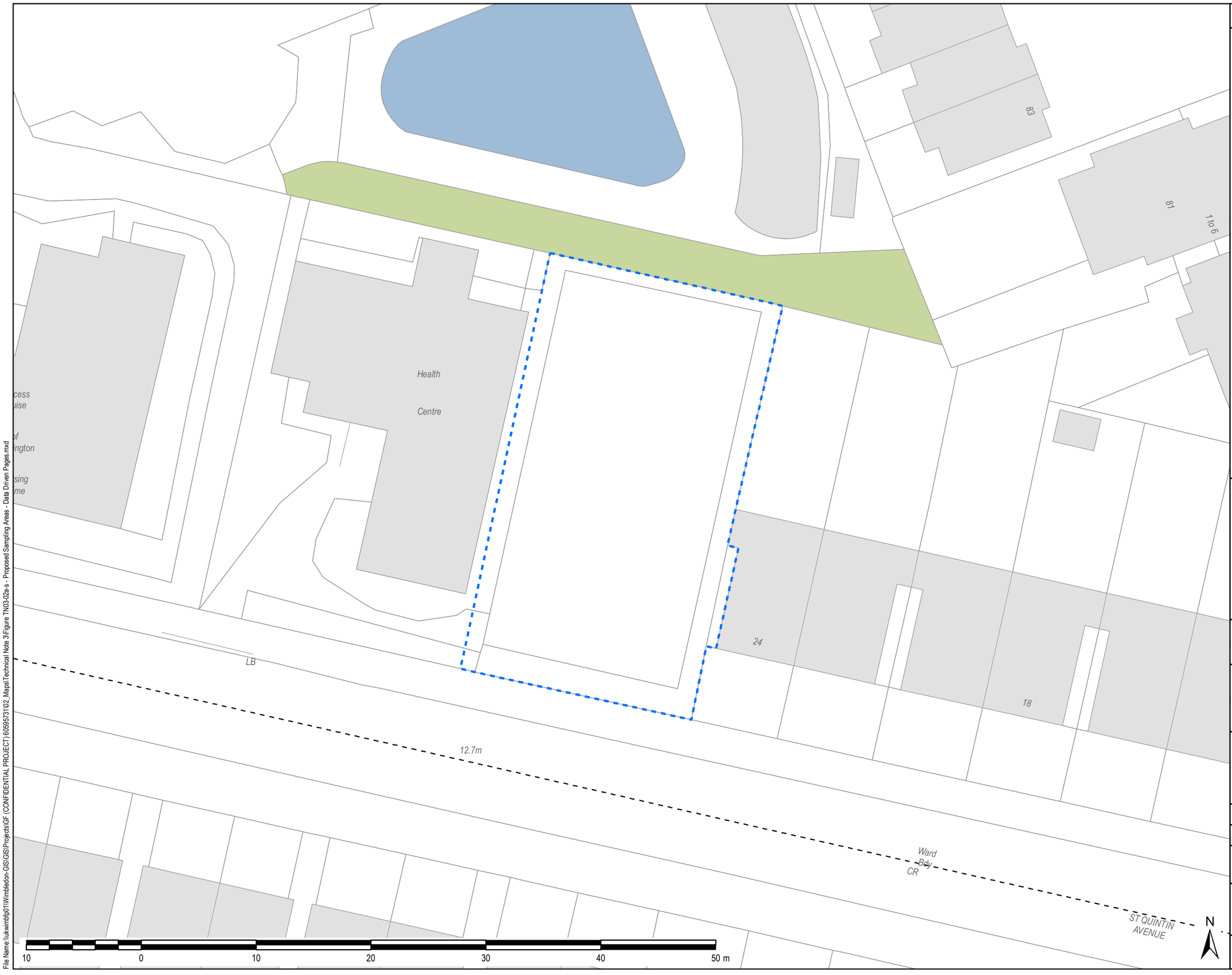

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Proposed Sampling Area

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Project Title
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ST. QUINTIN COMMUNITY KITCHEN GARDEN (AREA 7) PROPOSED SAMPLING AREA

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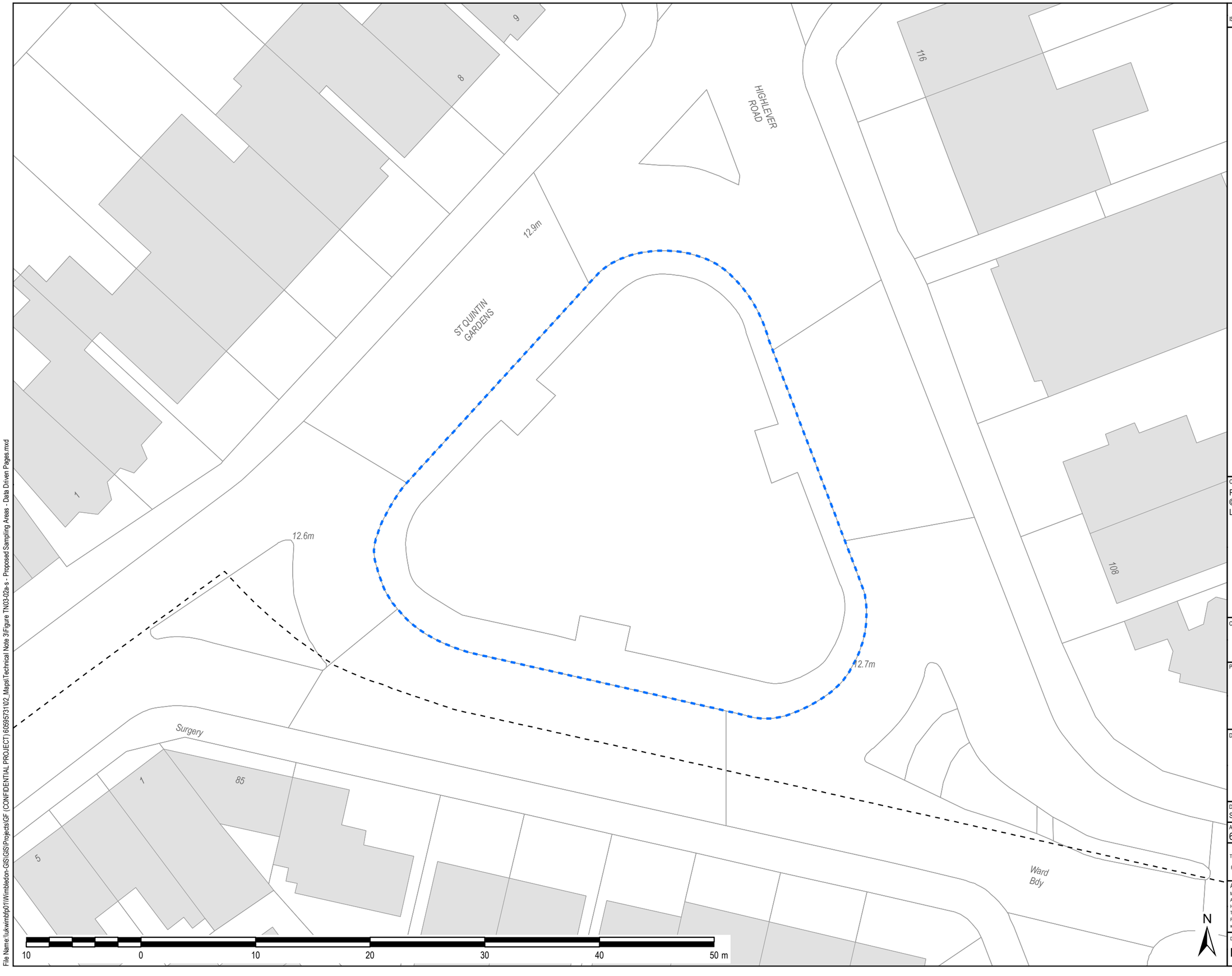

