GeoArch

Report 2024/05

Geophysical Surveys at Purlon Farm, Llantwit Major, Vale of Glamorgan

Dr Tim Young
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(Replaces report 2023/05)

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Dr T.P. Young

Abstract

Geophysical surveys by magnetic gradiometry and ground resistivity were conducted across fields off the Wick Road belonging to Purlon Farm.

The survey revealed evidence for three ring ditches, each 18-20m in diameter and interpreted as ploughed-out barrow. At least one showed geophysical evidence for survival of some mound material and two show very slight topographic expression as mounds.

There was also evidence for a range of linear features (ditches) defining some large land divisions and merging into a complex of very low amplitude anomalies, barely above background, that are tentatively suggestive of a curvilinear central enclosure (36m x 28m), fringed by other enclosures over an 100m across. The tentative plan is not unlike that of a newly discovered 'banjo' enclosure near Boverton, but the low amplitude of the anomalies gives a low degree of confidence in the identified features. The longer, more rectilinear elements resemble those seen around the Moorlands settlement to the N.

In the SW part of the survey area, 19th and 20th century mapping shows that two former subdivisions of the field had opposing rounded 'dog-leg' deviations when approach Wick Road. LiDAR data shows a ridge or terrace between these two areas suggesting a former (pre-1840) land division 150m wide (NW-SE) and extending up to 55m into the present field. The rounded corners of this former field were suggestive of those of a Roman military site. No indication was present in the geophysical survey for this boundary being associated with ditches, and a simple narrow roadside field is indicated.

Contents

Methods

Survey rationale and background

The survey was undertaken as a component of a research project to investigate the landscape archaeology of the Llantwit Major area. The surveys were conducted as the field element of Cardiff University Archaeology Department's module HS2202 Geophysical Surveying with a field season in late February to early March of each year. Surveys are undertaken within the CIfA (2014) and EH (2008) guidelines. The survey was undertaken with the assistance and encouragement of the Llantwit Major Local History Society.

The second half of the 2023 course entailed surveys on land belonging to Purlon Farm, to investigate a ring ditch identified as a cropmark visible on Bing aerial imagery and a linear cropmark corresponding to a feature also visible on LiDAR.

The solid geology of the survey area for 2023 was the Porthkerry Member of the Blue Lias Formation (Lower Jurassic). The area is mapped by BGS as having no superficial deposits.

The surveys were conducted in February/March 2023, under good weather conditions.

The survey was conducted with the kind permission of Mr Dave Powell.

Survey layout

The survey was laid-out using a Trimble survey-grade RTK GPS system (5700 base station and 5800 rover). A temporary base-station was located near the NW margin of the area. The survey was staked out to design locations at 20m intervals of National Grid using the Trimble 5800 rover (Figure 1). The grid pegs were positioned to within 40mm of the relative design location reported by the GPS. The survey was post-processed using the *convert-to-rinex* and *rinexweek* utilities, to produce rinex files from the logged GPS data and from the nearest 6 OS-Net stations, backdated to permit baseline process in *Trimble Geomatics Office*. The resultant GPS accuracy means that all grid locations are known to within 50mm.

The survey design is illustrated on Figures 1 on the modern basemap.

LiDAR topographic base

The base mapping for the survey was provided by the publicly-accessible 1m pixel LiDAR dataset (http://lle.wales.gov.uk/GridProducts#data=LidarCompositeDataset). The DTM data were download as ASCII files, imported into *Surfer* for imaging. The LiDAR data are illustrated in Figure 21 (illuminated from the NW).

Magnetic gradiometry

Magnetic gradiometry was undertaken with two Bartington Grad 601 Dual fluxgate gradiometers. Data were collected at 0.125m intervals on traverse 2m apart, giving an effective traverse interval of 1.0m (singe density; a data grid of 0.125m x 1.0m). Grids were walked on South to North traverses in a zig-zag pattern over the whole survey area. The central section of the survey was repeated with traverses walked in an East to West direction to aid in the imaging of the circular features. Data were downloaded from the instruments, assembled and cleaned using DW Consulting's '*Terrasurveyor Lite v3*' software. The grids were assembled, the data clipped and the destriping function employed for data in which there was an imbalance between the two gradiometers.

The data were then exported from *Terrasurveyor* and interpolated to a 0.125m node-spacing using Golden Software's *Surfer* package to reduce pixilation where required.

Ground resistivity

The ground resistivity surveys were undertaken with two setups:

- a Geoscan RM15 resistivity meter, operating a 'parallel twin electrode' configuration, employing three electrodes with 0.5m probe spacing on a PA5 frame, via an MPX15 multiplexer.
- a Geoscan RM15 resistivity meter, operating a 'parallel twin electrode' configuration, employing two electrodes with 0.5m probe spacing on a development model of the GST frame (kindly loaned by Tim Southern).

For the Geoscan PA5 frame/MPX15 combination, the adjacent mobile electrode pairs had a 0.5m spacing (giving the main component of the response from 0.5-0.7m depth), with 0.5m between centres, to give a 0.5m effective traverse interval. The outer probes therefore had a 1.0m spacing (giving the main component of the response from 1.0-1.5m depth), with a 1.0m traverse interval. Data were collected as a series of three measurements (left 0.5m-, right 0.5m-, 1.0m-spaced). Data were collected with a 0.5m sample interval (i.e. the raw 0.5m-spaced data has 0.5 x 0.5m node spacing and the 1.0m-spaced data has a 0.5 x

1.0m node spacing). Grids were walked on South to North traverses in a zig-zag pattern.

Data were downloaded from the instrument and collated using Geoscan Research's '*Geoplot*' software. The left and right datasets at 0.5m mobile probe spacing were merged into a single composite.

For the GST frame, the data were collected at 0.5m intervals on 0.5m-spaced traverses, walked in parallel. Data were downloaded from the instrument and collated using Geoscan Research's '*Geoplot*' software.

Data processing for both setups was then limited to one or two passes of the 'despike' function in Geoplot, with radius set to 1 and a threshold of 3 std. dev., using Gaussian statistics.

Data were then exported from Geoplot and imported to Golden Software's 'Surfer'. The data were gridded by kriging to a node-spacing of 0.125m for production of the final, less pixelated, image.

Use of this report

The techniques chosen for the survey, magnetic gradiometry and ground resistivity, were selected for their utility in detecting a wide range of feature types. As with any geophysical technique, it is always possible for archaeological features to be present, but not to be distinguished, or distinguishable, by variation in the physical properties being examined at the time of survey – in this case magnetic susceptibility and water content. Absence of detectable geophysical anomalies cannot be taken as indicative of the absence of archaeological features. All anomalies have been interpreted as far as possible, with contrasting possible interpretations given where appropriate. Geophysical techniques cannot provide an unambiguous evaluation of buried features. Where a higher degree of certainty is required, physical ground-truthing of any geophysical anomalies resolved by the survey will be required.

Results

Magnetic gradiometry

The quality of the magnetic data was generally good, but some areas are of lower quality (resulting from user inexperience). The contrasts between anomalies interpreted to be of archaeological origin and the background was often rather low, leading to uncertainty in the interpretation and even the identification of anomalies.

The magnetic gradiometer data from the N-S walked survey are presented in Figures 2 to 6, from the E-W walked survey in Figures 7 to 11 and a dataset formed by merging the two in Figures 12 to 16.

Ground resistivity

The quality of the ground resistivity data was good, but the data are very variable and the contrast of features and background poor, probably reflecting a variable subsoil or weathered rockhead.

The ground resistivity data are illustrated in Figure 17 (Geoscan frame at 0.5m mobile probe spacing), Figure 18 (Geoscan frame at 1.0m mobile probe spacing), and in Figure 19 (GST frame at 0.5m probe spacing).

The three different probe systems produced very different patterns of resistivity distribution.

Interpretation

Geology

The geology of the site is represented in the magnetic data mainly by a series of SSW-NNE linear anomalies (the major elements are in gold colour on figures 24 and 25), the most substantial of which is up to 4m in width. These are interpreted as zones of weathering associated with a prominent joint set that has been imaged on most of the adjacent surveys. This lineation is best imaged in the north and west of the site.

The resistivity data show a markedly different background in the NE part of the area surveyed with those techniques (figures 17-19). The boundary between the lower resistivity to the east is approximately the same as the line over which the linear magnetic anomalies from the jointing disappear. This is interpretable by the rock head becoming progressively buried by a subsoil to the east of this line.

Post-medieval agriculture and services

Anomalies in the geophysical data that are interpreted as of being of modern/post-medieval origin are also indicated in figures 24-26. These include a mainly negative linear magnetic anomaly associated with a scatter of ferrous-type anomalies on the mapped line of the division between the northern historic fields (Tithe parcels 387 and 388; Figure 22). The boundary between the former fields to the south (Tithe parcels 388 and 389) is marked by a linear array of ferrous anomalies, but also shows a linear negative anomaly where it appears close to the western field margin. The negative magnetic anomalies may be generated by surviving remains of a stone field wall; the associated ferrous anomalies are interpretable as iron/steel debris from fencing materials.

In the southern most of the historic fields, a scatter of debris (brick or ferrous materials) has produced a high amplitude speckled anomaly (red tone on figures 24-26).

Another set of anomalies that are assumed to be associated with relatively young features are small areas of elevated magnetic gradient (centred upon [295489, 169544] and [295473, 169624]; purple tone on figures 24-26). The size and shape of these anomalies resemble those interpreted elsewhere in the area as former field ponds. Another possible pond or small quarry ([295531, 169626]) shows stronger internal magnetic anomalies and also appears as a visible depression in the LiDAR data; this is interpreted as a partially backfilled feature.

The zone along the western margin of the field shows a variety of magnetic anomalies (pale and dark blue on figures 24-26). A major and rather irregular, broad anomaly with both positive and negative components (dark blue on figures 24-26) can apparently be traced from [295424, 169702] to [295483, 169535]. The character of this anomaly is similar to some of those of geological origin but its course, neatly parallel to the modern road strongly suggests its anthropogenic nature.

The most prominent feature in the zone near the road is a segmented ferrous pipe (most likely therefore mains water) passing from [295400, 169687] to [295578, 169460]. The course suggests that this is an otherwise roadside pip that 'cuts the corner' in this area.

In the SW part of the survey area, 19th and 20th century mapping (Figures 22 and 23) shows that two former subdivisions of the field had opposing rounded 'dog-leg' deviations when approach Wick Road. LiDAR data shows a ridge or terrace between these two areas suggesting a former (pre-1840) land division 150m wide (NW-SE) and extending up to 55m into the present field. The rounded corners of this former field were suggestive of those of a Roman military site and provided one of the stimuli for the survey of this site. No indication was present in the geophysical survey for this boundary being associated with ditches, and a simple narrow roadside field is indicated. The form of the field suggests this may have been an early enclosure within a former open-field. The pipe described above runs along the line of the former boundary between [295469, 169599] and [295549, 169491].

Ring-ditches

Attention was drawn to this site by two cropmarks, one of which was an annular cropmark on a Bing aerial image that was current in Spring 2023. This ring-ditch appear entire and had a tangential NW-SE linear on its eastern side.

The geophysical surveys reveal the presence of three ring-ditches across the site (dark green on figures 24 and 27), here described as ring-ditches 1-3, from west to east. Ring-ditch 1 is that initially recognised on the aerial image.

Ring-ditch 1 – the details of this (see Figures 17-20 are somewhat problematic. The crop mark shows as a dark circle, approximately 17m EW and 18m NS. The three geophysical surveys (magnetic gradiometry, Geoscan resistivity and GST resistivity) all show a sub-circular feature, but they differ in detail as to its size and location. These confirm that the ring-ditch is centred upon [295517, 169660] and is approximately 18m in diameter, but it is possible that the resistivity surveys were mislocated by approximately 2m with respect to the site grid. Imaging of the ring-ditch by resistivity is less complete than by magnetics, indicating a poor contrast. The setting is further complicated by strong SSW-NNE geological anomalies (strongly imaged on the surveys with the GeoScan frame) and by the SW-NE ploughing (most strongly imaged by the GST Frame). The boundary of the putative subsoil layer (see above also passes SE-NW through the location of the ring-ditch.

Ring-ditch 2 – this is represented by an annular positive magnetic anomaly, 16m in internal diameter and 2m wide, centred upon [295537, 169730]. This ring ditch shows tangential linear anomalies to N and W (see below). There are three areas of raised magnetic gradient within the area enclosed. The area of Ring-ditch 2 shows as a very slight mound in the LiDAR data (Figure 21).

Ring-ditch 3 – This is centred upon [295656, 169633] and is shown as an annular positive magnetic anomaly 19m in internal diameter and 1.8m in width. There are two small areas of raised magnetic gradient close to the #E-W midline and there is a strong monopolar anomaly coincident with the ditch on the S side. The area of Ring-ditch 3 shows as a very slight mound in the LiDAR data (Figure 21).

Other possible features

Anomalies not explicable in terms of post-medieval activities or by the natural geology are illustrated in Figure 27.

Three group of anomalies are distinguishable:
- elements forming part of a rectilinear system of land division (dark brown on Figure 27)
- elements forming extensive WSW-ENE features (burgundy on Figure 27)
- elements forming a network of curvilinear anomalies (light brown and sand colour on Figure 27).

The rectilinear system shows no relationship with the other. They represent ditches apparently defining a very large area that is at a slight angle to the post-medieval field boundaries. The post-medieval boundaries show a slight reverse-S shape in plan and are therefore likely to be based upon medieval fields – the rectilinear system is therefore presumably earlier than that. A Roman or Iron Age date would not be unreasonable but is entirely conjectural.

The two WSW-ENE anomalies are grouped together because of their orientation, but they have rather different characters. The southern example (from [295583, 169517] to [295708, 169566]) is represented by a narrow continuous positive magnetic anomaly. Although it crosses the southern part of the rectilinear system, it is approximately perpendicular to the northern part of the E part of the rectilinear system (e.g. around [295586, 169708]) - and it is possible that it is a part of the same system of large land divisions.

The northern example (from [295490, 169654] to [295611, 169693]) is broader and more diffuse, becoming more intermittent before disappearing eastwards. These are characters that might be more reasonably be associated with a source within the geology, that is progressively buried by the subsoil downslope.

The curvilinear anomalies are also problematic to interpret. Several elements appear to radiate from ring-ditches 1 and 2, but away from these foci the curvilinear elements are of extremely low amplitude, barely above background. Although the low amplitude anomalies closely resemble anomalies produced by archaeological ditches, car must be taken in the light of a survey at Boverton which produced evidence that similar anomalies there were produced by the stepped edges of discrete bedrock limestone beds. At Purlon, the plan of the anomalies strengthens the case for an archaeological interpretation, but a bedrock explanation might be appropriate for the very minor curvilinear anomalies around [295458, 169720] and [295572, 169693].

There seem to be reasonable grounds for interpreting at least some of the linear positive anomalies in the region of ring ditches 1 and 2 as archaeological ditches. They would appear to suggest possibly a central enclosure between the two ring-ditches, with a zone of peripheral enclosures that includes the ring-ditches. The southern side of this potential enclosure may be associated with the northern side of the large rectilinear enclosure, with the apparently cross-cutting natura of the NW linear element being a superposition of the south side of the enclosure with plough lineations on the same alignment as the rectilinear.

Discussion

The evidence for the nature of the underlying geology ties in closely with the neighbouring Moorlands site (Young 2020b). On that site the bedrock showed the production of very strong anomalies along the major joints, but this disappeared rapidly SW into the valley hosing the Dimlands enclosure. The Purlon survey shows a similar feature but associated with the NE side of the ridge. The intensity of the bedrock anomalies at Moorlands may be due to the loss of the overlying soil from intensive agriculture.

The survey produced evidence for three ring ditches, all with a size (16-120m diameter) that means they are likely to be Bronze Age barrows (as opposed to roundhouses or hayricks, which are usually smaller). Their size is closely comparable with other examples in the immediate area: the outer ditch of the Morfa Round Barrow has a diameter of 19.5m (Young 2016), the barrow excavated by NMW at Great House, Llanmaes had an anomaly 18m in diameter (Young 2007), one surveyed at Boverton (Young 2020a) was 18m in diameter, but the cluster to the SE of the enclosure at Llanmaes were smaller (two at 11m, one at 16m diameter; Young 2008). The location of the barrows close to the boundary between the drier areas of bedrock and the lower-lying damper areas is also a feature of the examples mentioned above; none of these examples lies on a substantial ridge crest.

