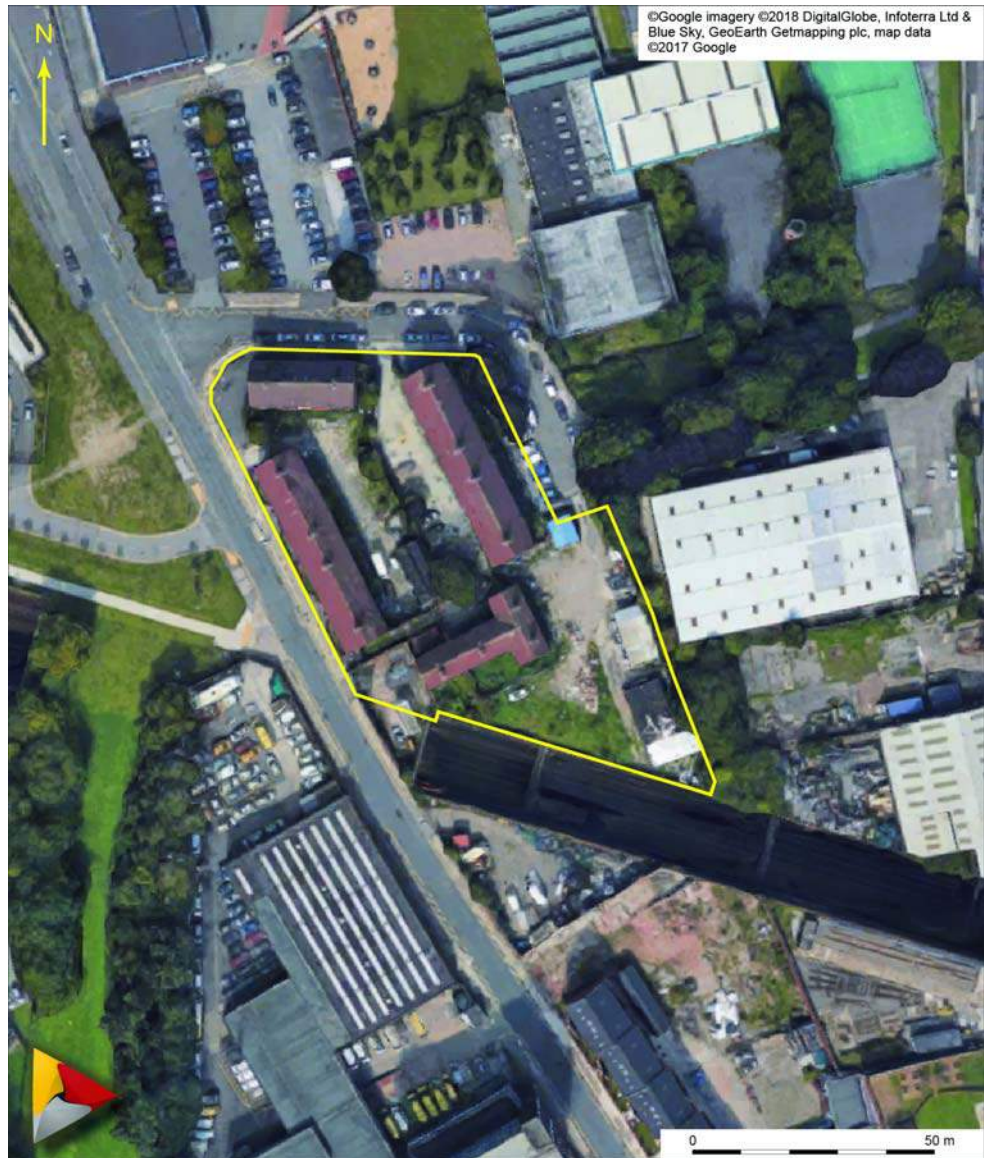


Land at Elm Grove, Liverpool (18F/1967)



Final Report on an Archaeological Evaluation (Pre-Demolition and Post Demolition Phases)

Document Number: 3429.R03a

October 2019

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INTRODUCTION

Planning permission is being sought by Liverpool City Council to erect a multi-storey car park and combined heating and power energy centre following demolition of existing residential properties and outbuildings on land (hereafter the Site) bounded by Smithdown Lane, Elm Grove and Albert Street Liverpool L7 3EH (18F/1967).

As Local Planning Authority Liverpool City Council, as advised by the Merseyside Environmental Advisory Service (hereafter MEAS), considers the site is of potential archaeological interest and wishes to secure satisfactory treatment of the archaeological remains, as required by the *National Planning Policy Framework* (hereafter NPPF). Accordingly, Liverpool City Council wishes to undertake an archaeological evaluation to determine the presence/absence and character of any archaeological remains that may exist at the Site

This document provides detailed results of a programme of archaeological work (the monitoring of geotechnical boreholes and excavation of a number of evaluation test pits and trial pits) prior to and subsequent to the demolition of Smithdown Court¹. The document incorporates and supersedes the summary statement on the results of the pre-demolition archaeological work (Nexus Heritage 2019).

Discussions were held with the Archaeologist (Planning) at MEAS (Mr. D. Moir), to discuss the aims of the archaeological works, and the methods to be employed, in order to ensure that the archaeological works meet the expectations of the Council. Mr. Moir endorsed the aims and methods as defined in the Nexus Heritage document *Land at Elm Grove, Liverpool, (18F/1967) Written Scheme of Investigation and Contractor Specification for an Archaeological Evaluation*: In the event the proposed post-demolition phase of geotechnical investigations should have included a micro-gravity survey - but this was abandoned - the amount of cut to formation and the likely inaccuracies of the technique mean that it was decided to focus efforts and resource on ground-truthing by the means of trial pits and rotary core boreholes and attempting some non-invasive prospection by means of laser survey. So, there has been some modification to the approach detailed in the WSI.

Nexus Heritage is appointed as the Archaeological Consultant for this project and has prepared this document.

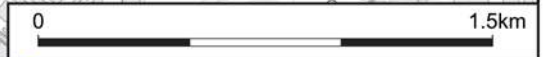
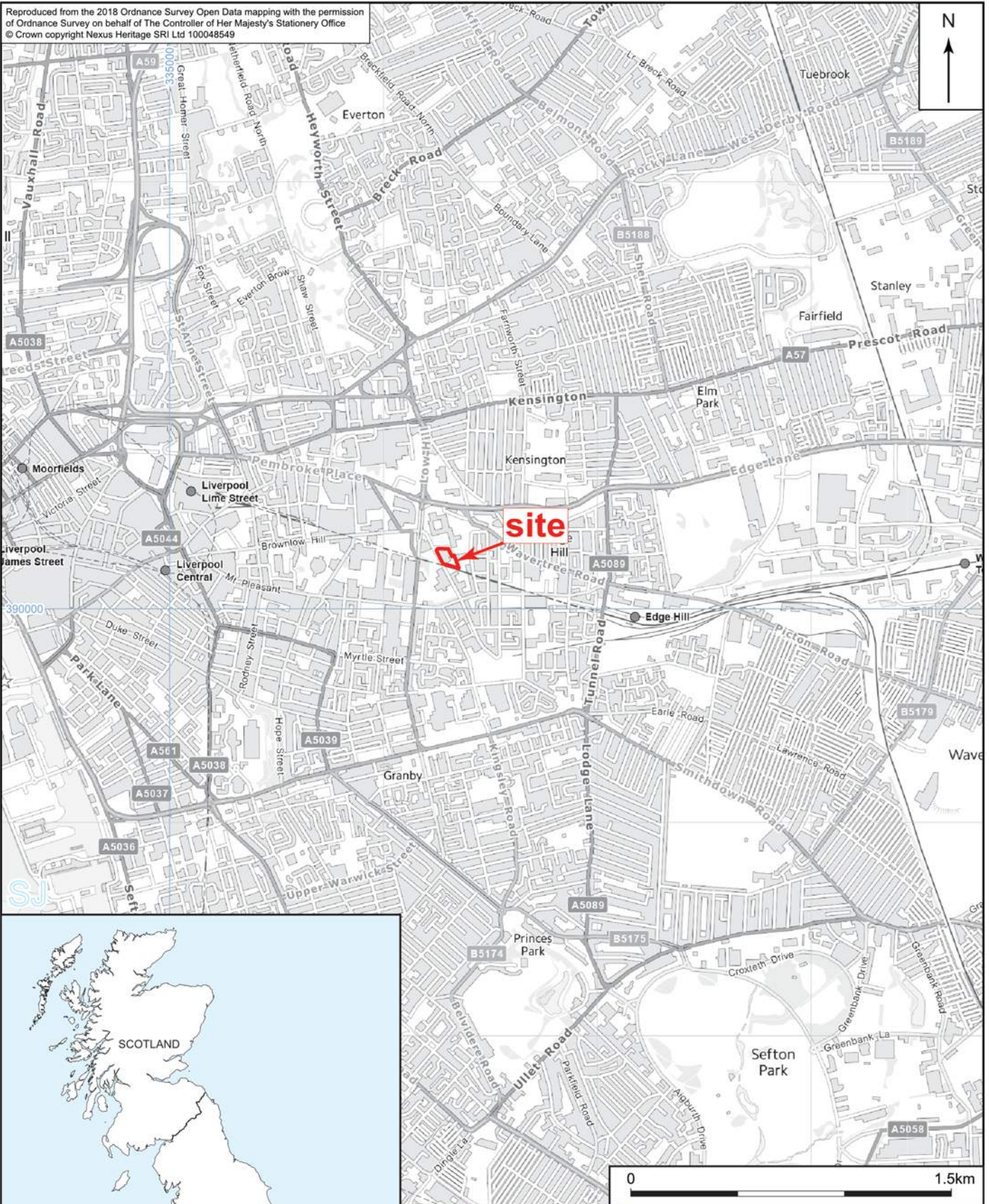
LOCATION AND TOPOGRAPHICAL BACKGROUND