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Proposed Sampling Area

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Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
ST. QUINTIN'S ROUNDABOUT (AREA 8) PROPOSED SAMPLING AREA

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Proposed Sampling Area

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Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
KENSINGTON MEMORIAL PARK (ST. MARKS PARK) (AREA 9) PROPOSED SAMPLING AREA

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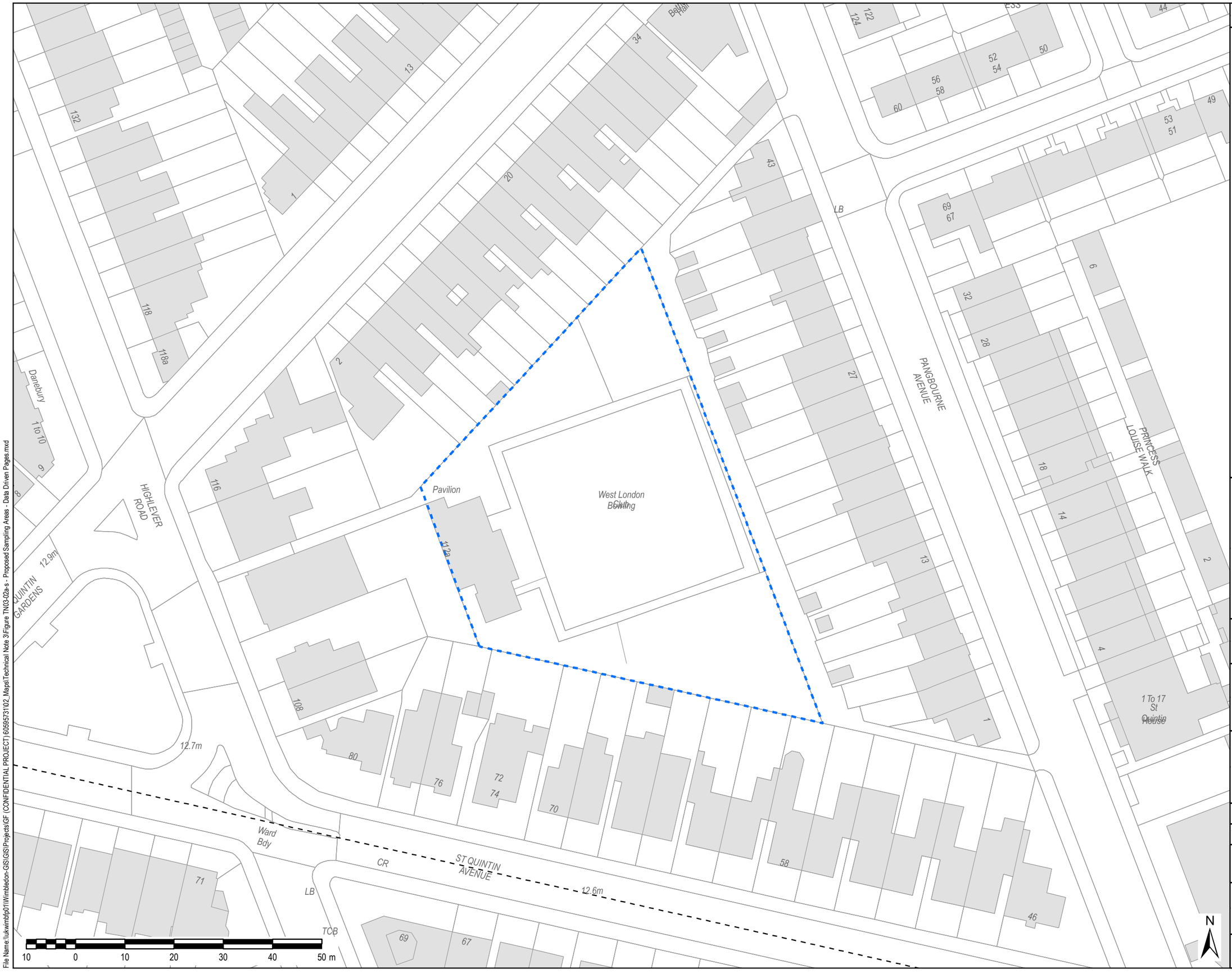

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Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
WEST LONDON BOWLING CLUB (AREA 10) PROPOSED SAMPLING AREA

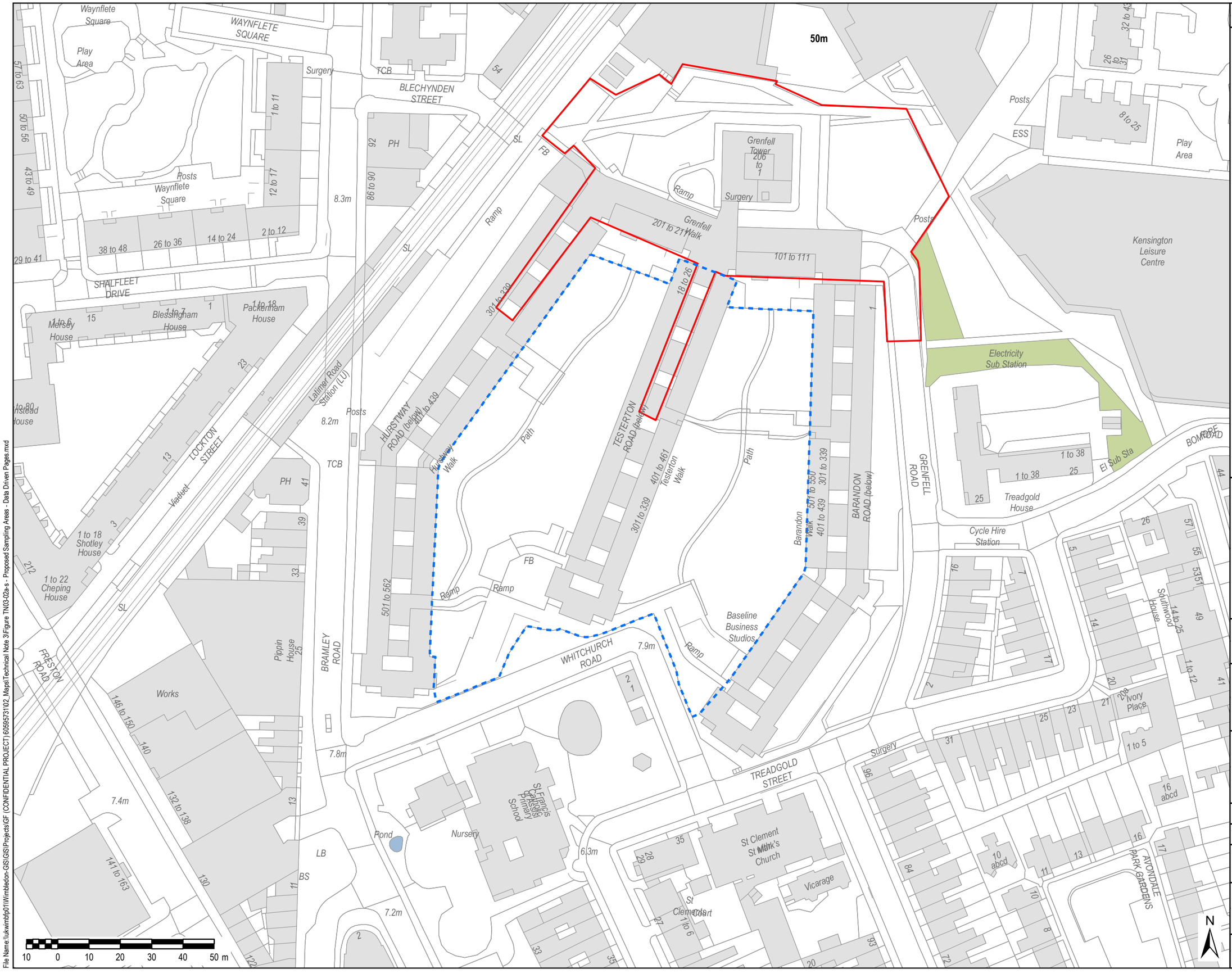
Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:700

