Green Hill Solar Farm
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UAV Multispectral Aerial Survey

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Green Hill Northampton

UAV Multispectral Aerial Survey

York Archaeology

Report Number YA/2025/234

Green Hill, Northampton

UAV Multispectral Aerial Survey Final Report

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SUMMARY

York Archaeology (YA) was commissioned by Lanpro to undertake a UAV Multispectral Aerial Survey across land within the Green Hill Solar Farm ('the Scheme') in support of an application for a Development Consent Order (DCO). The Scheme is located within the administrative boundaries of West Northamptonshire, North Northamptonshire and Milton Keynes. The survey was undertaken across Green Hill A, A.2, B, C, D, E, F G, and Battery Energy Storage Systems (BESS) of which 940.9ha was suitable for survey. Fieldwork was conducted between the 12th-16th of May, 13th August and 11th September 2025.

The UAV multispectral aerial survey has provided a complementary dataset to the archaeological evaluation works previously undertaken for the scheme (air photo and LiDAR mapping and interpretation, geophysical survey and targeted evaluation trial trenching) and will assist in the comprehensive identification and mapping of archaeological features within the Green Hill scheme.

CONTENTS

FIGURES

PLATES

APPENDICES

1 INTRODUCTION

1.1 Project Background

1.1.1 York Archaeology (YA) was commissioned by Lanpro to undertake a UAV Multispectral Aerial Survey across land within the Green Hill Solar Farm ('the Scheme') in support of an application for a Development Consent Order (DCO). The Scheme is located within the administrative boundaries of West Northamptonshire, North Northamptonshire and Milton Keynes. The survey was undertaken across Green Hill A, A.2, B, C, D, E, F G, and Battery Energy Storage Systems (BESS) of which 940.9ha was suitable for survey. Fieldwork was conducted between the 12th-16th of May, 13th August and 11th September 2025.

1.1.2 The survey was carried out in accordance with the Method Statement issued by YA in 2025 (Appendix 1), which was approved by the Northamptonshire County Archaeologist on the 8th May 2025. The Method Statement set out the requirements and methodologies for the survey.

1.1.3 Multispectral and hyperspectral imaging techniques have been the subject of increased research in recent years for their potential to contribute to the detection of sub-surface archaeological features as a result of their greater spectral resolution compared to standard RGB photography (Doneus et al. 2014). The development of UAV (unmanned aerial vehicle) technology has made archaeological prospection using these techniques viable within the UK commercial environment. UAV based multispectral imaging has been tested for archaeological prospection in the UK over relatively limited areas (Moriarty et al. 2018, Leek et al. 2023). This survey represents one of the first applications of UAV-based multispectral imaging over a large development area within a UK commercial setting.

2 SITE LOCATION, TOPOGRAPHY AND GEOLOGY

2.1 Location and Topography

2.1.1 Green Hill Solar Farm is located between Northampton and Wellingbrough, Northamptonshire (NGR SP 84853 65789). The site consists of nine Sites totalling 1200.6ha (Figures 2 and 3). The landscape consists of undulating agricultural land interspersed with historic villages. From north to south: Site A is located central to Mawsley, Old and Walgrave; Site A.2 is located to the east of Walgrave, Site B is located between Holcot and Moulton, Site C is located to the north-east of Sywell; Site D is located to the north of Mears Ashby, Site E is located between Mears Ashby, Wellingborough and Earls Barton; the BESS site is located to the north of Grendon; Site F is located between Grendon, Easton Maudit and Bozeat; and Site G is located to the north of Lavendon.

2.1.2 The natural topography of the landscape in which the Scheme lies has a general downward slope to the BESS site, which is located to the south of the River Nene and centrally within the scheme. The highest point within the Scheme is located in the north of Green Hill A and measures c. 136m above ordnance datum (aOD). The lowest level within the scheme is located within the BESS site, which lies between 47m and 53m aOD.

2.1.3 The Site spans four National Character Areas: 95 - Northamptonshire Uplands; 89 - Northamptonshire Vales; 91 -Yardley-Whittlewood Ridge; 88 - Bedfordshire and Cambridgeshire Claylands. The landscape contains a variety of field patterns and a strong pattern of enclosure, consisting of regular geometric patterns with straight hedgerows and roads among which sit farmsteads. The majority of the landscape within the Order Limits of the Scheme is characterised by post-medieval and modern enclosure, including pre-19th century non-parliamentary enclosure, parliamentary enclosure, fragmentary enclosure and modern fields (see Lanpro 2025).

2.1.4 At the time of the fieldwork the vegetation mostly consisted of a mix of winter crops of wheat and barley, and spring sown Maize and cover crops. Growth In some areas had been impeded by exceptionally dry weather over the preceding weeks. Weather conditions were generally dry and/or sunny throughout most of the survey.

2.2 Geology

2.2.1 There are ten different geological formations recorded within the Scheme: Northampton Sand Formation (Ironstone, ooidal), Whitby Mudstone Formation (Mudstone), Wellingborough Limestone (Limestone and mudstone), Stamford Member (Sandstone and siltstone, interbedded), Rutland Formation (Mudstone), Blisworth Limestone Formation (Limestone), Wellingborough Limestone Member (limestone and mudstone, interbedded), Cornbrash Formation (Limestone), Kellaways Clay Member (Mudstone) and Kellaways Sand Member (Sandstone and siltstone, interbedded) (BGS 2025).

2.2.2 Large areas of Oadby Member (Diamicton) superficial deposits are present across the Scheme. Alluvium, consisting of clay, silt, sand and gravel occurs adjacent to extant watercourses. Small pockets of Mid Pleistocene Glaciofluvial Deposits (sand and gravel), Milton Sand (Sand and gravel), Bozeat Till (Diamicton) and Ecton Member (Sand and gravel) are recorded within the Scheme, as well as occasional areas where no superficial deposits are recorded (BGS 2025).

2.2.3 Soils vary across the Scheme and are mapped as: Freely draining lime-rich loamy soils (Soilscape 5), freely draining slightly acid loamy soils (Soilscape 6), freely draining slightly acid but base-rich soils (Soilscape 7), sightly acid loamy and clayey soils with impeded drainage (Soilscape 8), limerich loamy and clayey soils with impeded drainage (Soilscape 9) and slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils (Soilscape 18) (Cranfield University 2025).

3 ARCHAEOLOGICAL BASELINE

3.1.1 The information provided below is a summary of the baseline collated for the archaeological desk-based assessments for Sites A-G (Lanpro 2025a-f), as well as the results of geophysical (gradiometer) surveys (ASWYAS 2023; 2024a; 2024b; 2024c; 2024d; 2024e) and the results of air photo and LiDAR interpretation (Deegan 2025).

Sites A and A.2

Designated Heritage Assets

3.1.2 Green Hill Sites A and A.2 do not contain any designated Heritage Assets.

Non-designated Heritage Assets

3.1.3 The Northamptonshire HER records eight 'monument' entries which are recorded as being within (or partially within) Sites A and A.2. The records relate to possible prehistoric enclosures identified from cropmarks on aerial photographs, an Iron Age coin and the Jurassic Way which runs to the east of Site A.2, following the route of the modern Kettering Road (A43). The Northampton to Kettering Turnpike extends along the eastern edge of Site A.2 in Field A.2F1.

Geophysical Survey

3.1.4 Geophysical survey of Sites A and A.2 has detected magnetic anomalies associated with an agricultural landscape, including former field boundaries, medieval/post-medieval ridge and furrow cultivation, modern ploughing and land drains.

3.1.5 Most anomalies in Sites A and A.2 were agricultural, including former field boundaries, ridge and furrow cultivation, modern ploughing, and land drains. However, concentrations of anomalies in Fields AF1 and AF11 are likely related to prehistoric and Roman settlement activity. In Field AF1, a cluster of ring ditches, linear ditches and enclosures correspond with prehistoric cropmarks. Field AF11 contains a large rectangular enclosure, as well as smaller enclosures and possible ring ditches. Field AF15 has two possible ring ditches within an enclosure and a larger rectangular enclosure to the south. In Field AF16, two parallel ditches may relate to a buried feature continuing beyond the study site. A possible rectilinear enclosure and ring ditch were identified in Field AF20. In Green Hill A.2F1, anomalies form part of a large enclosure with smaller enclosures inside, and in A.2F4, a ring ditch, 'D-shaped enclosure, and possible trackway are present. Several uncertain anomalies were identified, including a depression in Field AF4, pit-like responses in Field AF5, and parallel trends in Field AF9. Some weak anomalies in Fields AF18 and AF26, and linear features in AF25, may relate to land drains.

Air Photo and LiDAR

3.1.6 The Environment Agency's National LiDAR Programme Digital Terrain Model (DTM) and Digital Surface Model (DSM) data, at 1m resolution, together with a full range of vertical air photo and digital orthophotography, were used to inform a detailed programme of aerial interpretation of the study site (Deegan 2025). The results are summarised below.

3.1.7 Site A shows no evidence of Neolithic or Bronze Age features but includes possible Iron Age or Roman enclosures in AF1 and AF11. Widespread medieval and post-medieval cultivation is evident. Ridge and furrow patterns and plough headlands are recorded across numerous fields, but have since been levelled. LiDAR imagery reveals slight lynchets along former field boundaries in AF1, AF11, and AF23, as well as earthwork banks in AF11, AF14, AF15, AF16, AF17 and AF18, which may represent additional lynchets or plough headlands. Post-medieval quarrying activity is indicated by depressions in AF1, AF9, AF10, AF11 and AF29 along with evidence of stream management and possible haystack platforms.

3.1.8 Site A.2 shows no evidence of Roman or earlier features, however, there is evidence of medieval and possibly early post-medieval cultivation, including plough headlands and ridge and furrow in all the fields. While some ridge and furrow survived as earthworks into the 1940s, all plough ridges have now been levelled. LiDAR imagery reveals a network of low, well-spread plough headlands in A.2F3 and A.2F4, with some areas showing plough furrows running over the headlands instead of terminating on either side.

Evaluation trenching

3.1.9 Areas assessed to have archaeological potential, based on consideration of all available archaeological data, were targeted with evaluation trenches in Site A and A.2 Field AF4, both to 'ground truth' the results of previous surveys and to provide samples of 'blank' areas, in which archaeological remains had not been identified by non-intrusive methods. Overall, there was a strong correlation between the results of the geophysical survey, aerial photographic and LiDAR interpretation, and the results of the evaluation.

3.1.10 Within Site A, 97 trenches were excavated, and archaeological remains and features were recorded within 17 trenches (ES Appendix 13.4; CFA 2025b).

3.1.11 In Field AF9, a north-west to south-east orientated gully in Trench 3 contained pottery dating from the Late Iron Age to the early 2nd century. In Field AF15, a cluster of activity in the north-western corner was confirmed by excavation, aligning with geophysical survey features such as rectilinear ditches and gullies, possibly indicating a settlement area. A gully in Trench 1, interpreted as a ring ditch, was truncated by a furrow, limiting its visibility. In Field AF16, curvilinear ring ditches and linear ditches were recorded in Trenches 5 and 13, aligning with geophysical survey results. Two parallel ditches in Trench 12 may indicate a trackway. In Field AF20, north to south linear ditches in Trenches 13 and 17 matched features from the geophysical survey, with additional ditches in Fields 15, 16 and 20 corresponding to historic ridge and furrow. Features of unknown origin were found in Trenches 3, 5, 8 and 18. Pottery from a pit in Trench 16 dates to the prehistoric period, while pottery in Trench 8 dates to the 2nd century. In Field AF23, linear trends in Trench 1 may be part of an enclosure ditch, with pottery spanning from the prehistoric (likely Iron Age) to early Roman periods.

3.1.12 Within Site A.2 Field 4, 42 trenches were excavated, and archaeological remains and features were recorded within 15 trenches (ES Appendix 13.4; CFA 2025a).

3.1.13 In Field A.2F4, features identified by trial trenching align with geophysical survey results, suggesting settlement and agricultural activity from the Late Iron Age to Roman period. A curvilinear ditch in Trench 2 and potential boundary or enclosure ditches in Trench 11 were recorded. A faint rectilinear or D-shaped enclosure, recorded by the geophysical survey at the eastern end of Field AF29, was confirmed through excavation in Trenches 33, 34, and 42, with associated peripheral features in Trenches 23, 24, and 32. Prehistoric pottery was found in Trench 34. Furrows in Trenches 1, 4, and 35 may be part of a ridge and furrow system, while a 19th-20th century field boundary was noted in Trench 18. Features of unknown origin were found in Trenches 15, 17 and 20, with Roman pottery recovered from Trench 17.

Site B

Designated Heritage Assets

3.1.14 Green Hill Site B does not contain any designated Heritage Assets.

Non-designated Heritage Assets

3.1.15 The Northamptonshire HER records two 'monument' which are partially within Site B in Field BF5, comprising undated possible enclosures and ditches and probable medieval or post-medieval plough

headlands identified during from an aerial survey.

Geophysical Survey

3.1.16 An archaeological geophysical (magnetometer) survey was undertaken across the study site in April 2024. The geophysical survey detected magnetic anomalies of agricultural origin, comprising former field boundaries, medieval/post-medieval ridge and furrow cultivation, modern ploughing and land drains. Likely archaeological anomalies were recorded within the south of Field BF2 in the form of discrete linear and curvilinear features which may form enclosures of a possible prehistoric/Roman date. Likewise, within the south of BF3, possible archaeological anomalies in the form of linear features of a possible enclosure was recorded. Geological responses reflect either the topography of the site, a former water course or natural variations. Magnetic disturbance can be attributed to adjacent tracks and metal fencing with smaller areas corresponding to infilled ponds or former fencing (ASWYAS 2024b).

Air Photo and LiDAR

3.1.17 Within Site B, no features of Roman or earlier date have been identified as part of the air photo and LiDAR assessment (Deegan 2025). Medieval and possibly early post-medieval cultivation is, however, visible throughout the site, including ridge and furrow and plough headlands, which have been levelled. LiDAR imagery also reveals plough headlands and areas where plough furrows cut across them. The trackway from Tithe Farm, and the drainage ditch in BF2, are likely of late post-medieval origin.

Evaluation trenching

3.1.18 Areas assessed to have archaeological potential, based on consideration of all available archaeological data, were targeted with evaluation trenches in Site B both to 'ground truth' the results of previous surveys and to provide samples of 'blank' areas, in which archaeological remains had not been identified by non-intrusive methods.

3.1.19 Within Site B, 61 trenches were excavated, and archaeological remains and features were recorded within 17 trenches (ES Appendix 13.4; CFA 2025c).

3.1.20 In Field BF2, a ditch in Trench 7 may form part of a longer curvilinear feature identified by geophysical survey, while a possible rectilinear enclosure or set of parallel ditches in the south-western corner were confirmed in Trenches 12 and 23, with Roman grey ware pottery found in Trench 23. A complex series of linear features, possibly an enclosure, was confirmed in Trenches 27-30. In Field BF3, scattered features in Trenches 2, 3, and 4 indicate dispersed activity extending from BF2. Furrows in Trench 7 may be remnants of an older ridge and furrow system, and a north-south ditch in Trench 27 could be part of a possible rectilinear enclosure extending beyond the field.

Sites C to E

Designated Heritage Assets

3.1.21 There are no designated heritage assets with Green Hill Sites C, D and E.

Non-designated Heritage Assets

3.1.22 The Northamptonshire HER contains seven records located within Site C, of prehistoric worked flint, Roman pottery, a possible prehistoric and Roman site, areas of Iron Age activity, a possible medieval / post-medieval ditch and bank and a medieval pottery scatter.

3.1.23 There are two records within Site D, relating to medieval to post-medieval water management.

3.1.24 There are 103 HER records within Site E, comprising a Bronze Age barrow, prehistoric enclosures, Iron Age pits and ditches, prehistoric to Romano-British settlements, Romano-British enclosures and trackways, earthworks of a medieval windmill, and undated ditches and enclosures. There are post-medieval structures and WWII searchlight also listed.

Geophysical Survey

3.1.25 Geophysical survey in Sites C, D and E (ASWYAS 2024c) has detected magnetic anomalies associated with an agricultural landscape, including former field boundaries, medieval/post-medieval ridge and furrow cultivation, modern ploughing and land drains. Numerous palaeochannels have also been mapped across Site E, many of which respect natural topographical depressions.

3.1.26 In Site C, various archaeological features were identified, suggesting late prehistoric and Romano-British settlement activity. In Field CF1, conjoined enclosures, linear ditches, and a ring ditch with a possible entrance were found, alongside a modern service trench. Survey in Field CF2 revealed rectilinear and curvilinear enclosures, possibly indicating settlement, and Field CF4 contained a small rectilinear enclosure with a possible entrance. In Field CF5, curvilinear ditches were recorded, which potentially form part of Iron Age settlement, linked to the nearby CF10 site. The survey in Field CF6 revealed a sub-square enclosure and parallel ditches, possibly Romano-British and related to a vineyard. Fields CF8 and CF10 both contained linear features connected to Iron Age settlements, with additional linear trends possibly of similar or later origin.

3.1.27 In Site D, former field boundaries were recorded within Fields DF2 and DF3. Anomalies of an unknown origin were identified in Fields DF1 and DF2, and generally these were composed of very weak increases in magnetic value and align with anomalies related to agricultural activity.

3.1.28 In Site E, geophysical survey mapped a series of contiguous enclosures, as well as rectilinear, linear, curvilinear and sub-circular anomalies that are indicative of likely prehistoric and/or Roman settlement activity. Further anomalies of a likely archaeological origin have been identified to the north of Mears Asby Road in Fields EF4 and EF9.

Air Photo and LiDAR

3.1.29 The air photo and LiDAR assessment (Deegan 2025) identified various archaeological features across multiple fields. In Field CF4, faint cropmarks of an Iron Age/Roman enclosure and a ditch containing Late Iron Age pottery were found, potentially linked to nearby settlement activity. Post-medieval quarry pits were noted in Fields CF3 and CF4, and uncertain ditches were identified in Fields CF2 and CF3. Site D showed no significant features. In Field EF9, several small enclosures were identified, along with a curving ditch. Iron Age/Roman enclosures were found in Fields EF16, EF19, and EF22, with additional features in EF23, EF24, EF25, and EF28. A potential Bronze Age round barrow was recorded in Fields EF30 and EF33, with associated Iron Age/Roman trackways and enclosures. Post-medieval quarrying was observed in Fields EF26 and EF33. World War II features, such as goods/ammunition stores and a possible searchlight/anti-aircraft battery, were identified in Fields EF5, EF9, and EF20. Other features were related to modern or agricultural activities, including ridge and furrow, plough headlands, and post-medieval structures.

Evaluation trenching

3.1.30 Within Site C, 50 trenches were excavated, and archaeological remains and features were recorded within 19 trenches (ES Appendix 13.4; CFA 2025d).

3.1.31 In Field CF1, an enclosure complex with possible ring ditches was confirmed, dating to the early Roman period, though an Iron Age origin cannot be ruled out. A second enclosure with a Late Neolithic to Late Bronze Age ring ditch was also found. In Field CF2, complex ditches suggesting settlement activity were identified, with pottery dating to the late Iron Age and Roman periods. In Field CF5, ditches formed a

possible small rectilinear enclosure, likely associated with nearby settlement evidence. Field CF6 contained a square enclosure with early Roman pottery, along with an irregular ditch interpreted as a furrow.

3.1.32 Within Site E, 246 trenches were excavated, and archaeological remains and features were recorded within 87 trenches (ES Appendix 13.4; CFA 2025e).

3.1.33 In Field EF4, two Iron Age enclosures were found, with features likely related to livestock containment. In Field EF14, small enclosures with a meandering ditch were present, dating to the late Iron Age with some Roman pottery. Field EF15 contained dense Romano-British enclosures, with finds including Roman pottery and a decorated sherd of plate. In Field EF16, a series of rectilinear enclosures with Iron Age pottery was discovered, with Roman pottery isolated to a few features. Field EF17 contained both Iron Age and Roman features, including concentric ring ditches and square enclosures. Limited features were found in Field EF18, with evidence suggesting Iron Age activity. In Field EF21, Roman pottery was found with external boundary ditches and a kiln fragment. Field EF22 showed a mix of Roman and Iron Age features, with Iron Age ditches in some trenches and Roman-era cultivation furrows in others. In Field EF23, Iron Age square enclosures were identified, with evidence suggesting domestic use. Field EF24 contained both Iron Age ring ditches and Roman rectangular enclosures. In Field EF28, small to medium-sized ditches formed a field system, likely for crop cultivation. Evidence of a Roman farmstead was found in the southern end of the field. Field EF31 contained Roman ditches forming a field system and Iron Age features in the south. Lastly, Field EF33 revealed Iron Age features, including drainage ditches and habitation evidence.

Site F

Designated Heritage Assets

3.1.34 There are no designated heritage assets within Site F.

Non-designated Heritage Assets

3.1.35 There are 48 HER records located within (or partially within) Site F. These comprise Iron Age/Romano-British settlement activity including enclosures, ditches and trackways, a 3rd century stone footed circular building, a Roman villa at Easton Maudit, a possible Saxon sunken-featured building, as well as Anglo-Saxon pottery and inhumations.

Geophysical Survey

3.1.36 Geophysical surveys across various fields (FF1, FF5, FF7, FF8, FF9, FF10, FF11, FF13, FF14, FF19, FF21, FF26, FF27, FF32) have revealed significant archaeological features, indicating extensive prehistoric and Roman activity (ASWYAS 2024d). These include rectilinear and circular anomalies likely representing enclosures, trackways, and settlement remains, with some features possibly dating to the Iron Age or Romano-British period. Additional evidence includes medieval/post-medieval ridge and furrow cultivation, former field boundaries, and field drains.

Air Photo and LiDAR

3.1.37 Aerial imagery across Fields FF10, FF11, FF13, FF19, FF21 and FF27 have revealed various archaeological features (Deegan 2025). These include a small rectilinear Roman building in FF10, three possible Bronze Age round barrows in FF11, and Iron Age/Roman enclosures in FF13 and FF21. In FF19, cropmarks suggest a Neolithic or Bronze Age curvilinear enclosure. The Easton Maudit Roman Villa in FF27 shows visible features such as a central range and two circular structures. Additional finds include poorly defined cropmarks, short ditches of uncertain date, and evidence of agricultural activity, such as ridge and furrow, field boundaries and land drains. Post-medieval activity is seen in quarrying, a

windmill in FF16, and a trackway in FF33.

Evaluation trenching

3.1.38 Within Site F, 291 trenches were excavated, and archaeological remains and features were recorded within 83 trenches (ES Appendix 13.4; CFA 2025f).