There was also evidence for a range of linear features (ditches) defining some large land divisions and merging into a complex of very low amplitude anomalies, barely above background, that are tentatively suggestive of a curvilinear central enclosure (36m x 28m), fringed by other enclosures over an 100m across. Unambiguous interpretation of these anomalies is not possible.

The major rectilinear elements resemble some of the features seen on the Downs and Caermead sites to the N (Young 2021 and 2016 respectively; Figures 28 and 29). An Iron Age to Roman date for these features is likely but speculative.

The tentative plan is not unlike that of a newly discovered 'banjo' enclosure near Boverton (Young 2024), but any comparison is hampered by the low degree of confidence in the identified features at Purlon, because of low amplitude of the anomalies.

References

Chartered Institute for Archaeologists 2014. *Standard and guidance for geophysical survey.*

English Heritage 2008. *Geophysical Survey in Archaeological Field Evaluation.*

Young, T.P. 2007. Geophysical Survey at Llanmaes, 2007 season. *GeoArch Report 2007/16*, 6pp.

Young, T.P. 2008. Geophysical Survey at Llanmaes, 2008 season. *GeoArch Report 2008/19*, 5pp.

Young, T.P. 2016. Geophysical Surveys at Caermead Roman Villa, Llantwit Major, Vale of Glamorgan. *GeoArch Report 2016/07*. 32pp.

Young, T.P. 2020a. *Dr DG Smith memorial project, geophysical survey 3: land south of Boverton*. GeoArch Report 2020/02, 29pp.

Young, T.P. 2020b. Geophysical survey at Moorlands Farm, Llantwit Major, Vale of Glamorgan. *GeoArch Report 2021/08*. 32pp.

Young, T.P. 2021. Geophysical survey of land near The Downs, Llantwit Major, Vale of Glamorgan. *GeoArch Report 2021/08.*

Figure Captions

Figure 1: basemap: modern OS digital mapping, with grid peg locations (crosses) and GPS base-station (red circle) (base mapping © Crown copyright 2016 Ordnance Survey; an EDINA supplied service).

Figure 2: magnetic gradiometry (+1nT white to -1nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 3: magnetic gradiometry (+2nT white to -2nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 4: magnetic gradiometry (+4nT white to -4nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 5: magnetic gradiometry (+8nT white to -8nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 6: magnetic gradiometry (+16nT white to -16nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 7: magnetic gradiometry, E-W traverses (+1nT white to -1nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 8: magnetic gradiometry, E-W traverses (+2nT white to -2nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 9: magnetic gradiometry, E-W traverses (+4nT white to -4nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 10: magnetic gradiometry, E-W traverses (+8nT white to -8nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 11: magnetic gradiometry, E-W traverses (+16nT white to -16nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 12: magnetic gradiometry, merged data (+1nT white to -1nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 13: magnetic gradiometry, merged data (+2nT white to -2nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 14: magnetic gradiometry, merged data (+4nT white to -4nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 15: magnetic gradiometry, merged data (+8nT white to -8nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 16: magnetic gradiometry, merged data (+16nT white to -16nT black) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 17: ground resistivity, 0.5m probe spacing on Geoscan Frame, grey scale as shown

Figure 18: ground resistivity, 1.0m probe spacing on Geoscan Frame, grey scale as shown

Figure 19: ground resistivity, 0.5m probe spacing on GST frame, grey scale as shown

Figure 20: magnetic gradiometry, merged data (+2nT white to -2nT black) same area as resistivity

Figure 21: LiDAR image illuminated from NW

Figure 22: Extract from Tithe Map of c. 1840

Figure 23: OS First Edition mapped in 1878 (base mapping © Crown copyright 2016 Ordnance Survey; an EDINA supplied service).

Figure 24: all picked anomalies, for details of colour see text (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 25: anomalies believed to be of geological origin (gold) or post-medieval (blue, red, purple), for details of colour see text (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 26: anomalies believed to be of post-medieval age(blue, red, purple), for details of colour see text, displayed on the 1st Edition OS base mapping of c.1878 (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 27: picked anomalies not immediately interpretable as either geology or as post-medieval features. Green = ring-ditches, dark brown = rectilinear ditch system, burgundy = WSW-ENE anomalies, pale brown = low amplitude positive magnetic anomalies, sand = extremely low positive magnetic anomalies) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 28: Compilation of magnetic gradiometer results for the area surrounding the Purlon Farm site (after Young 2016, 2020b, 2021) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

Figure 29: Simplified interpretation of geophysical survey results for the area surrounding the Purlon Farm site. Black = ditches, red = ring ditch (Bronze Age barrows), green = major enclosures near water sources with internal ditch/external bank (after Young 2016, 2020b, 2021) (base mapping © Crown copyright 2023 Ordnance Survey; an EDINA supplied service).

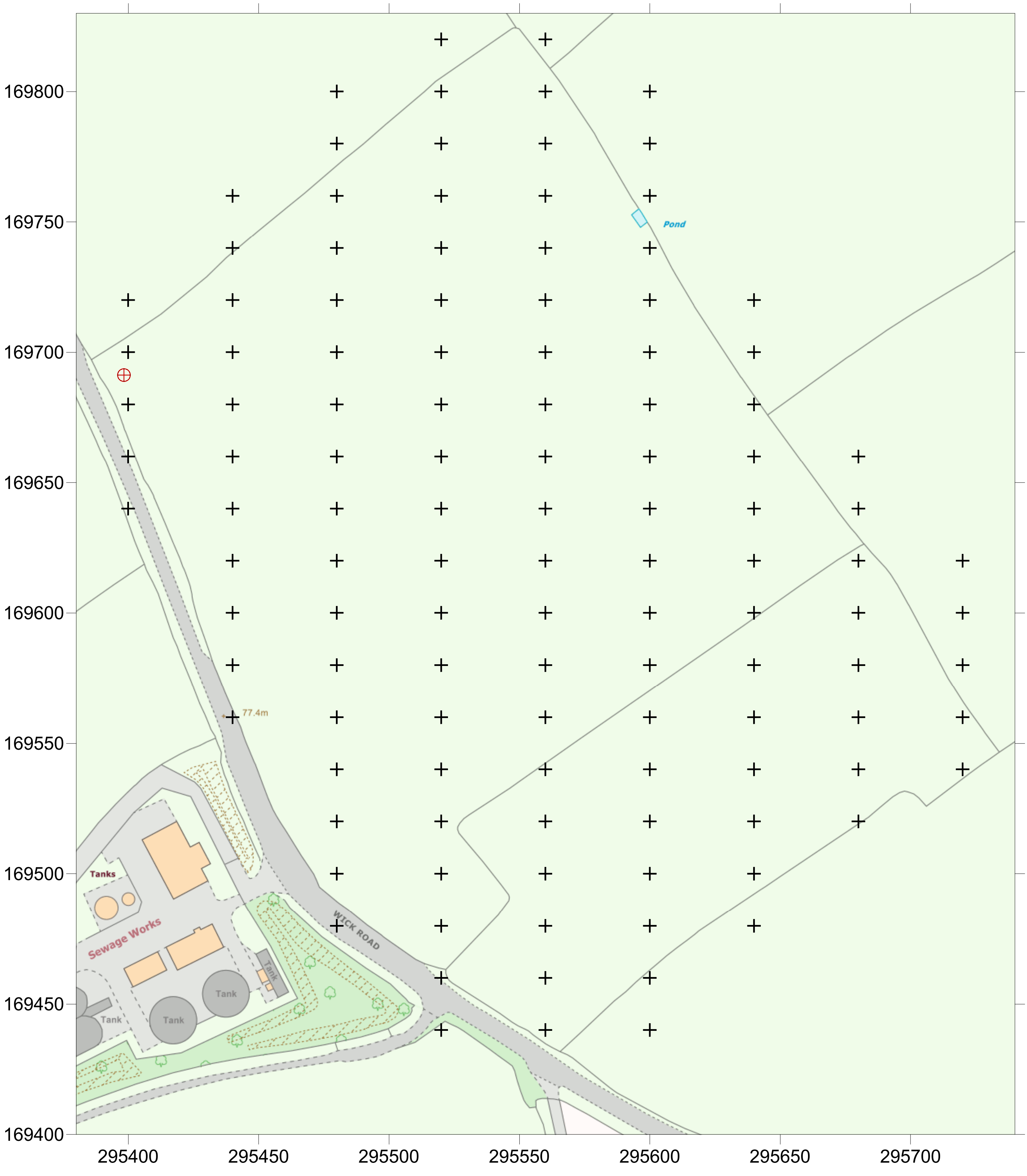
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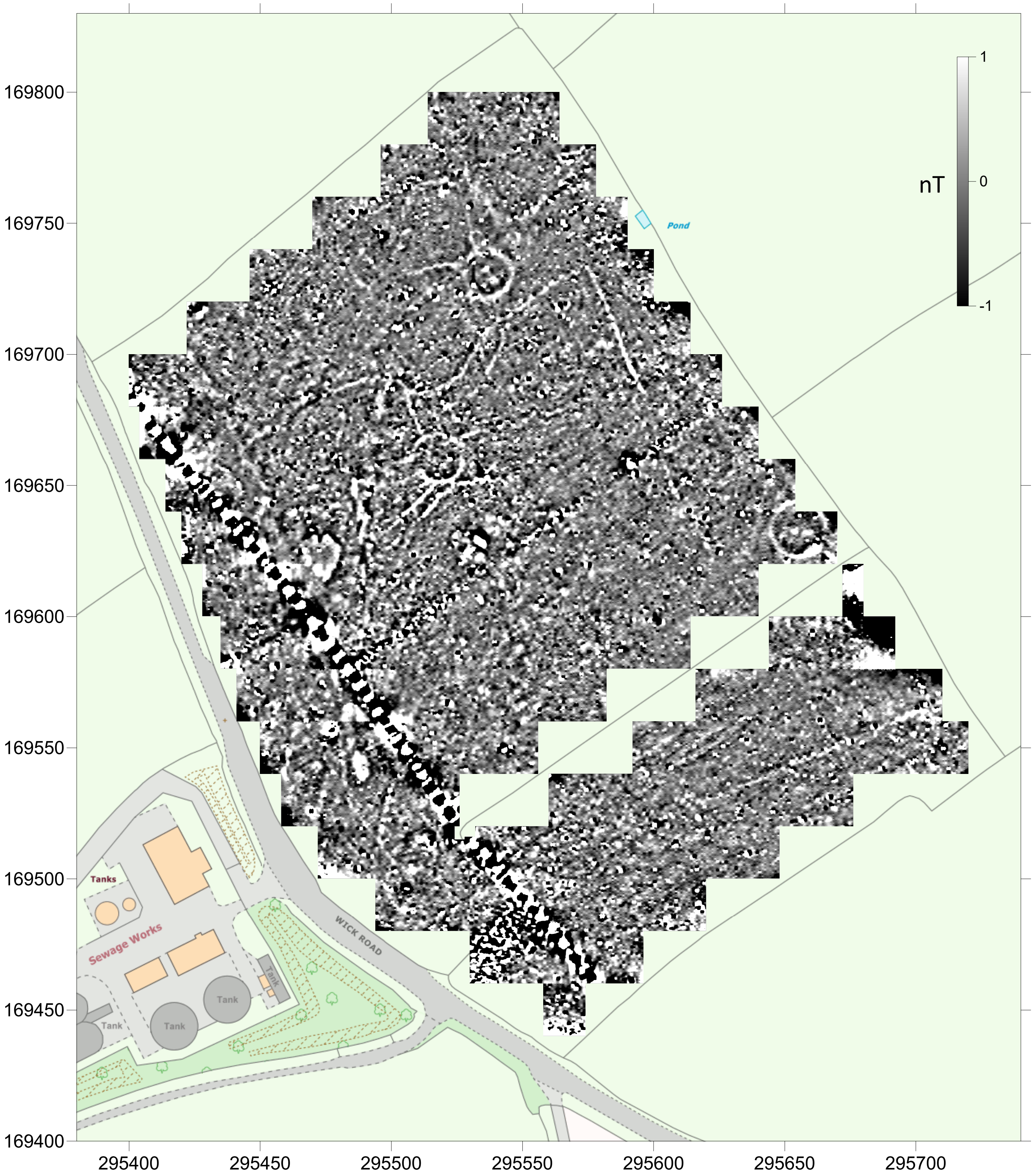
Figure 2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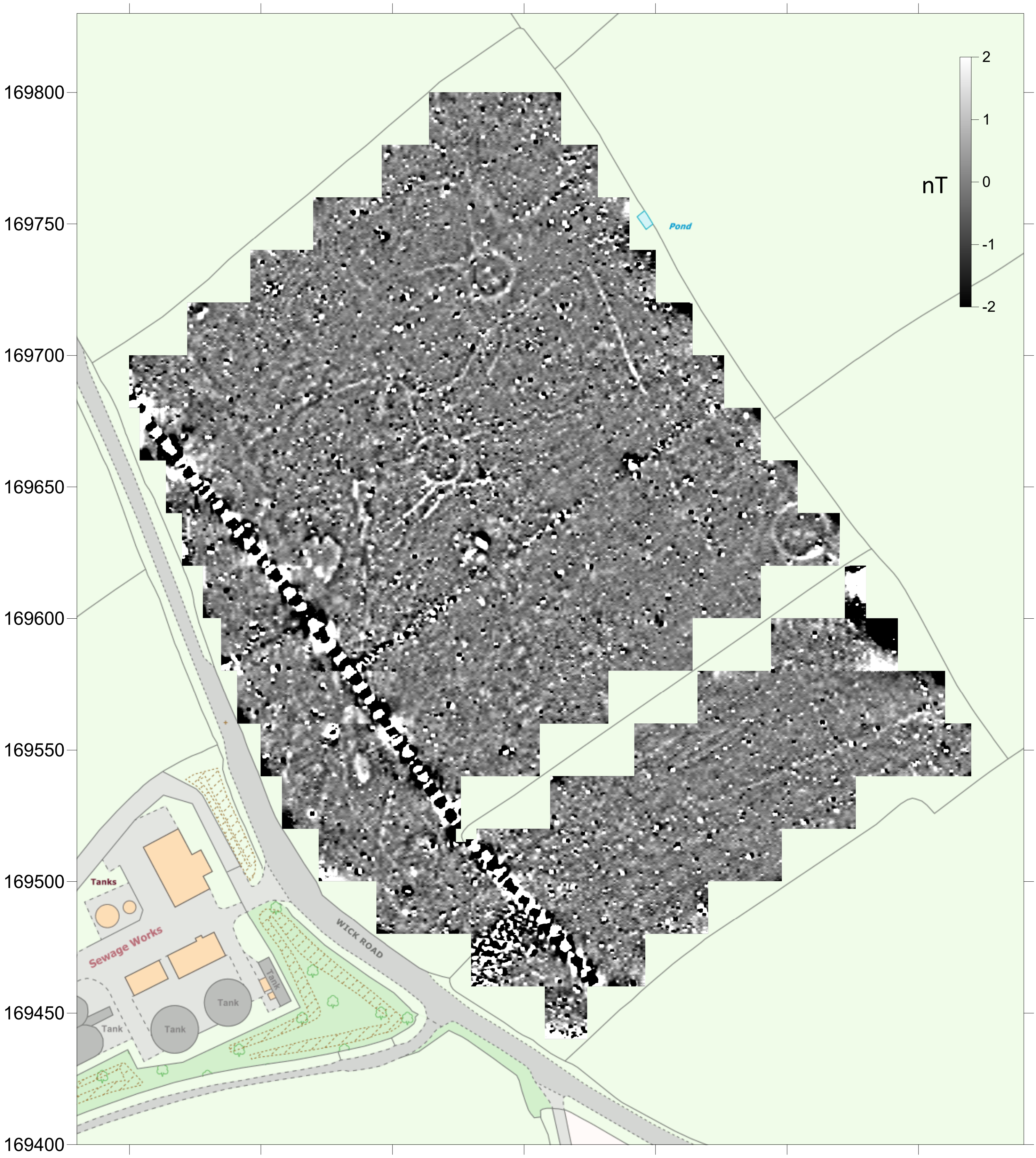
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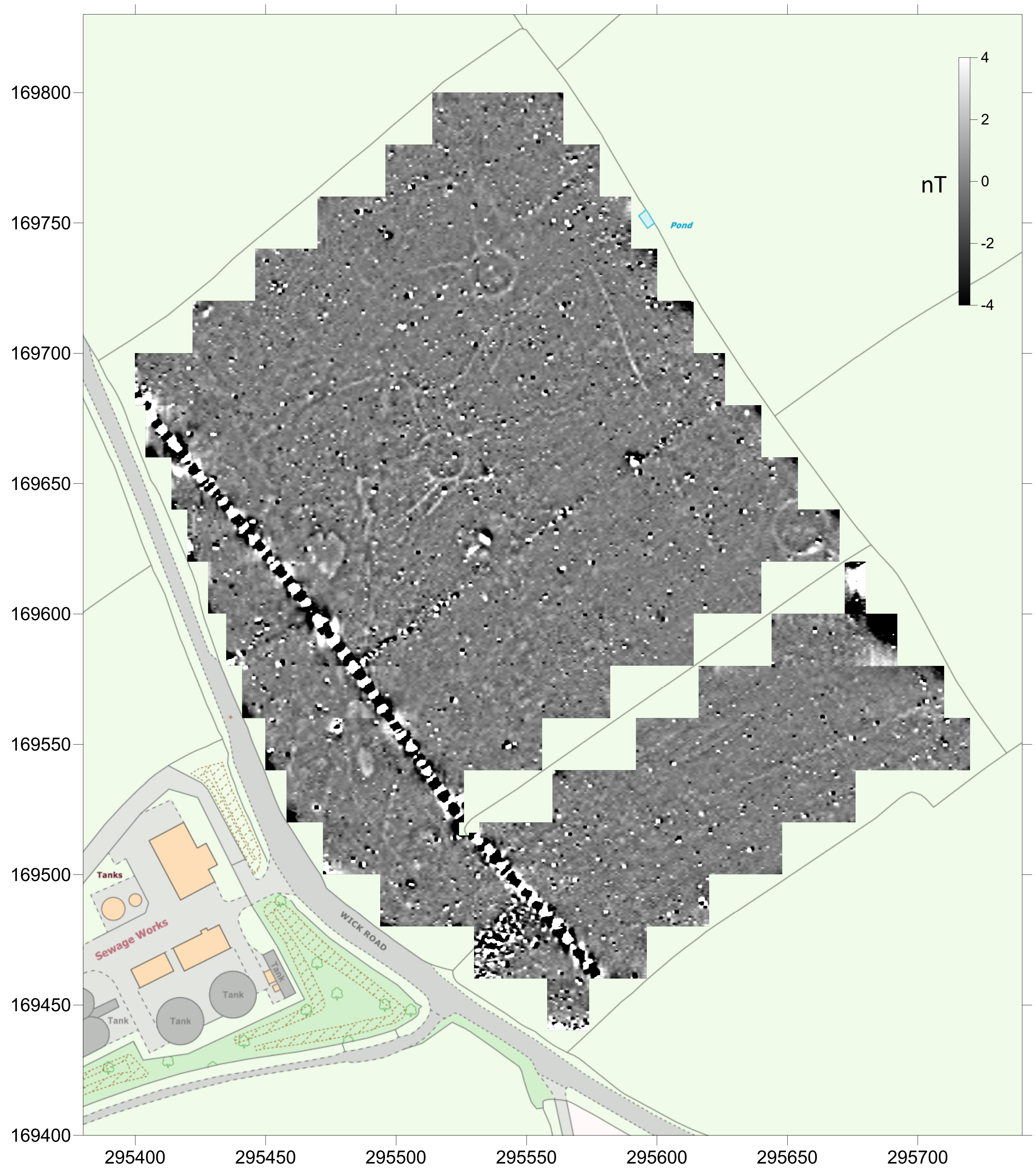
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Figure 5