AECOM
Midpoint
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number
FIGURE TN03-2l

Rev
01



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LEGEND

- Tower Cordon
- Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
LANCASTER WEST WALKWAYS COMMUNAL GARDENS (AREA 11) PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:1,100

AECOM
Midpoint
Alencon Link, Basingstoke
Hampshire, RG21 7PP
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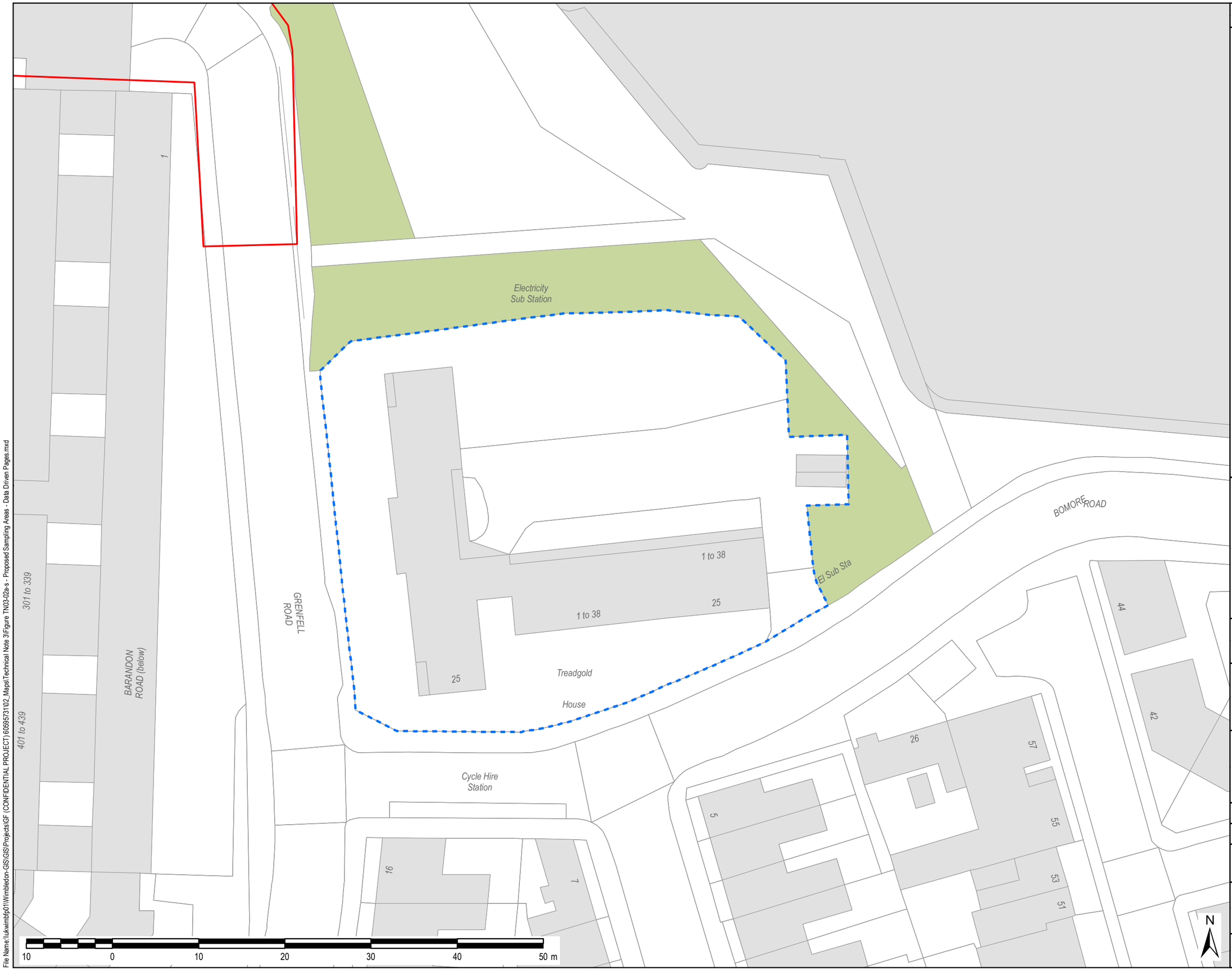
Drawing Number
FIGURE TN03-2J

Rev
01

File Name:\\ukwimfp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT) 60595731\02_Maps\Technical Note 3\Figure TN03-02a-s - Proposed Sampling Areas - Data Driven Pages.mxd



LEGEND

- Tower Cordon
- Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
COMMUNAL GARDEN AT TREADGOLD HOUSE (AREA 12) PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:400

AECOM
Midpoint
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number
FIGURE TN03-2K

Rev
01

File Name:\\ukwimbfp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT) 60595731\02_Maps\Technical Note 3\Figure TN03-02a-s - Proposed Sampling Areas - Data Driven Pages.mxd

File Name:\\ukwimbfp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT) 60595731\02_Mapsl\Technical Note 3\Figure TN03-02a-s - Proposed Sampling Areas - Data Driven Pages.mxd

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LEGEND

Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
COMMUNITY KITCHEN GARDEN AND PORTLAND ROAD (AREA 13) PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:400