3.1.39 Field FF1 contained a late Iron Age to early Romano-British enclosure with associated pottery. In Field FF4, a possible drainage channel was recorded, while Field FF5 produced a ditch and pits containing handmade Iron Age pottery. Field FF7 included ditches linked to peripheral activity from an enclosure complex on the boundary with Field FF11. Field FF10 showed dense occupation, especially in the north-west, with sub-rectangular enclosures and a large ring ditch dating from the 2nd to mid-4th century AD, though a Saxon date could not be ruled out. A well-preserved burial-oriented north-west–south-east was also found in the field's southeast corner. Field FF11 contained early Roman ditches, pottery, a brooch, and a possible cremation pit or bustum. Field FF15 included large features interpreted as former extraction pits. In Field FF19, a burial, multiple pits and ditches, and a large circular feature with Iron Age pottery were recorded; enclosures to the east included possible human remains, suggesting a barrow. Field FF21 showed late Iron Age to early Roman activity through ditches and pits. Field FF26 had extensive enclosure remains along its southern edge. In Field FF28, a large curvilinear ditch of probable late Iron Age to early Roman date was recorded. Pits and ditches were identified in Field FF32, while Field FF33 contained features likely representing former agricultural boundaries.

Site G

Designated Heritage Assets

3.1.40 There are no designated heritage assets within Site G.

Non-designated Heritage Assets

3.1.41 There are 31 HER records located within (or partially within) Site G. These comprise Iron Age to Roman activity in the form of cropmarks of enclosures, ditches and trackways, areas of slag, Roman pottery, a Roman kiln, medieval ridge and furrow and plough headlands, a 19th century farmstead and a Second World War Practice Bombing Range.

Geophysical Survey

3.1.42 In Fields GF1, GF2, GF3, GF4, GF6, GF10, GF11, and GF12, various archaeological and geological features have been identified through geophysical survey (ASWYAS 2024e). Linear and curvilinear anomalies in GF1 may indicate potential archaeological remains, while several Iron Age and Roman features, such as enclosures and trackways, were confirmed in Fields GF3 and GF6. Unidentified bomb craters and possible unexploded ordnance from a Second World War bombing range are present in GF7, GF8 and surrounding areas. Agricultural features, including ridge and furrow, and field boundaries, are visible across multiple fields, with some elements corresponding to medieval/post-medieval activity. Some anomalies, particularly in GF12, are likely of geological origin.

Air Photo and LiDAR

3.1.43 Enclosures have been identified within Site G through aerial photo assessment, possibly dating to the Iron Age or Roman period, and are spread across Fields GF3, GF10, GF11 and possibly GF7 (Deegan 2025). A hollowed trackway in GF1, resembling a Roman road, aligns with a low embankment extending into GF3, though it is indistinguishable from medieval or post-medieval plough headlands. Ridge and furrow earthworks were present in several fields until the late 1940s but have since been

levelled. Post-medieval field boundaries and lynchets are visible in various fields, with some possibly predating historical maps. Additionally, the disturbance at the former Tinnick Farm site in Field GO6 is noted from LiDAR data.

Evaluation trenching

3.1.44 Within Site G, 189 trenches were excavated, and archaeological remains and features were recorded within 79 trenches (ES Appendix 13.4; CFA 2025g).

3.1.45 In Field GF1, Late Iron Age to Roman activity was evidenced by ditches and pits. Field GF3 contained an Iron Age to Roman sub-circular ditch and a series of ditches possibly related to former field boundaries. Field GF6 revealed a ring ditch and a rectangular enclosure, both associated with Iron Age to Roman pottery, along with other related features containing pottery and animal bones of similar date. Field GF10 primarily showed signs of agricultural use, but also included several ditches and a kiln with Romano-British dating, and one ditch dated to the Iron Age. In Field GF11, ditches and pits indicated Romano-British occupation from the 2nd century BC; a skeleton was found near one ditch, along with a possible ring ditch. Field GF12 contained a ditch with Iron Age dating and four intercutting ditches suggesting a continuation of the Romano-British occupation seen in GF11.

BESS Site

Designated Heritage Assets

3.1.46 Green Hill BESS Site does not contain any designated Heritage Assets.

Non-designated Heritage Assets

3.1.47 There are 10 HER records within (or partially within) the BESS Site. These include five heritage assets that were recorded prior to gravel extraction in 2004-5, comprising a single sherd of prehistoric pottery, a 10m diameter ring ditch enclosure dated to the Early Bronze Age, a small shallow pit which contained burnt bone, an undated pit, and a possible medieval trackway. The polygon surrounding a Middle to Late Iron Age trapezoidal enclosure excavated ahead of gravel extraction in 1974-5 also partially extends into the BESS Site although this is beyond the area investigated.

Geophysical Survey

3.1.48 The results of the geophysical survey (ASWYAS 2023) largely relate to agricultural activity, including former field boundaries, medieval/post-medieval ridge and furrow cultivation and modern ploughing. Linear and curvilinear anomalies were identified within the southern part of the BESS Site, which are of an unknown origin, although they could be associated with agricultural activity.

3.1.49 Towards the south-west of the BESS Site, ferrous anomalies and magnetic disturbance were identified which are interpreted as relating to an infilled pond, and close to the northern boundary of the BESS Site a diffuse area of modern building material and rubble caused magnetic disturbance. It is noteworthy that this is in the vicinity of the site of the 19th century field barn depicted on historic mapping which appears to have been used as the site of a searchlight battery during Second World War (HER 9201/0/1). Other areas of magnetic disturbance were identified as being caused by an electricity pylon and overhead power lines, and along the limits of survey areas due to interference from metal fencing, adjacent roads, and the existing substation. Significant magnetic disturbance interpreted as being of geological origin was detected following the eastern boundary of the BESS Site, following the course of a brook which flows around the eastern edge of the field which could indicate a palaeochannel. Agricultural anomalies associated with medieval or post-medieval ridge and furrow ridge and furrow, and two former field boundaries were also identified.

3.1.50 Within the BESS Site, no anomalies were identified that were considered to be of archaeological

interest. Instead anomalies were considered to be caused by agricultural activity associated with medieval or post-medieval ridge and furrow.

4 RELEVANT LEGISLATION AND GUIDANCE

4.1.1 As the Scheme is defined as a Nationally Significant Infrastructure Project (NSIP), assessments have been undertaken to meet the requirements of the Overarching National Policy Statement for Energy (EN-1) (DESNZ 2023) and the National Policy Statement for Renewable Energy Infrastructure (EN-3) (DESNZ 2023), and have been undertaken in accordance with the Chartered Institute for Archaeologists (CIfA) guidelines Standard and guidance for historic environment desk-based assessment (CIfA 2020).

4.1.2 The aerial photographic survey was conducted in line with Historic England Aerial Investigation and Mapping (AI&M) standards (Winton 2019).

5 AIMS AND OBJECTIVES

5.1.1 The aim of the UAV Multispectral Survey was to identify and record surface and sub-surface archaeological remains as part of a non-intrusive landscape survey approach to the archaeological evaluation.

5.1.2 The objectives of the archaeological investigation, as defined by the Project Design, are:

- To identify and record potential archaeological features across the site
- To establish the character and extent of potential archaeological features across the site with a view to establishing their significance and potential; and
- To create a permanent record of identified features within the Northamptonshire Historic Environment Record (HER).

6 METHODOLOGY

Field Survey – Multispectral Imaging

6.1.1 The UAV Multispectral survey was undertaken using a DJI Mavic 3 Multispectral (M3M) connected to a terrestrial GNSS base station established using the Real-Time Kinematic (RTK) solution.

6.1.2 Overlapping multispectral imagery was captured for the survey area using the M3M sensor. The sensor captured imagery in the following bands: blue, green, red, red edge, near infrared (NIR).

6.1.3 The area surveyed was pre-programmed prior to flight and flown autonomously along parallel flight-lines separated by a predetermined percentage of overlap. The following survey parameters were applied:

Survey Parameter	Value
Side Overlap	70%
Forward Overlap	80%
Flight Altitude	120m
Speed	8.9m/s
Ground Sampling Distance (GSD)	5.53cm/pixel

6.1.4 UAV Multispectral images were processed to produce the following output:

- 6-band Multispectral Orthomosaic
- Multispectral Index Visualisations

6.1.5 The following methods were used to create these outputs:

6-band Multispectral Orthomosaic

6.1.6 Vertical photographs were imported into Agisoft Metashape and reflectance was calibrated using the sun sensor. Once calibrated, photographs were aligned and processed to create a sparse point cloud. Following this a dense point cloud and DEM were produced.

6.1.7 A 6-band multispectral orthomosaic was produced using the DEM as the base dataset. The orthomosaic was generated to a resolution of 6cm/pixel and exported for archiving and further analysis.

6.1.8 *Multispectral Index Visualisations*

6.1.9 Three multispectral Index Visualisations were produced for this survey: Normalised Difference Vegetation Index; Normalised Difference Red Edge; Green Normalised Difference Vegetation Index.

Normalised Difference Vegetation Index (NDVI) quantifies vegetation by measuring the difference between near-infrared (which vegetation strongly reflects) and red light (which vegetation absorbs) (James, et al. 2020). Vegetation which reflects more near-infrared light than absorbs red light are typically healthier. The values given by this index range from -1 to 1. This method essentially measures the 'greenness' of the crop which is helpful in visualising crop stress, and thus possible cropmarks relating to archaeological remains, which may not be visible to the naked eye or through traditional aerial photography.

Normalised Difference Red Edge (NDRE) is like NDVI but instead measures the amount of chlorophyll in plants by measuring the ratio of near-infrared and red-edge. High values of NDRE represent higher levels of leaf chlorophyll content. Soil typically has the lowest values, unhealthy plants have intermediate values, and healthy plants have the highest values. NDRE is a better indicator of vegetation health/vigour than NDVI for mid to late season crops that have accumulated high levels of chlorophyll in their leaves. This is because red-edge light is more translucent to leaves than red light and so it is less likely to be completely absorbed by a canopy. The values given by this index range from -1 to 1

Green Normalised Difference Vegetation Index (GNDVI) is an index of plant "greenness" or photosynthetic activity. It is a chlorophyll index and is used at later stages of development, as it saturates later than NDVI. It is one of the most widely used vegetation indices to determine water and nitrogen uptake in the crop canopy. The values given by this index range from -1 to 1.

Aerial Mapping and analysis

6.1.10 The aerial photographic survey was conducted in line with Historic England Aerial Investigation and Mapping (AI&M) standards (Winton 2019).

6.1.11 Archaeological features visible on the multispectral imagery were mapped using polygons to demarcate the extent of the features. Different colours were used to represent different types of features. The colours used are outline below:

- **Orange** – Archaeological feature
- **Teal** – Area and orientation of ridge and furrow

6.1.12 The Feature interpretation and dating were based on recognising morphological characteristics forms and cross-examination with other known examples and cartographic data. Complimentary cartographic sources used includes The National Record for the Historic Environment (NRHE), Historic Environment Record data (HER) and readily available historic OS mapping accessed through the National Library of Scotland digital mapping portal. Cross reference is also made to results of geophysical surveys and evaluation trial trenching in aiding interpretation.

6.1.13 The prevalence of periglacial features renders interpretation difficult in some areas; digitised features generally show some different alignment or character.

7 RESULTS

7.1.1 A UAV Multispectral survey was successfully undertaken across the nine areas which make up The Site. Multispectral data were collected and processed for the 941ha survey area in a series of visits carried out between the 12th-16th of May, 13th August and 11th September 2025. The majority of the areas were captured during May, but a number of areas were not under crop, or only recently planted, in May and so lacked the necessary crop growth for meaningful results. Subsequent inspection during July established that these areas were either under cover crop, and not susceptible to good crop mark formation, or down to maize, which matures later (although in the end, the very hot dry summer meant that harvest was significantly advanced). Survey of maize crops in Area G was undertaken on 13th August and revisited on 11th September, although largely harvested at this point.

7.1.2 The multiband orthomosaic was processed to a resolution of 5.53cm and was post-processed using Agisoft Metashape to produce the specified multispectral index visualisations. The survey was conducted in sunny conditions which provided optimal lighting conditions for the collection of multispectral imagery. This section comprises a summary of results for each of the individual survey areas.

7.2 Area A

7.2.1 Area A was surveyed in sunny weather conditions. Field AF1, AF2 and AF3 were not surveyed as a result of there being no crop on these fields. The remainder of the fields (AF4-AF13) were subjected to survey and contained crops of grass and winter wheat. Crops of spring oats in fields AF24-29 were still in the early stages of growth, reducing the likely visibility of cropmarks in these fields.

7.2.2 A possible Iron Age/Roman rectilinear enclosure and probable field boundaries [1] are visible as positive cropmarks in multispectral imagery in Field AF11 and AF 4 (Figure 7). Higher values of near-infrared reflection correspond to denser and healthier vegetation associated with the ditches of the enclosure. These show best on NDRE visualisations as a curvilinear feature with near-infrared reflectance values which contrast with the natural sub-soils.

7.2.3 Feature Group [2] consists of several positive and negative linear and rectilinear cropmarks spread across AF9 and AF14 (Figure 7). Given the concentration of features visible in these field and their proximity to a square double-ditched enclosure [4] in field AF29, it is possible these cropmarks relate to archaeological features.

7.2.4 The survey recorded areas of ridge and furrow [3] which were identified in fields AF4 and AF11 (Figure 7). Furrows are most clearly visible on the NDVI multispectral index visualisation where they are visualised as linear features reflecting higher values in the near-infrared near infrared spectrum. Higher values of near-infrared reflection typically correspond to denser and healthier vegetation. In this case the data shows a contrast between the silted and more nutrient rich furrows and the less nutritious and compacted ridges.

7.2.5 A possible square double-ditched enclosure [4] is visible as positive cropmarks in field AF29 (Figures 10-12) with lower reflectance values from between the ditches suggestive of remains of a bank. However, evaluation trenching identified no ditched features here.

7.2.6 A probable medieval/post-medieval rectilinear field boundary [5] is visible as positive cropmarks in the north of field AF14 (Figure 10).

7.2.7 The survey identified medieval plough headlands [6] which are visible as negative cropmarks in fields AF14, AF24 and AF23. These are associated with cropmarks relating to ridge and furrow [7] which show well in the south and east of the field package (Figure 10).

7.3 Area A2

7.3.1 Area A2 was surveyed in sunny weather conditions. All of the fields (A2F1-A2F4) were subjected to survey and contained crops of winter wheat. These crops had been damaged by exceptionally wet weather when planted in the autumn, reducing the likely visibility of cropmarks in these fields (Figure 16).

7.3.2 Two probable post-medieval field boundaries [8] are visible as positive cropmarks in the western extent of field A2F3. The easternmost of these is depicted on the OS Second Edition Six-inch 1901 mapping of the parishes of Walgrave and Hannington (Figure 16).

7.3.3 The survey recorded areas of ridge and furrow [10] which were identified in fields A2F2, A2F3 and AF4 (Figure 16).

7.4 Area B

7.4.1 Area B was surveyed in sunny weather conditions. All of the fields (BF1-BF5) were subjected to survey and contained crops of grass and winter wheat. While the grass in BF1 was in good condition for survey, the winter wheat/barley in fields BF2-BF5 were stunted.

7.4.2 A negative rectilinear cropmark [11] is visible in the north-east of field BF1 (Figure 20). The lower reflectance values associated with these features may be indicative of an earthen banked enclosure. The enclosure is aligned with additional positive cropmarks to the north and may form part of a broader site.

7.4.3 A smaller positive rectilinear cropmark [12] is also visible in the north-east of field BF1 (Figure 20). The higher reflectance values associated with these cropmarks is possibly indicative of a ditched enclosure. Weak circular cropmarks Feature Group [13], were also identified within the possible enclosure.

7.4.4 Two rectangular cropmarks [14] are visible in the north-east of field BF1 (Figure 20). These features are associated with higher reflectance values indicative of cut features.

7.4.5 A possible rectilinear cropmark [15] is visible in the north-east of field BF3 (Figure 20). The higher reflectance values associated with these features are possibly indicative of a cut feature.

7.4.6 The survey also recorded the remains of a medieval plough headland [16], visible as a negative cropmark in fields BF1, and cropmarks associated with ridge and furrow [17] in fields BF1, BF3 and BF5 (Figure 20).

7.5 Area C

7.5.1 Area C was surveyed in sunny weather conditions. All of the fields (CF1-CF8) were subjected to survey and contained crops of spring wheat/barley. The crops in these fields were in the early stages of growth, reducing the likely visibility of cropmarks in these fields.

7.5.2 The survey recorded areas of ridge and furrow [18] identified in the east of field CF6 (Figure 24).

7.6 Area D

7.6.1 Area D was surveyed in sunny weather conditions. Fields DF1 and DF2 were subjected to survey and contained crops of spring wheat/barley, while fields DF3 and DF4 were not under crop and were not surveyed.

7.6.2 Two probable post-medieval field boundaries [19] are visible as positive cropmarks in the western extent of field DF2. These are depicted on the OS Second Edition Six-inch 1901 mapping of the parishes of Hardwick, Great Harrowden and Wellingborough (Figure 28).

7.6.3 The survey recorded areas of ridge and furrow [18] identified in field DF1.

7.7 Area E

7.7.1 Area E was surveyed in sunny weather conditions. Fields EF1-EF4 and EF7-EF12 did not contain crops and were not subjected to survey. Fields EF5-EF6 and EF13-EF34 contained winter/spring crops of wheat and barley, with the exception of field EF29 which was subject to pasture (horse grazing). The condition of crops varied across the site, ranging from optimal in fields EF19, EF20, EF23, EF25, EF26, EF30-EF32, EF33 and EF34 to poor in fields EF18 and the east of fields EF22 and EF24.

7.7.2 Two likely Iron Age/Roman square enclosures [20] are visible as positive cropmarks in field EF20 (Figure 33 and 36). These are closely associated with a further positive cropmark [21] in the same field perhaps part of a similar enclosure or possibly associated field boundary. These are likely to be associated with a probable prehistoric/Roman settlement recorded as being visible as cropmarks in the HER (1977).

7.7.3 Two likely Iron Age/Roman curvilinear enclosures [22] are visible as positive cropmarks in field EF16 (Figure 33). These are likely to be associated with a probable prehistoric/Roman settlement recorded as being visible as cropmarks in the HER (1977).

7.7.4 Feature Group [23] consists of a cluster of possible field boundaries and pits visible as positive cropmarks at the south-western extent of field EF19 (Figure 33). These may be associated with a probable prehistoric/Roman settlement recorded as being visible as cropmarks in the HER (1977).

7.7.5 A series of likely Iron Age/Roman field or trackway ditches [24] are visible as positive cropmarks running across fields EF25 and EF26 which have been grouped together as a result of similarity in their orientation and shape (Figure 36). They are spatially associated with a probable curvilinear enclosure [25] and a possible field boundary [26] in field EF26 and may be associated with a possible prehistoric settlement recorded as being visible as cropmarks in the HER (3871; Figure 36).

7.7.6 Two probable Iron Age/Roman field boundaries [27] are visible as positive cropmarks in the south-western extent of field EF25. Their orientation is similar to a probable Iron Age/Roman field boundary [28] which is visible as a positive cropmark in the north-western extent of field EF28 (Figure 36).

7.7.7 Feature Group [29] consists of a cluster of possible Iron Age/Roman settlement features visible as positive linear and curvilinear cropmarks at the northern extent of field EF29 (Figure 38). These are closely associated with a probable Iron Age/Roman curvilinear enclosure [30] which is visible as a cropmark in field EF29 and a probable prehistoric trackway [31] visible as positive cropmarks running north-south in the north-west of field EF29 (Figure 38). These may be associated with a probable prehistoric/Roman settlement recorded as being visible as cropmarks in the HER (1984).

7.7.8 A probable prehistoric trackway [32] is visible as positive cropmarks running north-south across field EF30 (Figure 38).

7.7.9 Possible Iron Age/Roman settlement features [33] consisting of boundaries, enclosures and a trackway are visible at the northern extent of field EF30 and the southern extent of field EF31 (Figure 38). A possible ring ditch with a pit visible at its centre [34] is also visible as positive cropmarks directly adjacent to the settlement. These are likely associated with a possible prehistoric funerary and/or settlement and ring ditch recorded as being visible as cropmarks in the HER (1983).

7.7.10 Three probable Iron Age / Roman ditches [35] and enclosure [36] are visible as positive cropmarks at the southern extent of field EF23 (Figure 41). These may be associated with an undated enclosure and settlement recorded as being visible as cropmarks/soilmarks in the HER (5888/0/1).

7.7.11 Two possible Iron Age/Roman curvilinear enclosures [37] are visible as positive cropmarks at the southern extent of field EF33 (Figure 41). The westernmost enclosure is associated with Feature Group [38], a cluster of pit features visible as positive cropmarks, many of which are located within the enclosure. The pits appear to be aligned with a probable Iron Age/Roman feature [39] visible as positive cropmarks (Figure 41), although the evident geological patterning leaves some uncertainty over interpretation of linear features here.

7.7.12 A series of possible Iron Age/Roman ditches [40, 41] are visible as positive cropmarks at the southern extent of field EF33 (Figure 41). These are broadly aligned and have been grouped together as a result of similarity in their orientation and shape. Feature Group [42] consists of a cluster of possible Iron Age pits [42] visible as cropmarks at the southern extent of field EF33 (Figure 41). Unlike the cluster of pits to the north, there is more variation in the size of these cropmarks and it may be that some or all of these features are natural.

7.7.13 A positive cropmark [9] is visible as a at the southern extent of field EF33. This is location is recorded in the HER as Low Hill, a Bronze Age round barrow used as a hundredal meeting place (1985/0/1) (Figure 41).

7.7.14 A possible Iron Age/Roman field system [43] is visible as positive cropmarks in field EF34 and are likely associated with a rectilinear enclosure [44] which is also visible as positive cropmarks at the northern extent of field EF34 (Figure 44).

7.7.15 The survey also recorded a medieval plough headland [45] visible as a negative cropmark in field EF13 and cropmarks associated with ridge and furrow [46] (Figure 44). Another plough headland [47] was recorded in field EF27.

7.8 Area BESS

7.8.1 Area BESS was surveyed in overcast weather conditions. All of the fields (BESS1-BESS2) were subjected to survey and contained crops of winter wheat/barley.

7.8.2 The survey recorded ridge and furrow [48] in the west of field BESS1 (Figure 49).

7.9 Area F

7.9.1 Area F was surveyed in sunny weather conditions. All of fields FF1-FF35 were subjected to survey with the exception of fields FF3 and FF4 which did not contain crop and were not surveyed. Crops of grass and winter/spring wheat and barley were present in the other fields. The condition of crops varied across the site with limited growth in fields FF7, FF8, FF10 and FF18. and the east of fields EF22 and EF24.

7.9.2 Two possible Iron Age/Roman square enclosures [49] are visible as positive cropmarks in field FF17 (Figure 54). The eastern enclosure is well-defined and more likely to be of archaeological origin, while the western enclosure is more diffuse and is interpreted as a possible archaeological feature.

7.9.3 A probable rectilinear enclosure and field boundaries [50] are visible as positive cropmarks in the west of field FF13 (Figure 55). Three probable pits [51] are visible as positive cropmarks immediately adjacent to the enclosure and enclosed by the field boundaries. These are likely associated with a probable undated enclosure recorded as being visible as cropmarks/soilmarks in the HER (3290/0/1).

7.9.4 A possible prehistoric trackway [52] is visible as positive cropmarks running north-west to south-east across field FF5 (Figure 52). This lies adjacent to a possible medieval/post-medieval field boundary [53] visible as a positive cropmark in field FF5. A further length of probable trackway [54] can be seen in field FF11.