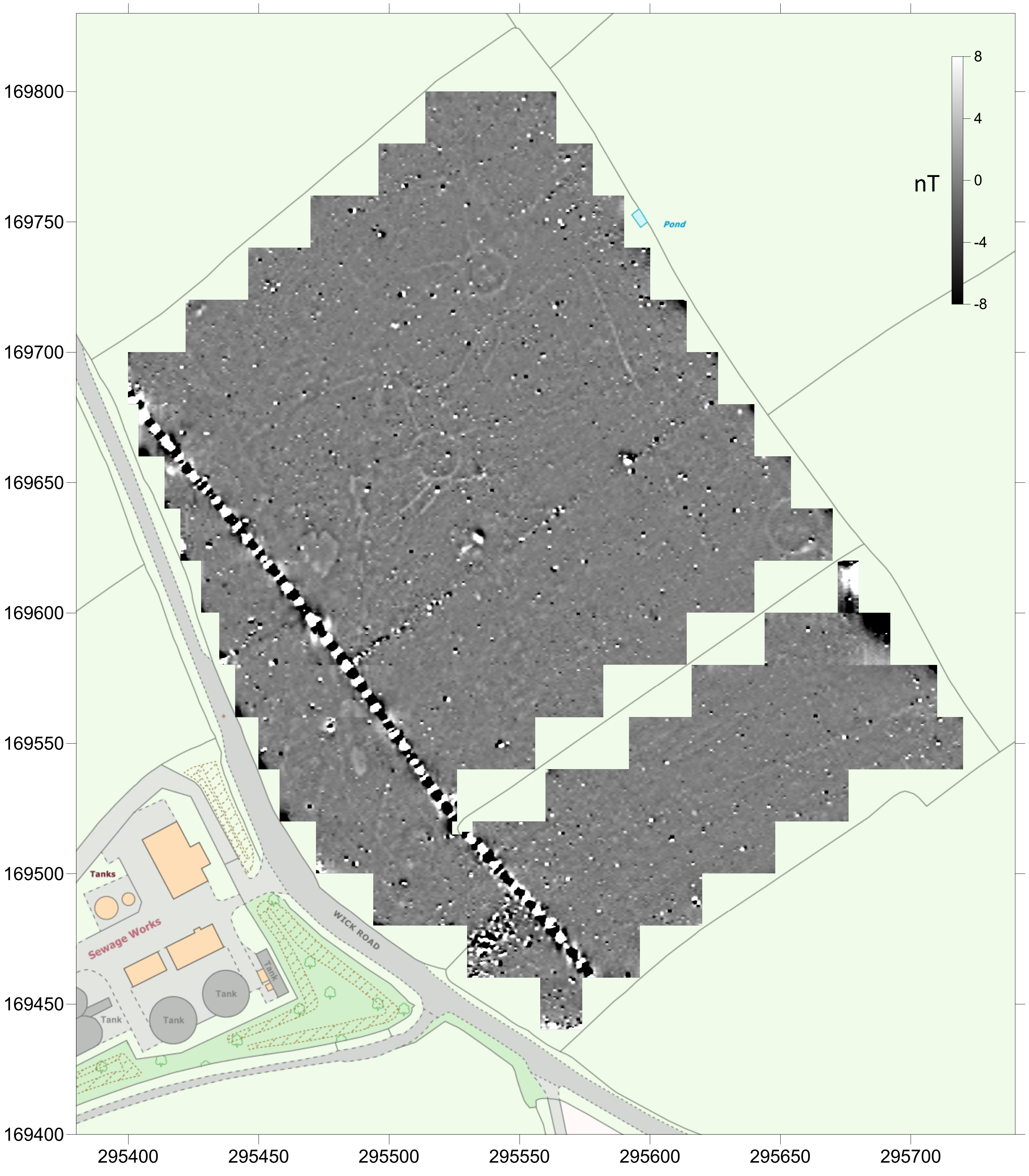
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Figure 6

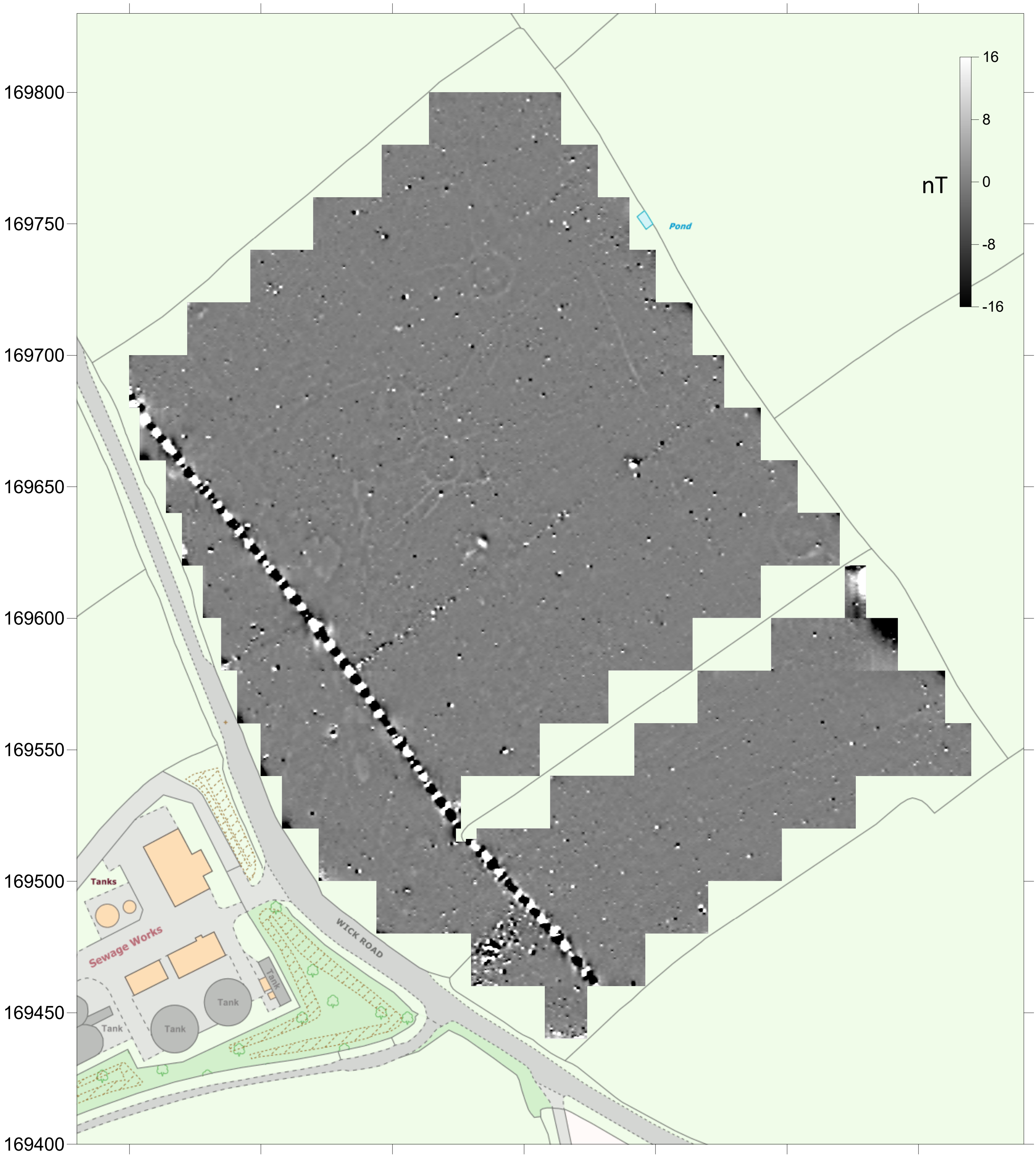

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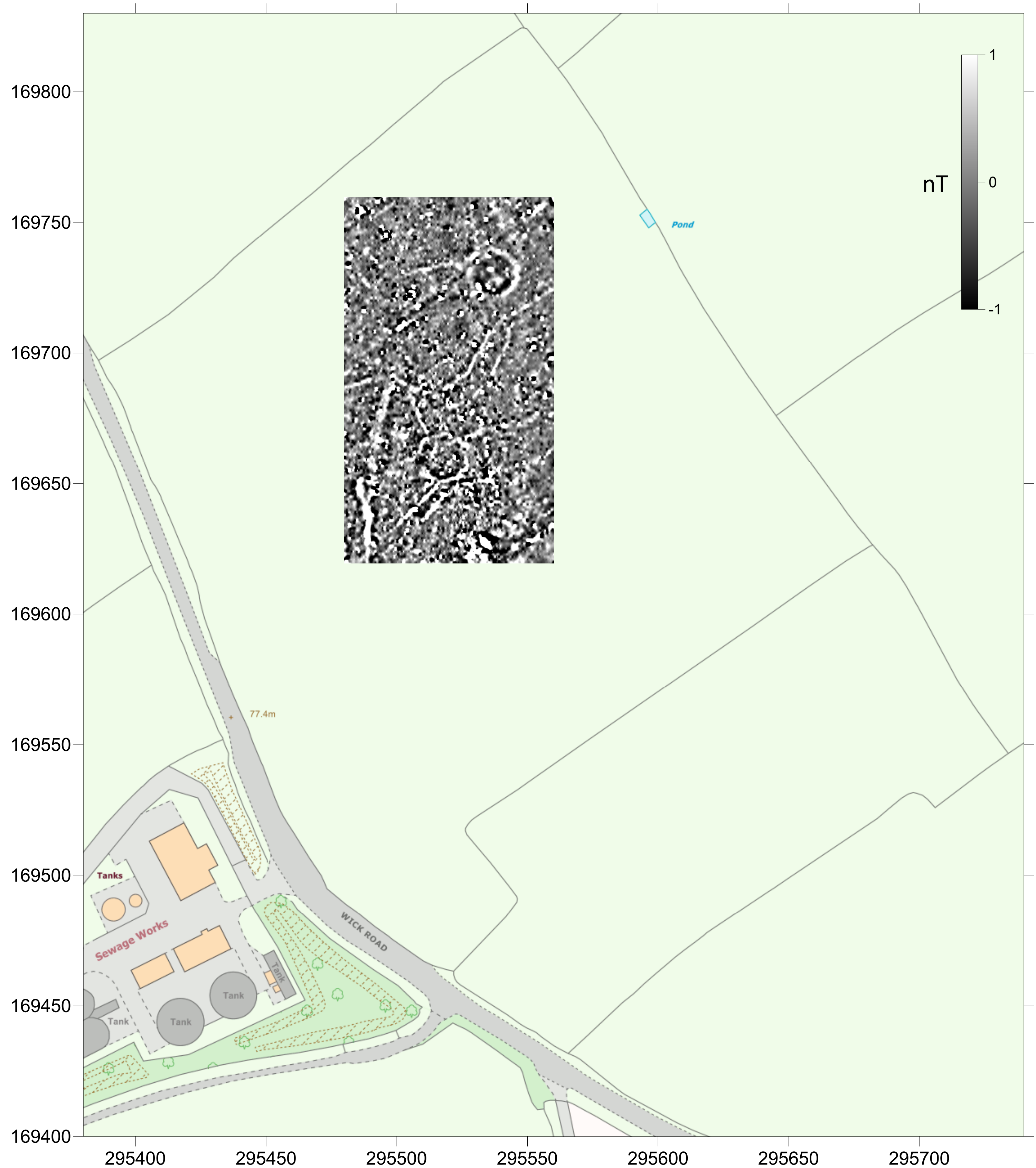
Figure 7