AECOM
Midpoint
Alencon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
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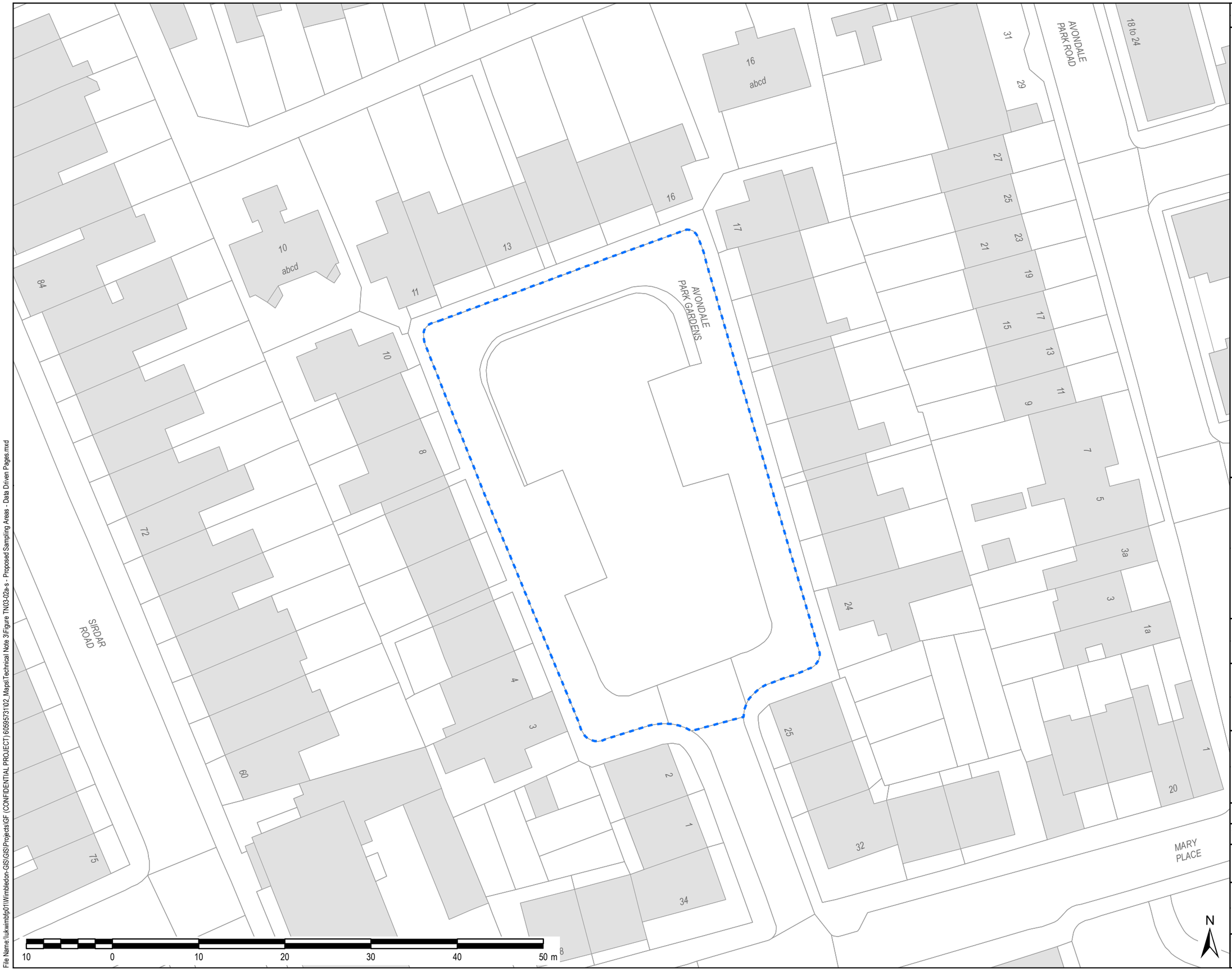
Drawing Number	Rev
FIGURE TN03-2L	01



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LEGEND

Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
COMMUNAL SPACE AT AVONDALE PARK (AREA 14)
PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:400

AECOM
Midpoint
Alençon Link, Basingstoke
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Fax (01256) 310201
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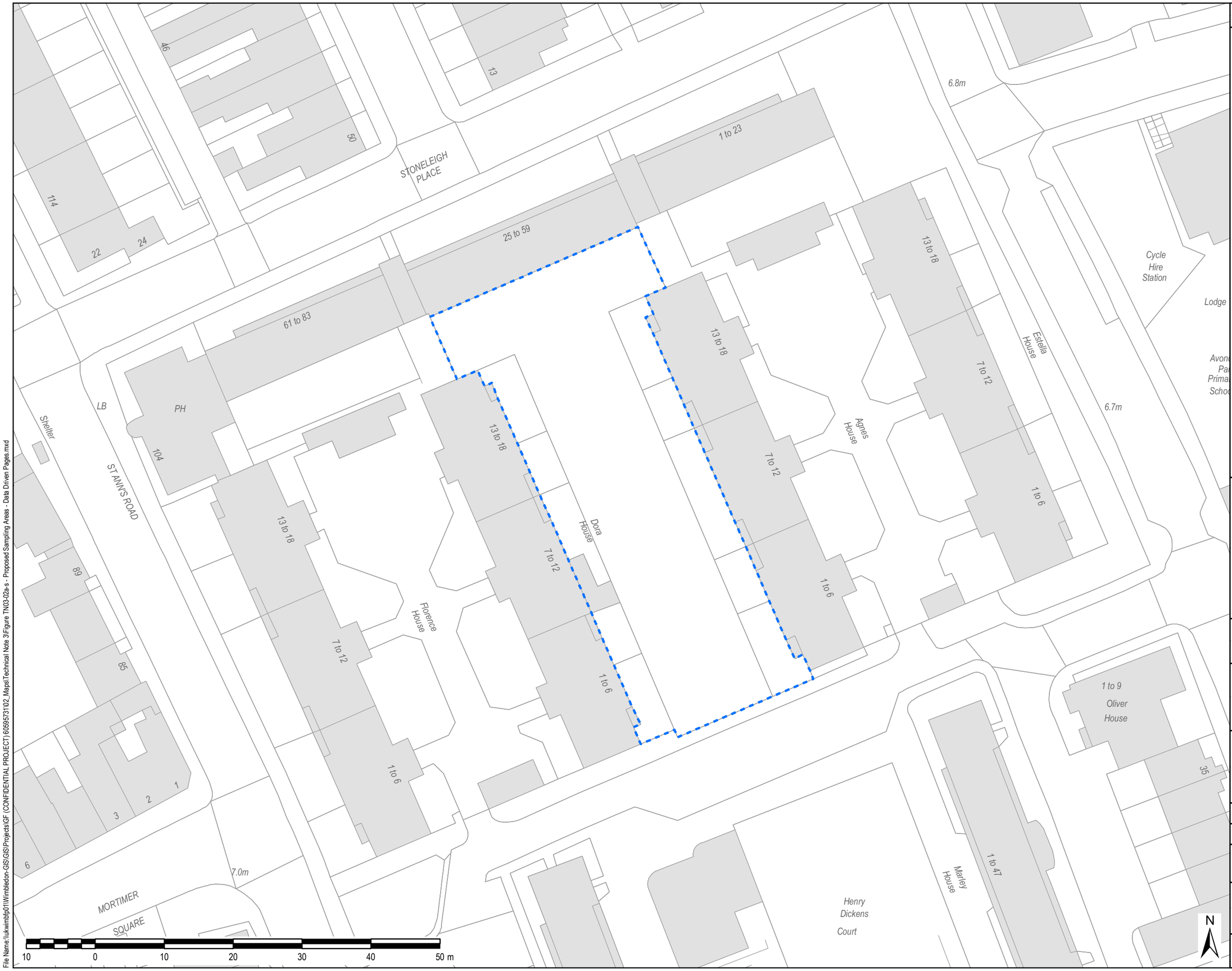
Drawing Number
FIGURE TN03-2M

Rev
01

File Name:\\ukwimbp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT) 60595731\02_Maps\Technical Note 3\Figure TN03-02a-s - Proposed Sampling Areas - Data Driven Pages.mxd



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Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
COMMUNAL GARDEN AT HENRY DICKENS ESTATE (AREA 15) PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:500

AECOM
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Drawing Number
FIGURE TN03-2N

Rev
01

File Name:\\ukwimbfp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT)\60595731\02_Maps\Technical Note 3\Figure TN03-02a-s - Proposed Sampling Areas - Data Driven Pages.mxd

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LEGEND

Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
AVONDALE PARK
(AREA 16)
PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:500