7.9.5 The survey recorded medieval plough headlands [55] which are visible as negative cropmarks at the western extent of field FF29. These align with a possible medieval routeway recorded in the HER (3279/0/1). Cropmarks associated with areas of ridge and furrow [56] are visible in fields FF30, FF29, FF28, FF27 and FF26 (Figures 56, 57).

7.9.6 A possible post-medieval water channel [57] is visible as a positive cropmark at the south-eastern extent of field FF33 (Figures 56, 57). This appears to be connected with a wider network of watercourses visible as cropmarks and soilmarks in adjacent fields to the south-east. These may be associated with Bozeat Grange landscape park (3495) to the south-east.

7.10 Area G

7.10.1 Area G was surveyed in sunny weather conditions. Fields GF1-GF2, GF6-GF9, GF11-GF13, GO1 and GO4-GO6 were subject to survey. Fields GF5 and GF8 were down to a cover crop, GF3-GF4, and GF10 were down to maize, but early harvest meant that these were not captured. Crops of spring barley and forage maize were present in the surveyed fields with limited growth in field GF6 and more advanced crop in field GF13.

7.10.2 A possible rectilinear positive cropmark [58] is visible in field GF13 (Figure 62). At the eastern edge of Field GF11 a curvilinear feature [61] may represent a prehistoric ring ditch or small enclosure (Figures 63-64). A possible group of pits [62] is evident a short way to the north but it is unclear if these are related. At the western edge of the field, linear features [68] and [69] are possibly of an archaeological origin. A similar feature is recorded to the west (MMK8112), although the two do not align well (it seems possible that both might relate to earlier ridge and furrow cultivation). Overlapping into GF12 is a further short length of linear feature [70]. This does not appear to relate to the post-medieval field layout, but is otherwise of uncertain date.

7.10.3 Several probable post-medieval field boundaries [59]-[67] are visible as positive cropmarks at the southern extent of field GF6 and in fields GF11-GF13 (Figures 61, 63). These are depicted on the OS First Edition 1885 Six-inch mapping of the parishes of Warrington, Lavendon and Cold Brayfield.

7.10.4 Several groups of pits [71]-[77] are apparent in Field GF7, some quite large (Figures 63-64). These appear likely to relate to the recorded WWII bombing range (MMK8118). [71]-[74] express as positive cropmarks. [75]-[77] represent areas of negative growth, to the point of being bare of crop, but also appear to correlate to WWII features (features of Iron Age/Roman date were found here in trenching).

7.10.5 At the southern edge of Field GF12 a herringbone pattern of modern drainage is apparent (not mapped). Periglacial features are also apparent here demonstrating the variability of the background geology.

8 Discussion

8.1.1 The UAV multispectral aerial survey has provided a complementary dataset to assist in the comprehensive identification and mapping of archaeological features at Green Hill, Northampton. Site conditions at the time of survey were good for the identification of cropmarks in cereal crops using the standard RGB photography captured by the UAV as a result of the prolonged dry-spell which preceded the survey. This resulted in a number of the sites mapped by the survey being visible in standard RGB photography as well as multispectral outputs, a good example of this being the linear features [37, 39] and pits [38] in field EF33.

8.1.2 Other features were readily identified in multispectral imagery that were not visible, or very hard to interpret, in standard RGB photography. These include a possible Iron Age/Roman rectilinear enclosure [1] in field AF11, Feature Group [23] which consists of a cluster of possible field boundaries and pits visible as positive cropmarks at the south-western extent of field EF19 and a possible Iron Age/Roman rectilinear enclosure [57] in field GF13 and ring ditch [61] in GF11.

8.1.3 Although the prolonged dry-spell which preceded the survey increased the visibility of cropmarks in fields where the crop was at a more advanced stage of growth, the lack of rainfall had impacted crop growth in a significant number of fields. Crops where growth had been stunted at an early stage by a lack of rainfall are less likely to have established root systems to the depth of underlying archaeological features and there will be no variance in reflectance associated with these features. The site conditions are likely to have negatively impacted the results of the survey in these areas. Likewise, areas planted late in the spring with maize (particularly in Area G) had not developed sufficiently in the first survey window. These were partially captured later in the season, having had time for cropmarks to develop, but the continuing dry spell meant that harvest was significantly advanced and three fields on the western edge of Area G were not captured.

8.1.4 The possible Iron Age/Roman curvilinear enclosure [37] visible as positive cropmarks at the southern extent of field EF16 is associated with a cluster of probable pits [38], many of which appear to be located within the enclosure. These features are clearly visible in RGB and multispectral aerial imagery along with a large number of curving linear cropmarks that likely represent periglacial features. The identification of these pits highlights the potential for UAV aerial survey to identify discrete pits that may not be associated with a magnetic response and not be identified in historic aerial photography. Periglacial landforms can contain Pleistocene deposits that may be as least as old as the last Ice Age and can be targeted to inform geoarchaeological landform modelling of a given site or landscape.

8.1.5 UAV based multispectral imaging has been tested for archaeological prospection in the UK in a variety of landscapes (Bennett et al. 2012; Leek et al. 2023: grassland/upland) and with positive results, but often at quite small scale (Moriarty et al. 2018). Key advantages of a UAV-mounted multispectral camera over RGB aerial photography are in widening the window for successful survey and increased spatial resolution, offering the potential to detect smaller and subtler objects within the multispectral imagery. Ultimately, however, the technique depends on the same soil-moisture deficits and crop stresses as conventional photography, but allowing use of a suite of multi-spectral indices to better discriminate these differences. Thus, although the technique can offer significant advantages, it cannot entirely overcome factors such as background geology or seasonal variations in soil-moisture deficits in determining the formation of visible differences in the crop (even if 'visible' on a wider spectrum).

8.1.6 In conclusion, the UAV multispectral aerial survey has successfully identified archaeological features across the nine survey areas. As a result of dry conditions at the time of the survey resulting in visible cropmark formation, the RGB camera has also proved useful for the identification of cropmarks, demonstrating the value of collecting standard RGB photographs alongside multispectral images in order to identify archaeological features in a range of conditions. In total 24% of mapped features were identified primarily from the multispectral imagery and may not have otherwise been detected.

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APPENDIX 1: GAZETTEER OF FEATURES

OBJECT_ID	PERIOD	INTERP	CERTAINTY	EVIDENCE_1	SOURCE_1	HER_NO
1	ROMAN/IRON AGE	RECTILINEAR ENCLOSURE	PROBABLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	
2	MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
3	MEDIEVAL	RIDGE AND FURROW	PROBABLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	
4	ROMAN/IRON AGE	ENCLOSURE	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
6	MEDIEVAL	PLOUGH HEADLAND	POSSIBLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	
7	MEDIEVAL	RIDGE AND FURROW	PROBABLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	
8	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
9	BRONZE AGE	ROUND BARROW	PROBABLE	POSITIVE CROPMARK	BNDVI_ORTHOMOSAIC	1985/0/1
10	MEDIEVAL	RIDGE AND FURROW	PROBABLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	
11	MEDIEVAL	ENCLOSURE	POSSIBLE	NEGATIVE CROPMARK	RGB_ORTHOMOSAIC	
12	MEDIEVAL	ENCLOSURE	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
13	MEDIEVAL	PIT	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
14	MEDIEVAL	POND	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
15	MEDIEVAL	ENCLOSURE	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
16	MEDIEVAL	PLOUGH HEADLAND	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
17	MEDIEVAL	RIDGE AND FURROW	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
18	MEDIEVAL	RIDGE AND FURROW	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
19	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
20	IRON AGE/ROMAN	CURVILINEAR ENCLOSURE	POSSIBLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	1977
21	IRON AGE/ROMAN	LINEAR FEATURE	PROBABLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	1977
22	IRON AGE/ROMAN	CURVILINEAR ENCLOSURE	POSSIBLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	1977
23	IRON AGE/ROMAN	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	BNDVI_ORTHOMOSAIC	1977
24	IRON AGE/ROMAN	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
25	IRON AGE/ROMAN	ENCLOSURE	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
26	IRON AGE/ROMAN	ENCLOSURE	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
27	IRON AGE/ROMAN	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
28	IRON AGE/ROMAN	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	

29	IRON AGE/ROMAN	ENCLOSURE	PROBABLE	POSITIVE CROPMARK	BNDVI_ORTHOMOSAIC	1984
30	IRON AGE/ROMAN	ENCLOSURE	PROBABLE	POSITIVE CROPMARK	BNDVI_ORTHOMOSAIC	1984
31	IRON AGE/ROMAN	TRACKWAY	PROBABLE	POSITIVE CROPMARK	BNDVI_ORTHOMOSAIC	1984
32	IRON AGE/ROMAN	TRACKWAY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	9805
33	IRON AGE/ROMAN	TRACKWAY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	1983
34	IRON AGE/ROMAN	CIRCULAR ENCLOSURE	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	1983
35	IRON AGE/ROMAN	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	5888/0/1
36	IRON AGE/ROMAN	SETTLEMENT	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	5888/0/1
37	IRON AGE/ROMAN	ENCLOSURE	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
38	IRON AGE	PIT	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
39	IRON AGE	FIELD BOUNDARY	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
40	IRON AGE/ROMAN	FIELD BOUNDARY	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
41	IRON AGE/ROMAN	FIELD BOUNDARY	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
42	IRON AGE/ROMAN	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
43	IRON AGE/ROMAN	FIELD SYSTEM	PROBABLE	POSITIVE CROPMARK	NDRE_ORTHOMOSAIC	
44	IRON AGE/ROMAN	ENCLOSURE	PROBABLE	POSITIVE CROPMARK	NDRE_ORTHOMOSAIC	
45	MEDIEVAL	PLOUGH HEADLAND	PROBABLE	NEGATIVE CROPMARK	RGB_ORTHOMOSAIC	
46	MEDIEVAL	RIDGE AND FURROW	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
47	MEDIEVAL	PLOUGH HEADLAND	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
48	MEDIEVAL	RIDGE AND FURROW	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
49	ROMAN/IRON AGE	SQUARE ENCLOSURE	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
50	IRON AGE	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	3290/0/1
51	IRON AGE/ROMAN	PIT	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	3290/0/1
52	IRON AGE/ROMAN	TRACKWAY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	3274
53	POST MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
54	IRON AGE/ROMAN	TRACKWAY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	3290/0/1
55	MEDIEVAL	PLOUGH HEADLAND	POSSIBLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
56	MEDIEVAL/POST-MEDIEVAL	RIDGE AND FURROW	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
57	MEDIEVAL/POST-MEDIEVAL	WATER CHANNEL	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	
58	ROMAN/IRON AGE	RECTILINEAR ENCLOSURE	POSSIBLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	
59	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	NDVI_ORTHOMOSAIC	
60	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	RGB_ORTHOMOSAIC	

61	PREHISTORIC	CURVILINEAR FEATURE	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
62	UNCERTAIN	PIT	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
63	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
64	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
65	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
66	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
67	POST-MEDIEVAL	FIELD BOUNDARY	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
68	IRON AGE/ROMAN	LINEAR FEATURE	POSSIBLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
69	IRON AGE/ROMAN	LINEAR FEATURE	POSSIBLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
70	UNCERTAIN	LINEAR FEATURE	POSSIBLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
71	20TH CENTURY	PIT/HOLLOW	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
72	20TH CENTURY	PIT/HOLLOW	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
73	20TH CENTURY	PIT/HOLLOW	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
74	20TH CENTURY	PIT/HOLLOW	PROBABLE	POSITIVE CROPMARK	GNDVI_ORTHOMOSAIC	
75	20TH CENTURY	PIT/HOLLOW	PROBABLE	NEGATIVE CROPMARK	GNDVI_ORTHOMOSAIC	
76	20TH CENTURY	PIT/HOLLOW	PROBABLE	NEGATIVE CROPMARK	GNDVI_ORTHOMOSAIC	
77	20TH CENTURY	PIT/HOLLOW	PROBABLE	NEGATIVE CROPMARK	GNDVI_ORTHOMOSAIC	