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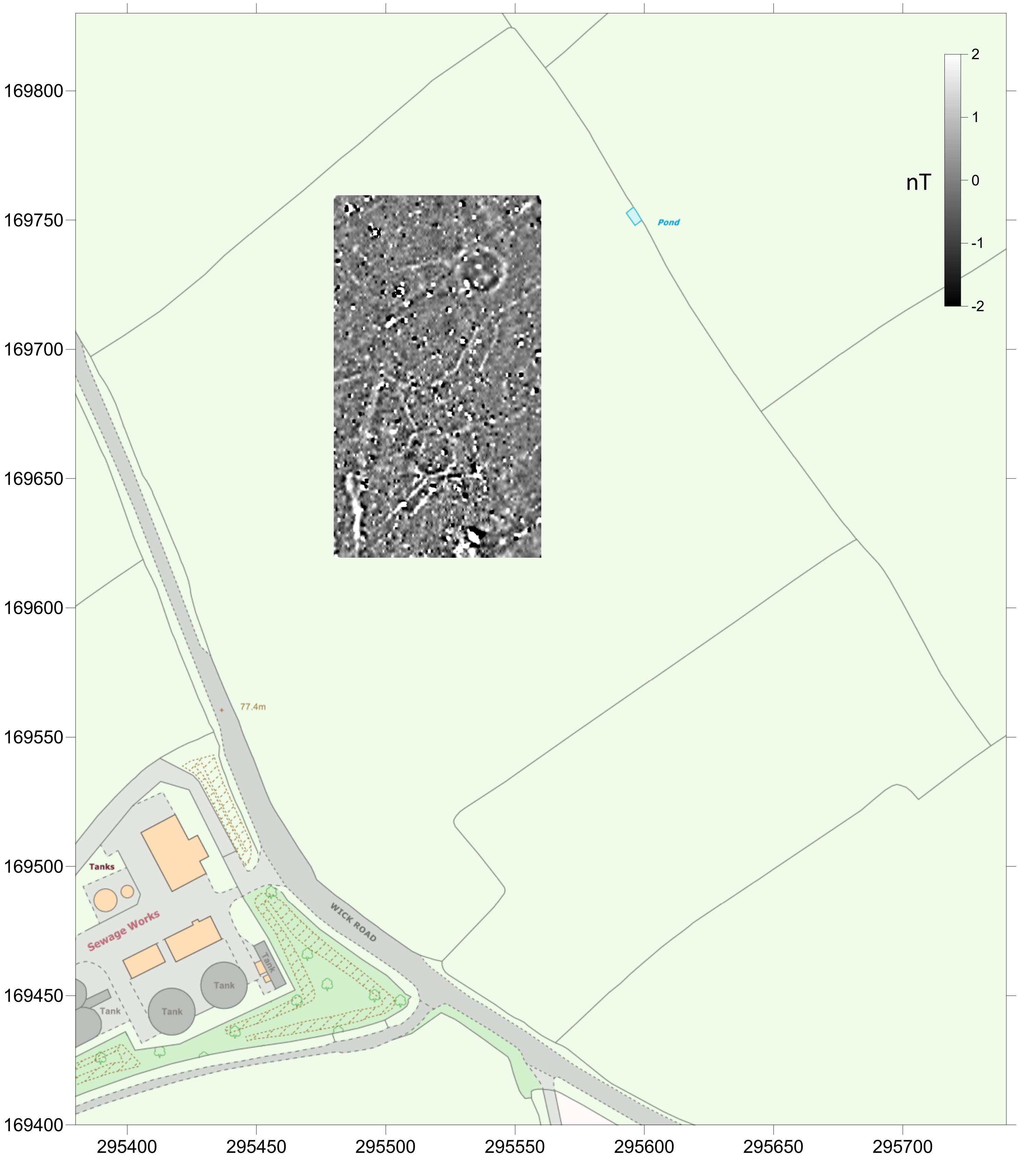
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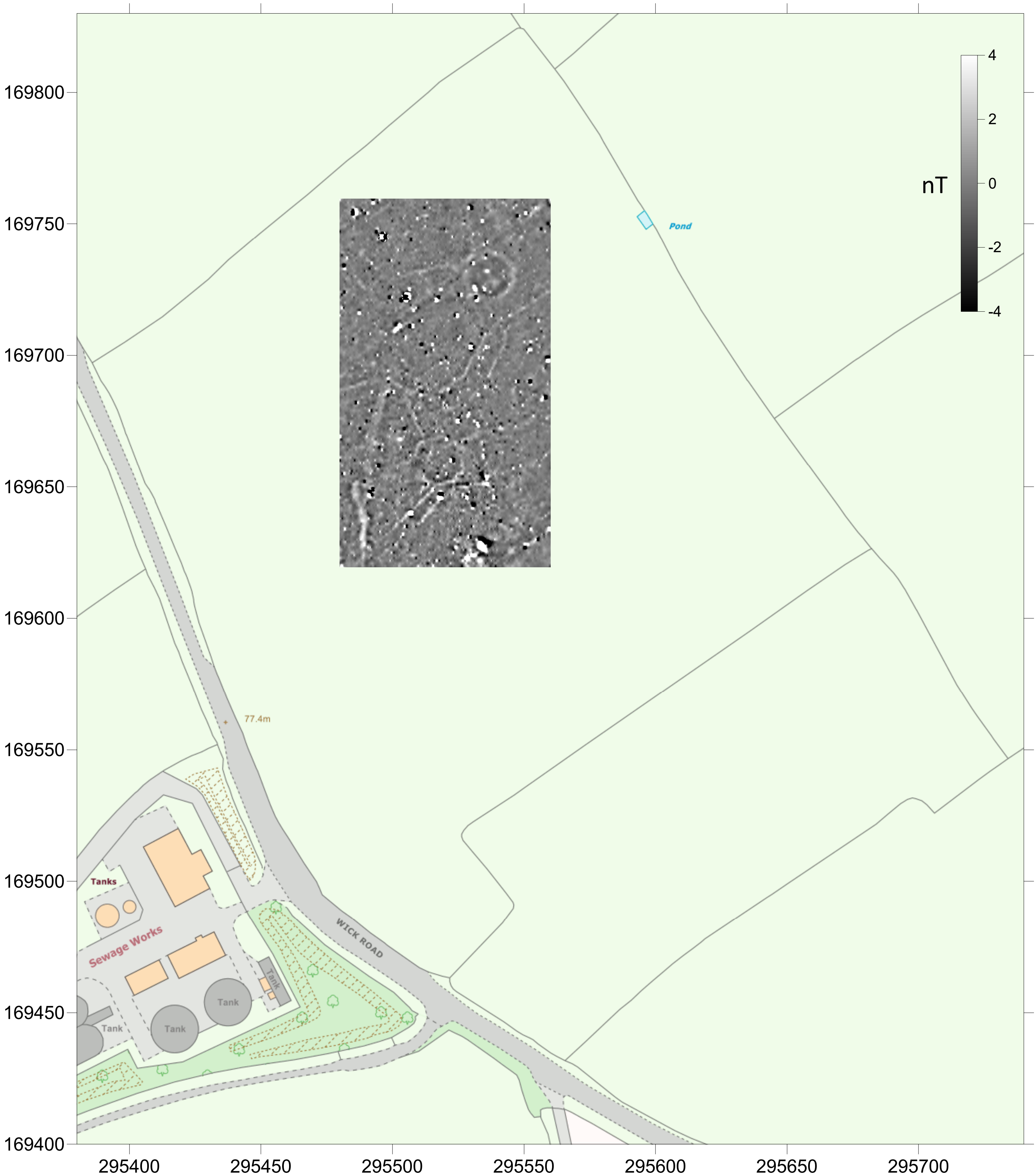
WICK ROAD

Figure 9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Pond
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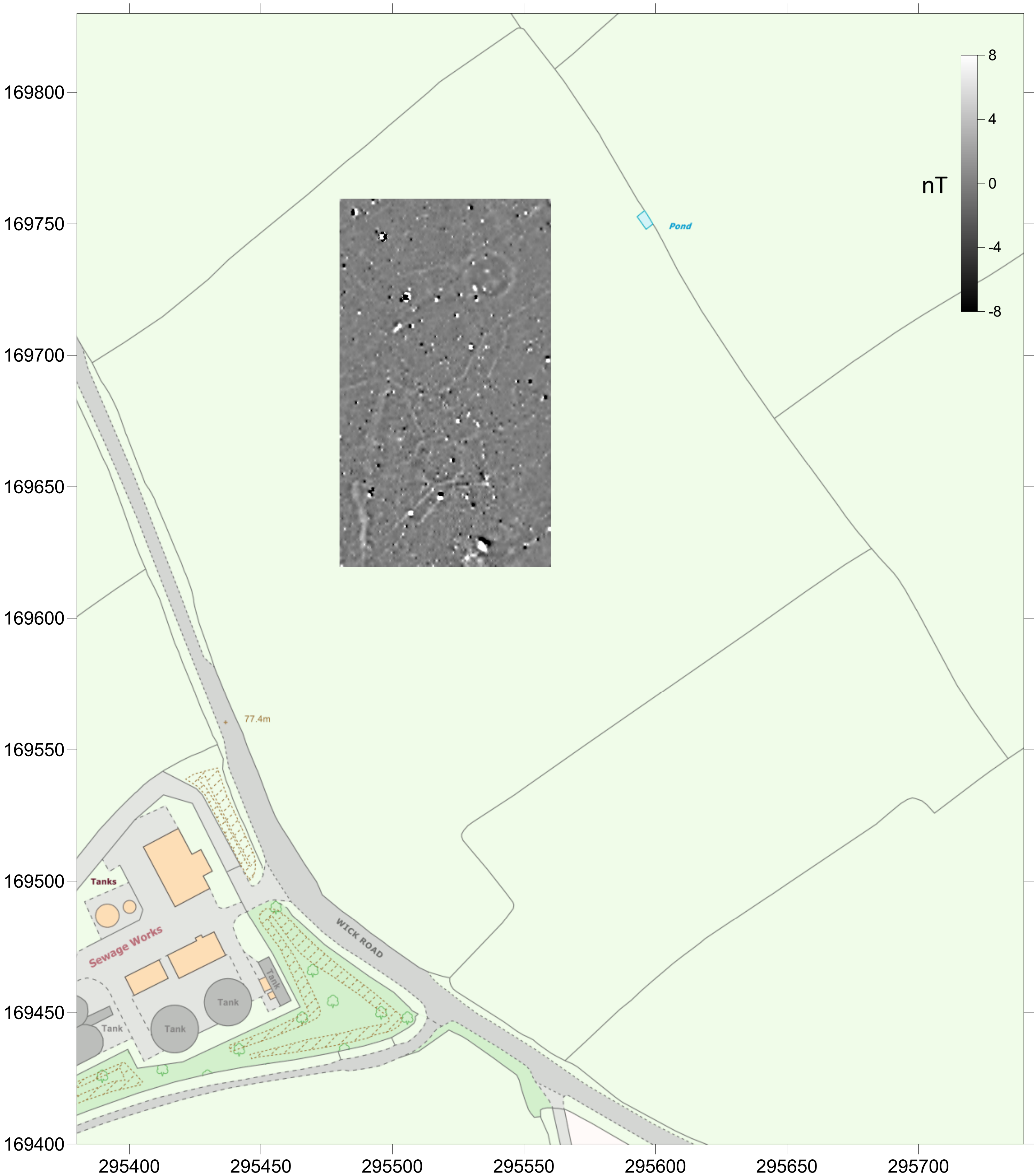
Tanks
Sewage Works
Tank
Tank
Tank
Tank
WICK ROAD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Pond
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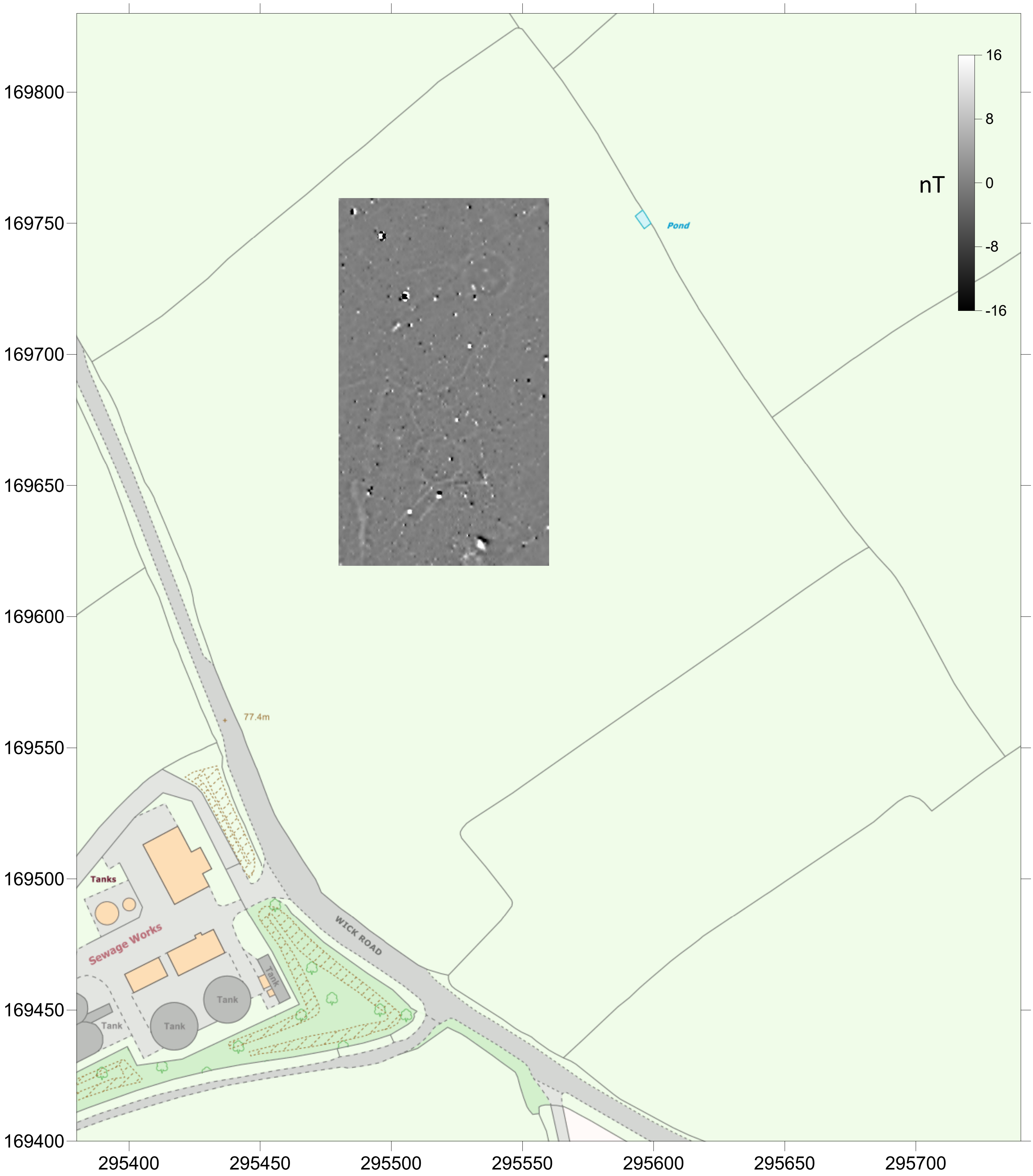
Tanks
Sewage Works
Tank
Tank
Tank
Tank
WICK ROAD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295650
295700
16
8
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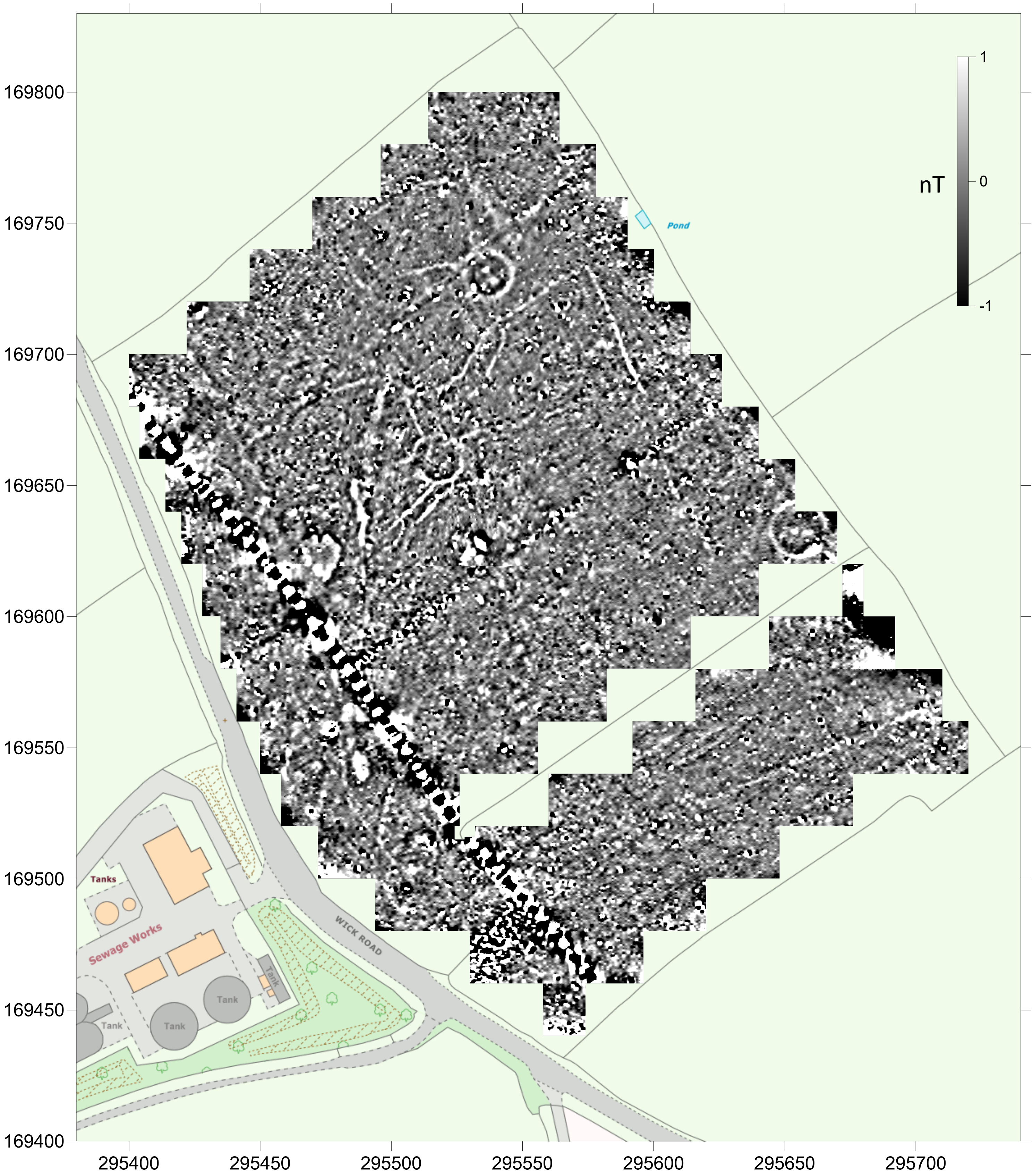
nT
Pond
77.4m
Tanks
Sewage Works
Tank
Tank
Tank
Tank
WICK ROAD