AECOM
Midpoint
Alençon Link, Basingstoke
Hampshire, RG21 7PP
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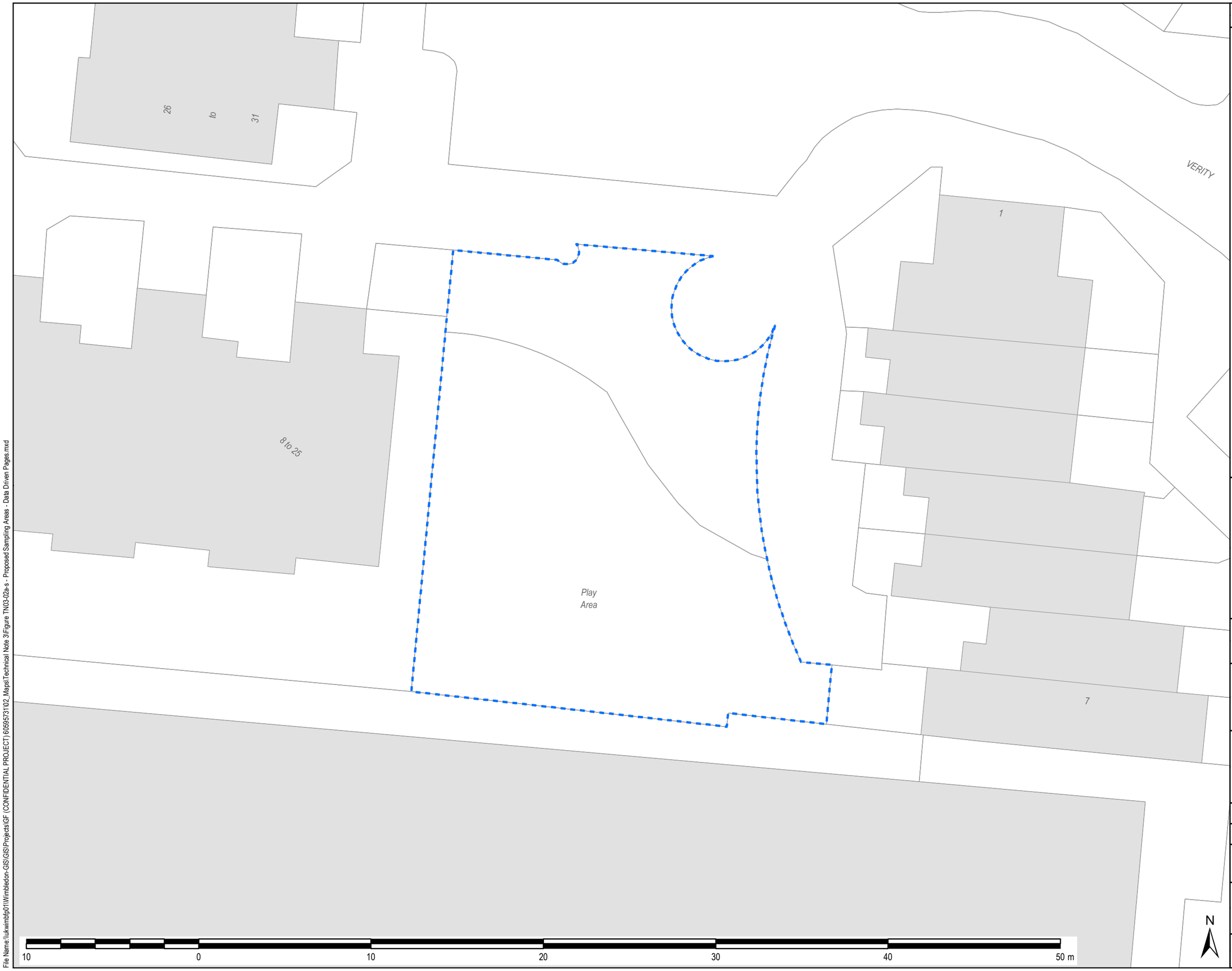
Fax (01256) 310201
www.aecom.com

Drawing Number
FIGURE TN03-2O

Rev
01



File Name:\\ukwimbfp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT) 60595731\02_Maps\Technical Note 3\Figure TN03-02a s - Proposed Sampling Areas - Data Driven Pages.mxd

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Proposed Sampling Area

Client

ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title

GRENFELL PART 2A ASSESSMENT

Drawing Title

OPEN SPACE AT VERITY CLOSE (AREA 17) PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:200

AECOM
Midpoint
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Hampshire, RG21 7PP
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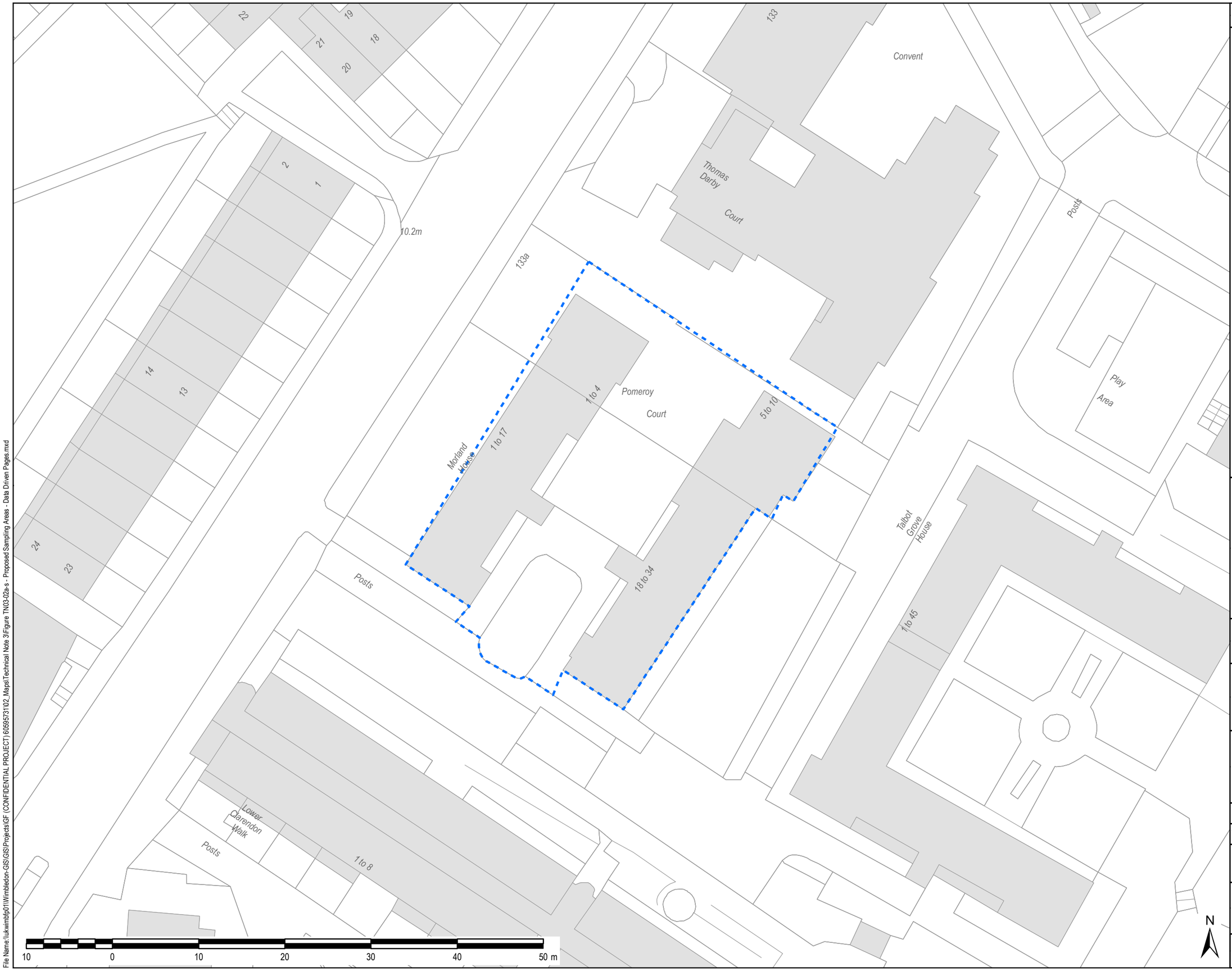
Drawing Number	Rev
FIGURE TN03-2P	**01**