FIGURES

FIGURES

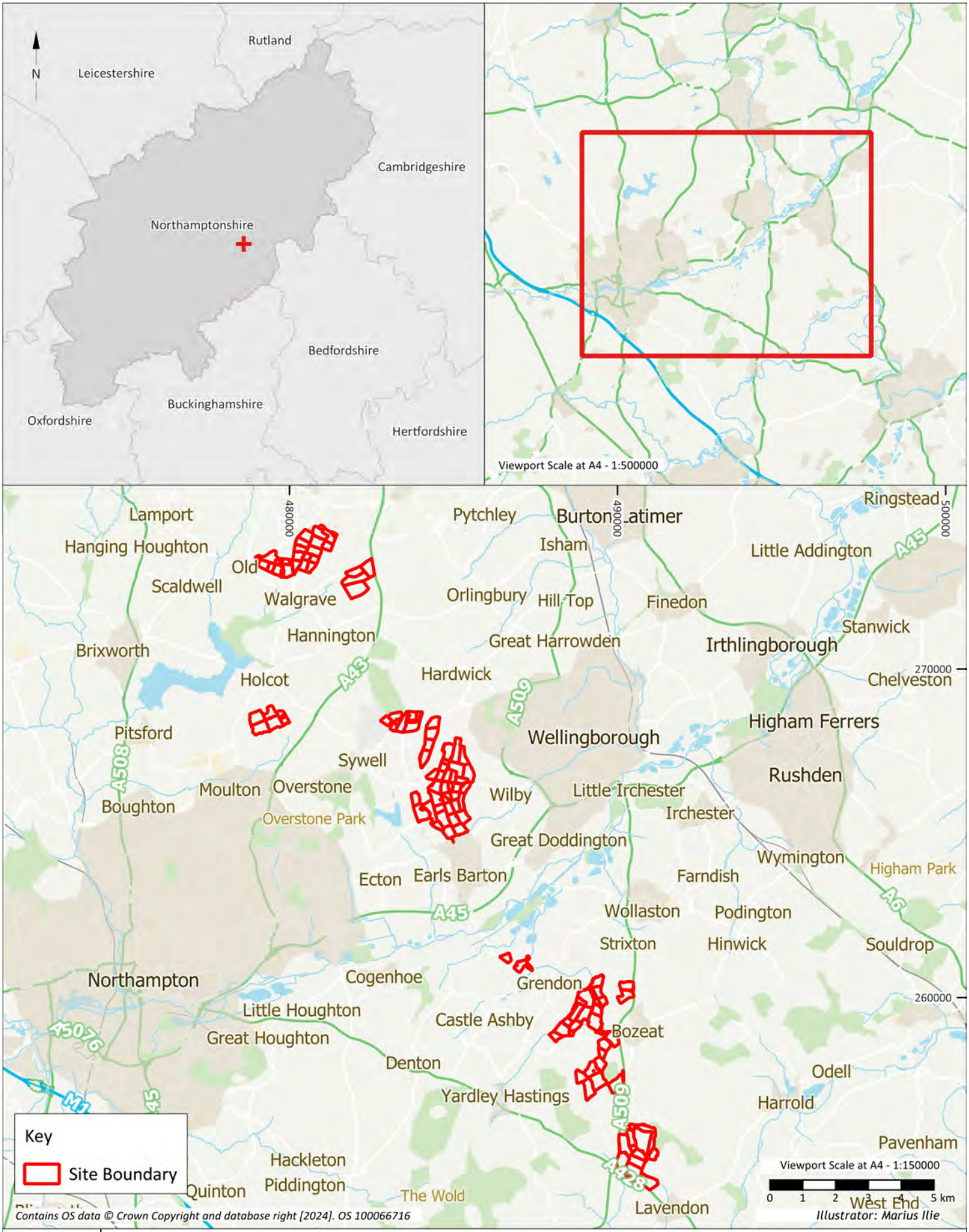

Figure 01 - Location Map
10292 - Green Hill, Northampton

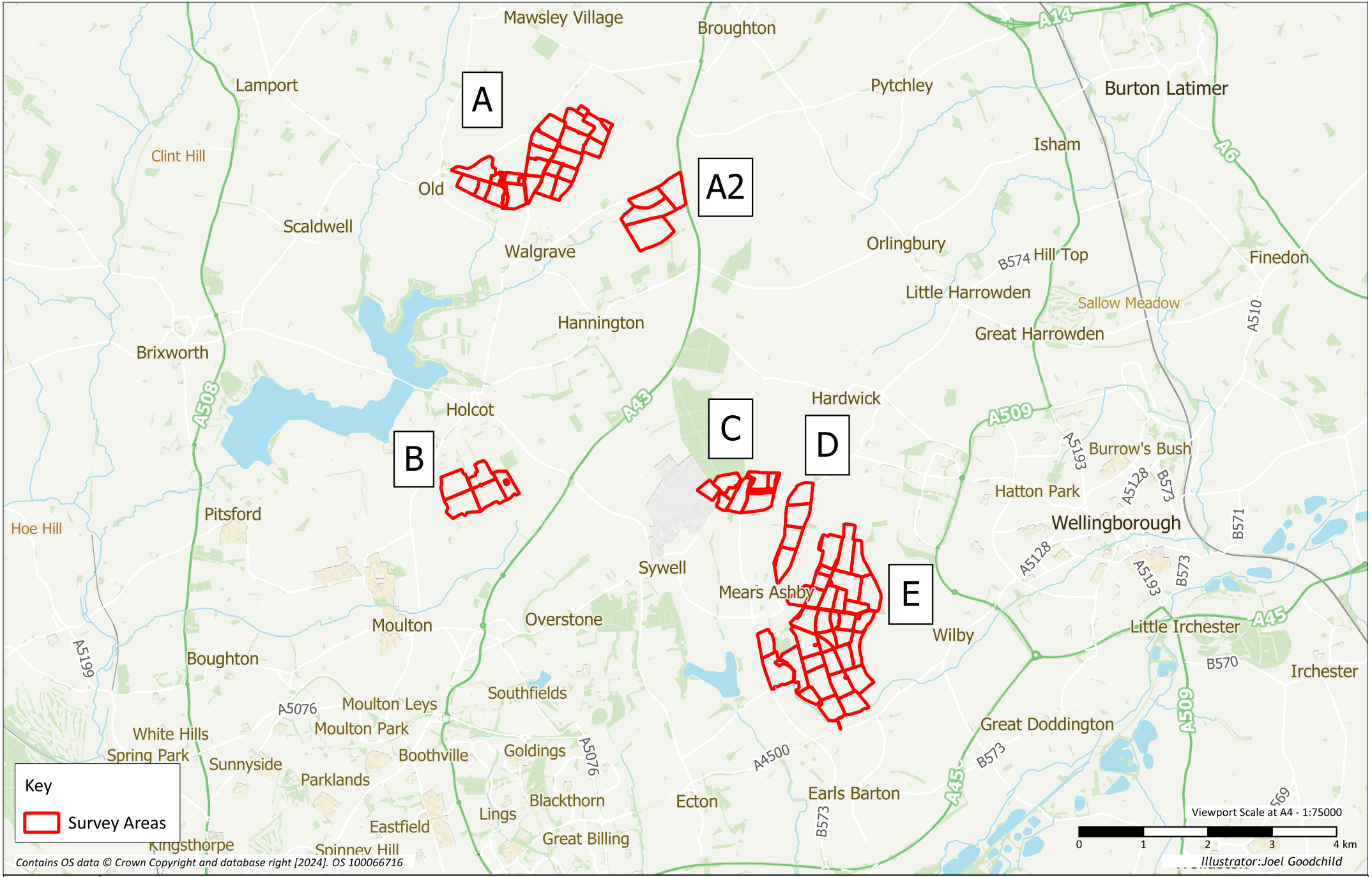

Figure 02 - Survey Areas
10292 - Green Hill, Northampton

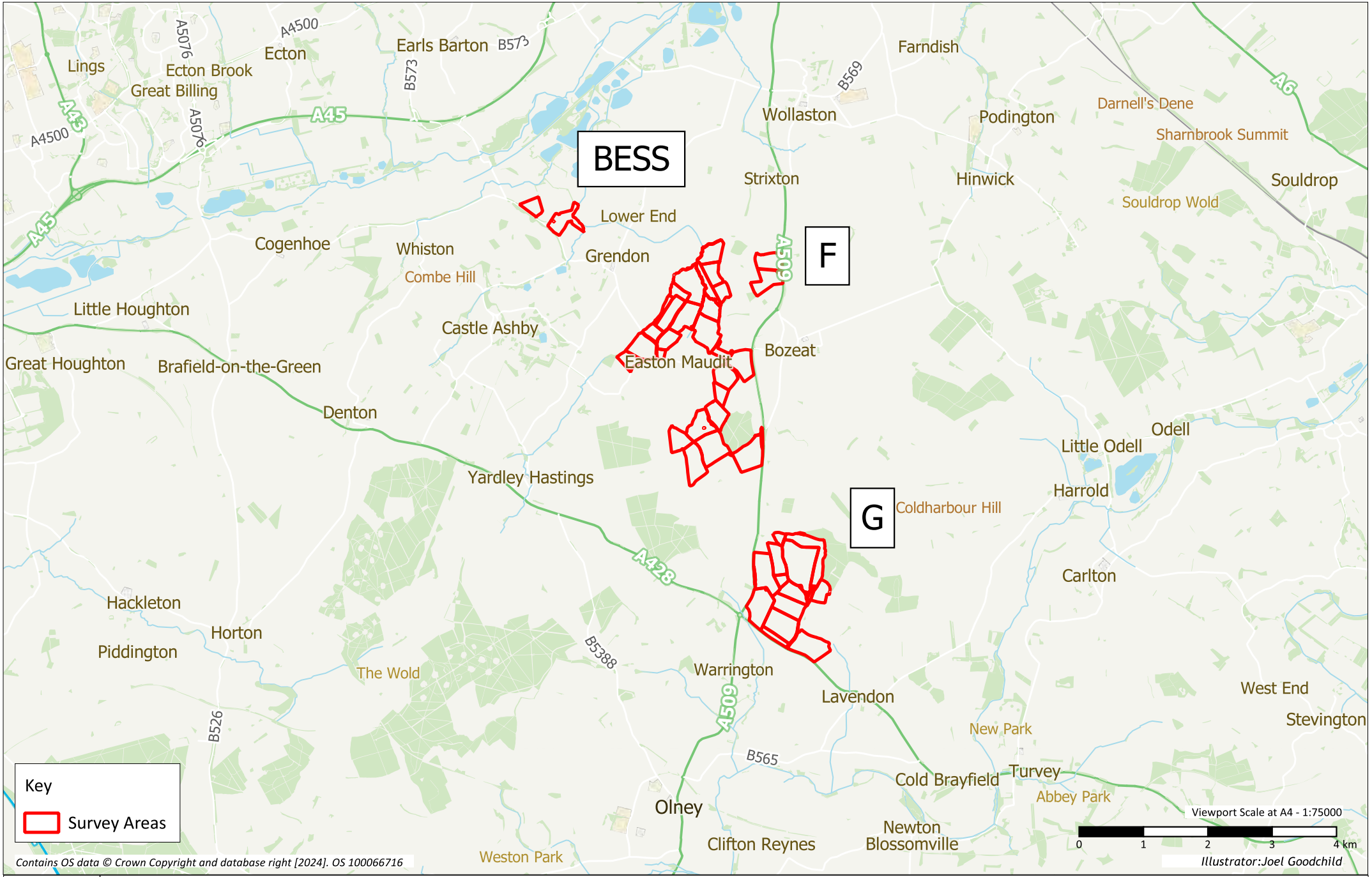

Figure 03 - Survey Areas
10292 - Green Hill, Northampton

Figure 04 - Area A
10292 - Green Hill

Figure 05 - Area A (west) RGB
10292 - Green Hill

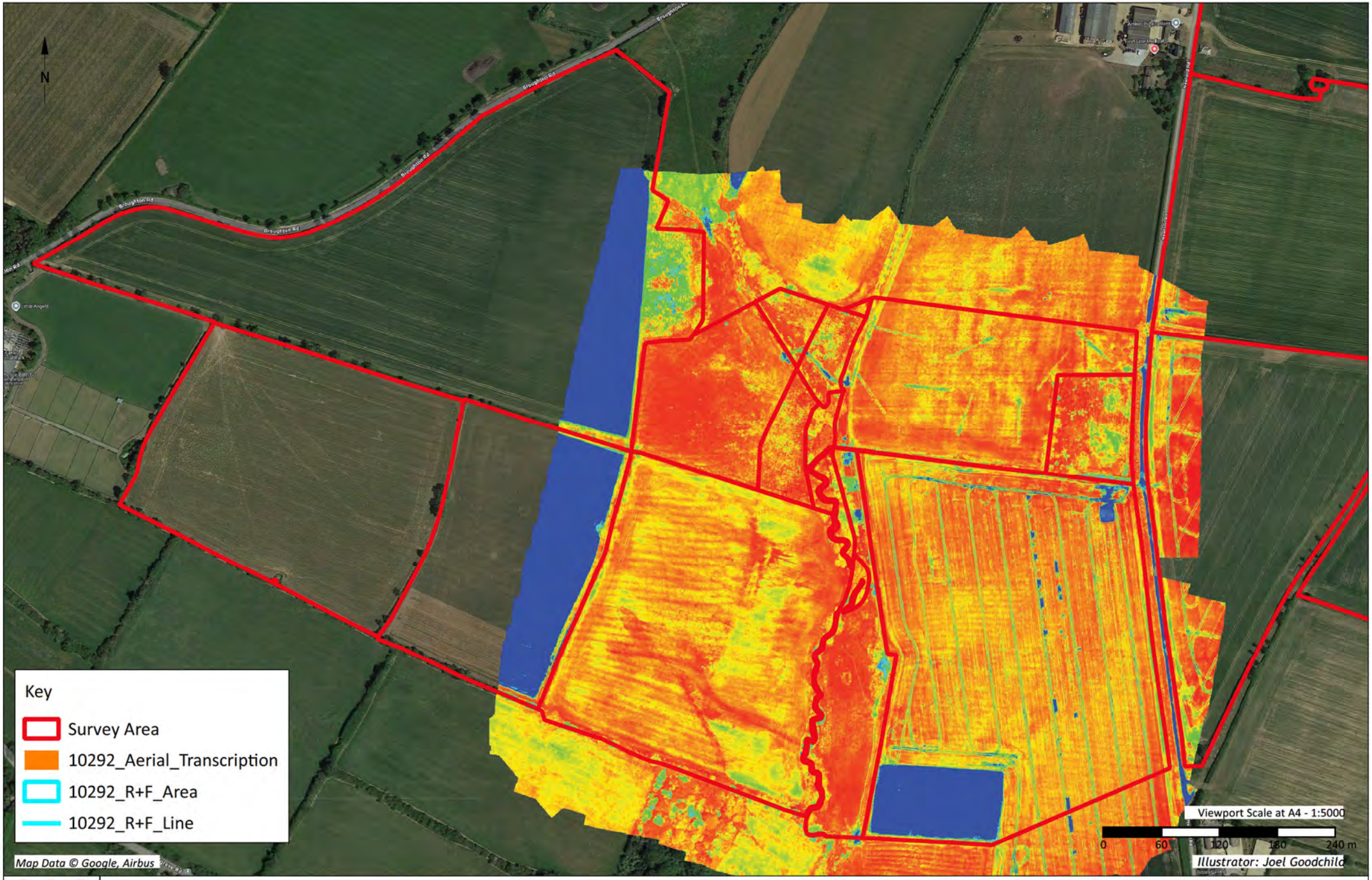

Figure 06 - Area A (west) NDVI
10292 - Green Hill

Figure 07 - Area A (west) Aerial Transcription
10292 - Green Hill

Figure 08 - Area A (east) RGB
10292 - Green Hill

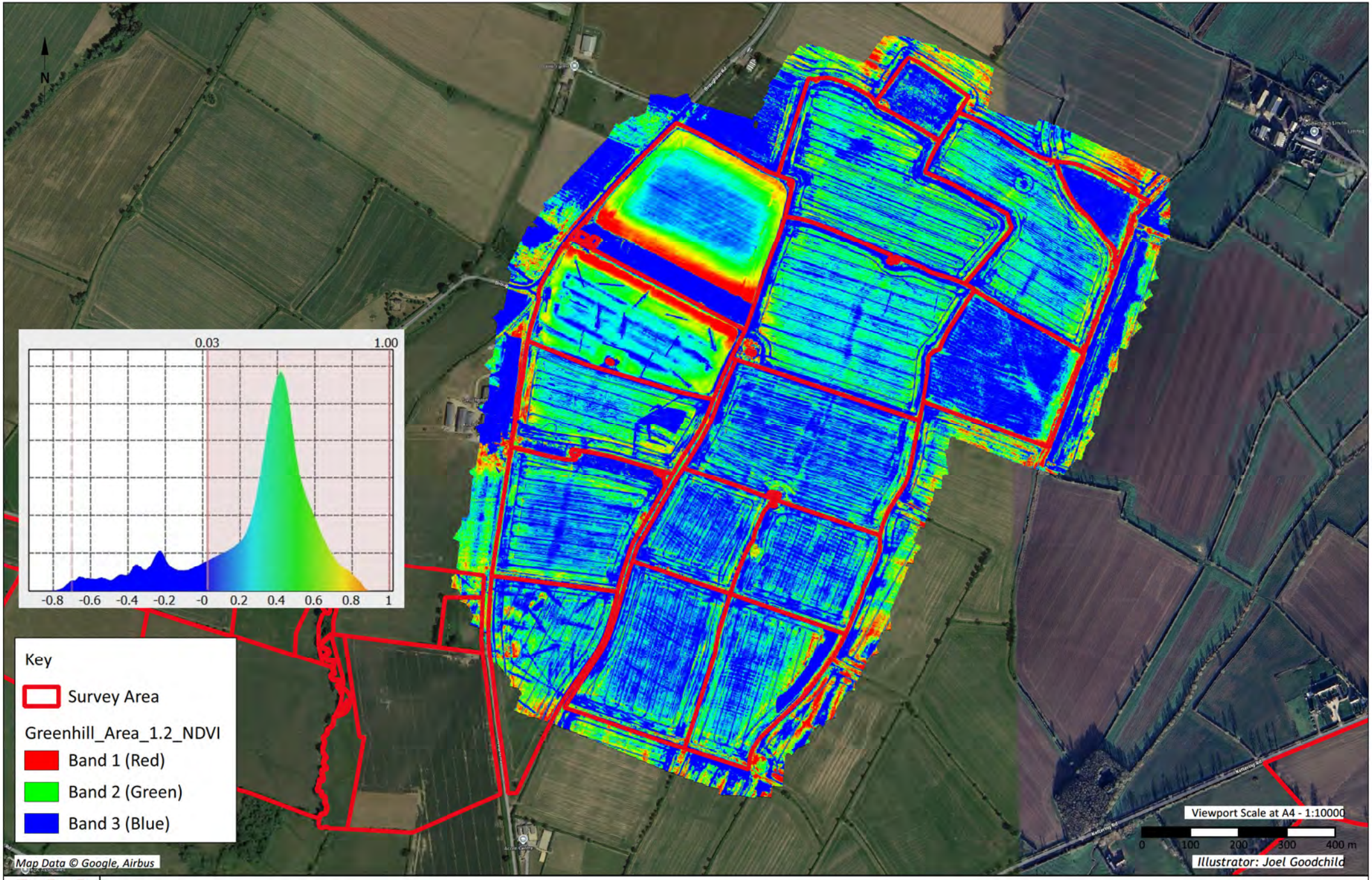

Figure 09 - Area A (east) NDVI
10292 - Green Hill, Northampton

Figure 10 - Area A (east) Aerial Transcription
10292 - Green Hill, Northampton

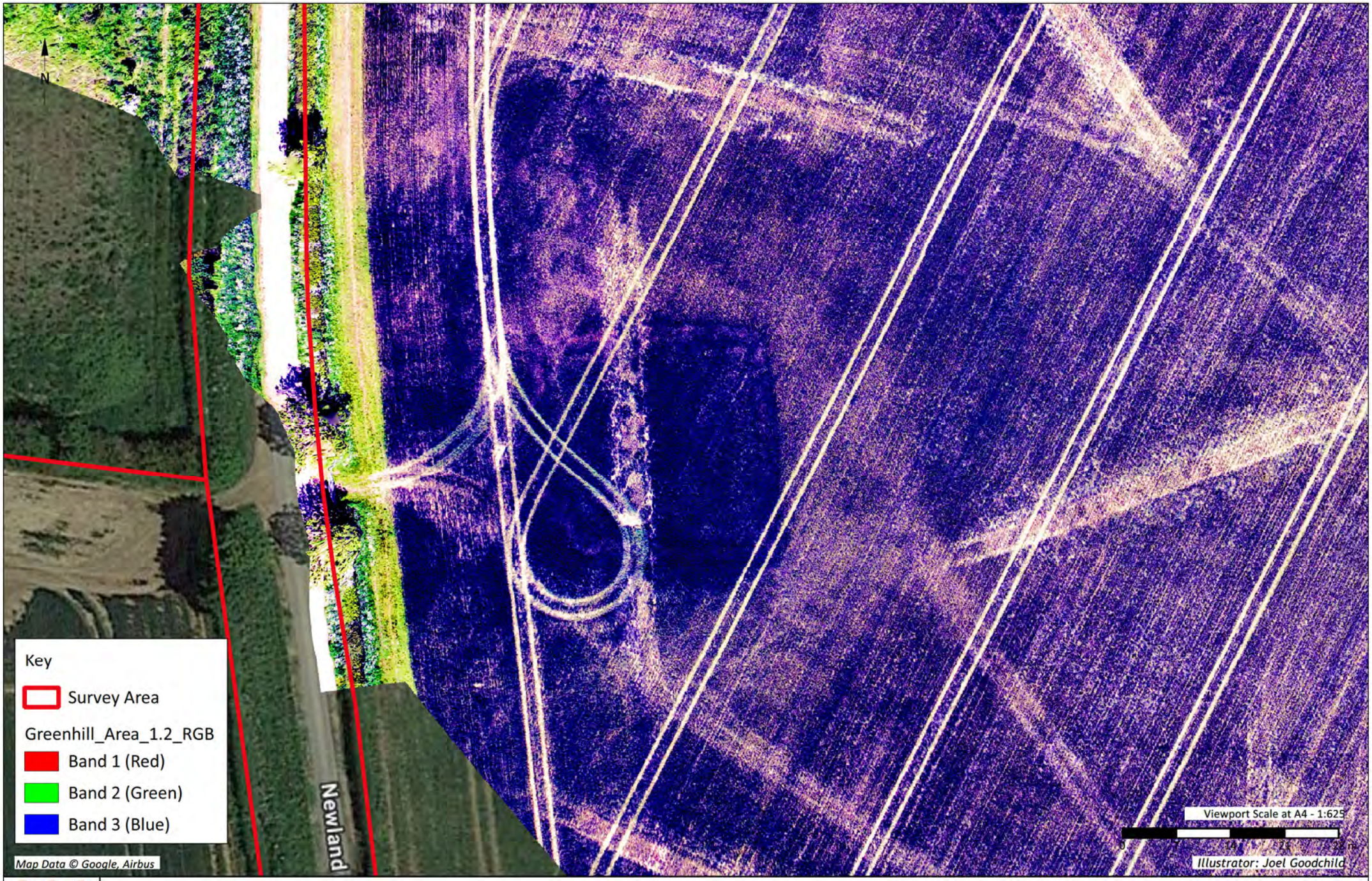

Figure 11 - Area A (east) Square Enclosure
10292 - Green Hill, Northampton

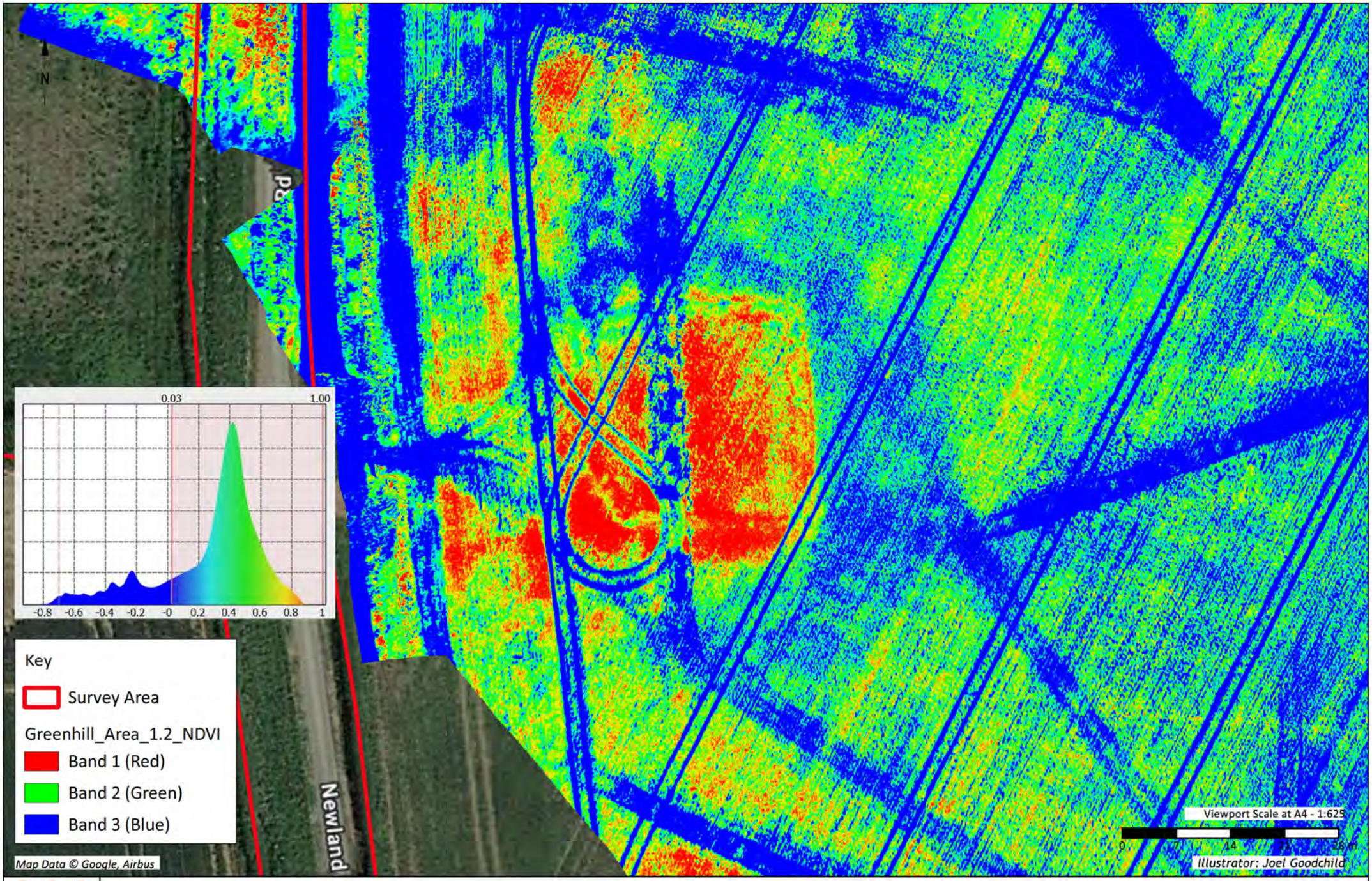

Figure 12 - Area A (east) Square Enclosure
10292 - Green Hill, Northampton

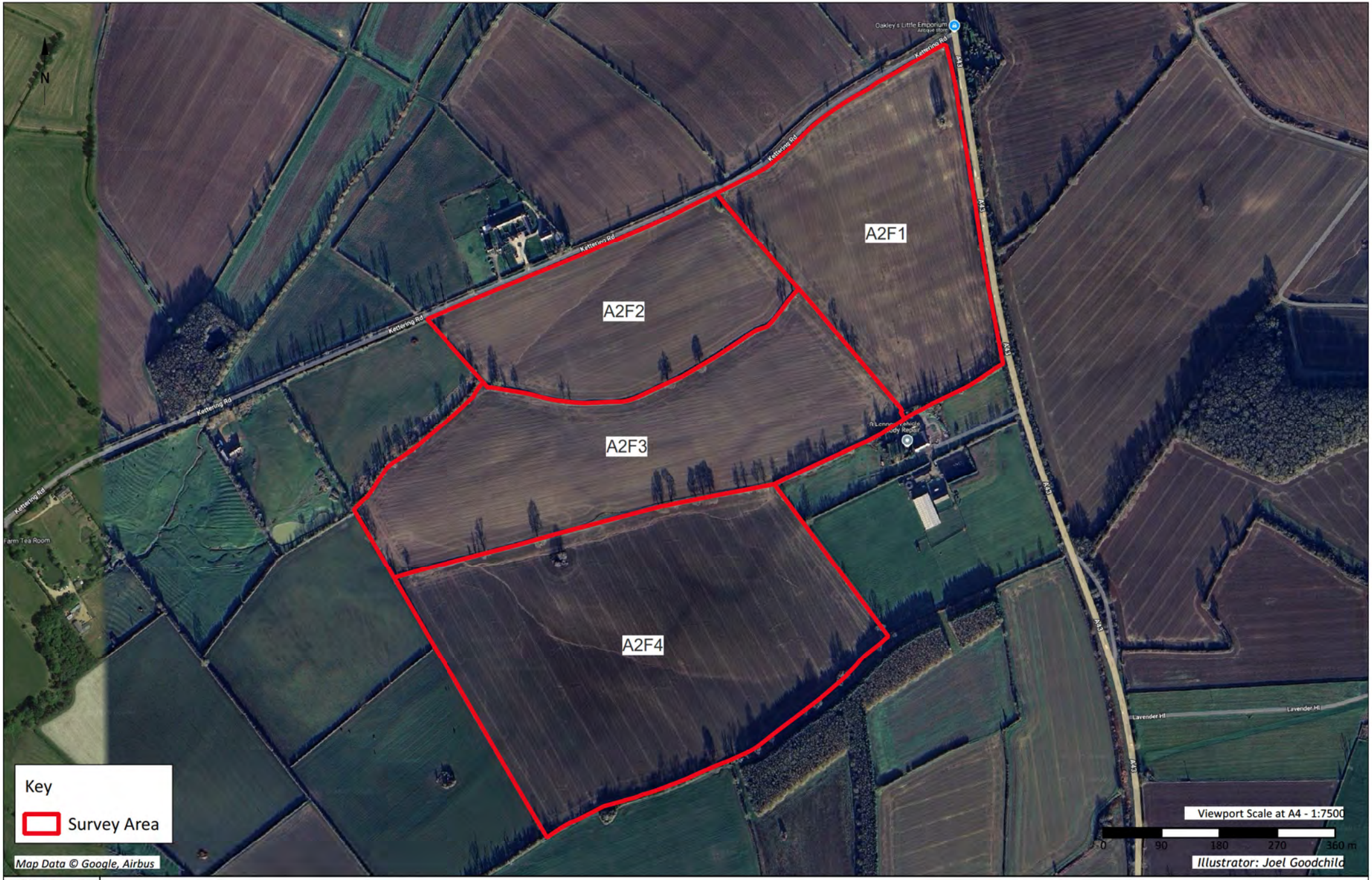