Figure 12



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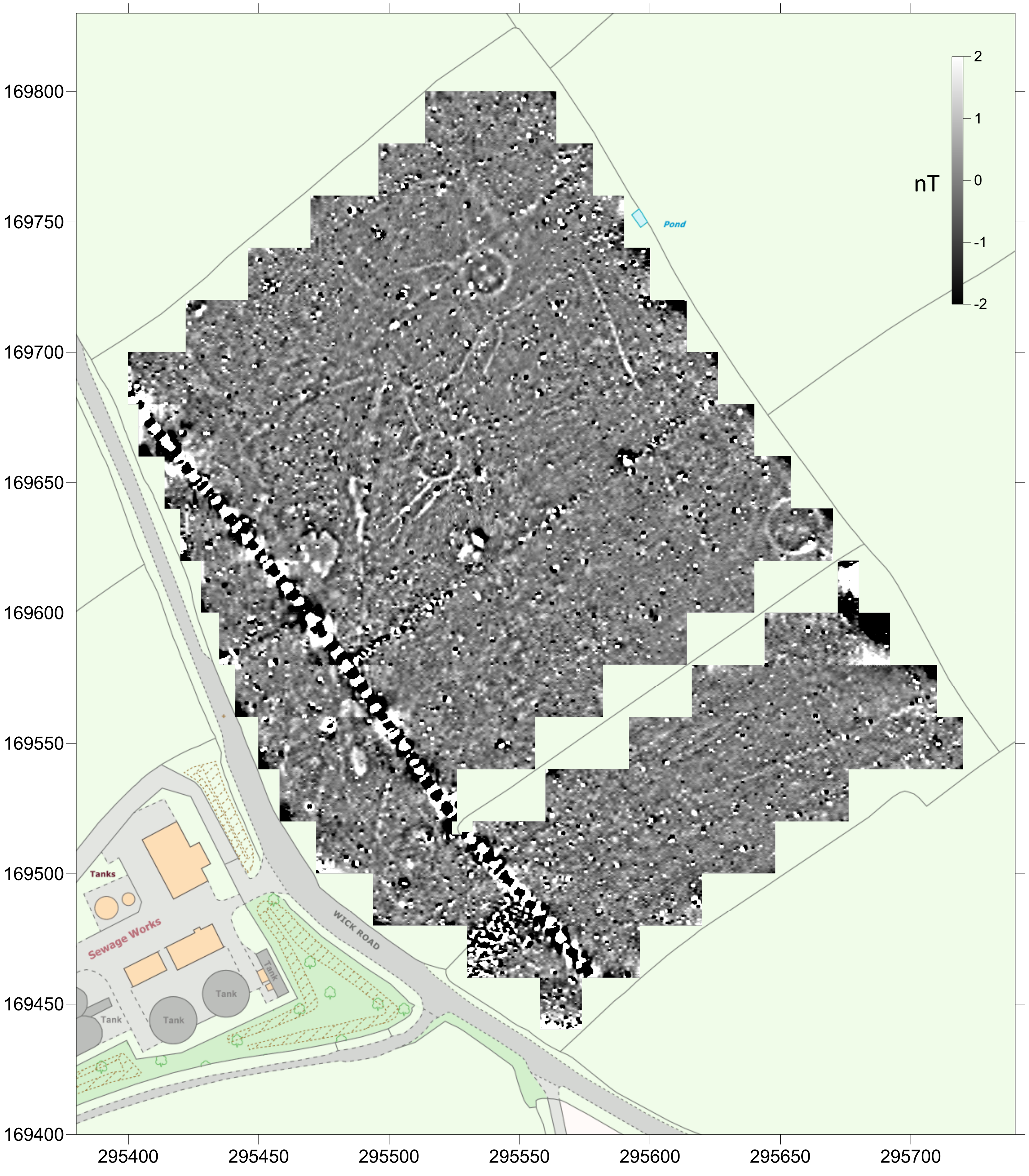
Pond
Tanks
Sewage Works
Tank
Tank
Tank
Tank
WICK ROAD

Figure 13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Pond
Tanks
Sewage Works
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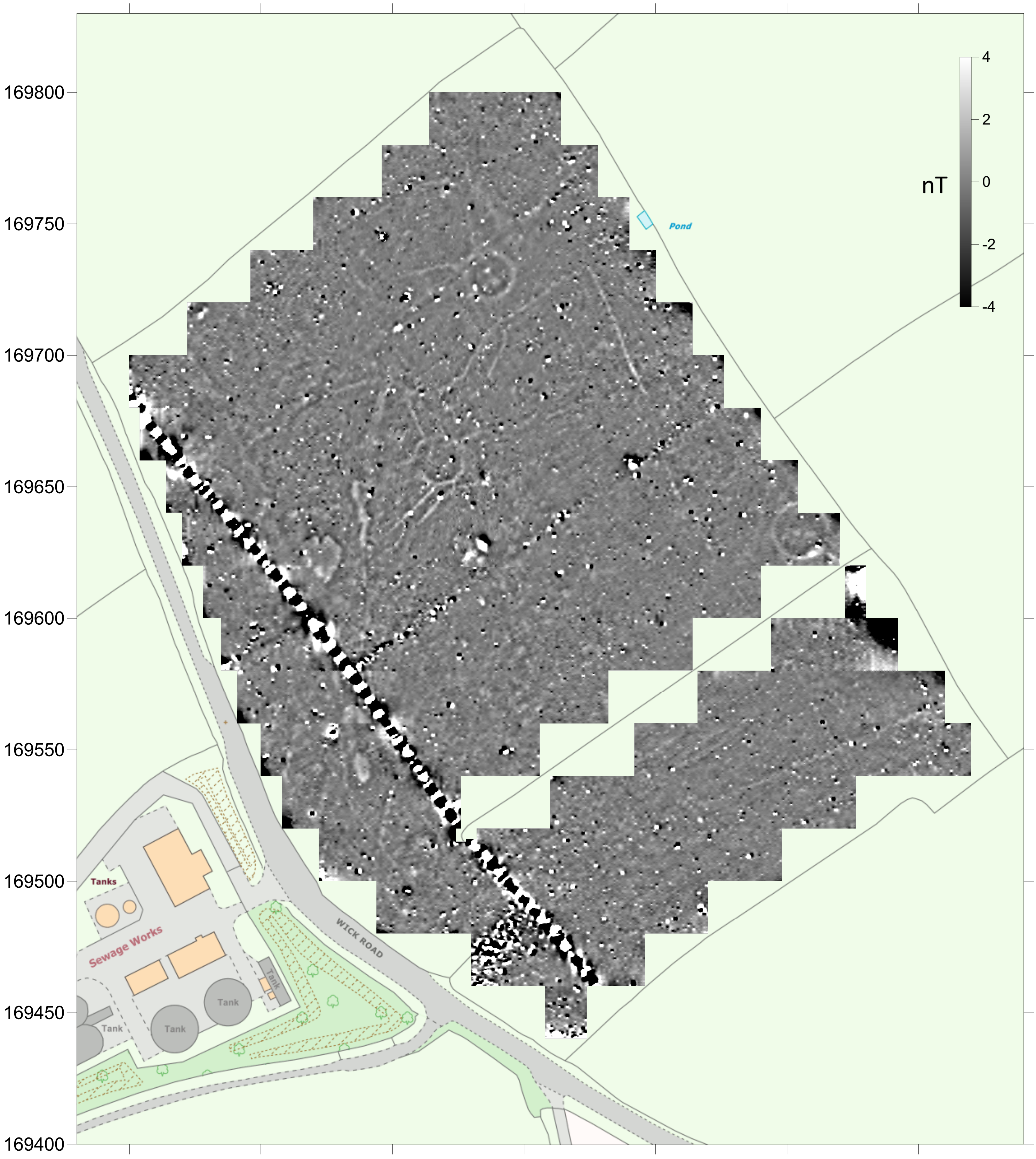
Tank
Tank
Tank
WICK ROAD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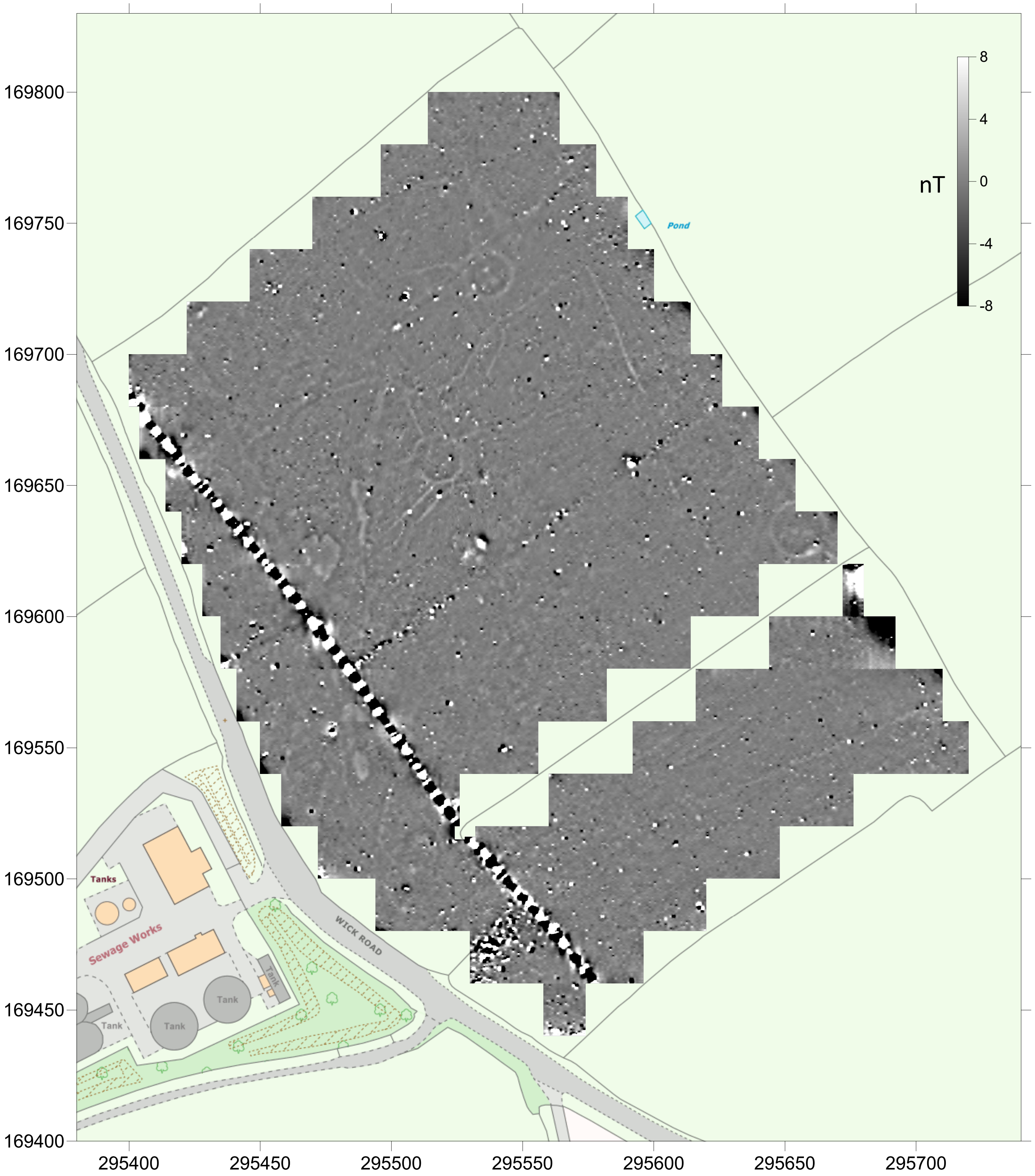
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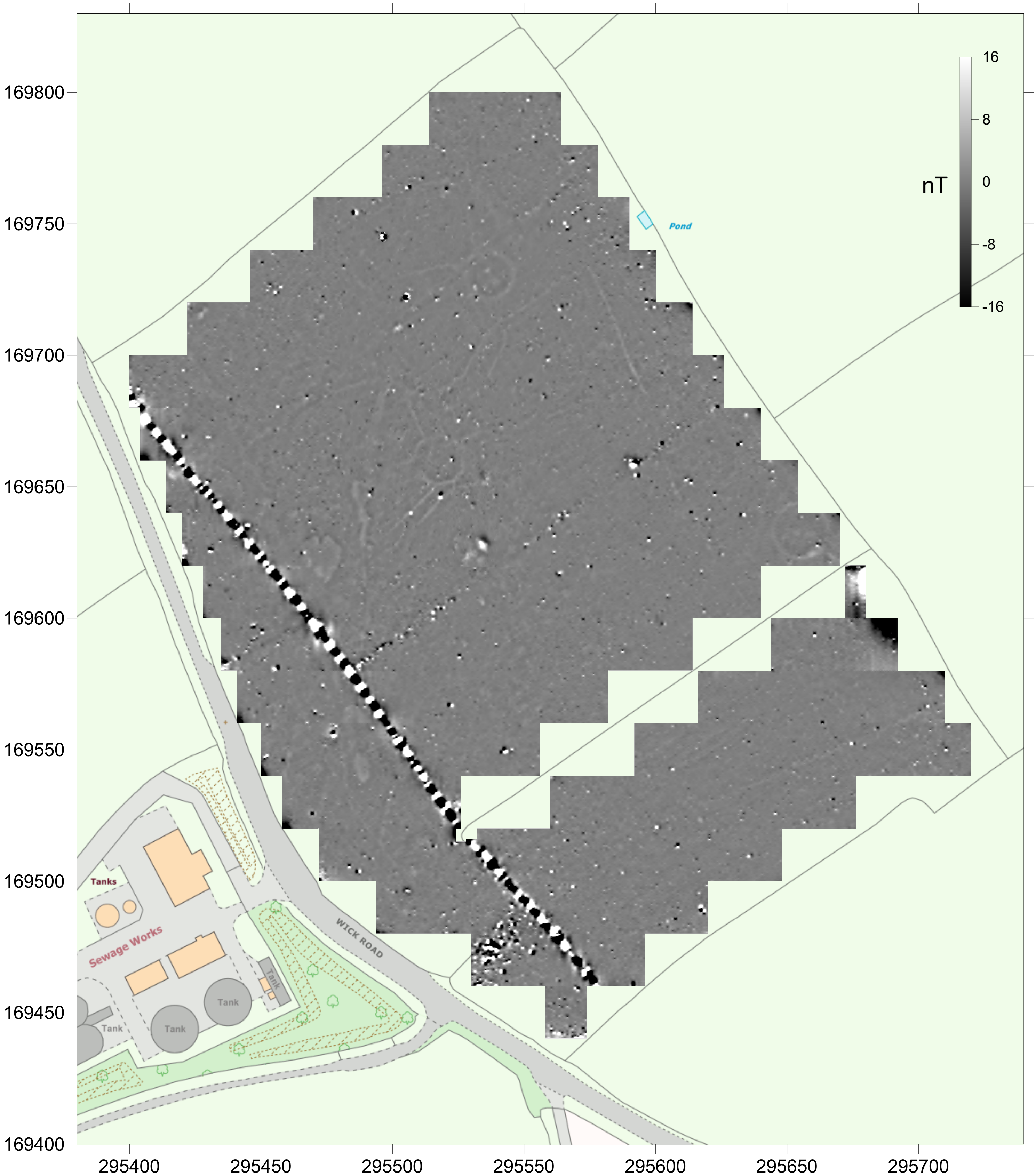
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nT
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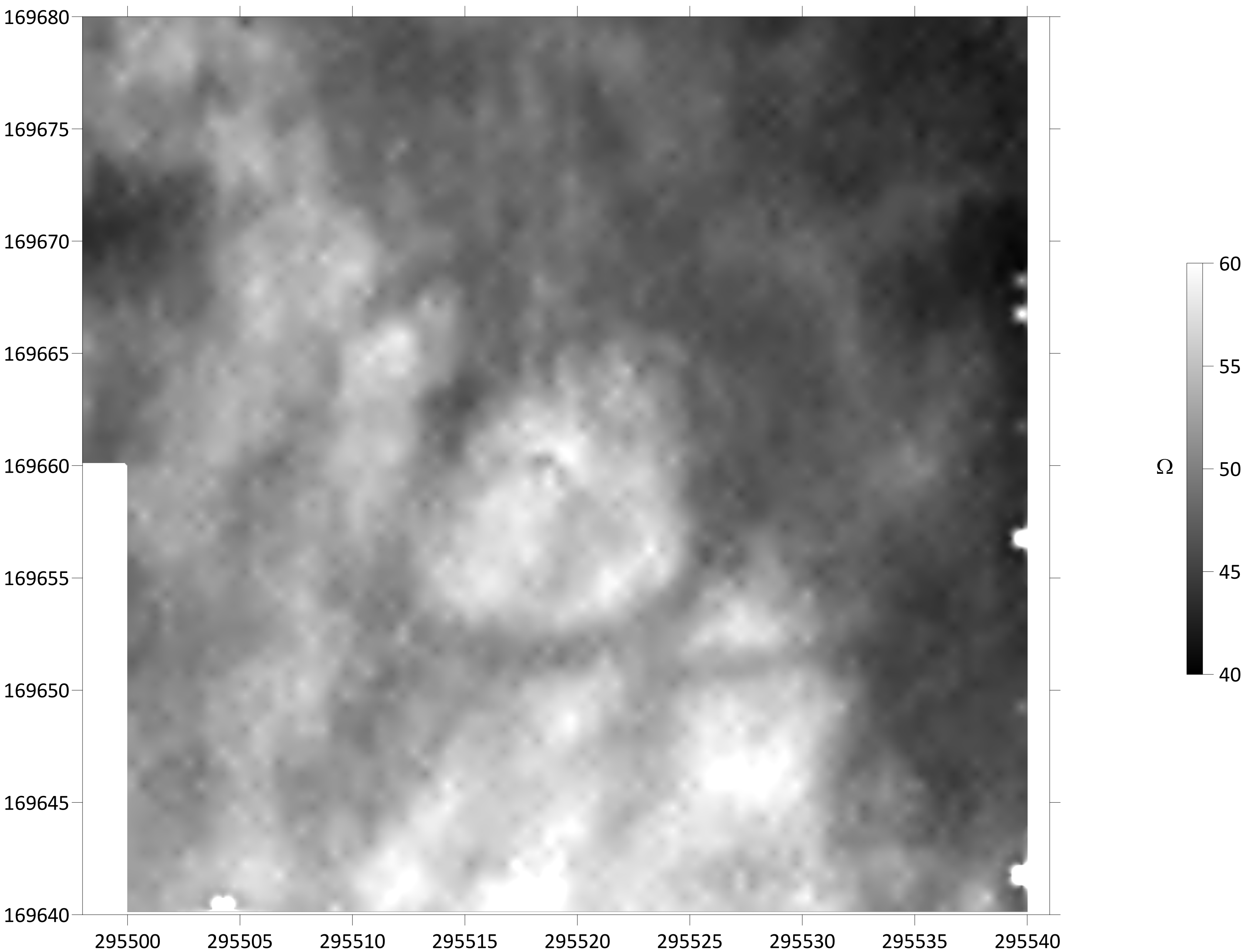
Pond
Tanks
Sewage Works
Tank
Tank
Tank
Tank
WICK ROAD