File Name:\\ukwimbtp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT) 60595731\02_Maps\Technical Note 3\Figure TN03-02a-s - Proposed Sampling Areas - Data Driven Pages.mxd

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LEGEND

Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
COMMUNAL OPEN SPACE AT MORLAND HOUSE (AREA 18) PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:400

AECOM
Midpoint
Alençon Link, Basingstoke
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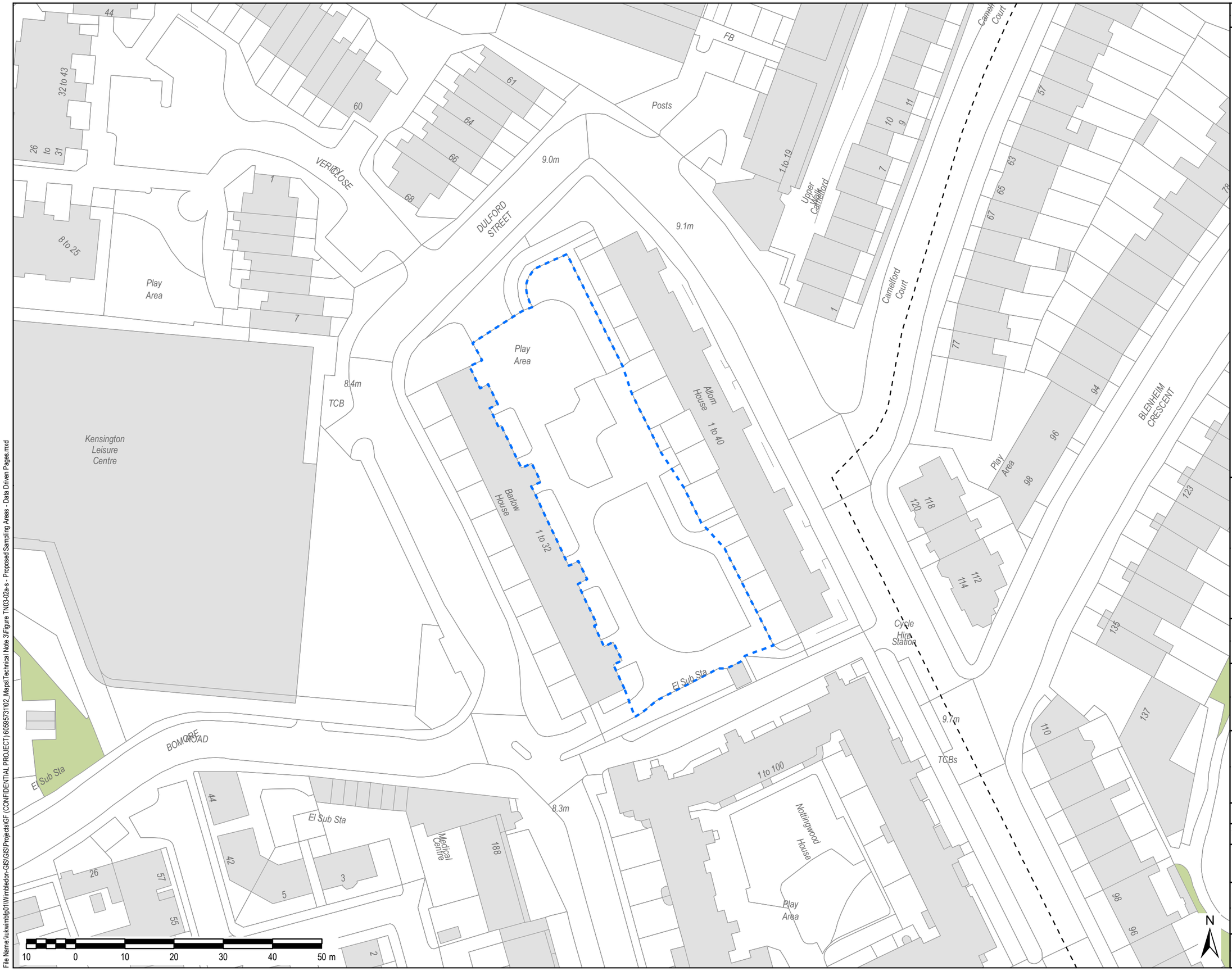
www.aecom.com

Drawing Number
FIGURE TN03-2Q

Rev
01



File Name:\\ukwimbfp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT) 60595731\02_Maps\Technical Note 3\Figure TN03-02a-s - Proposed Sampling Areas - Data Driven Pages.mxd

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LEGEND

Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
COMMUNAL OPEN SPACE AT ALLOM HOUSE AND BARLOW HOUSE (AREA 19) PROPOSED SAMPLING AREA