The Site (Fig. 1) is situated off Elm Grove, Liverpool, (OS SJ 36291 90249). The site occupies an area of 1.45 hectares of levelled/terraced ground comprising some open space laid hardstanding. Until mid-2019 the Site was also occupied by a complex of residential properties - Smithdown Court - a collection of three-storey, brick-built apartment blocks (Fig. 2) dating to the middle of the 20th century and possessing no historic or architectural interest. Smithdown Court was demolished during the summer and early autumn of 2019.

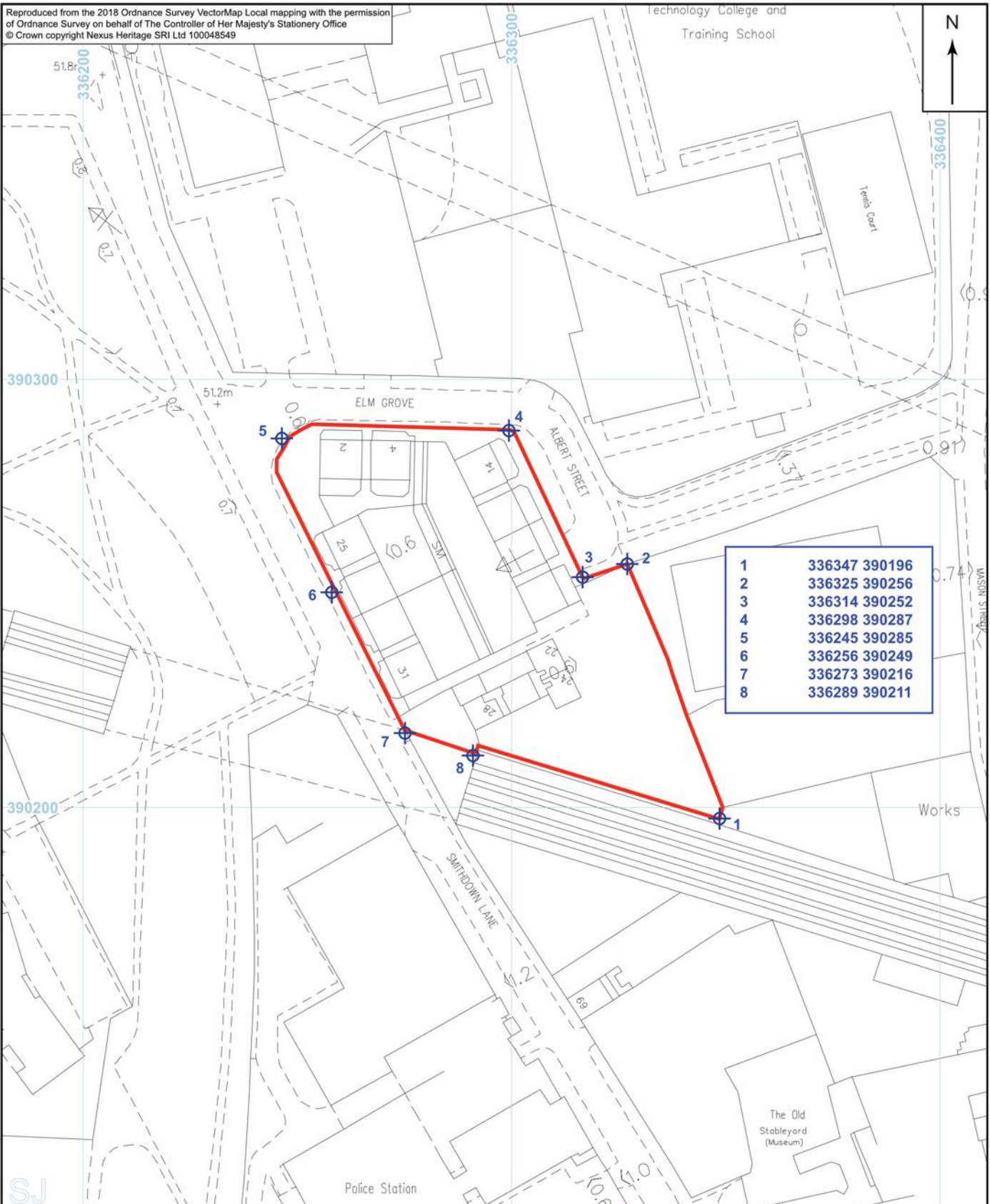
¹ A video survey of Smithdown Court, prior to and during demolition is available at <https://www.youtube.com/watch?v=t7mE-nN7qWA>



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| PROJECT TITLE: Land at Elm Grove, Edge Hill, Liverpool, Merseyside | | |
| DRAWING TITLE: Site Location | | |
| DATE: 30/09/19 | DRAWN BY: ECMG | FIGURE: 1 |



| | |
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| 1 | 336347 390196 |
| 2 | 336325 390256 |
| 3 | 336314 390252 |
| 4 | 336298 390287 |
| 5 | 336245 390285 |
| 6 | 336256 390249 |
| 7 | 336273 390216 |
| 8 | 336289 390211 |

Development Site



PROJECT TITLE:
**Land at Elm Grove, Edge Hill,
 Liverpool, Merseyside**

DRAWING TITLE:
Site Plan

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| DATE: 08/10/19 | DRAWN BY: ECMG | FIGURE: 2 |
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ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

An Archaeological Assessment was prepared to inform the planning application (Nexus Heritage 2018) and the details of the assessment need not be rehearsed here. However, the following summary provides a concise outline of the broad archaeological and historic context.

The locations of six potential archaeological assets are positioned within the Site.

- Williamson tunnels and a tunnel entrance;
- two early-19th century residential dwellings;
- mid-19th century residential occupation in the form of at least 43 terraced dwellings, associated yards and a thoroughfare called Hamilton Terrace;
- a yard for military engineering which was provided with a building (of unknown function) and a rail line;
- St. Stephen's Boys and Girls School; and
- several structures of unknown function built in what was the Yard between 1908 and 1927.

With respect to this document and the objectives of the programme of archaeological evaluation the principal archaeological interest is associated with the Williamson tunnels.

ARCHAEOLOGICAL EVALUATION

The rationale underpinning the evaluative archaeological works at the Site involves the recovery of archaeological information from pre-demolition and post-demolition phases of evaluation undertaken in tandem with geotechnical explorations into the depth of made-ground, the nature of geological deposits and the presence of relic sub-structures (including Williamson tunnels). This document reports on both the pre-demolition and post-demolition phases of geotechnical explorations. Archaeological attendances were maintained during two stages of pre-demolition geotechnical explorations between 21st - 25th January, 14th - 22nd February 2019 and one stage of post-demolition geotechnical exploration on 9th September 2019.