Figure 17



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295520
295525
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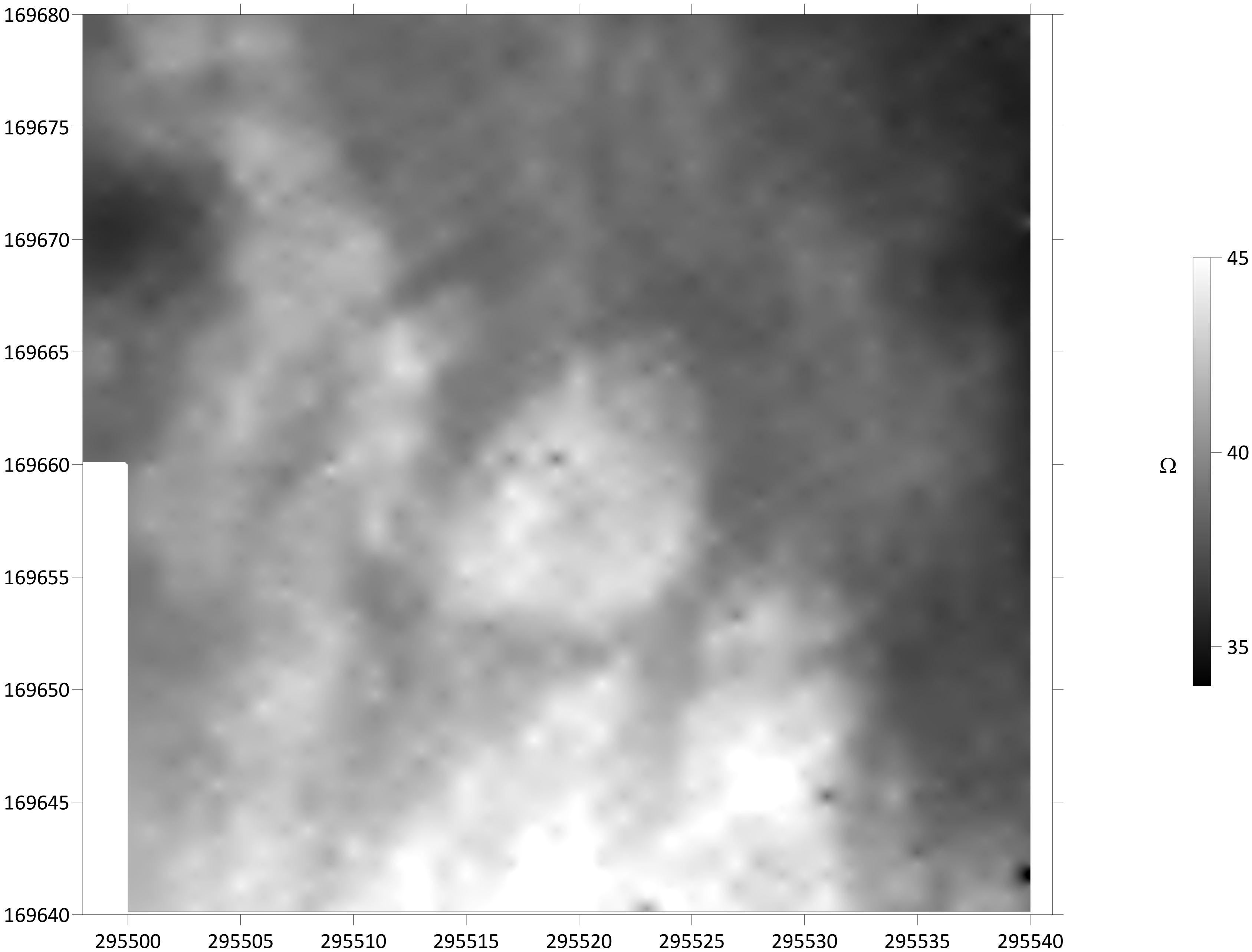
295535
295540
Ω
60
55
50
45
40

Figure 18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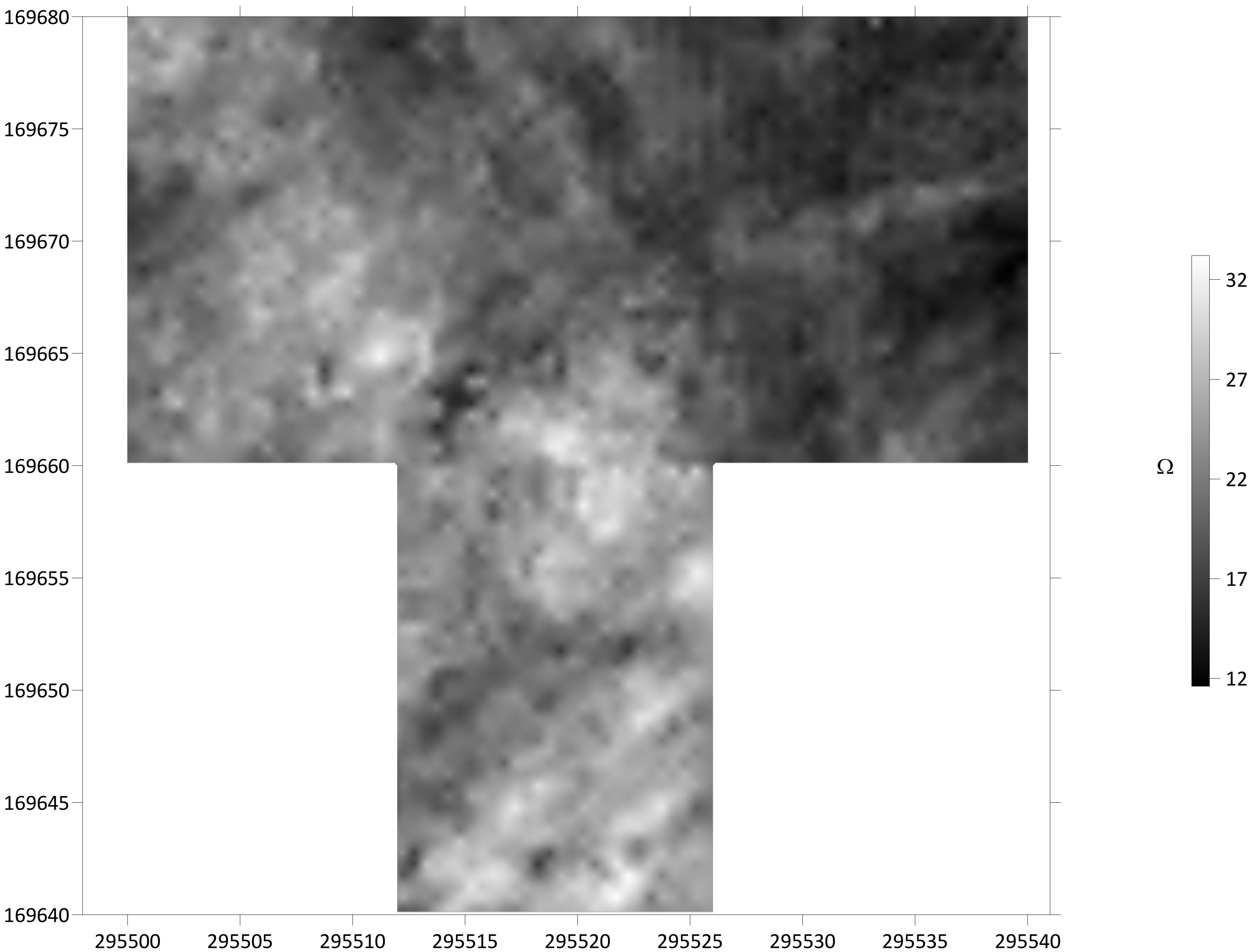
295520
295525
295530
295535
295540
Ω
45
40
35

Figure 19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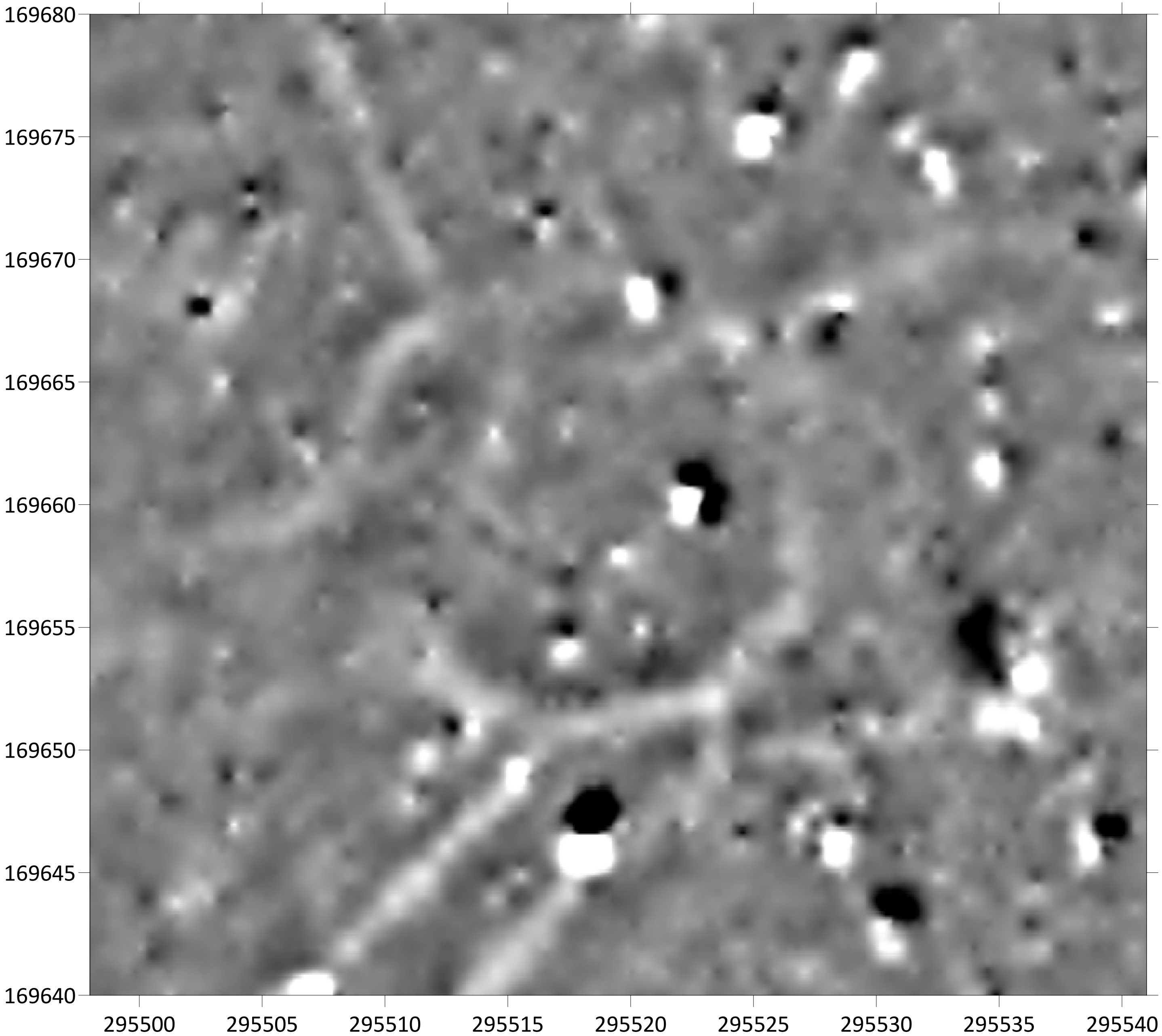
Ω
32
27
22
17
12