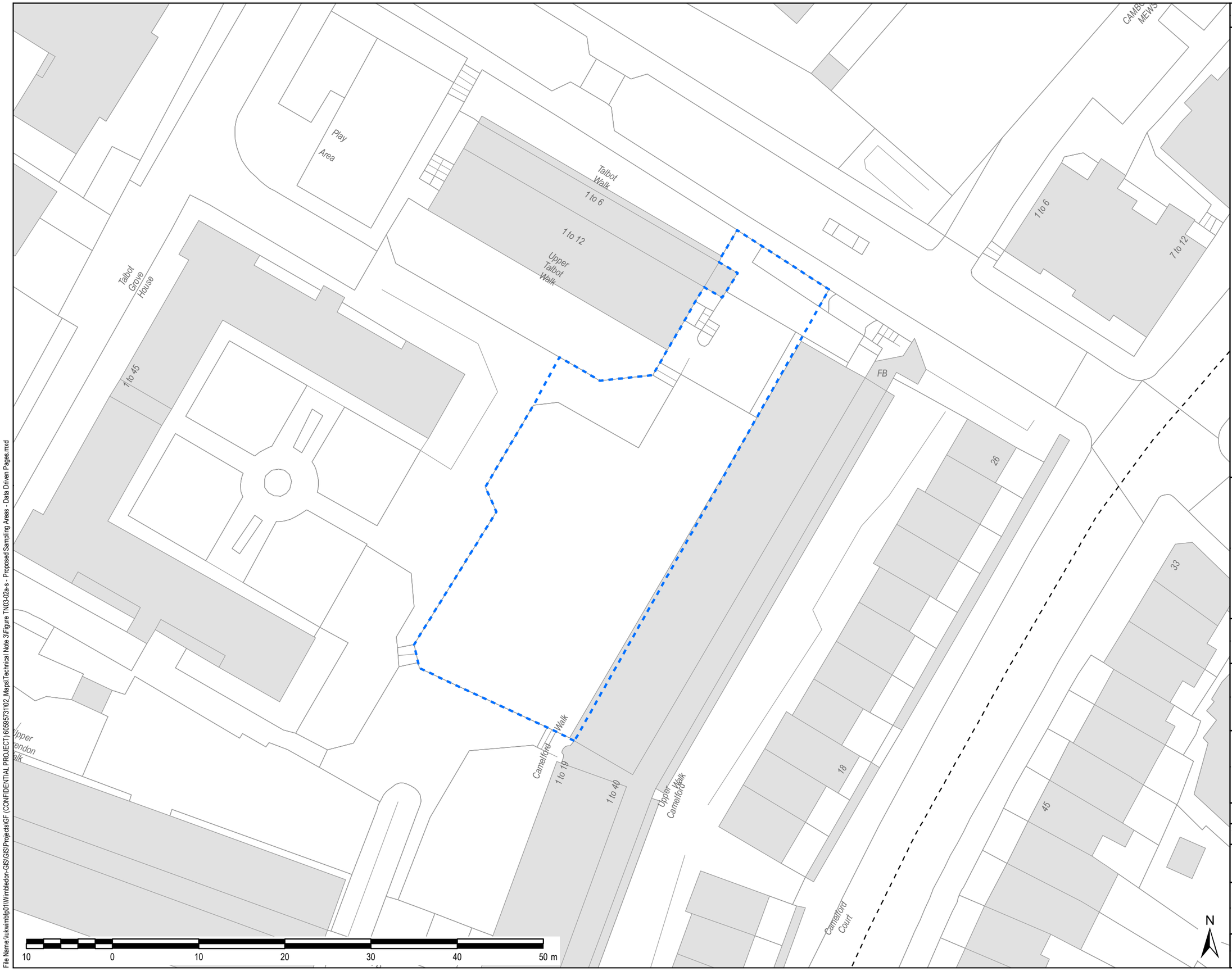
Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:700

AECOM
Midpoint
Alençon Link, Basingstoke
Hampshire, RG21 7PP
Telephone (01256) 310200
Fax (01256) 310201
www.aecom.com

Drawing Number
FIGURE TN03-2R

Rev
01



File Name:\\ukwimfp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT)\60595731\02_Maps\Technical Note 3\Figure TN03-02e-s - Proposed Sampling Areas - Data Driven Pages.mxd

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LEGEND

Proposed Sampling Area

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
COMMUNAL OPEN SPACE AT CAMELFORD WALK (AREA 20) PROPOSED SAMPLING AREA

Drawn	Checked	Approved	Date
SM	DD	DD	19/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:400

AECOM
Midpoint
Alencon Link, Basingstoke
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www.aecom.com

Drawing Number
FIGURE TN03-2S

Rev
01

File Name:\\ukwimbfp01\Wimbledon-GIS\GIS\Projects\GF (CONFIDENTIAL PROJECT)\60595731\02_Maps\Technical Note 3\Figure TN03-03 - Waynflete Square (Area 3) Proposed Sampling Area with Indicative Proposed Pilot Study Sampling Locations.mxd

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

LEGEND

- Proposed Sampling Area
- Sample Locations on Approximate 20m Grid with Samples at Two Depths (0-5cm and 10-15cm)
- Sample Locations with Sample at One Depth (0-5cm)

Client
ROYAL BOROUGH OF KENSINGTON & CHELSEA

Project Title
GRENFELL PART 2A ASSESSMENT

Drawing Title
WAYNFLETE SQUARE (AREA 3) PROPOSED SAMPLING AREA WITH INDICATIVE PROPOSED PILOT STUDY SAMPLING LOCATIONS

Drawn	Checked	Approved	Date
SM	DD	DD	18/06/2019

AECOM Internal Project No.	Scale @ A3
60595731	1:400

AECOM
Midpoint
Alençon Link, Basingstoke
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www.aecom.com

Drawing Number
FIGURE TN03-3

Rev
01

Appendix TN03-A: Soil Sampling Procedure

This is not a health and safety risk assessment

1. APPLICABILITY

This document describes the standard field procedure to be used by AECOM Remediation Services Practice personnel to collect soil samples for project 60595731. It relates specifically to the collection of soil samples from the following types of location:

- Surface or near-surface soil
- Sub-surface soil to a maximum depth of 15cm

2. SAFETY

All work must be undertaken in accordance with the requirements of the project Safety, Health and Environment (SHE) Plan.

3. OBJECTIVE

Soil samples are to be collected for subsequent laboratory analysis, and logging of the soil conditions. The objective is to collect a sample that is representative of the soil condition at the chosen sample location, including both the chemical composition and the geological consistency of the material. Identified sample locations are simple random sample locations chosen within the target area. The individual random samples should be of ground that appears to be representative of the typical ground conditions in the area being sampled. If there is visual and/or olfactory evidence of localised potentially contaminated soil, an additional targeted sample should be taken.

In all cases, care needs to be taken not to change the chemistry of the sample. This means minimising the disturbance of the soil and minimising the time taken to take the sample as far as reasonably practicable. It also means storing and transporting the sample as per the guidelines below.

4. SAMPLE COLLECTION

Equipment Decontamination

Prior to first use each day and after collection of each sample, all equipment that comes into contact with samples should be decontaminated (see AECOM FP07 *Decontamination of Equipment*). This will involve the use of de-ionised water supplied by the sub-contract laboratory.

A dedicated clean pair of disposable nitrile (powder free) gloves should be worn at each location and all reasonable measures taken when conducting the work to avoid cross-contamination of samples.

Sampling Locations

Sample areas will be indicated in the sampling plan. The precise sampling locations within each sampling area will be selected as part of the reconnaissance walkover and recorded in the presentation of factual sampling information (TN15). These locations will be subject to site conditions and constraints. If on the day of sampling specific locations are not accessible, alternative locations can be chosen. Consult with the Project Manager if this situation arises.

Sampling locations should be consistent with the overarching aims of the sampling (see above).

Sampling Frequency/Depth

For this specific sampling exercise, samples should be taken from the top 5cm of soil. For the 'pilot study' sample locations on a 20m grid at Waynflete Square, a second sample will be taken at each location at a depth of 10-15cm. Depths will be checked and confirmed using a tape measure. The near-surface sample (0-5cm depth) will include the root zone for turf and other shallow rooted plants that may be present. The soil will need to be carefully removed from the root zone at the sample location if this is the case. One sample will be taken from each location and depth increment (except where duplicates are scheduled).

Recording of Sampling Locations
Sampling locations should be photographed using a trial pit board with a colour scale. The sample location code must be as per the sample plan, and the sample location should be recorded by reference to a detailed site plan and relative distances for key features (e.g. building corners, kerb lines), so that the locations can be re-visited if necessary.

Specific health and safety measures
Refer to the project and task specific SHE Plan for full details. If the ground is damp, no specific measures are required. If the ground is dry and sampling activities visibly generate dust, damp down the ground before and during sampling using a hand-held water mister. Avoid excessive use of water which would make sample more difficult to handle.