The broad strategy for the archaeological work was to investigate areas of potential archaeological interest within the Site. The broad aims and detailed objectives of the archaeological works were catalogued in the *Written Scheme of Investigation*:

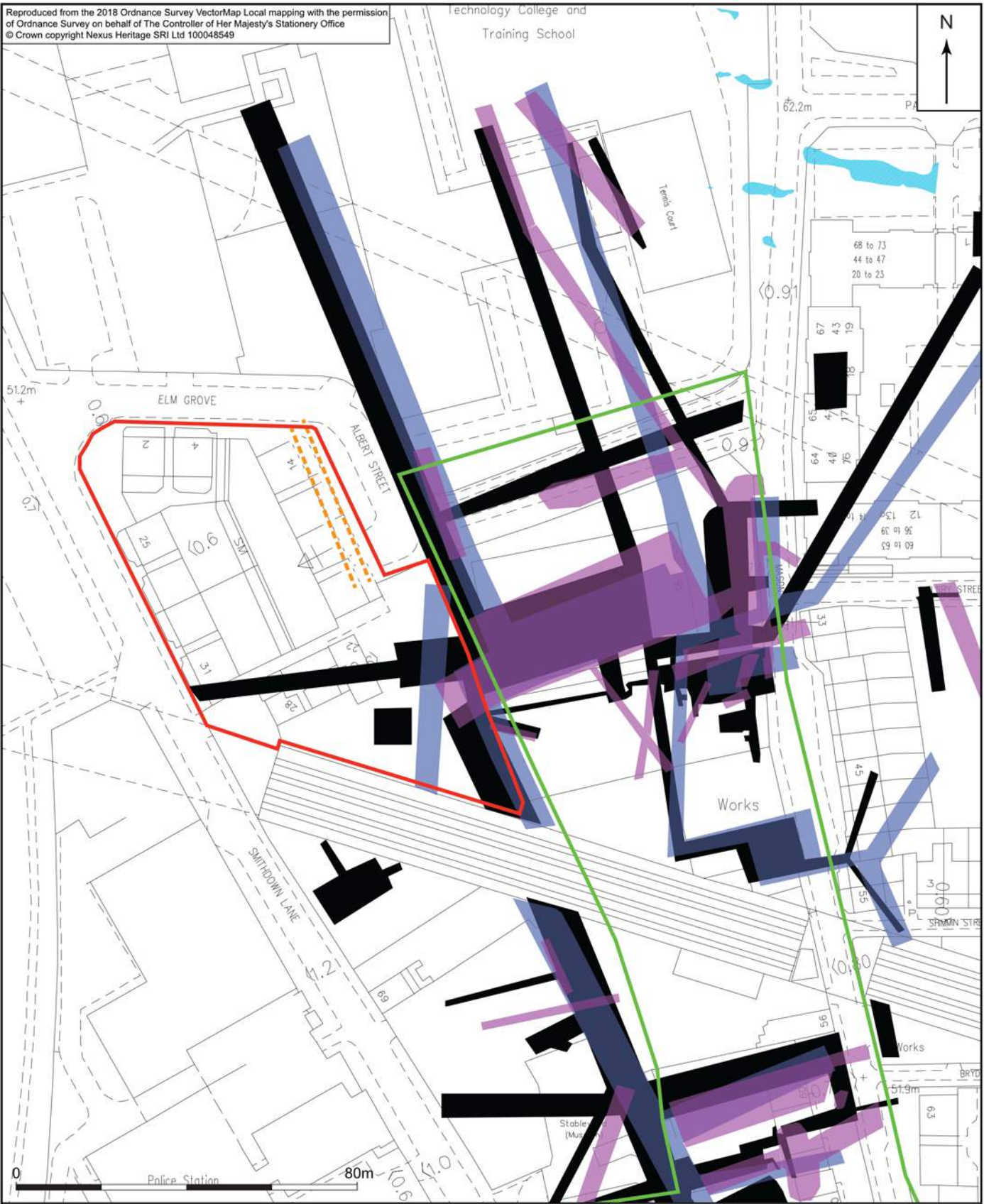
Pre-Demolition Phase

The evaluative works during this phase were proposed as follows:

- 2 no. cable percussive boreholes to up to 5m depth bgl;
- 4 no. cable percussive boreholes to up to 10m depth bgl;
- 1 no. cable percussive boreholes to up to 20m depth bgl;
- 2 no. hand-held window sample boreholes
- 6 no. machine dug trial pits to investigate the foundations of the existing brick retaining wall on the eastern boundary;
- 4 no. hand-dug pits to investigate foundations of retaining wall.

The proposed locations of the boreholes and trial pits/trenches are shown in an array as shown on Figure 4.

The excavation of x4 hand dug test pits to investigate the foundations of the existing brick retaining wall on the eastern boundary are located on Fig. 4 was undertaken as an archaeological operation. These test pits were considered unlikely to intercept any Williamson tunnels, or any other feature of archaeological interest, but in line with the precautionary principle it was considered prudent to ensure that any subsurface characteristics within the material through which the pits are excavated are recorded archaeologically.



- Site
- Extents of Williamson Leasehold
- 1907 Army Survey
- 1994 Microgravity Tunnel Survey
- 2017 microgravity survey negative Bouguer anomaly (area of lower density ground) potentially related to a feature such as a tunnel
- Anecdotal evidence for tunnel entrance
(Whittington-Egan, R (1968) Liverpool Characters and Eccentrics, p. 14)
- Tunnels based on numerous sources from the Friends of Williamson Tunnels, May 2018



PROJECT TITLE:
 Land at Elm Grove, Edge Hill,
 Liverpool, Merseyside

DRAWING TITLE:
 Site Plan showing location of suspected
 Williamson Tunnel features

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| DATE: 30/09/19 | DRAWN BY: ECMG | FIGURE: 3 |
|--------------------------|--------------------------|----------------------------|



The broad characteristics of the number, size, orientation and distribution of the boreholes and test pits were considered to be appropriate and were agreed in advance with MEAS.

Post-Demolition Phase

The evaluative works during this phase were proposed as follows:

12 no. trial pits to further characterise soils for contamination and re-use

3 no. trial pits to inspect foundation formation of Smithdown Court

4 no. trial trenches to test for the presence/absence, orientation of potential Williamson tunnels.

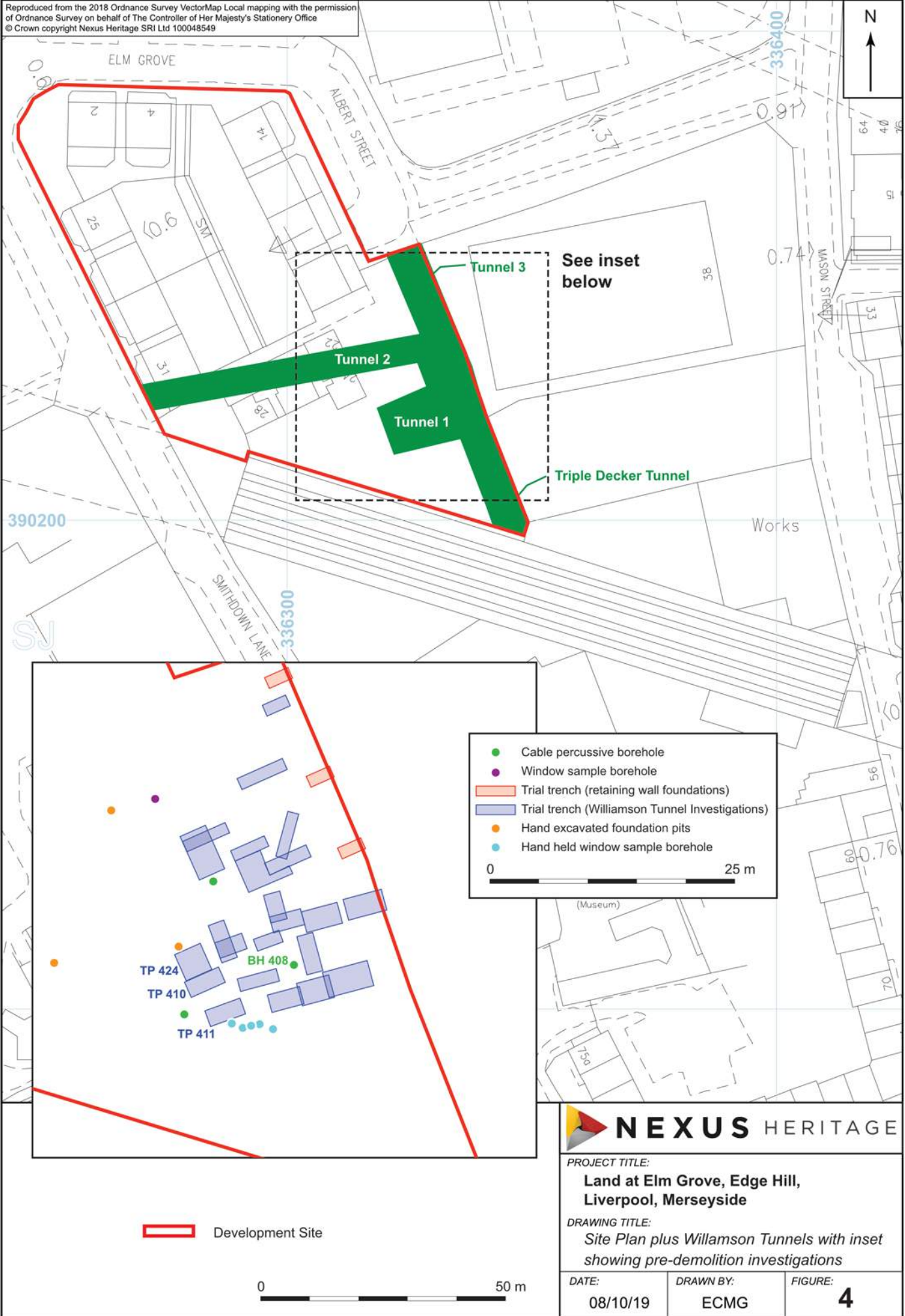
The proposed locations of the boreholes and trial pits/trenches are shown in an array as shown on Figure 5.