Figure 13 - Area A2
10292 - Green Hill, Northampton

Figure 14 - Area A2 RGB
10292 - Green Hill, Northampton

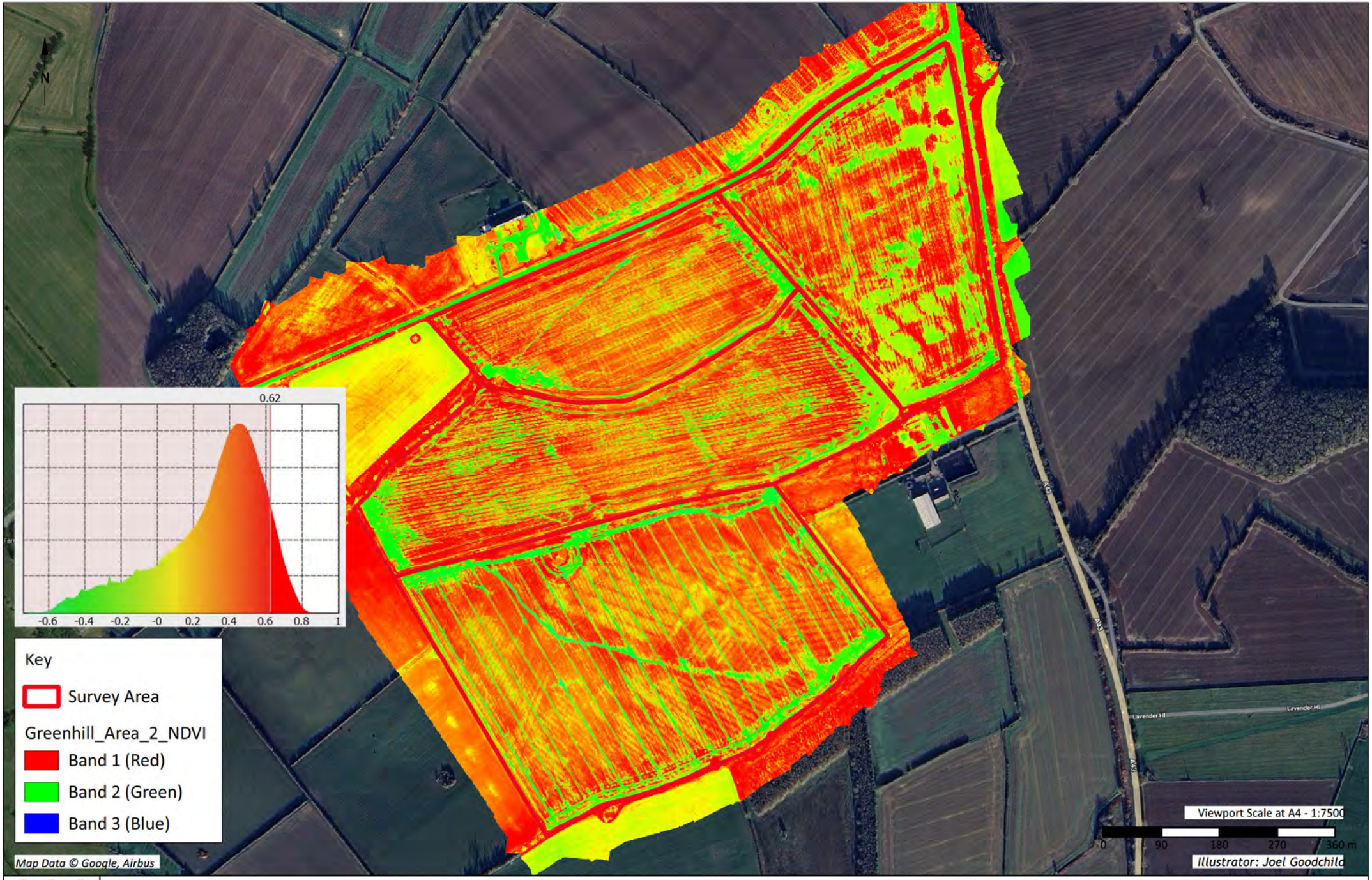

Figure 15 - Area A2 NDVI
10292 - Green Hill, Northampton

Figure 16 - Area A2 Aerial Transcription
10292 - Green Hill, Northampton

Figure 17 - Area B
10292 - Green Hill, Northampton

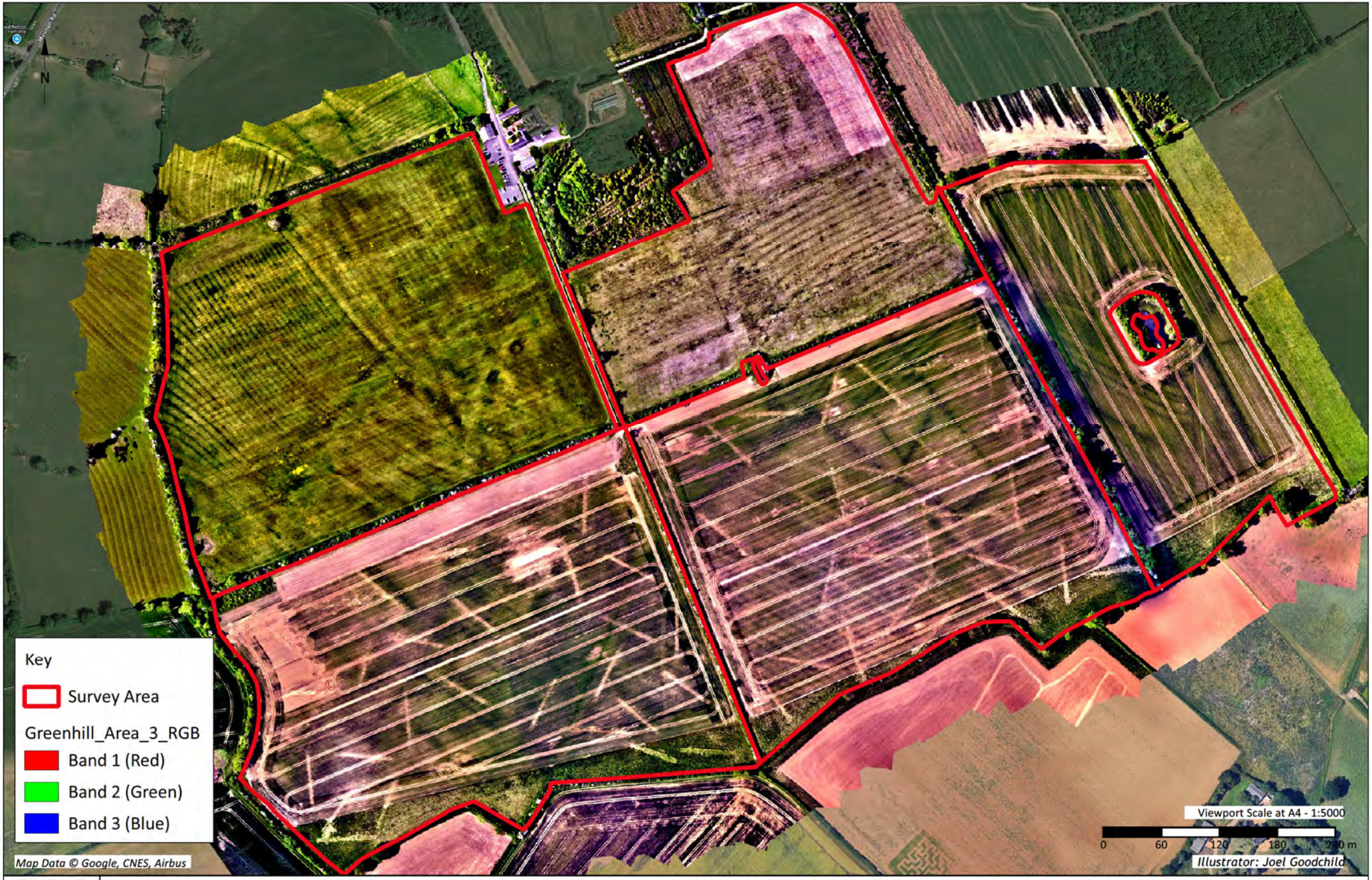

Figure 18 - Area B RGB
10292 - Green Hill, Northampton

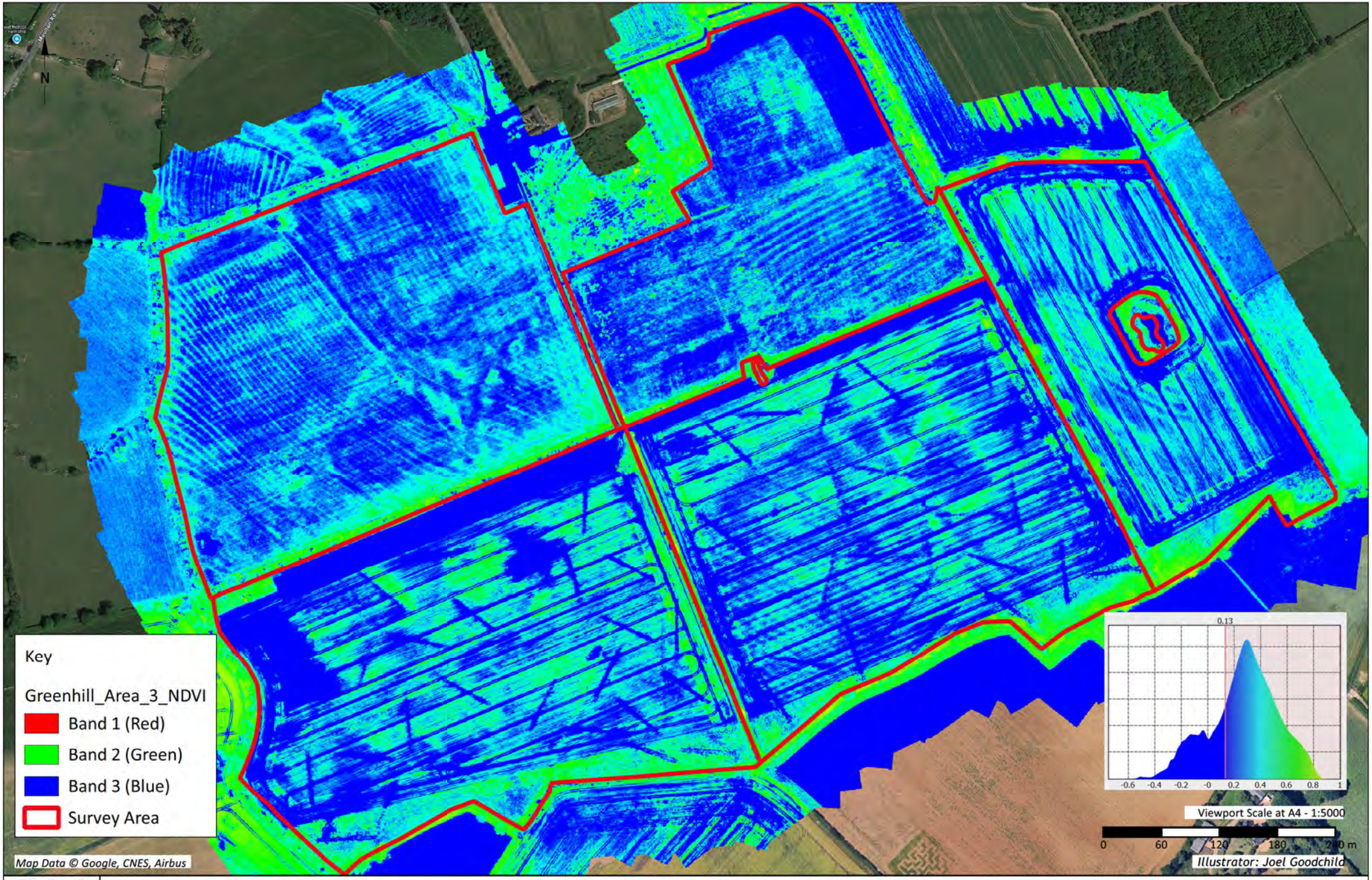

Figure 19 - Area B NDVI
10292 - Green Hill, Northampton

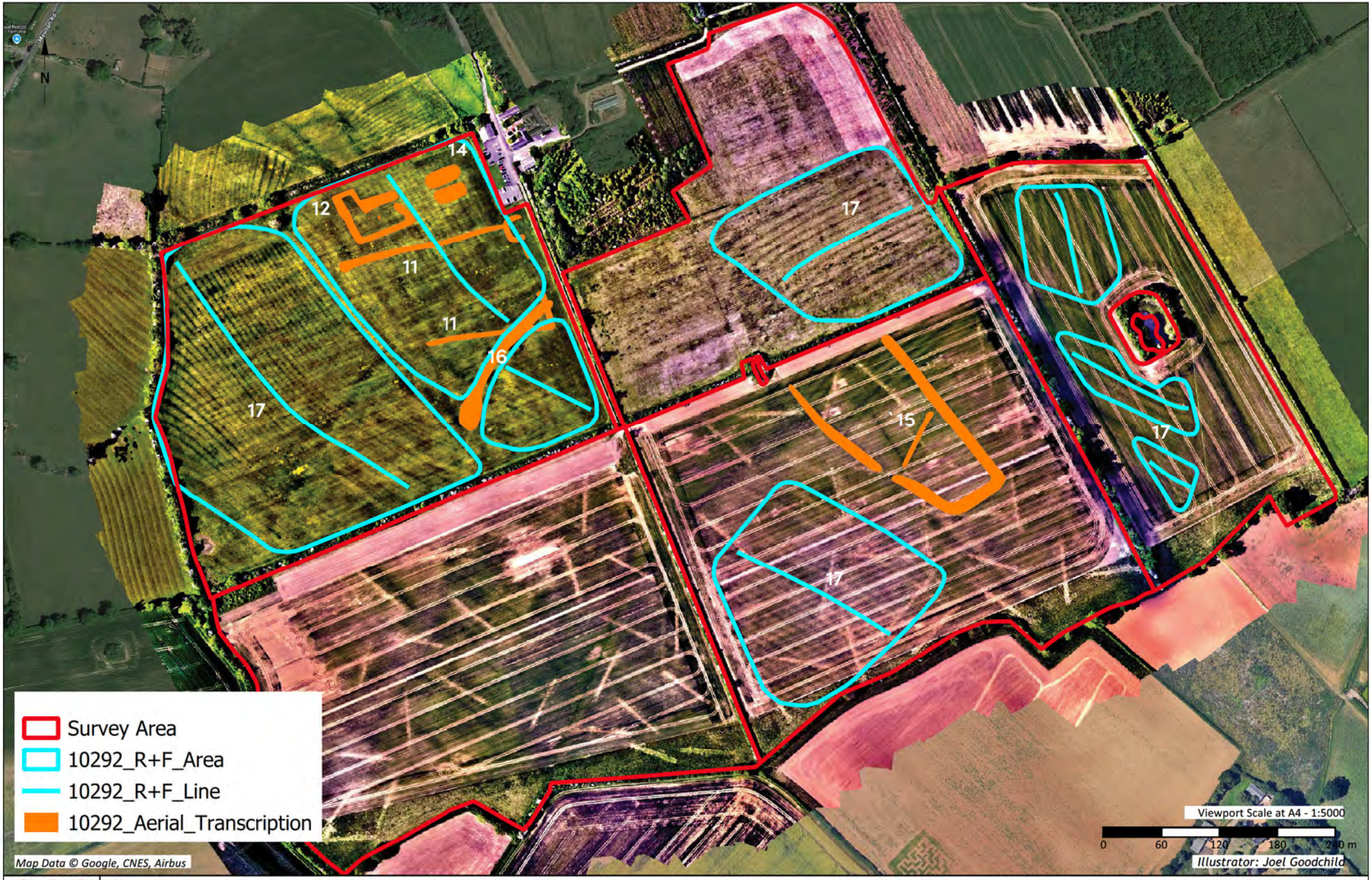

Figure 20 - Area B Aerial Transcription
10292 - Green Hill, Northampton

Figure 21 - Area C
10292 - Green Hill, Northampton

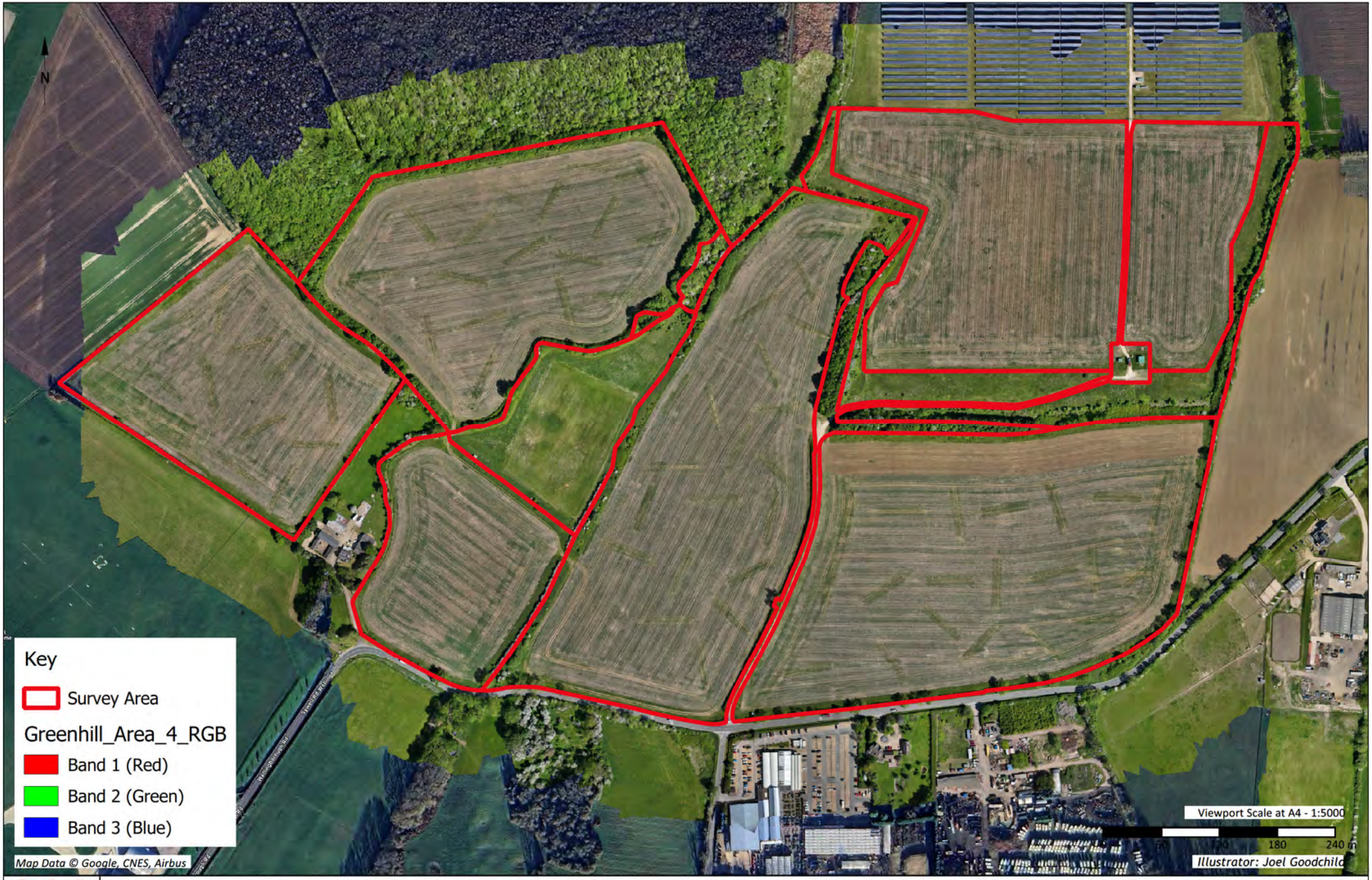

Figure 22 - Area C RGB
10292 - Green Hill, Northampton

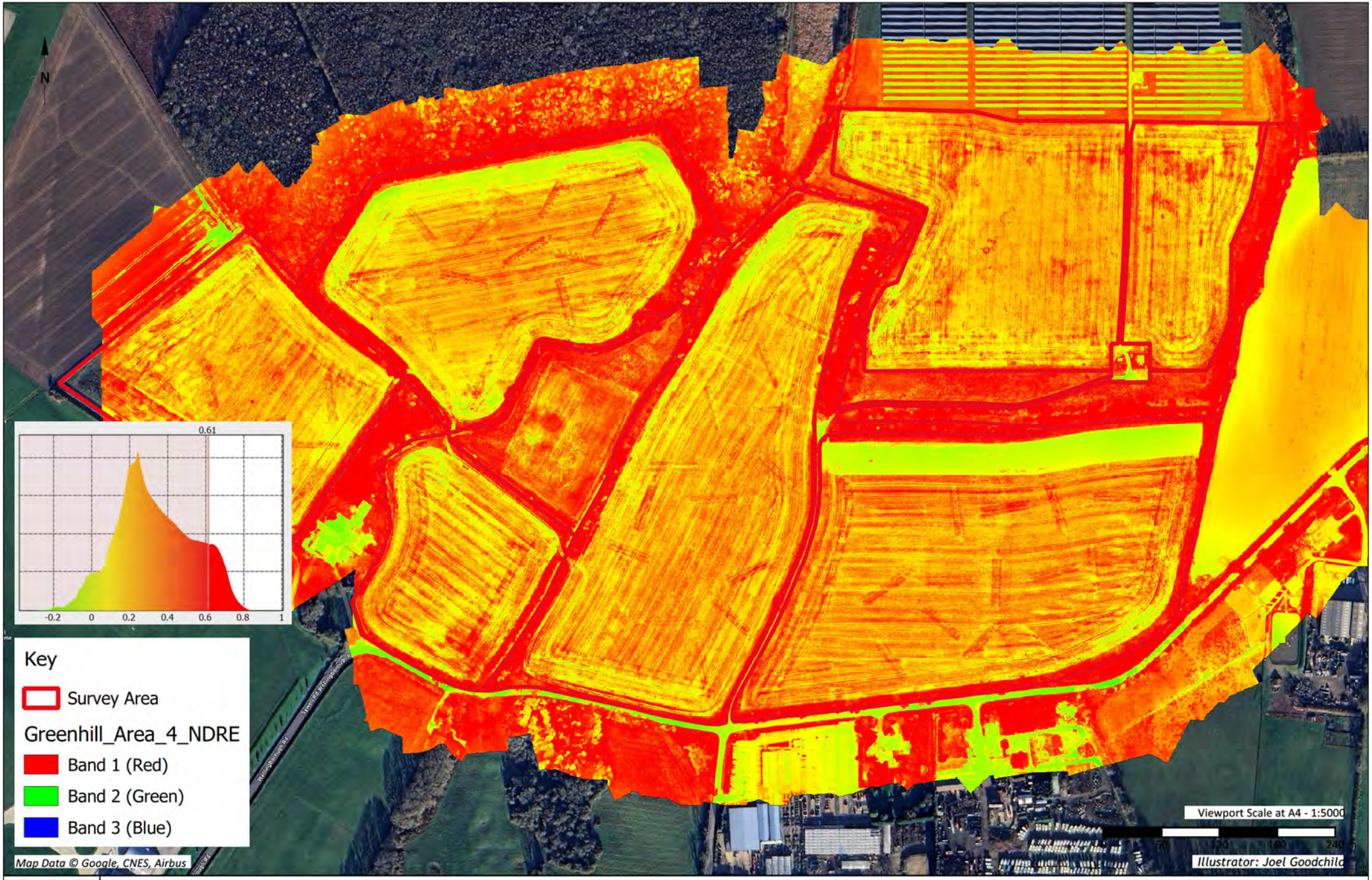

Figure 23 - Area C NDRE
10292 - Green Hill, Northampton

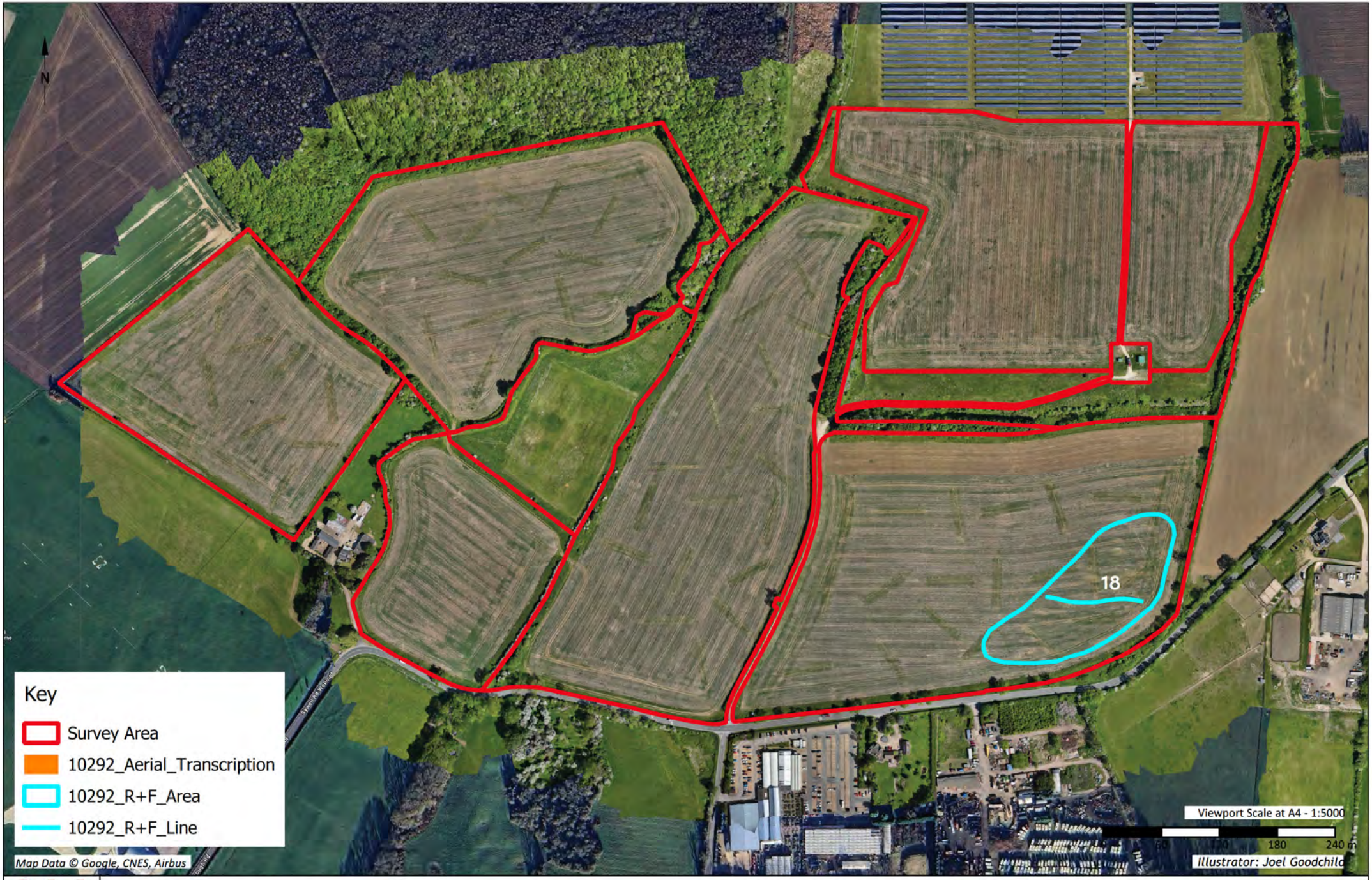

Figure 24 - Area C Aerial Transcription
10292 - Green Hill, Northampton

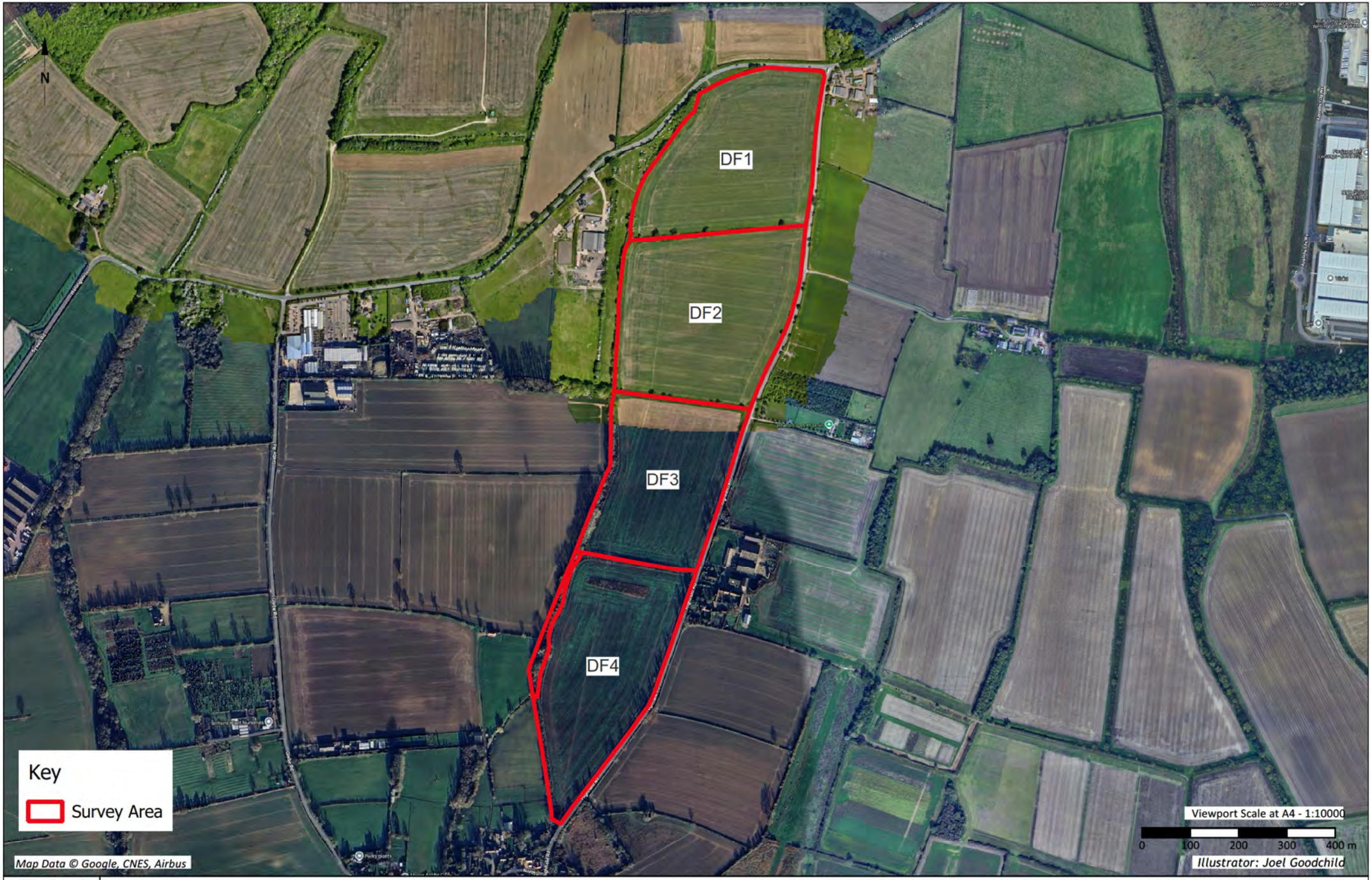