Collection of Soil Samples from Test Pits or using Hand Tools
Disturbed soil samples should be collected from each location using a decontaminated stainless-steel hand trowel. [Only unpainted hand tools that are made of stainless-steel should be used]. A square area with minimum dimensions 25cm x 25cm should be removed on to a clean piece of plastic sheeting. The sample jar for VOC laboratory analysis should be filled immediately to minimise volatile losses. Plants (inc. roots) should then be removed as far as is reasonably practicable from the remainder of the sample. If the soil is sufficiently granular, the resulting soil should be thoroughly mixed on the sheet using the hand trowel before being placed in the required sample containers (see below for laboratory sample container requirements). See AECOM FP24 *Soil Sample Volume Reduction and Sub-sampling by Cone and Quartering* for a method for sample mixing. Because near-surface soil samples are being taken, volatile losses during sampling should be negligible for semi-volatile compounds relative to any losses already due to very shallow depth of soil. If the sample is cohesive and cannot be easily mixed this should be noted in the field records and the sample transferred to the sample containers without mixing.

Sample Size and Storage
Laboratories specify minimum requirements (volumes) and types of sample container for analytical methodologies, which should be checked prior to collection of samples. The sample containers required for one complete sample for all analyses for the exploratory and pilot trial sampling include:

- 1 x 1kg (950ml) plastic tub,
- 2 x 250g (260ml) glass jars and
- 5 x 60g (74ml) glass jars per sample

Oversize fractions of sample that cannot be sampled in the required containers should be described in the field notes for each individual sample.

Samples should be securely packaged for transportation as soon as possible using the appropriate packaging containers provided by the laboratory. Samples should be stored and transported according to the analytical laboratory guidance provided, including sealing to prevent evaporative losses and as far as possible maintenance of a stable temperature (generally in the range 0-4 degrees C).

Sample Labelling and Chain of Custody
Samples should be labelled in accordance with the chain of custody requirements of the analytical laboratory. As a minimum this should include:

- Project identification code or Project Name
- Sample identification code
- Sample depth
- Sample time and date

Project Name, project code and each individual sample time, date and identification code must also be recorded on the Chain of Custody for cross referencing.

Duplicate samples

Duplicate samples should be taken at a minimum frequency of 10%, with an absolute minimum of 8 duplicate samples for each sampling mobilisation. See AECOM FP26 *Field Sampling and Laboratory QA* for further information. These samples should be taken following the cone and quartering of the original sample, not by taking a further sample from the ground adjacent to the original sample.

Duplicate sampling information must be recorded with the site personnel's notes or on a detailed plan for future QA/QC procedures.

Reinstatement

Because the sample depths are shallow, reinstatement should be achieved by placing unneeded excavated soil back in the shallow sample depression and/or by scrapping surrounding surface soil into the shallow sample depression to form an even surface layer. A bagged supply of commercially available topsoil should be available to complete reinstatement as necessary. Any turf cut away for the purposes of sampling will be placed back on top of the restored soil level. The sampled area should be firmed down by walking over it.

5. References

AGS Guide to Environmental Sampling, Association of Geotechnical and Geoenvironmental Specialists, 2019

BS 101075:2011+A2:2017 Investigation of potentially contaminated sites – Code of practice, British Standards Institution Publication, 2017

BS ISO 18400-102:2017 Soil quality – Sampling. Part 102: Selection and application of sampling techniques, British Standards Institution Publication, 2017

BS ISO 18400-105:2017 Soil quality – Sampling. Part 105: Packaging, transport, storage and preservation of samples, British Standards Institution Publication, 2017

BS ISO 18400-201:2017 Soil quality – Sampling. Part 201: Physical pretreatment in the field, British Standards Institution Publication, 2017

BS ISO 18512:2007 Soil Quality – Guidance on long and short-term storage of soil samples, British Standards Institution Publication, 2007

Appendix TN03-B: Example Chain of Custody

CHAIN OF CUSTODY

CLIENT: AECOM Infrastructure & Environment UK Ltd	If Electronic File Required please select file format below		SAMPLER: Jess Storey / Jon Craggs / Will Hartas (delete as appropriate)
ADDRESS: St. George's House, 5 St. George's Road, Wimbledon, SW19 4DR			MOBILE:
	EQUIS		EMAIL REPORT TO: simon.cole@aecom.com, david.dyson@aecom.com
PROJECT MANAGER (PM): Neil Cooper	CROSSTAB		cc REPORT TO: liz.philp@aecom.com, neil.cooper@aecom.com
MOBILE: 07825-534321	CLIENT	X (Esdat)	INVOICE TO: (if different to report) ukapinvoices@aecom.com, neil.cooper@aecom.com
PROJECT ID: 60595731	AGS (please also fill in AGS SAMP_TYPE & SAMP_REF below)		QUOTE NUMBER: 15573 HJ AECOM v4 / P.O No: 60595731
SITE: Grenfell			ANALYSIS REQUIRED including SUITE names (refer to quote for full details)

Exova JONES ENVIRONMENTAL

Chain of Custody sheet page ..... of .....

TURNAROUND - please tick

10 DAY		4 DAY	Other (as per quote)	X
5 DAY		3 DAY		

All waters - tick for samples to be tested shaken or settled

FOR LABORATORY USE ONLY

AVERAGE COOL BOX TEMP.(if required):

SAMPLE RECIEPT CONDITION:

MATRIX:- S=Soil, GW=GroundWater, SW=SurfaceWater, L/E=Leachate/Effluent, OW=OtherWater, P=Product/Oil)

SOILS -We are MCERTS accredited for samples predominantly made up of sand, loam and clay (no other matrices). Please request an MCERTS report if required. **WATERS -** we are accredited for surface and groundwaters (leachates and effluents are accredited for some tests, please see UKAS schedule). Please tick whether analysis is required on settled or shaken samples

Sample ID	AGS SAMP TYPE	AGS SAMP REF	Shaken	Settled	S/GW/SW /L/E/OW/ P	Date	Time	Depth in Metres	Preservation	Asbestos risk: High	Asbestos risk: Medium	Asbestos risk: Low	Fibre screen/ asbestos ID (HSG 248) including blue book preparation	Free Cyanide	Total Cyanide	Thiocyanate	pH	Full CLEA metals	Aluminium	VOC target list (inc BTEX/MTBE) + TICs	SVOC target list plus TICs	SVOC forensic scan	PAH 16 or 17	TOC by Eltra	PCB 7 congeners	Isocyanates	Man Made Mineral Fibres	Chlorinated Dioxins and Furans and Dioxin like PCBs	Brominated Dioxin & Furans	hexabromocyclododecane (1,2,5,6,9,10-)	Poly-brominated biphenyls	Brominated diphenyl ethers	tris(1-chloro-2-propyl)phosphate TCPP	tris(2-ethylhexyl) phosphate	tetrabromobisphenol A	
GTCS 1 - 05					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 06					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 07					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 08					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 09					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 10					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 11					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 12					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 13					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 14					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 15					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 16					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 17					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 18					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 19					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 20					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 21					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	
GTCS 1 - 22					S			0 - 0.05	None		x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	X	

RELINQUISHED BY:			**RECEIVED BY:**		**METHOD of SHIPMENT**
Name:	Date:		Name:	Date:	Consignment note No:
Of:	Time:		Of:	Time:	Courier Company:

Health & Safety instructions including known hazards (eg suspected asbestos). Please let us know if samples are heavily contaminated, high PAHs expected, provide PID readings if available

Exova Jones Environmental

Unit 3 Deeside Point, Zone 3 Deeside Industrial Park, Deeside, CH5 2UA Tel: 0044 1244 833 780

Registered Address :Exova Environmental UK Ltd, Lochend Industrial Estate, Midlothian, EH28 8PL Company reg No: 11371415