In the event Nexus observed the excavation of five of the trial pits (Figure 6) located to further characterise soils for contamination and re-use. Nexus Heritage was not present for excavation of the three trial pits to inspect foundation formation of Smithdown Court or the four trial trenches to test for the presence/absence, orientation of potential Williamson tunnels or the 16 additional rotary open hole borehole probes.

The actual locations of the pre-demolition and post-demolition boreholes and trial pits/trenches are shown in an array as shown on Figure 6.

Laser Survey

In order to augment the invasive investigations a laser survey was commissioned from Geoterra



NEXUS HERITAGE

PROJECT TITLE:
 Land at Elm Grove, Edge Hill,
 Liverpool, Merseyside

DRAWING TITLE:
 Site Plan plus Williamson Tunnels with inset
 showing pre-demolition investigations

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| DATE: 08/10/19 | DRAWN BY: ECMG | FIGURE: 4 |
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N 390296131
E 336308610



Elm Grove

Retaining Wall

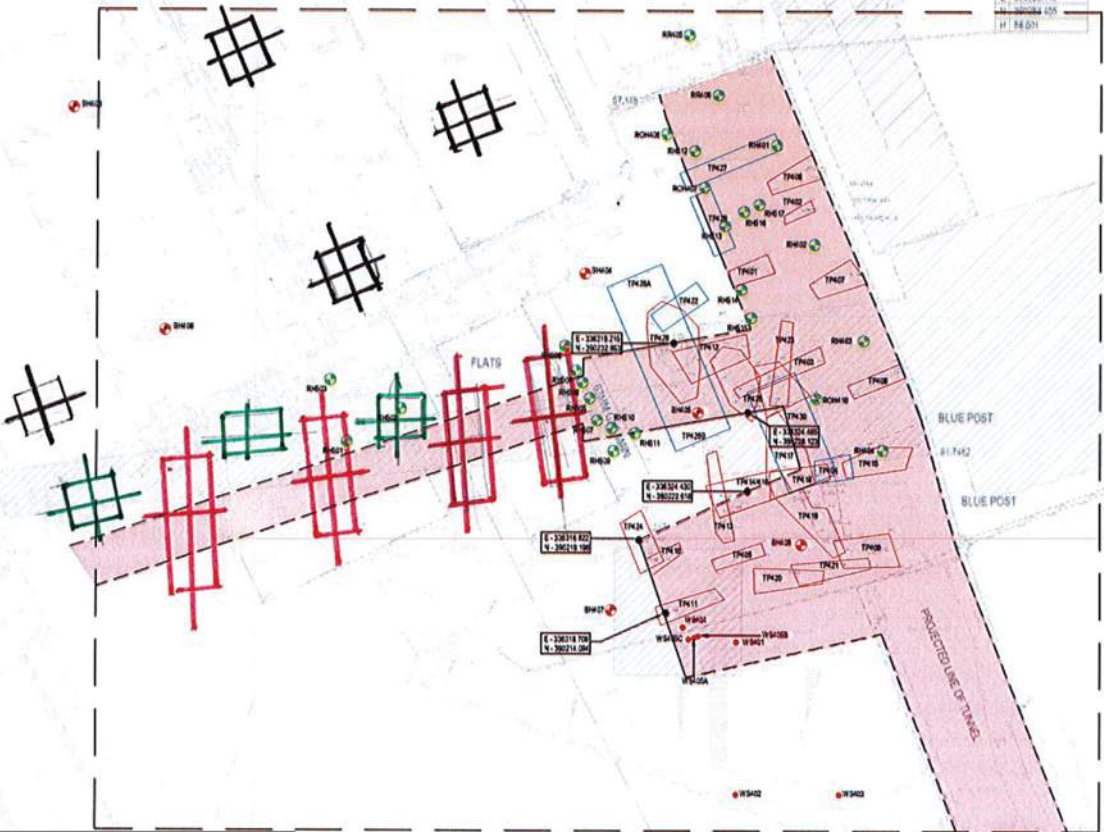
+55.10
+56.0
+55.80




+51.80 +55.08 +54.95 +55.80 +59.0 +58.0

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N 3902
E 3363

E 330206 140
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H 1 RE001



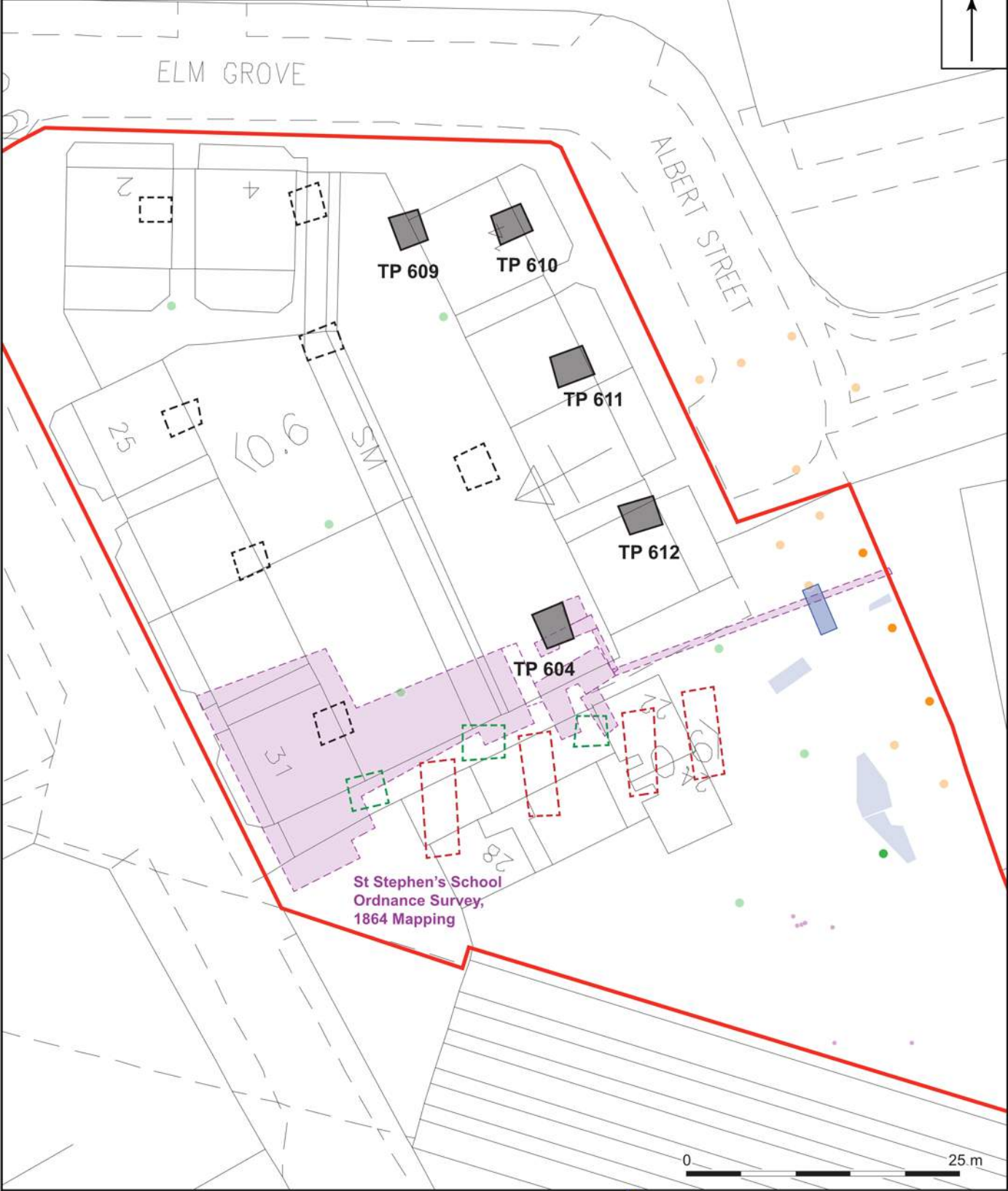
 Trial Pit to Further characterise soils for Contamination + Re-use.
 Trial Pit Foundation Formation Inspections
 Trial Trenches to Further Delineate Tunnel Extents.