Figure 25 - Area D
10292 - Green Hill, Northampton

Figure 26 - Area D RGB
10292 - Green Hill, Northampton

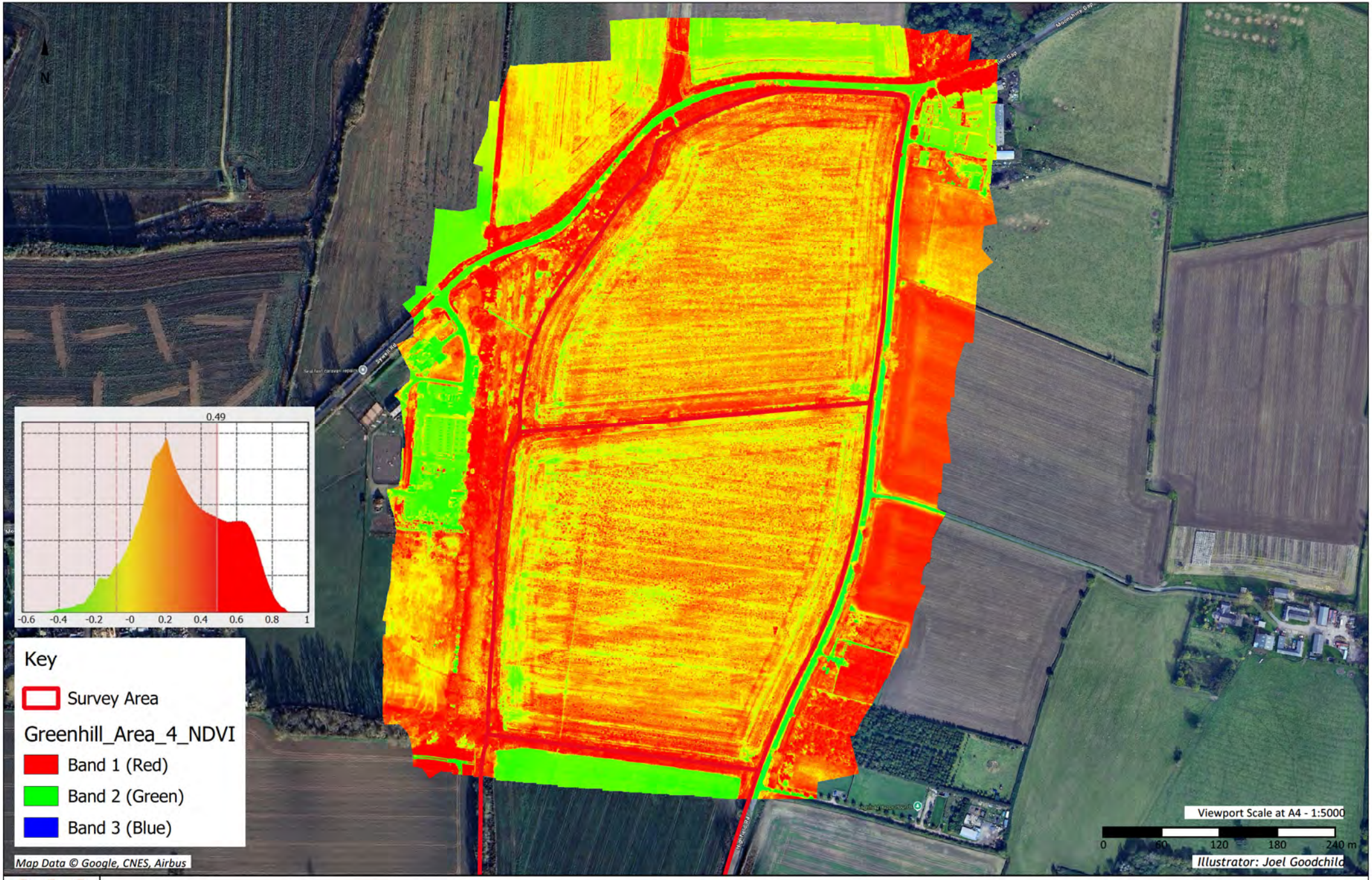

Figure 27 - Area D NDVI
10292 - Green Hill, Northampton

Figure 28 - Area D Aerial Transcription
10292 - Green Hill, Northampton

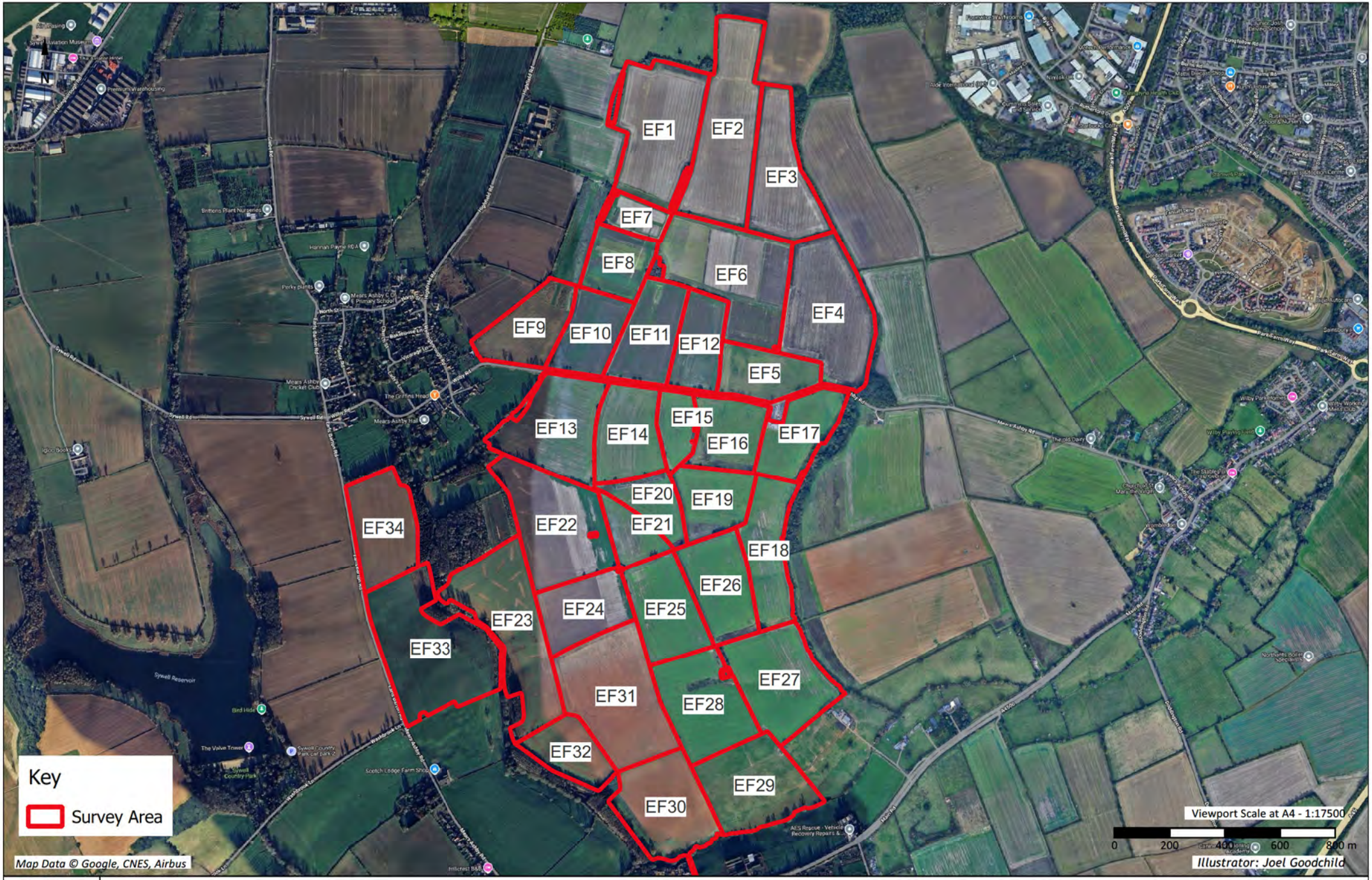

Figure 29 - Area E
10292 - Green Hill, Northampton

Figure 30 - Area E RGB
10292 - Green Hill, Northampton

EFigure 31 - Area E NDRE
10292 - Green Hill, Northampton

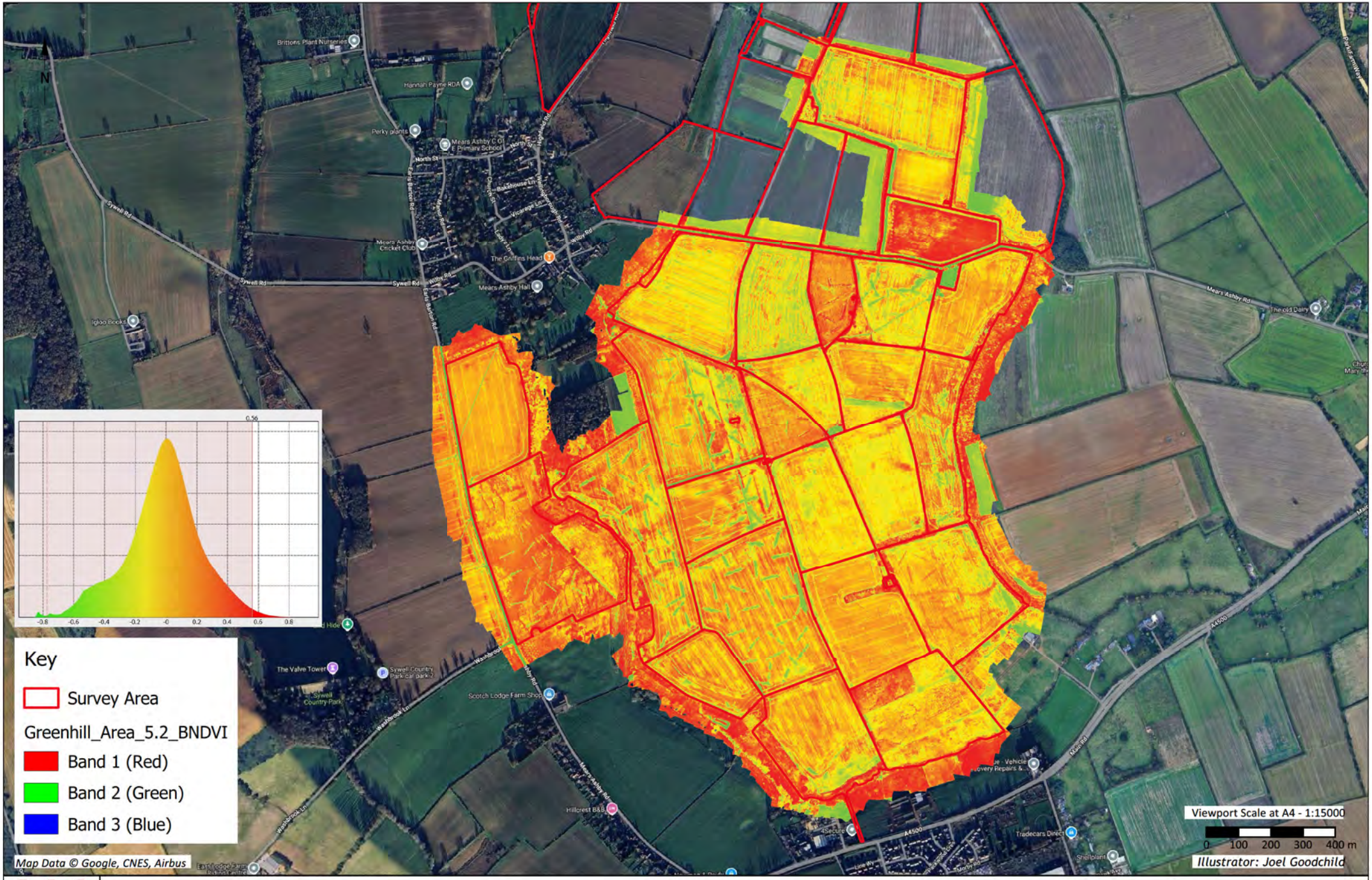

Figure 32 - Area E BNDVI
10292 - Green Hill, Northampton

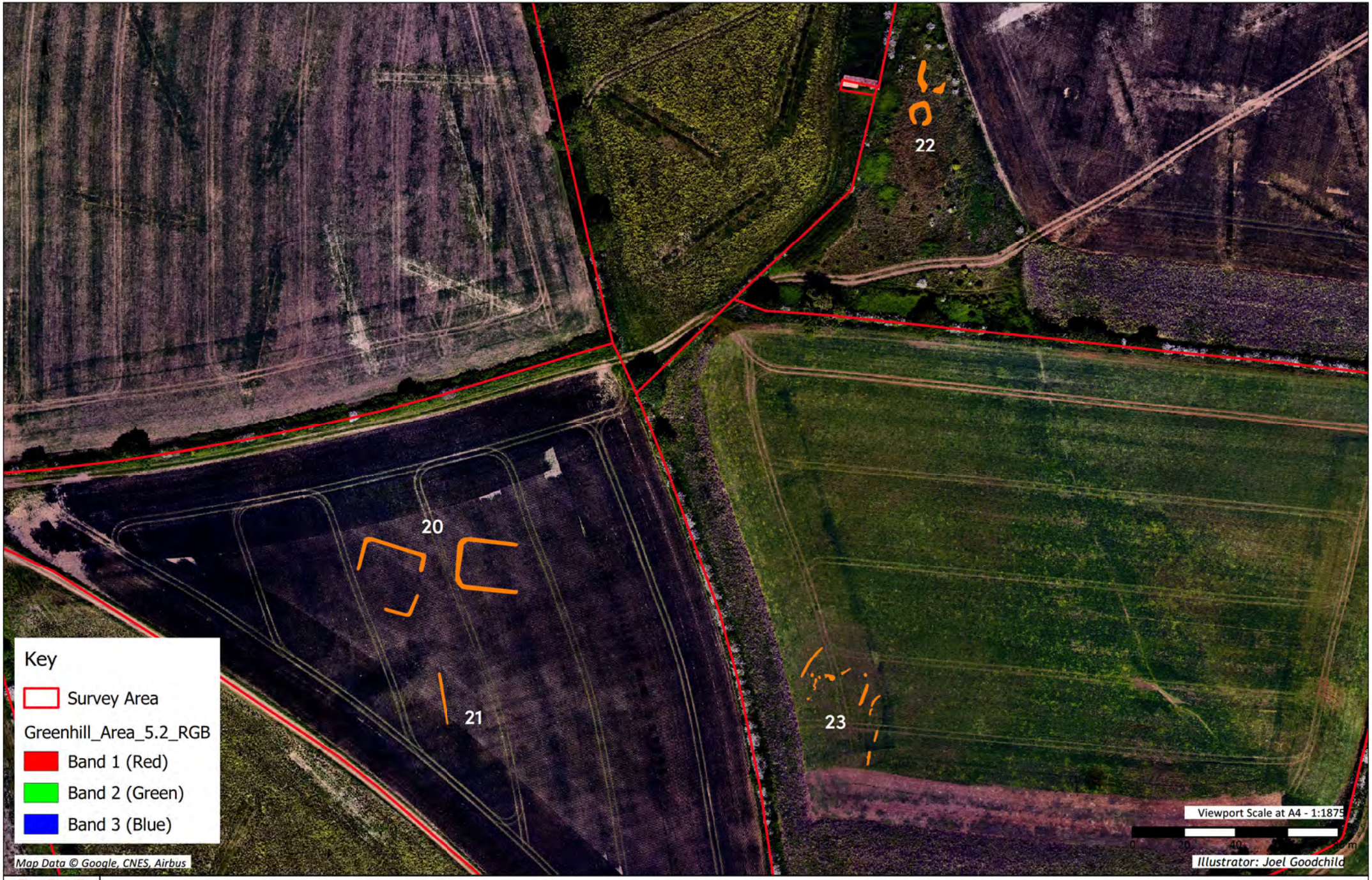

Figure 33 - Area E Aerial Transcription RGB
10292 - Green Hill, Northampton

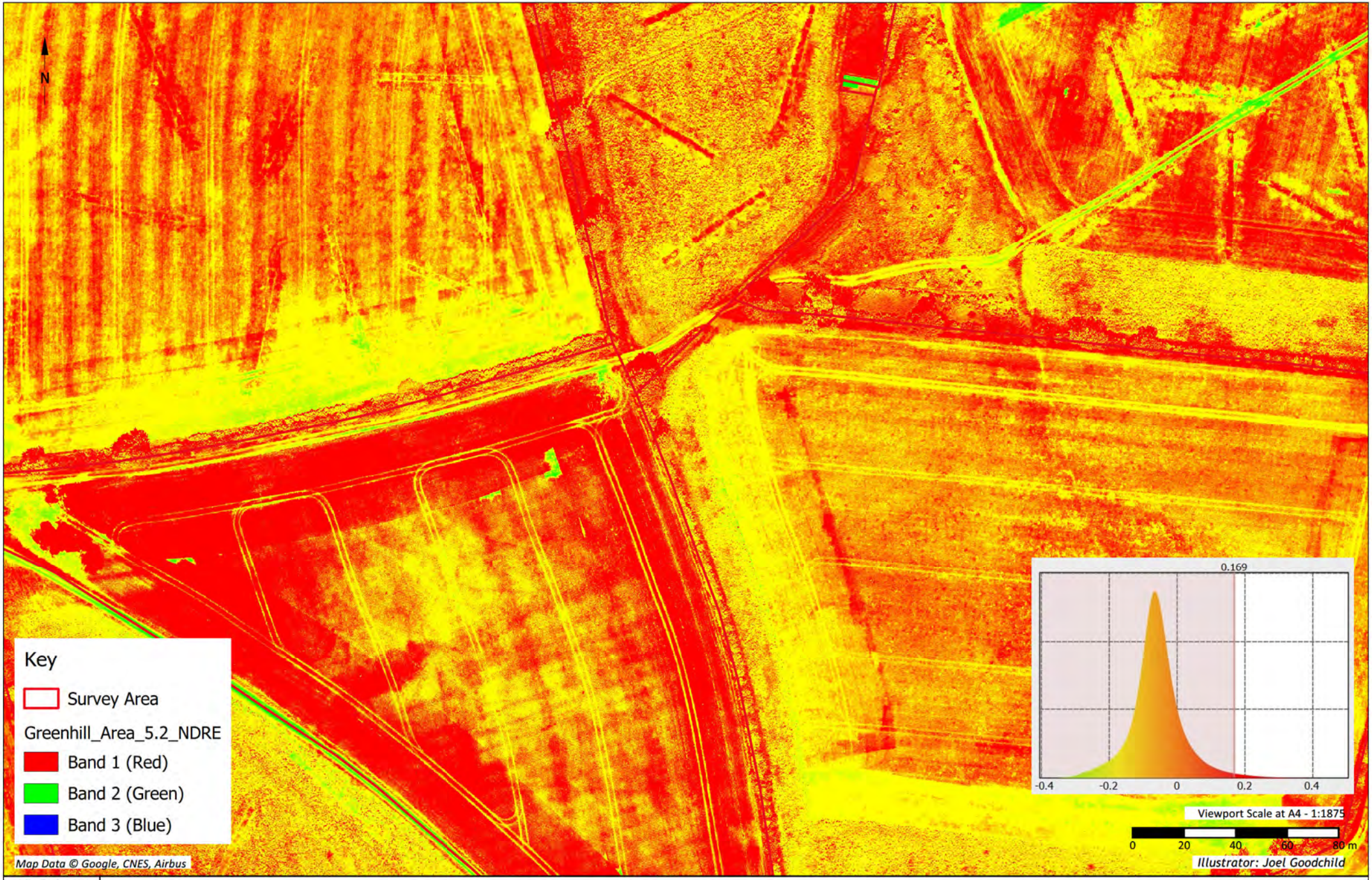

Figure 34 - Area E Aerial Transcription NDRE
10292 - Green Hill, Northampton

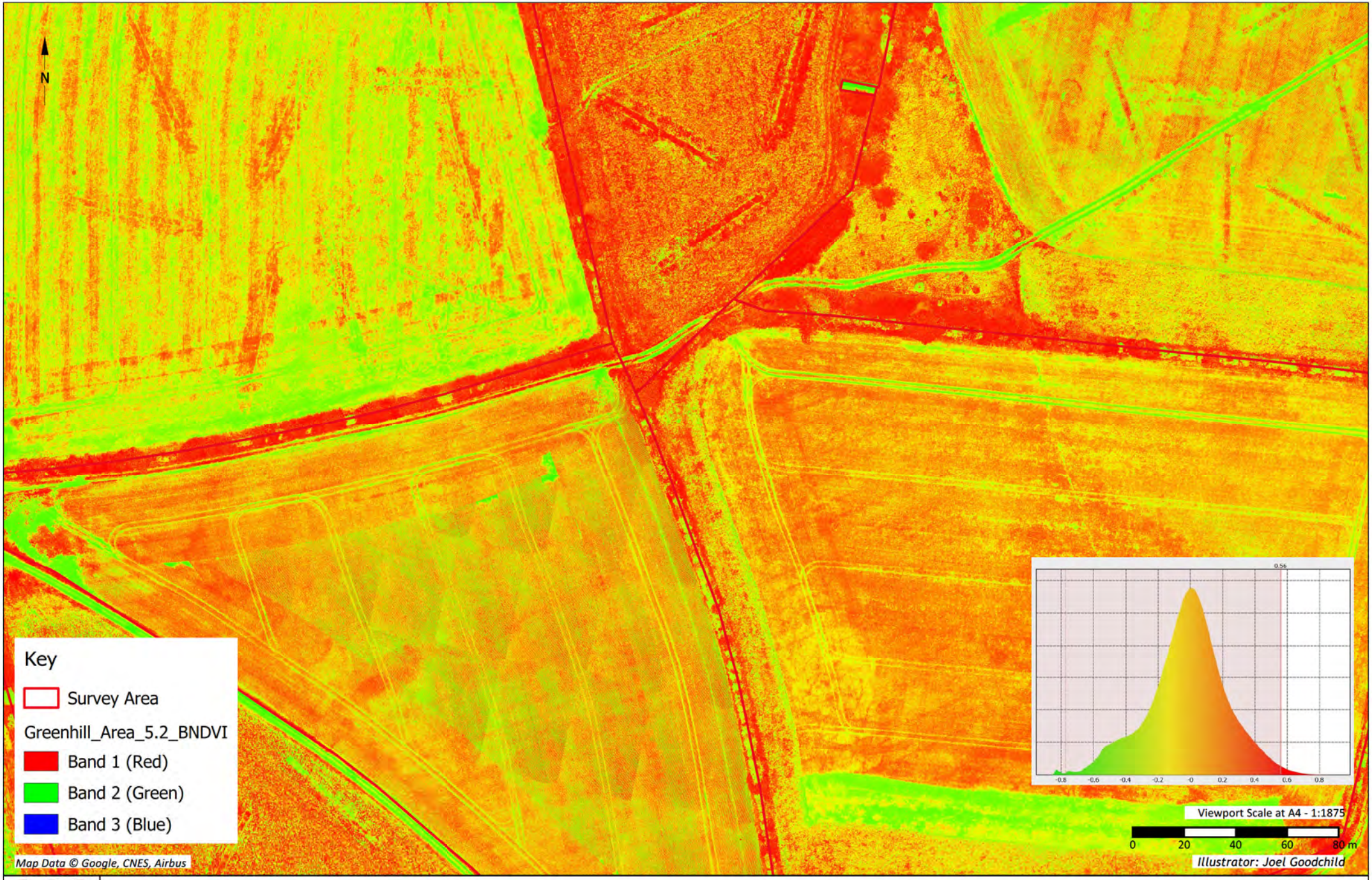

Figure 35 - Area E Aerial Transcription BNDVI
10292 - Green Hill, Northampton

Figure 36 - Area E Aerial Transcription
10292 - Green Hill, Northampton

Figure 37 - Area E Aerial Transcription RGB