Figure 20



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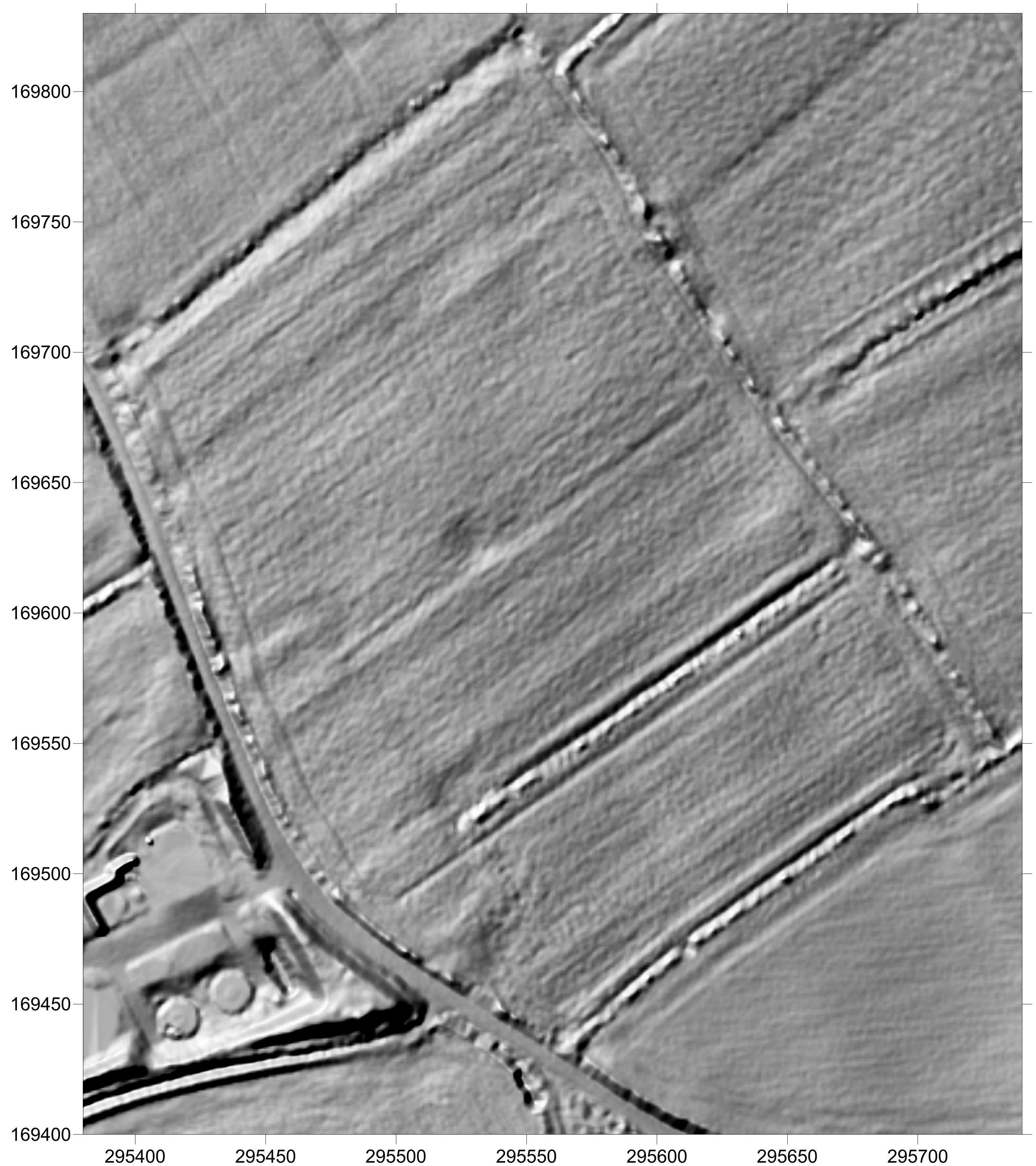
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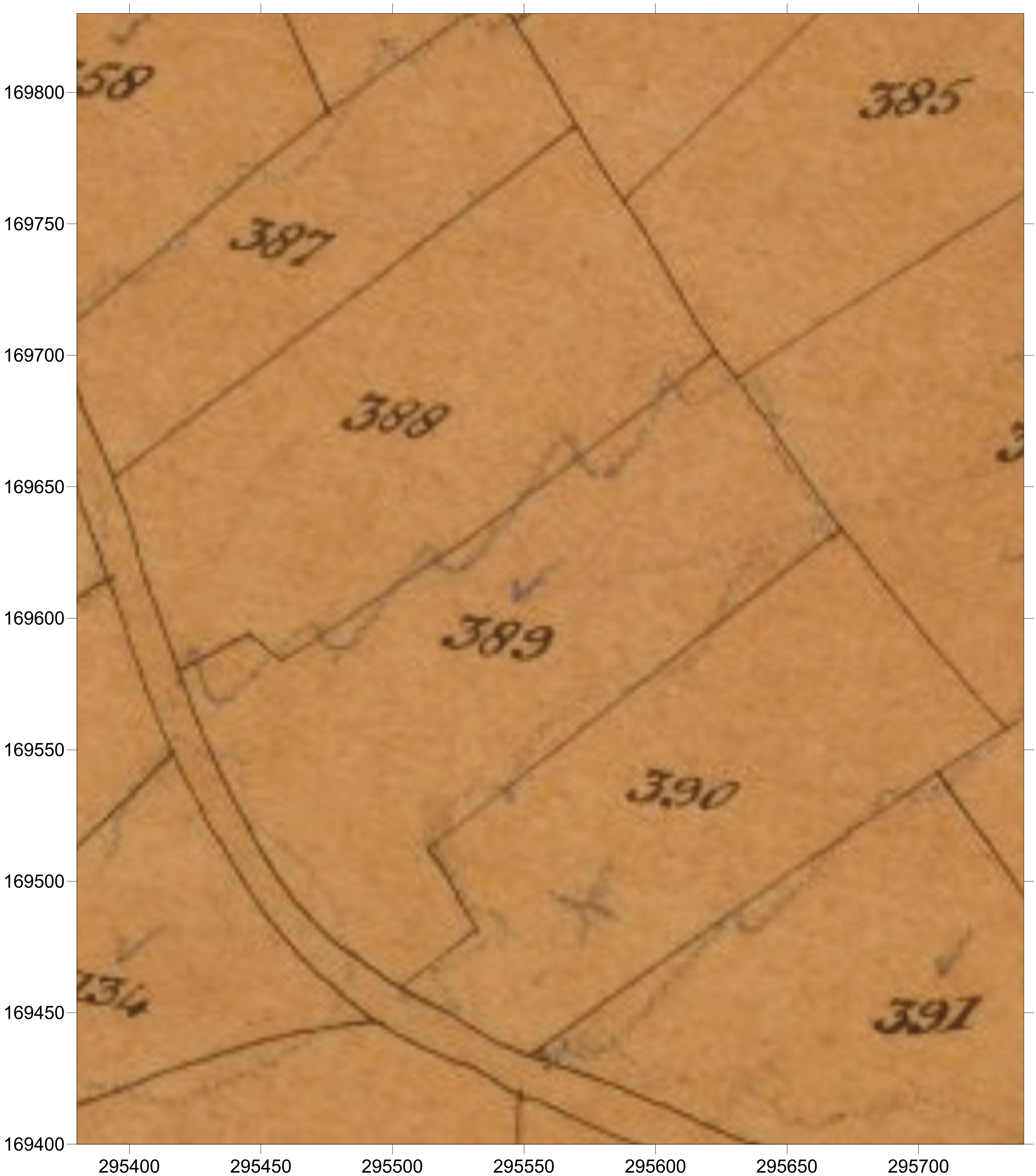