PROJECT TITLE:
Land at Elm Grove, Edge Hill, Liverpool, Merseyside

DRAWING TITLE:
Site Plan Showing Locations of Proposed Post-Demolition Boreholes, Trial Trenches, and Trial Pits

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| DATE: 30/09/19 | DRAWN BY: ECMG | FIGURE: 5 |
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- Development Site
- Cable percussive borehole (Williamson Tunnel Evidence)
- Cable percussive borehole (no Williamson Tunnel Evidence)
- Rotary Open Hole Borehole (Williamson Tunnel Evidence)
- Rotary Open Hole Borehole (no Williamson Tunnel Evidence)
- Trial trench (Williamson Tunnel Evidence)
- Trial trench (no Williamson Tunnel Evidence)
- Observed post-demolition Trial Pit
- Post-demolition Trial Pit
- Post-demolition Foundation Formation Pit
- Post-demolition Trial Trench



| | | |
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| PROJECT TITLE: Land at Elm Grove, Edge Hill, Liverpool, Merseyside | | |
| DRAWING TITLE: Actual Locations of Boreholes, Trial Trenches & Trial Pits | | |
| DATE: 08/10/19 | DRAWN BY: ECMG | FIGURE: 6 |



RESULTS

Preamble

Archaeological attendances were maintained during two stages of pre-demolition geotechnical explorations during January and February 2019 and one stage of post-demolition geotechnical explorations during September 2019. It is understood that further stages of pre-demolition geotechnical explorations were undertaken up to 17th April 2019. There were no archaeological attendances during any geotechnical explorations between 22nd February and 17th April 2019. It is also understood that Network Rail undertook some investigatory work on site and that this work revealed a tunnel which collapsed and was subsequently made safe. Nexus Heritage has no data on the location of this work or the tunnel that was revealed.

It is confirmed that where Nexus Heritage was in attendance, the archaeological investigations were carried out in accordance with the agreed *Written Scheme of Investigation* and in compliance with the applicable standards published by the Chartered Institute for Archaeologists.

It is confirmed that multiple subsurface features have been identified which are consistent with infilled and partially infilled Williamson tunnels. From a geotechnical perspective the tunnels and the material filling them are classified as made ground and the maximum depth below ground level (bgl) to which tunnel fill was observed was 20.00m. That these tunnels may adjoin and have as yet unrealised physical and temporal relationships is a reasonable assumption to make, but the nature of any interconnections and relationships cannot be predicted with any certainty.

Baseline Observations

Evidence for tunnel structures and/or infilling materials/voids was identified in 12 of the pre-demolition trial pits and four of the pre-demolition rotary open hole boreholes. Evidence ranges from brick-built arches, to 'cuttings' within the sandstone bedrock into which infilling material had accumulated. Of course, the brick-built arches are strong evidence of the presence of a tunnel while the allocation of infilled 'cuttings' as tunnels is less secure, but given the precautionary principle, is a not unsafe inference.

Evidence for tunnel structures and/or infilling materials/voids was identified in none of the post-demolition trial pits but within five of the post-demolition rotary open hole boreholes evidence consistent with tunnel structures and/or infilling materials/voids was identified.

The Identification of Tunnels and Some Notes on Individual Tunnels

In order to avoid confusion the identification and labelling of tunnels on this document will concur with that as reported in the Curtins' document *Paddington Place Plot 2, Liverpool (Pre-Demolition) Phase 2 Site Investigation*:

The 'Triple Decker Tunnel'

Tunnel 1

Tunnel 2

Tunnel 3

The 'Triple Decker Tunnel'

The tunnel commonly known as the 'Triple Decker Tunnel' is known to be present at the south-eastern portion of the site, orientated approximately NNE-SSW. Historic mapping, historic accounts and informed conjecture by the Friends of Williamson's Tunnels suggests the tunnel extends towards the south-eastern boundary of the site where it was severed by the railway cutting. The presumed eastern extent of the tunnel is obscured by a concrete structure, at the surface (Plate 1).



Plate1: Concrete structure obscuring the eastern extent of the 'Triple Decker Tunnel'

A not unreasonable assumption is that the base of the tunnel would be expected at a similar depth to the base of the sandstone cutting in which the Liverpool – Manchester railway line is present. The stopped-up continuation of the 'Triple Decker Tunnel' is visible in the southern side of the sandstone cutting (Plate 2), defined by ashlar blocks.



Plate 2: The stopped-up continuation of the 'Triple Decker Tunnel'



Mr N. Farnworth of Curtins advises that geotechnical work undertaken by Murphy on behalf Network Rail in 2017 identified the 'Triple Decker Tunnel' from a depth of approximately 54.30m AOD and at the location of the exploratory hole was estimated 9m wide from east to west. The tunnel contains a 2.00m deep void between 54.30m – 52.30m AOD, beneath which is infilling material. The location of the exploratory hole is not known to Nexus Heritage and further investigation in this area is not possible due to restrictions imposed by Network Rail.

As will be seen below and on Fig. 6 a tunnel on a northern continuation of the alignment of the 'Triple Decker' has been proved within the site – Tunnel 3.

Tunnel 1 (Trial Pits 410, 411 and 424 and Borehole 408)

Previous evidence for Tunnel 1 is restricted to some basic information which only permits indicative identification of a tunnel at a 'point' location, rather than a confident estimation of a tunnel and its alignment. The on-site observations from early 2019 confirm that 'Tunnel 1' aligns approximately east to west. The top of the tunnel is identified by a brick-built arch spanning north to south. The top of the tunnel was recorded at a range of depths bgl between 3.10m – 4.50m (52.30m – 51.50m AOD). The western edge of the tunnel was identified and the arch is present directly east of a vertical cutting into the sandstone. There is a void, of variable thickness, present beneath the brick arch between 1.60m and 1.70m. The material infill of the tunnel was a dark brown and reddish brown slightly clayey gravelly fine to coarse sand.

The sandstone was identified at 20.00m bgl, and this is notable as it is consistent with that of the 'Triple Decker Tunnel' to the south-east. The interpretative plot of the observations shows the presumed extent of Tunnel 1 and the 'Triple Decker Tunnel'. And highlights the difference between the mapping produced by the Friends of The Williamson's Tunnels and the on-site observations from early 2019.

Information provided Mr. N. Farnworth of Curtins confirms that during the third phase of the pre-demolition geotechnical investigation works not observed by Nexus Heritage a ground collapse occurred over Tunnel 1. The tunnel collapse was coincident with the site of third party works not instigated by Curtins or Morgan Sindall. Additional investigation works were undertaken by the third party to identify the cause of the subsidence. The tunnel crown in a portion of the west of the tunnel was found to have collapsed, infilled by made ground soils from above. Nexus heritage is advised that this was a partial collapse, and part of the arch crown in the centre of the tunnel was proven to still be intact, with likely voided ground below.

Tunnel 2 (Trial Pits 425, 426, 428, 428A and 430, Borehole 405 and Rotary Open Probes ROH505, ROH507, ROH508 and ROH510).

The presence of a tunnel at the target locations was mapped by the British army between 1882 and 1907. The putative tunnel was predicted to extend westwards across the site from its eastern boundary all the way to the western boundary at Smithdown Lane. Curiously the army mapped the tunnel width contracting soon after a short length entering the site from the east and continuing in its diminished extent to the west.

The geotechnical investigations confirmed the presence of a 'cutting' into the sandstone bedrock consistent in location with the army map of the tunnels. Sandstone bedrock was encountered between depths of 3.90m – 4.80m bgl (51.90m – 50.90m AOD). The edge of the sandstone cutting corresponding to the narrower length as mapped by the army was clearly seen and it was approximately 6.00m in width. Tunnel evidence was not identified in the area where the wider portion was anticipated and so the presence and horizontal dimensions of any cutting at this location remains unproven.

The made ground deposits identified within the cutting, extended to a maximum depth of 10.00m bgl (45.80m AOD). The material characteristics of the made ground were broadly consistent with the substance of the near surface deposit, comprising loose brown, dark brown and reddish

brown slightly clayey slightly silty gravelly fine to coarse sand, with fragments of brick, concrete, rare ash, sandstone and occasional cobbles of brick and concrete. Infrequent instances of yellow sandstone boulders were recorded adjacent to the sandstone bedrock.

There was no evidence of a brick-built arch cover or sandstone blocks which represent key signifiers of a Williamson Tunnel. There are possibly at least four explanations for this - that the top cover of the tunnel may have collapsed, that the top cover may have been removed, that the tunnel was never provided with a cover and/or that the cutting is not a Williamson construction. Nevertheless, the recorded depth of made ground identified in TP403 and TP423 observed towards Tunnel 3 indicate some relationship between Tunnel 2 and Tunnel 3.