10292 - Green Hill, Northampton

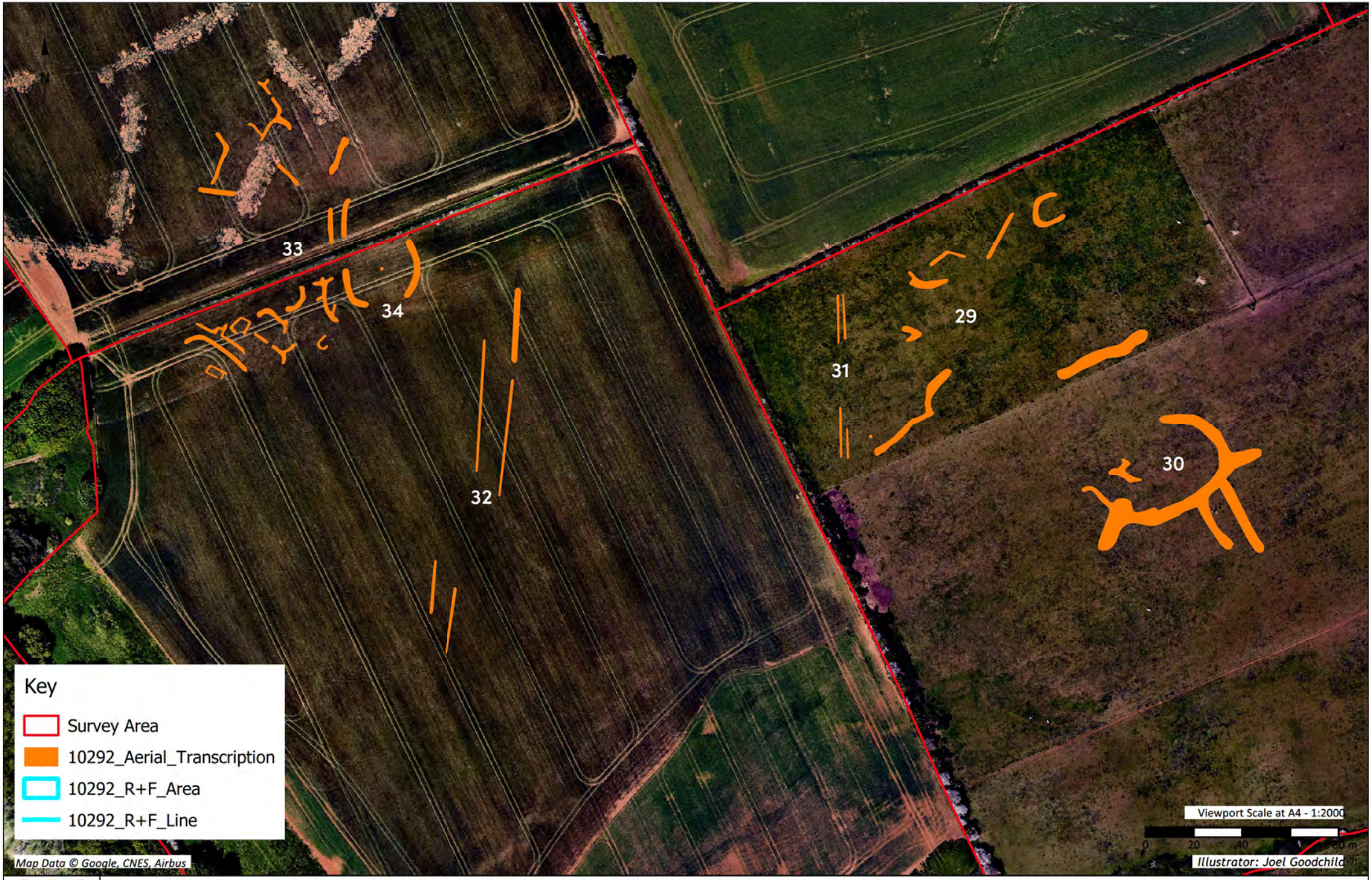

Figure 38 - Area E Aerial Transcription
10292 - Green Hill, Northampton

Figure 39 - Area E Aerial Transcription RGB
10292 - Green Hill, Northampton

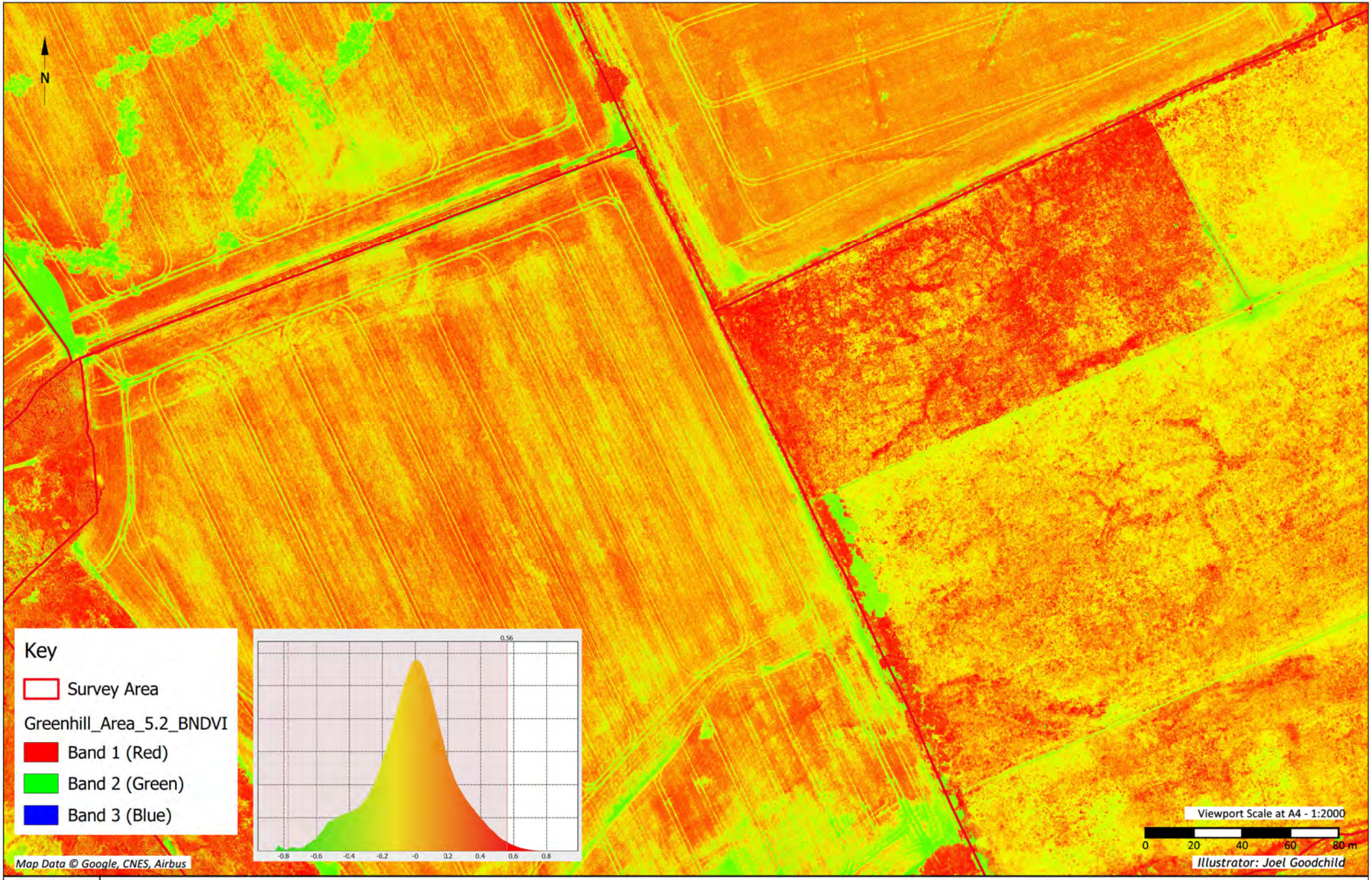

Figure 40 - Area E Aerial Transcription BNDVI
10292 - Green Hill, Northampton

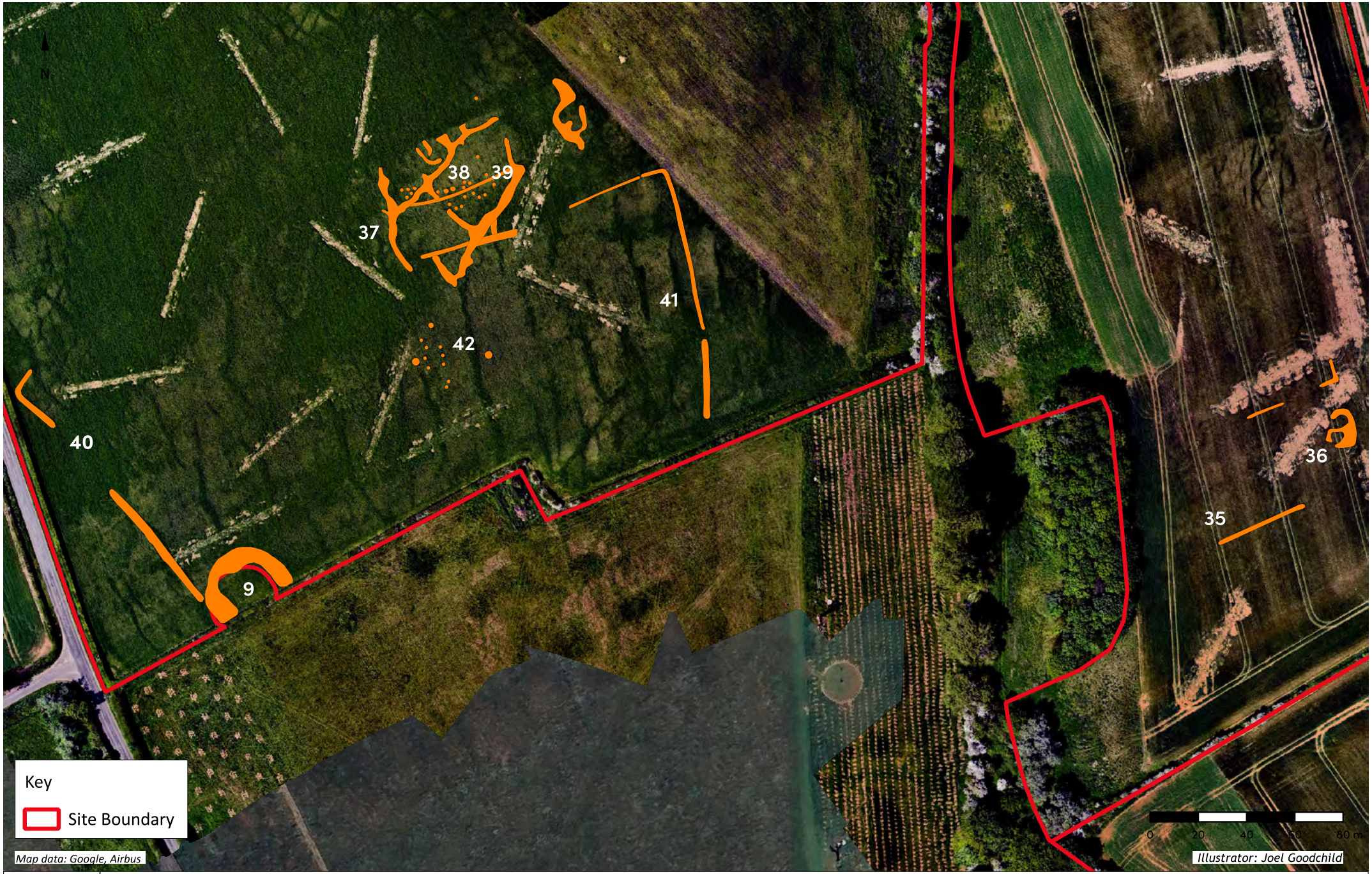

Figure 41 - Area E Aerial Transcription
10292 - Green Hill Northampton

Figure 42 - Area E Aerial Transcription RGB
10292 - Green Hill, Northampton

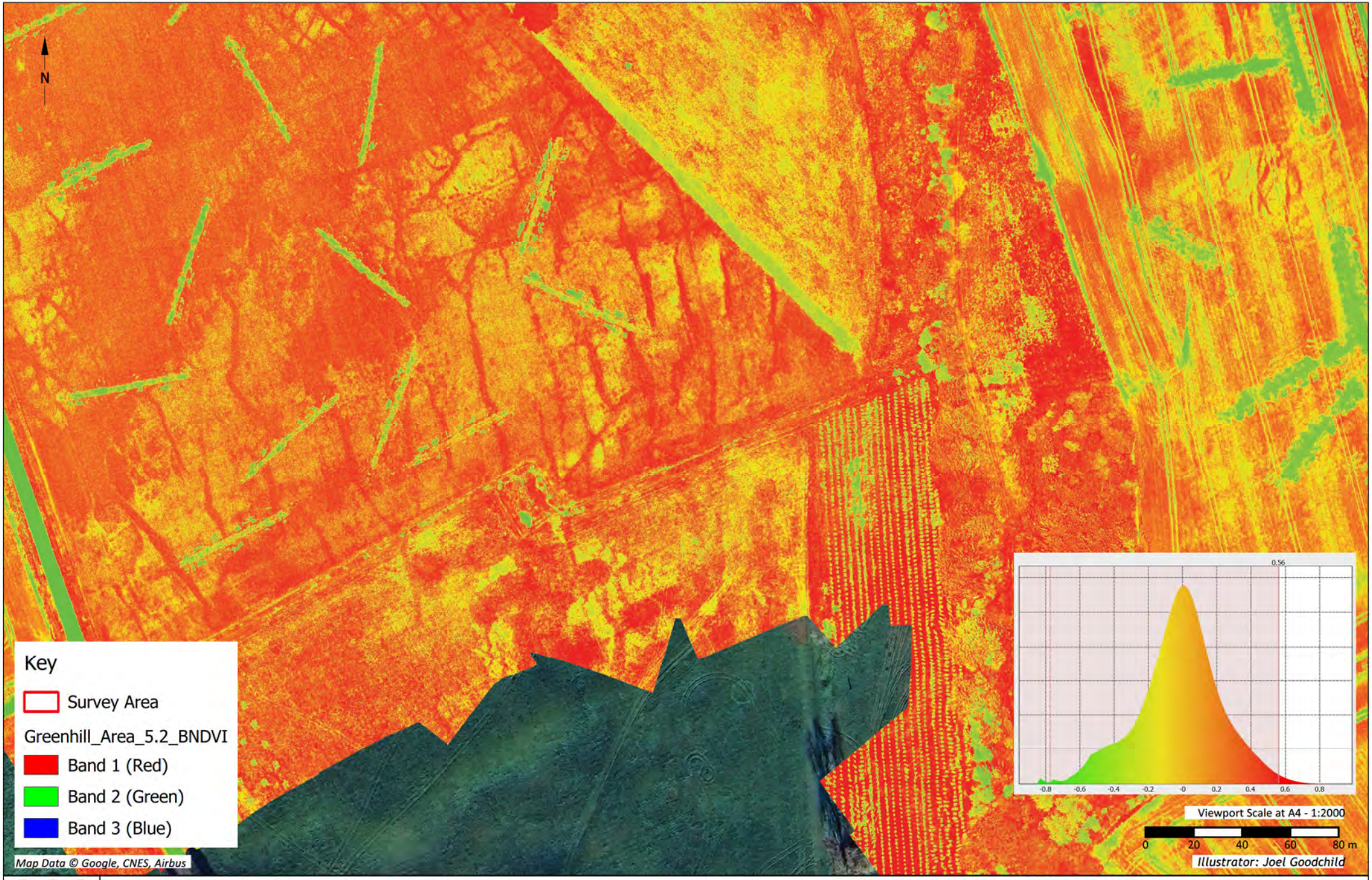

Figure 43 - Area E Aerial Transcription BNDVI
10292 - Green Hill, Northampton

Figure 44 - Area E Aerial Transcription
10292 - Green Hill, Northampton

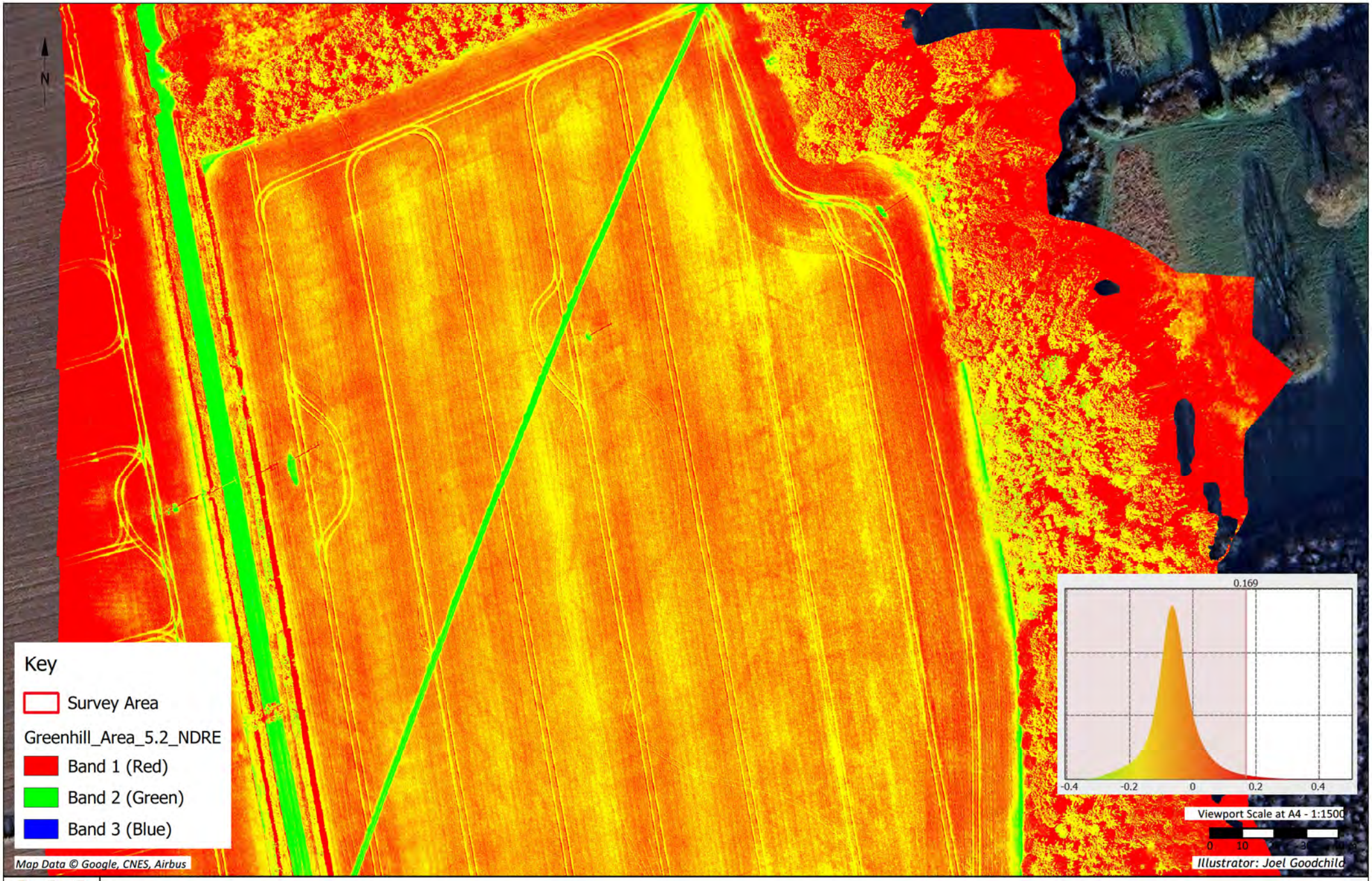

Figure 45 - Area E Aerial Transcription NDRE
10292 - Green Hill, Northampton

Figure 46 - Area BESS Aerial Transcription
10292 - Green Hill, Northampton

Figure 47 - Area BESS RGB
10292 - Green Hill, Northampton

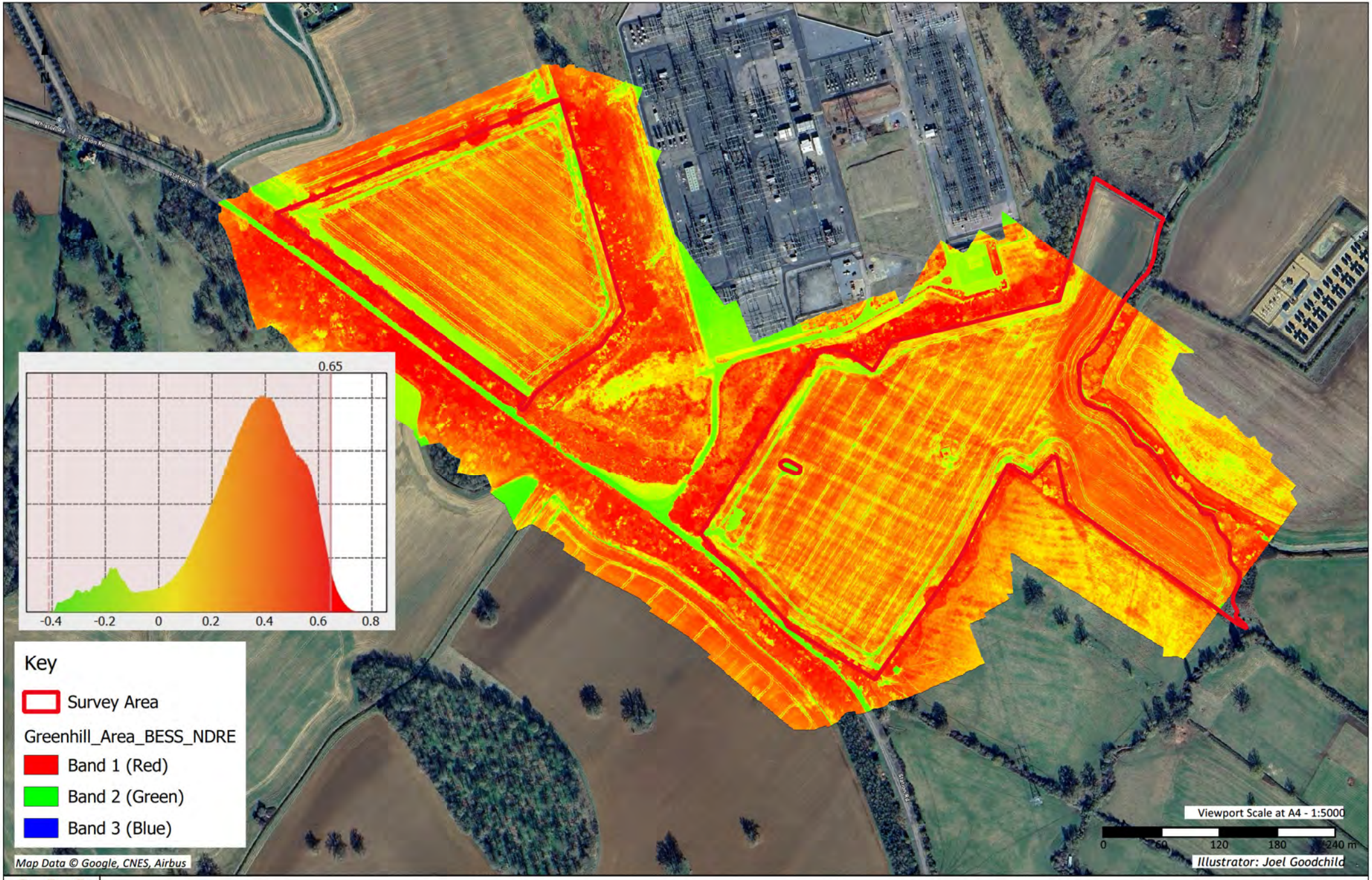

Figure 48 - Area BESS NDRE