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Figure 23

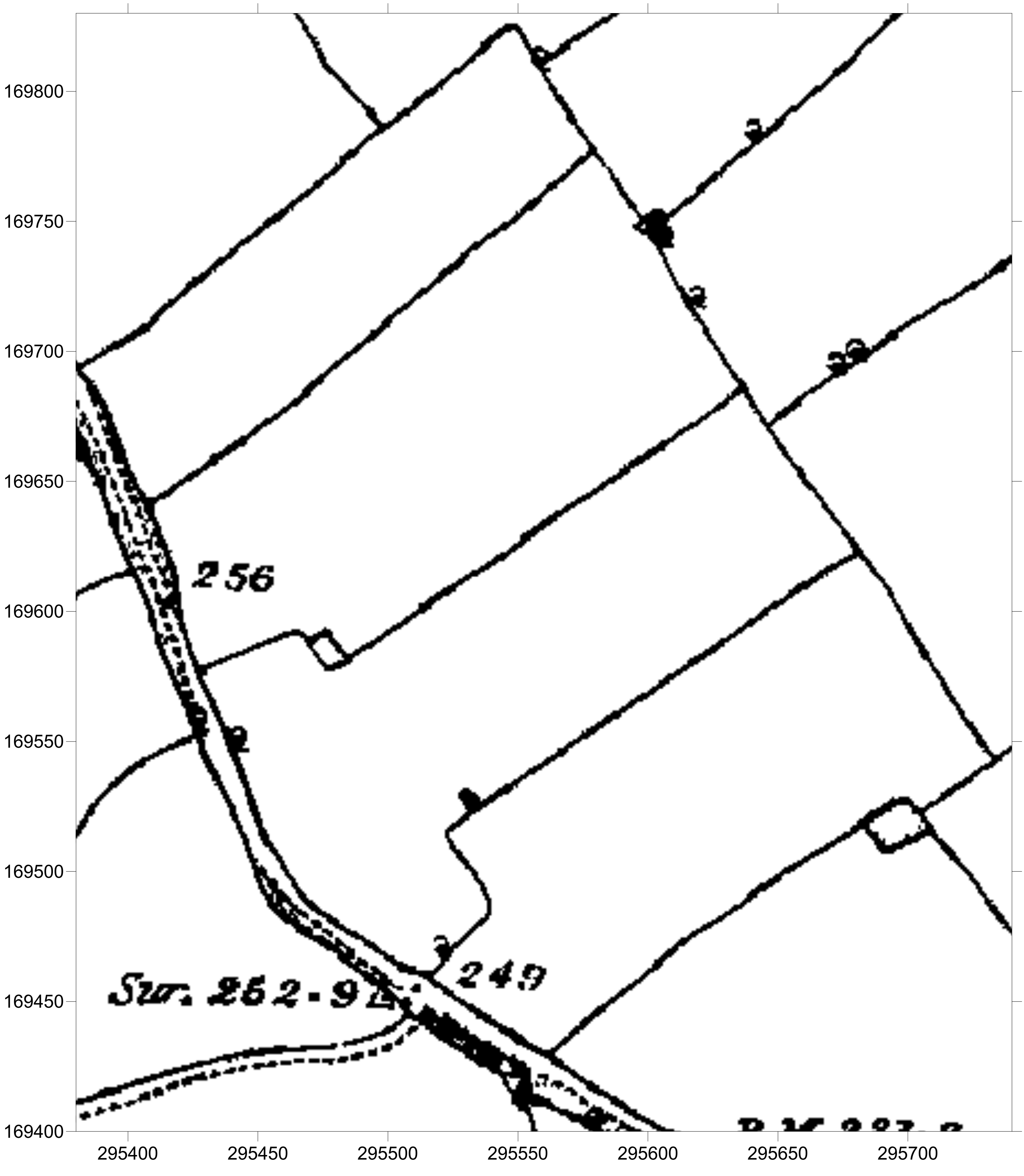
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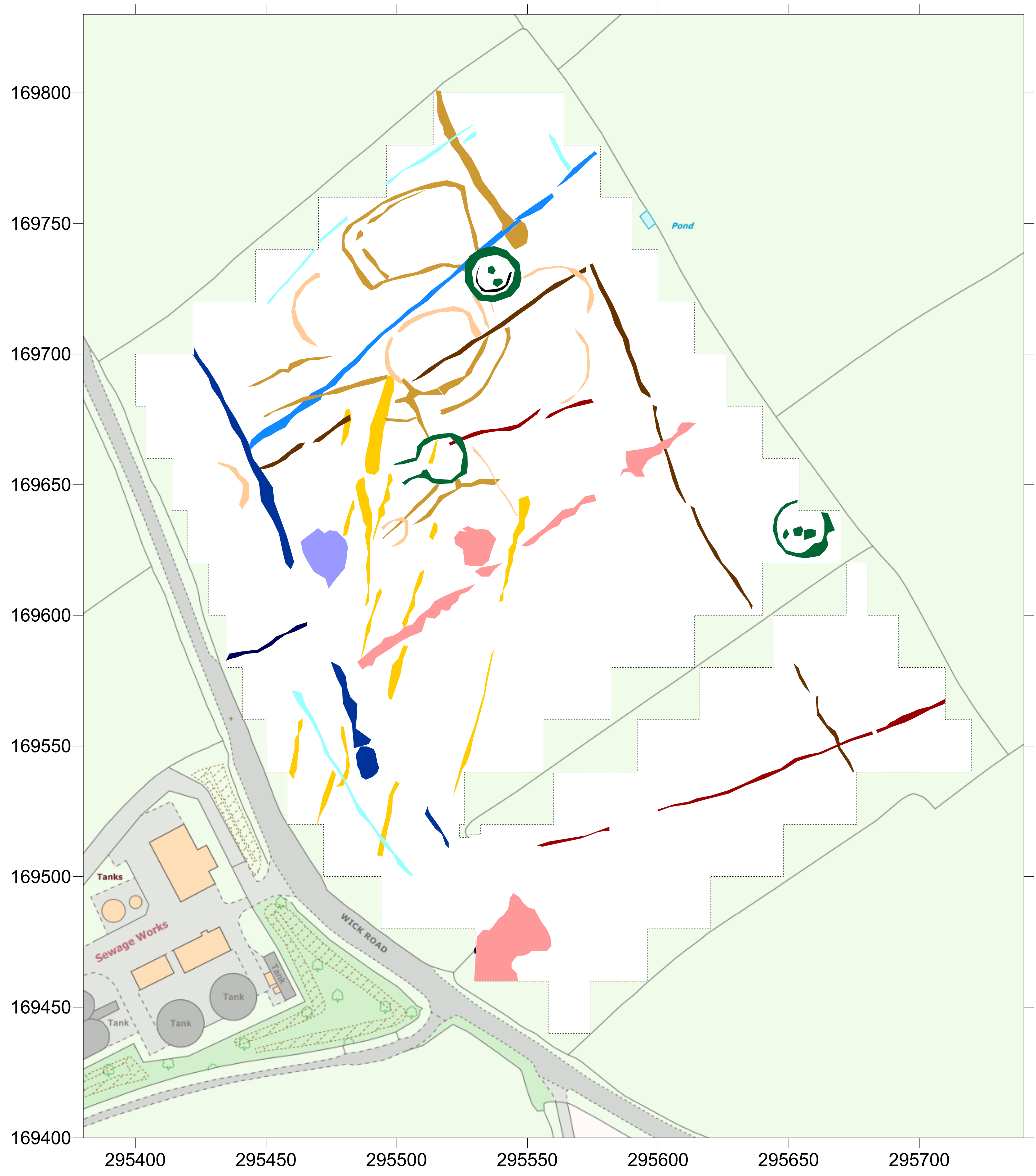
Figure 24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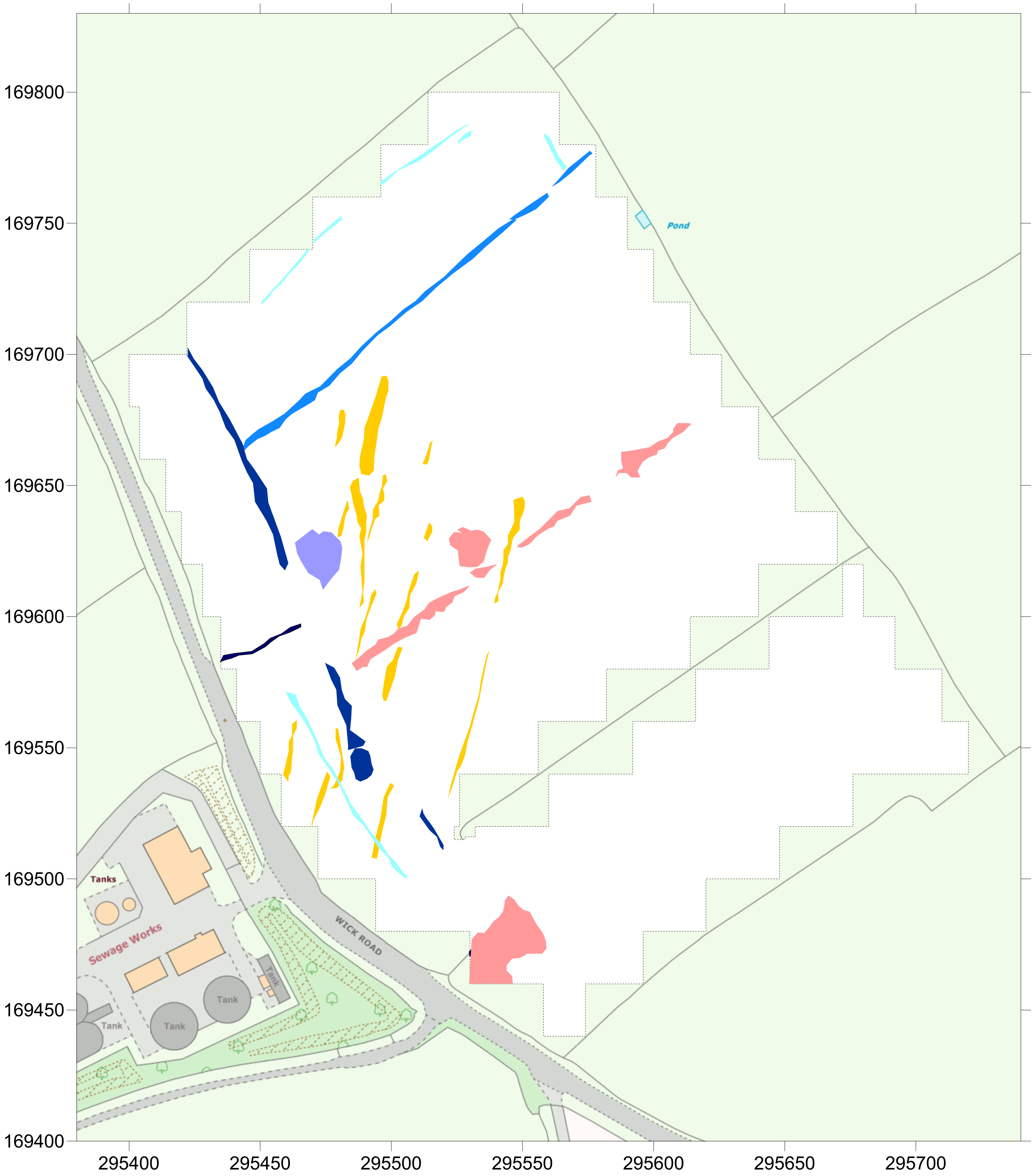
Pond
Tanks
Sewage Works
Tank
Tank
Tank
Tank
WICK ROAD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Pond
Tanks
Sewage Works
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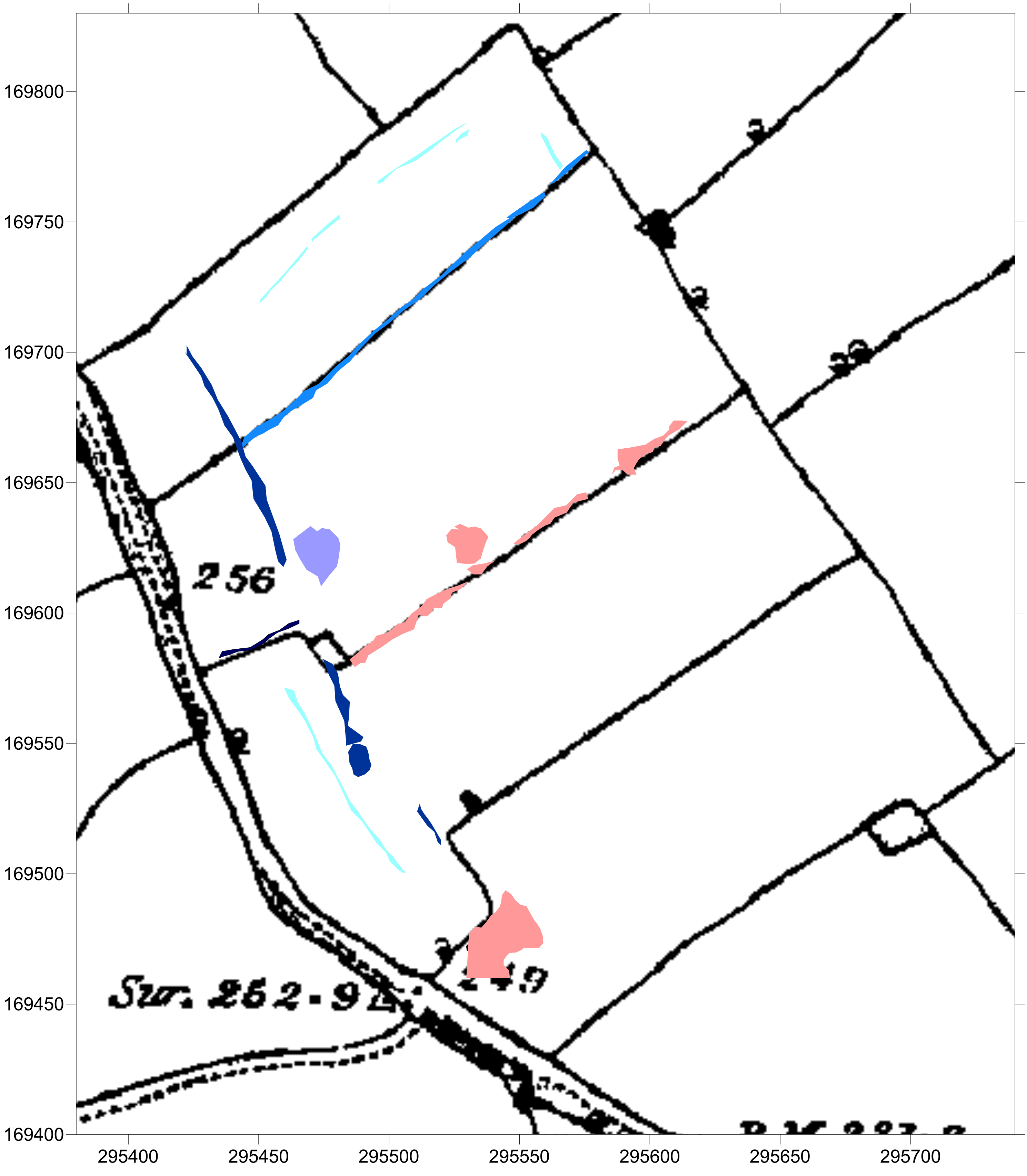
WICK ROAD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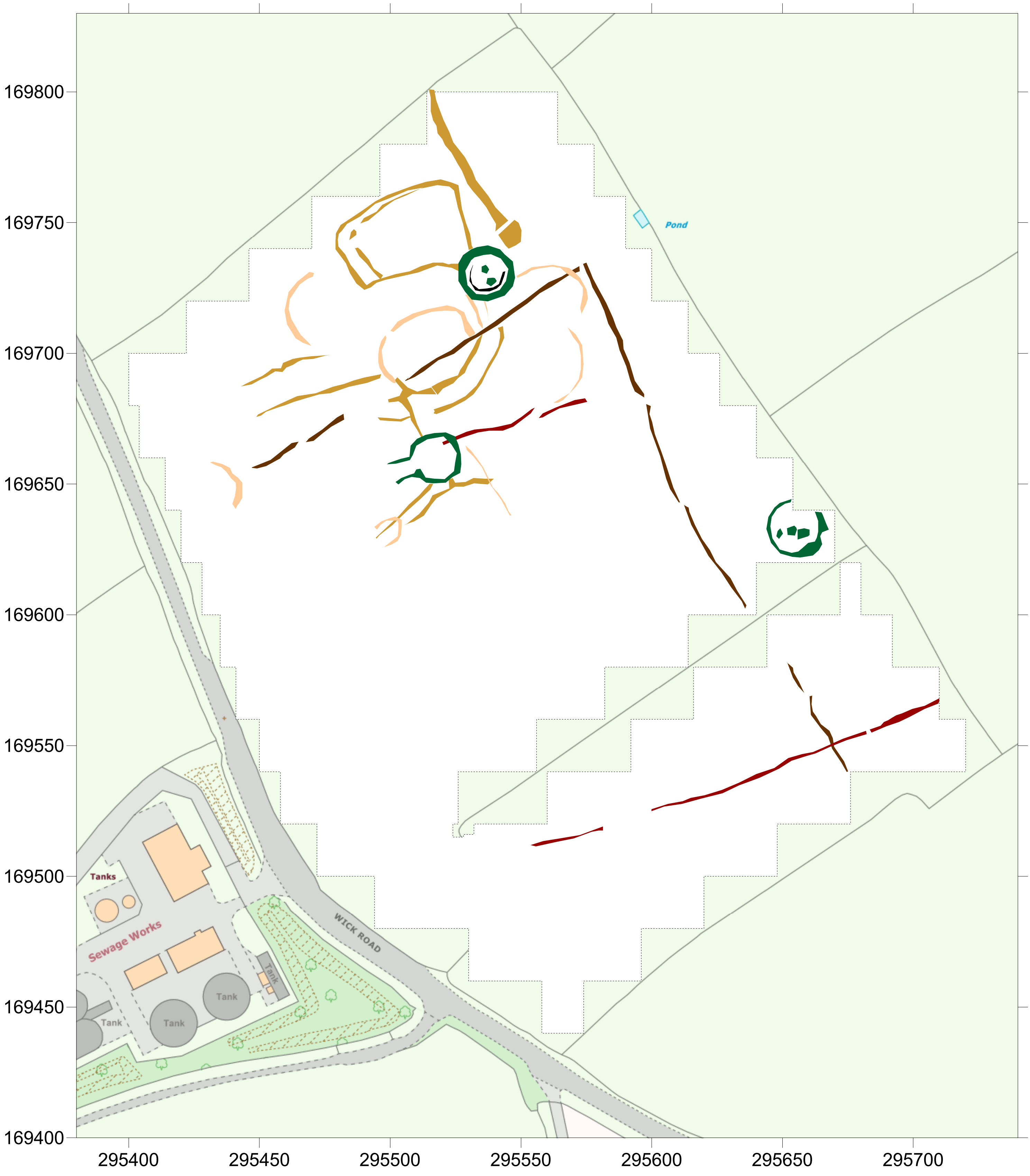
Sur. 262·9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Pond
Tanks
Sewage Works
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Tank
Tank
Tank
WICK ROAD

Figure 28


170200
170100
170000
169900
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169700
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169200
169100
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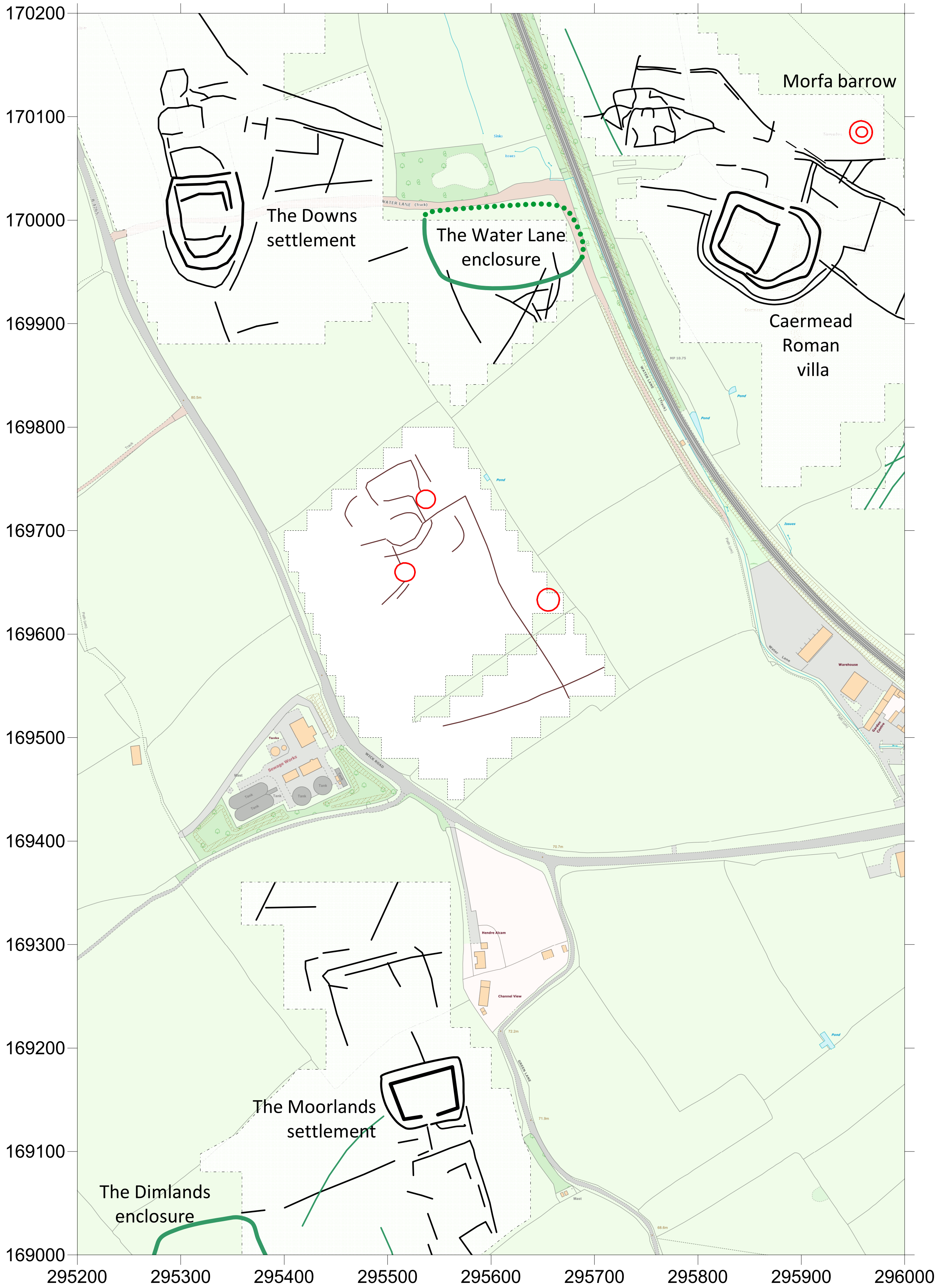
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295900
296000
Morfa barrow
The Downs settlement
The Water Lane enclosure
Caermead Roman villa
The Moorlands settlement
The Dimlands enclosure

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Caerphilly,
CF83 1BQ

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Web: www.GeoArch.co.uk