Tunnel 3 (Trial Pits 427 and 429, Boreholes 401, 402, 403, Rotary Open Probes RH 512, RH513, RH514 and RH515 and ROH512)

Projections based on historic data locate this tunnel on an approximate north-south alignment to the east of Albert Street and the retaining wall representing the eastern site boundary.

Observations made during the geotechnical investigation confirmed the existence of a tunnel to the west of the railway retaining wall, orientated on an approximate north-south alignment and in the absence of any contradictory data it is assumed that this evidence could refine and overturn the projections used by the Friends of Williamsons' Tunnels.

The evidence of tunnel construction was expressed as bricks and sandstone blocks forming an arch orientated approximately east to west. Evidence for a void space was noted between thicknesses of 1.10m - 2.40m. The infilling material is characterised as loose brown clayey silty gravelly fine to coarse sand, with gravels.

Sandstone bedrock was encountered and is assumed to be the base of the tunnel. Metrics for tunnel depth have an upper bound at 22m bgl (34.60m AOD) and a lower bound at 17.80m bgl (39.01m AOD).

The horizontal extent of the tunnel is suggested by the presence of sandstone bedrock to the west of the arch work and observations indicate the centre line of the tunnel (assumed to be the crown of the arch) is approximately 7.80m from the retaining wall along the eastern edge of the site. Possible evidence for damage to the tunnel structure was also identified when made ground consistent in character with tunnel infill was identified on the expected alignment to the north of the arch-work at depth of 5.40m bgl (51.00m AOD) and 5.70m bgl (50.80m AOD) which was below the crown of the observed arch-work. Therefore, it is possible that the tunnel cover had previously collapsed or been removed, in a situation similar to that interpreted in Tunnel 2.

Observations in other trial pits and boreholes along the projected alignment were either inconclusive with respect to tunnel identification or failed to encounter features or materials consistent with the presence of a tunnel. However, it should be noted that the investigations at the relevant locations were depth-limited and so it would be unwise to conclude that the tunnel does not extend beyond the verified positions.

The Geoterra laser survey obtained data on the void of Tunnel 3 via Probe ROH512. The location and extent of the void is shown in Fig. 7 and a series of four cross-sections is shown in Fig. 8. A series of eight digital 3D point-cloud screen-grabs of the void scanned in the tunnel at ROH512 is shown at Fig. 9. The point clouds are in RCS/RCP format for viewing in Navisworks and in LAS and can be requested from Morgan Sindall/Geoterra. Software for viewing RCS/RCP 3D data would be required. A low-res black and white infra-red video taken within the void through BH ROH 512 is available upon request to Morgan Sindall/ Geoterra.

Observations During Post-Demolition Geotechnical Investigations

Three of the five trial pits, the excavation of which was observed by Nexus Heritage were positioned in locations considered, approximately to coincide with a known or projected



alignment of a suspected Williamson tunnel. Anecdotal evidence from the second half of the 20th century indicates that there was a tunnel entrance, extending south-eastwards from Elm Grove, running parallel with Albert Street. The plotted location is far from certain (Fig. 3 above) and it may be a discrete tunnel or it may actually be a continuation of the Triple Decker. Trial Pits TP609, 610, 611 and 612 provided an opportunity to test for the presence/absence of features commonly associated with the existence of tunnels. For the purposes of comprehensive reporting the outcome of Trial Pit TP604 is also included. :

TP604

Made ground in the form of black/brown sandy gravel containing angular to sub-rounded and fine to coarse fragments of concrete, brick, timber and glass extending 2.20m bgl giving way to a deposit of loose brown/orange fill of angular cobbles of brick 0.30m thick. Beneath this deposit was an articulated brick floor 0.15m thick laid on top of a dark brown sandy gravel containing angular to sub-angular and fine to coarse demolition material including cobbles of angular brick. Excavation ceased within this material at 3.00m bgl. Two parallel, brick-built walls were also identified in this trial pit, surviving to a height of 16 courses. The observing archaeologist considers that neither the floor nor the walls were characteristic of Williamson tunnel capping or tanking and were likely to represent built elements of St. Stephen's School or 19th century residential dwellings at Hamilton Terrace. The anthropogenic debris within the made ground is likely to be demolition debris arising from the razing of St. Stephen's School and/or 19th century residential dwellings at Hamilton Terrace. However, the possibility that brickwork at the upper levels of Williamson Tunnels can take the appearance of cellar walls, especially within small scale excavations must be taken into account when offering interpretations of subterranean structures in this part of Liverpool.



Plate 3: TP604, North-East Facing Section of TP604 showing brick-wall

TP609

Made ground of dark-grey clayey-sand with frequent inclusions of sandstone fragments, brick fragments (whole and partial bricks) Orange brown sandstone at 2.40m bgl. Excavation ceased at 2.80m bgl. No evidence of any voids or any other features which could be said to be evidence of Williamson tunnels. The made ground is likely to represent demolition debris arising from the razing of St. Stephen's School and/or 19th century residential dwellings at Hamilton Terrace.



Plate 4: TP609, North-East Facing Section

TP610

The deposit to a depth of 2.70m bgl is characterised as made ground – a dark grey-brown clay silt with frequent inclusions of brick. Excavation extended c. 0.50m into an orange-brown clay silt above sandstone bedrock. Excavation ceased at 3.20m bgl. A single-skin brick wall was observed in the south-east facing section, at least 0.5m high. Unfortunately the depth at which the wall outcrops was not recorded. The wall is not characteristic of Williamson tunnel structure and is likely to represent built elements of St. Stephen' School or 19th century residential dwellings at Hamilton Terrace. The anthropogenic debris within the made ground is likely to be demolition debris arising from the razing of St. Stephen' School and/or 19th century residential dwellings at Hamilton Terrace. However, the possibility that brickwork at the upper levels of Williamson Tunnels can take the appearance of cellar walls, especially within small scale excavations must be taken into account when offering interpretations of subterranean structures in this part of Liverpool.





Plate 5: TP610, south-east facing section with brick wall partially visible.

TP611

The deposit to a depth of 2.50m bgl is characterised as made ground – a dark grey-brown clay silt with frequent inclusions of brick, mortar and crushed sandstone. Excavation extended c. 0.30m into an orange-brown clay silt above sandstone bedrock. Excavation ceased at 2.80m bgl. No evidence of any voids or any other features which could be said to be evidence of Williamson tunnels. The made ground is likely to represent demolition debris arising from the razing of St. Stephen's School and/or 19th century residential dwellings at Hamilton Terrace.



Plate 6: TP611, South-west facing section

Land at Elm Grove, Liverpool
October 2019

3429

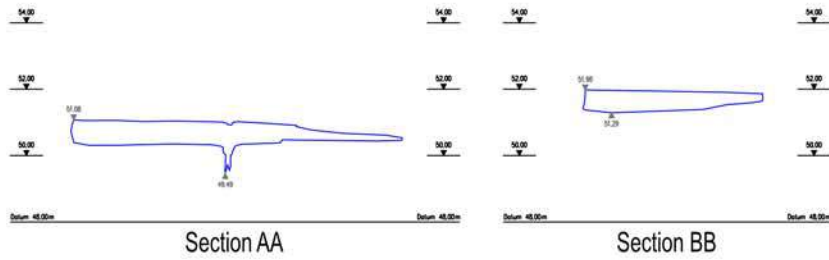
TP612

The location of this trial pit was moved to the south-east as a spoil heap occupied the proposed location. A deposit extending 2,80m bgl was identified as made ground comprising a dark-grey brown clay silt with inclusions of brick rubble and mortar. Below this was a crushed red sandstone representing the degraded outcropping of the sandstone bedrock within which excavation ceased at 3.00m bgl. No evidence of any voids or any other features which could be said to be evidence of Williamson tunnels. The made ground is likely to represent demolition debris arising from the razing of St. Stephens's School and/or 19th century residential dwellings at Hamilton Terrace.



Plate 7: TP612, North-West Facing Section





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Paddington Village, Plot 2

Paddington Village, Plot 2

Liverpool, L7 3ES

MH | CAD: JO | Checked: MH | Rev:
 Date of Survey: 05/07/19 | Reference: G19134

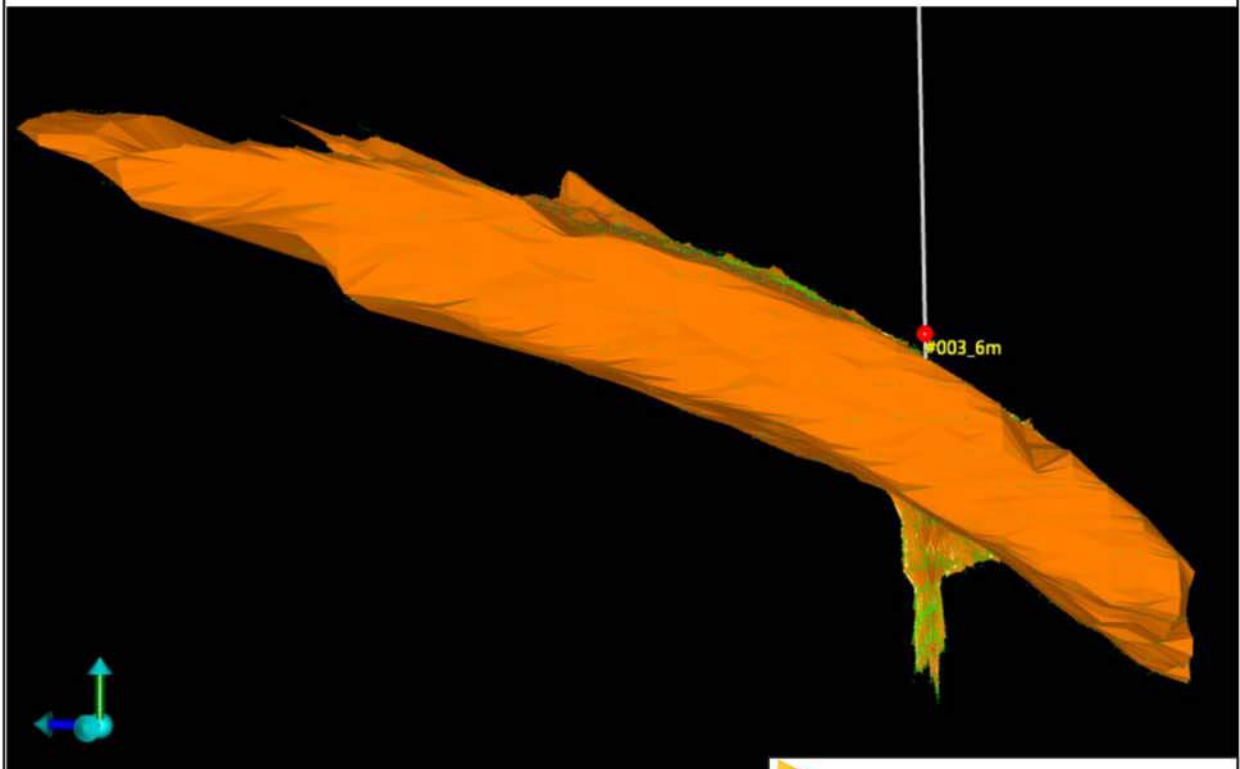
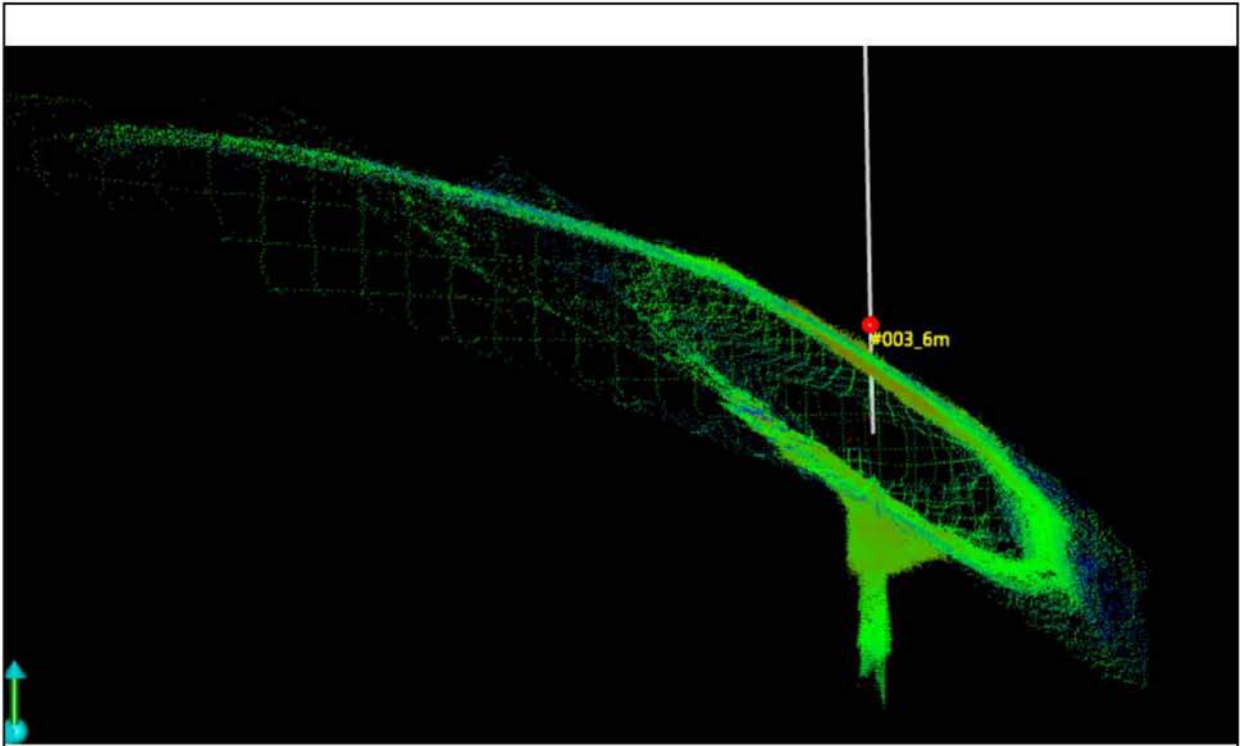


PROJECT TITLE:
**Land at Elm Grove, Edge Hill,
 Liverpool, Merseyside**

DRAWING TITLE:
Geoterra Laser Scan Cross Sections

| | | |
|-------------------|-------------------|---------------------|
| DATE: 30/09/19 | DRAWN BY: ECMG | FIGURE: 8 |
|-------------------|-------------------|---------------------|





PROJECT TITLE:
**Land at Elm Grove, Edge Hill,
 Liverpool, Merseyside**

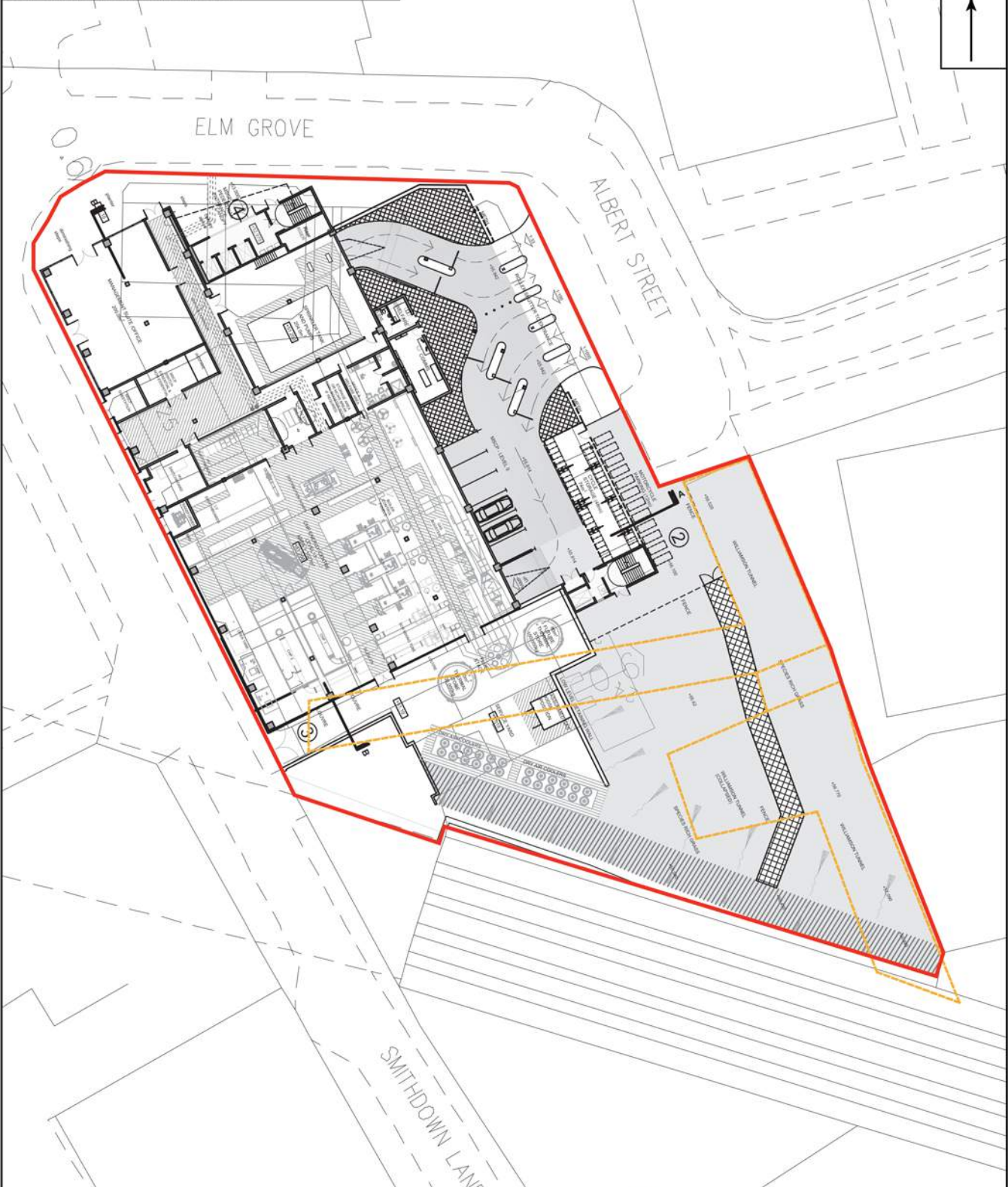
DRAWING TITLE:
*Geoterra 3-D Point-Cloud Screen-Grabs of the Void
 Scanned in the Tunnel (Possible Continuation of the
 'Triple Decker') at ROH512*

DATE:
 30/09/19

DRAWN BY:
 ECMG

FIGURE:
9

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-  Development Site
-  Williamson Tunnel as observed



PROJECT TITLE:
 Land at Elm Grove, Edge Hill,
 Liverpool, Merseyside

DRAWING TITLE:
 Site Plan as proposed Overlain with Plot of
 Williamson Tunnel Locations and projected Alignments

| | | |
|--------------------------|--------------------------|-----------------------------|
| DATE: 30/09/19 | DRAWN BY: ECMG | FIGURE: 10 |
|--------------------------|--------------------------|-----------------------------|



HEALTH AND SAFETY

No incidents or accidents to report.

DISCUSSION AND CONCLUSIONS

Reliability of Field Investigation

During the works the weather was generally dry and clear, and ground conditions remained benign throughout. However, the granular character of the made ground contributed to immediate collapse of trench/pit side walls and so clear observation and recording of sub-surface strata was slightly compromised. Where present, sub-surface features were nevertheless, well defined and easily identifiable.

The level of opportunity for securing empirical data provided by the geotechnical explorations combined with the results of the laser scan survey, suggests the archaeological evaluation can be considered to provide a reliable assessment of the presence/absence and condition of Williamson tunnels where Nexus Heritage was on site. The laser scan survey was not included as an evaluative prospection technique in the Written Scheme of Investigation, but in the absence of the proposed microgravity survey it represents an advantageous body of data. The excavation of three trial pits to inspect foundation formation of Smithdown Court and four trial trenches to test for the presence/absence, orientation of potential Williamson tunnels undertaken without the presence of an archaeologist means that potential for the project to provide archaeological data encompassing the entire geotechnical investigation is compromised.

Objectives and Results

The aims and objectives of the evaluation are detailed above within Section 2. In summary, the aims were to ground-truth the results of the desk-based assessment and establish the presence or absence of any sub-surface features or deposits displaying characteristics consistent with a positive identification as Williamson tunnels.

By and large the objectives have been met in that fabric of Williamson tunnel infrastructure was identified and the knowledge of tunnel presence and condition in the area of site expanded. This knowledge contributes to a greater understanding of the extent of the Williamson tunnel complex. The addition of laser scan outputs to the data set is of considerable value to consideration of the extent and charter of the Triple Decker Tunnel and/or another tunnel on a parallel, but separate alignment. However, the absence of an archaeologist for the excavation of seven investigatory trial-test pits means that the data set is deficient.

Interpretation and Significance

It is confirmed that the results of archaeological and geotechnical observations have been assessed and appraised by Nexus Heritage. The accuracy of the interpretive narrative and graphic representation of actual and predicted locations and extents of sub-surface features is within the bounds of expectation for an archaeological evaluation undertaken in association with a suite of invasive and non-invasive geotechnical investigations.

As discussed above, the results allow a conjecture to be advanced that the tunnel known as 'Triple Decker tunnel' continues on or intercepts an adjoining tunnel on the same approximate north-south alignment, from the railway cutting through to the site boundary at Albert Street. These lengths of tunnel/tunnels articulate in some way with two other cuttings/tunnels of varying size, depth and construction on an orthogonal projection to the west. This is a provisional interpretation based on investigations to date and it is possible that further unrecorded tunnels may exist on site or possible deviations to the presumed extents may be present.

Historically, Williamson tunnels, or subterranean features considered to be Williamson tunnels have been identified in a piecemeal manner and have sometimes been mapped as distinct, isolated features. This work provides persuasive, if not compelling data to suggest that the cuttings and covered tunnels consistent in location and form with Williamson tunnels are likely to adjoin.

It is understood that the design of the proposed multi-storey car park and combined heating and power energy centre has been modified to take account of the presence of Williamson tunnels and in this regard the project is informed by and takes into account the best interests of the archaeological resource represented by the Williamson tunnels. FIGURE 10

In response to the archaeological assets represented by the identified tunnels and in order to remove a potential impact on one of the tunnels, the separate, stand-alone energy centre has now been incorporated within the footprint of the multi-storey carpark. With respect to the engineering solutions required in order to establish a viable foundation solution for the carpark every effort will be made to avoid impact to tunnel fabric by means of bridging over tunnels in order to utilise rock bearings. In addition, the empirical data available to date on the existence of tunnels has been used to take into account of the existence of as yet unobserved tunnels the presence of which can be reasonably predicted on the basis of what has been observed.

In the light of the data on the presence/absence and condition and character of Williamson tunnels secured during the geotechnical investigations any unavoidable impacts to the fabric of tunnels can be formally identified and quantified. Subsequent to this, engineering solutions required in order to establish a viable foundation solution for the carpark can advance towards design freeze and, where required by the Council, a suite of archaeological mitigation measures can be devised for review by the Council and, if considered necessary, deployed. It is the Council's responsibility to detail the nature of any archaeological mitigation strategy. However, such a strategy may include some form of archaeological investigation, perhaps in tandem with measures to ensure the survival and stability of tunnels that can remain *in situ* and processes to ensure that the construction of the carpark does not lead to off-site effects on Williamson tunnels, especially those to the north of the site currently under investigation by the Friends of Williamson's Tunnels.

This report is sufficient in scope and contents to provide confidence to the Council that:

- the archaeological investigation of the site (when an archaeologist was in attendance) was carried out in accordance with the agreed WSI and the applicable industry standards as promoted by the Chartered Institute for Archaeologists. For those investigations when an archaeologist was not in attendance there was a breach of the Council's requirements for archaeological oversight and recording. This breach is ameliorated by the keen observations and excellent records kept by Curtins;
- the results of the archaeological evaluation have been reported accurately;
- the evolving proposals for the design of the foundations and other subterranean elements of the scheme continue to take proper account of the desirability to avoid direct and/or indirect harm to Williamson Tunnels;
- mitigation measures to avoid damage to Williamson Tunnels are under consideration and that where an ad hoc design solution can be brought to bear to ensure such avoidance consideration is given to consequential harm to areas of the site where no tunnels are expected to exist, but where they may exist; and
- where harmful impacts are unavoidable an informed approach can be taken to measures that the Council may wish to see enacted for archaeological mitigation.



SOURCES

Curtins, 2017, *Paddington Place, Liverpool, Phase 1 Preliminary Site Assessment*. Unpublished document, ref. B063878.200/MH/8356

Curtins, 2019, *Paddington Place Plot 2, Liverpool (Pre-Demolition) Phase 2 Site Investigation*. Unpublished document, ref. 066623-CUR-00-XX-RP-GE-002-V02.

Nexus Heritage, 2018, *Land at Elm Grove, Liverpool (18F/1967) - Archaeological Desk-Based Assessment*. Unpublished document ref. 3419.R01

Nexus Heritage, 2019, *Land at Elm Grove, Liverpool (18F/1967) – Brief Summary on an Archaeological Evaluation (Pre-Demolition Phase)*. Unpublished document ref. 3429.R02

Sources Identified but Not Consulted

Murphy/Network Rail 2017, *Smithdown Lane Investigation. Project no. R101.44*. (specifically Drawings Refs. R101.44-3000 to R101.44-3018)