10292 - Green Hill, Northampton

Figure 49 - Area BESS Aerial Transcription RGB
10292 - Green Hill, Northampton

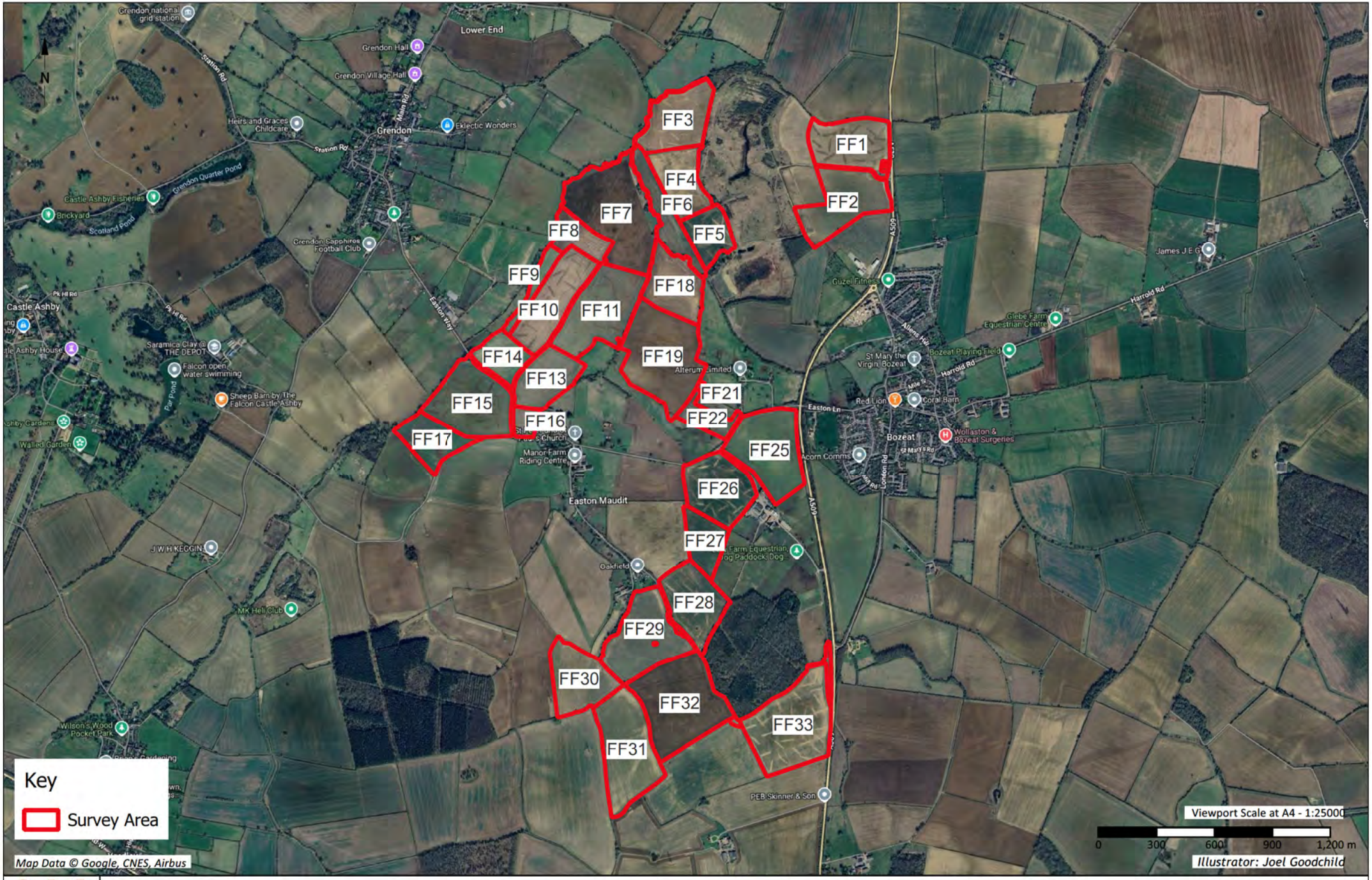

Figure 50 - Area F
10292 - Green Hill, Northampton

Figure 51 - Area F (north) RGB
10292 - Green Hill, Northampton

Figure 52 - Area F (north) Aerial Transcription RGB
10292 - Green Hill, Northampton

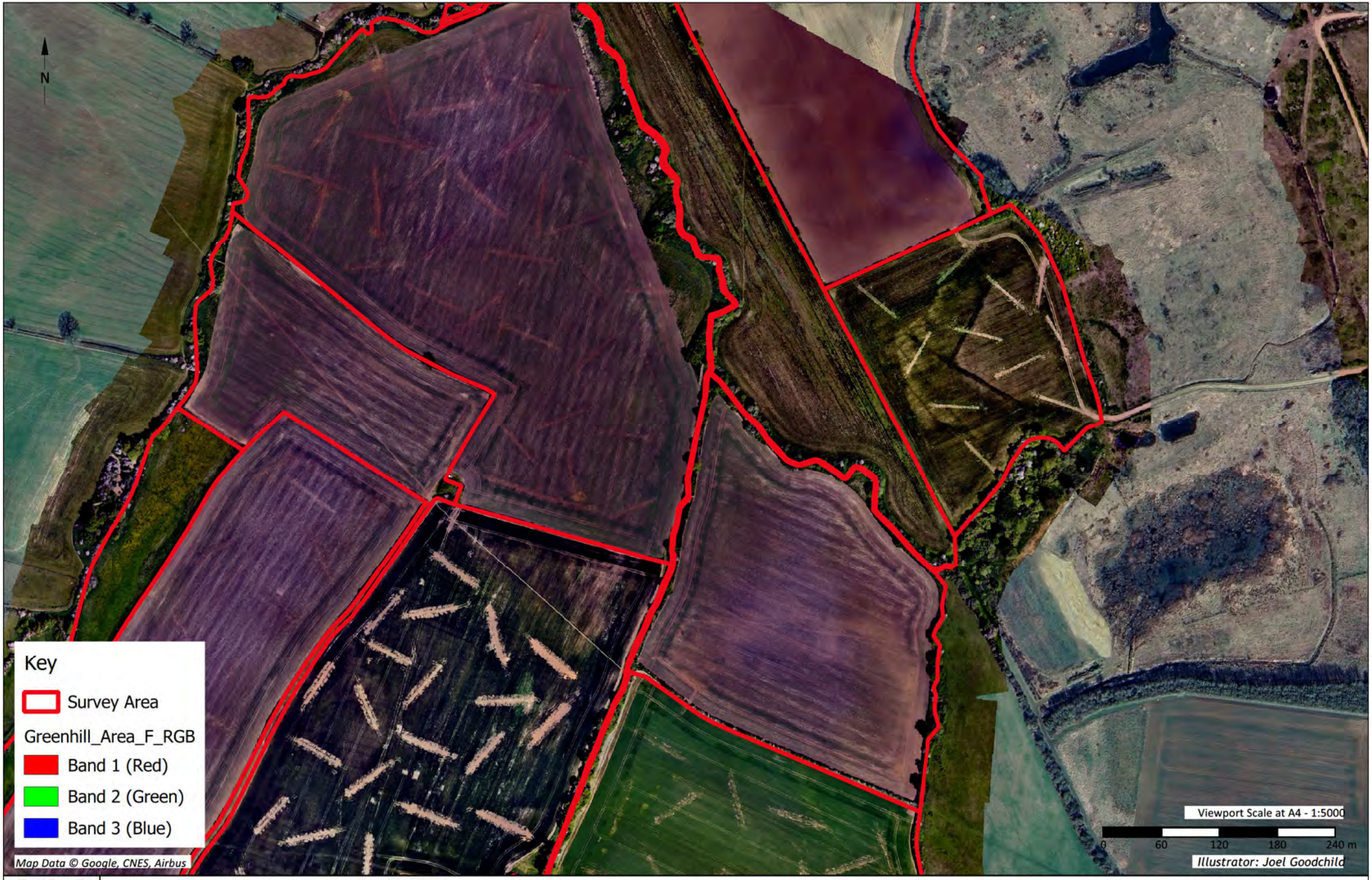

Figure 53 - Area F (north) RGB
10292 - Green Hill, Northampton

Figure 54 - Area F (north) Aerial Transcription RGB
10292 - Green Hill, Northampton

Figure 55 - Area F (north) RGB
10292 - Green Hill, Northampton

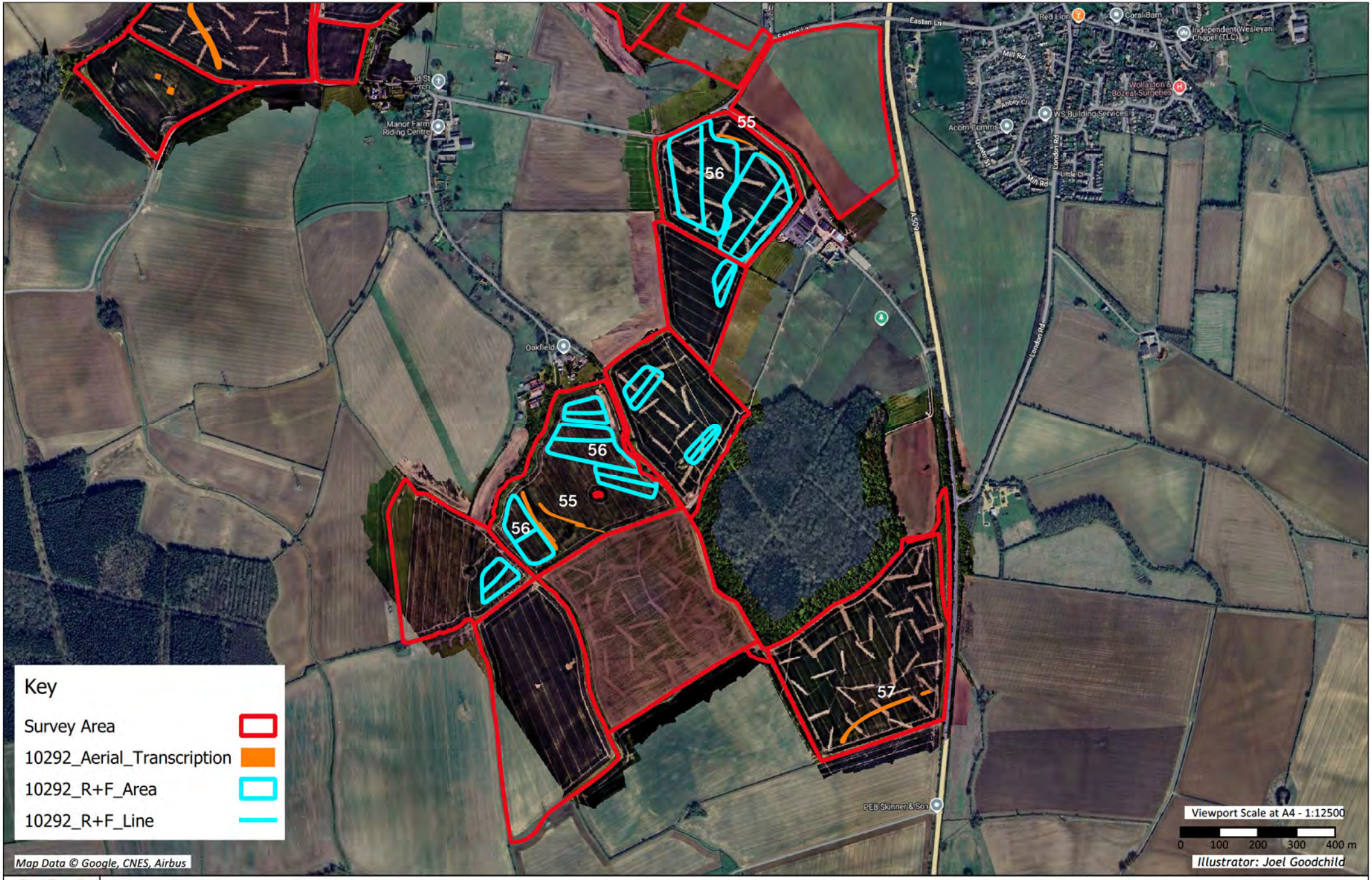

Figure 56 - Area F (south) Aerial Transcription RGB
10292 - Green Hill, Northampton

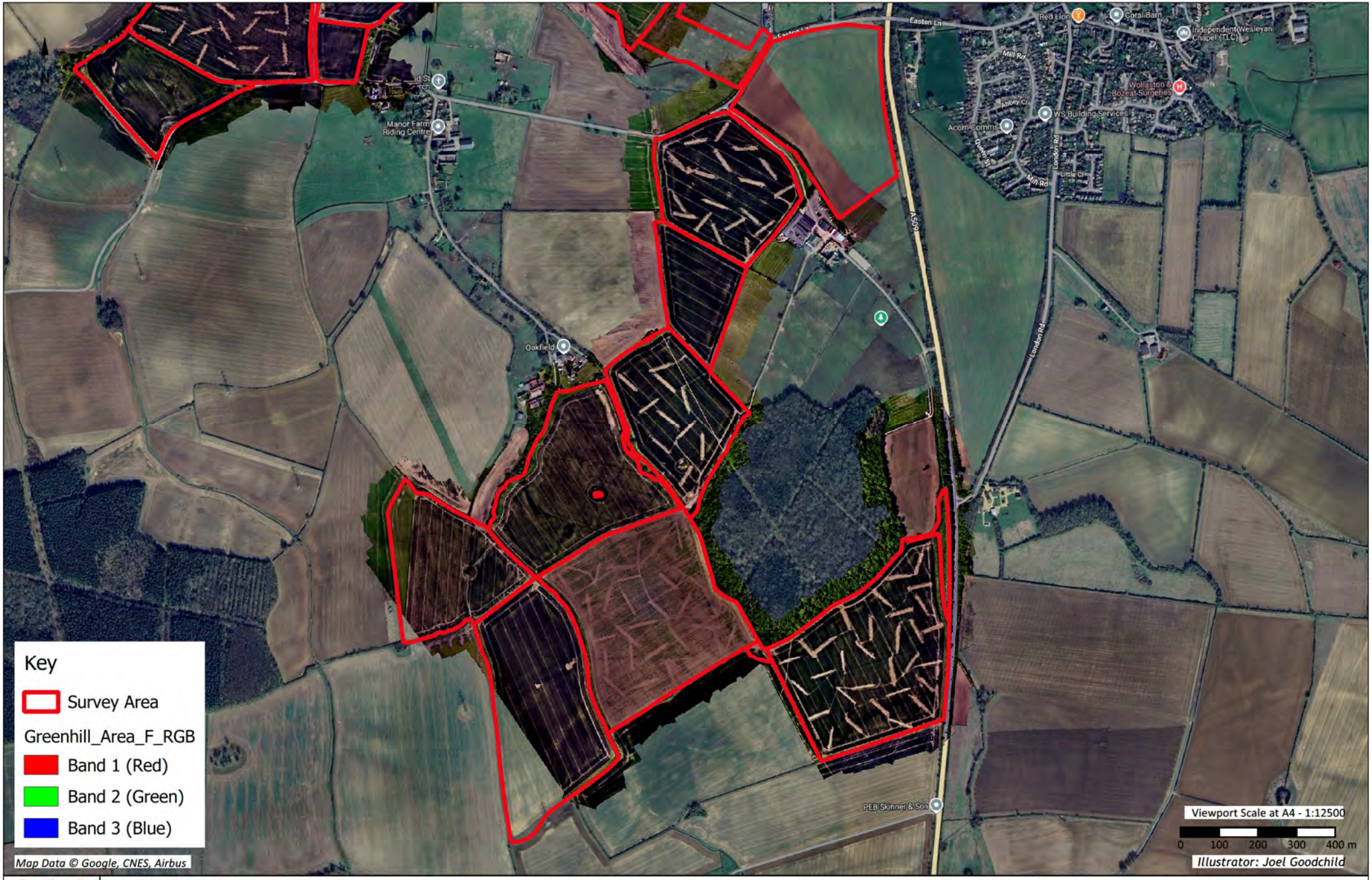

Figure 57 - Area F (south) RGB
10292 - Green Hill, Northampton

Figure 58 - Area G
10292 - Green Hill, Northampton

Figure 59 - Area G RGB
10292 - Green Hill Northampton

Figure 60 - Area G NDVI
10292 - Green Hill Northampton

Figure 61 - Area G Aerial Transcription RGB
10292 - Green Hill, Northampton

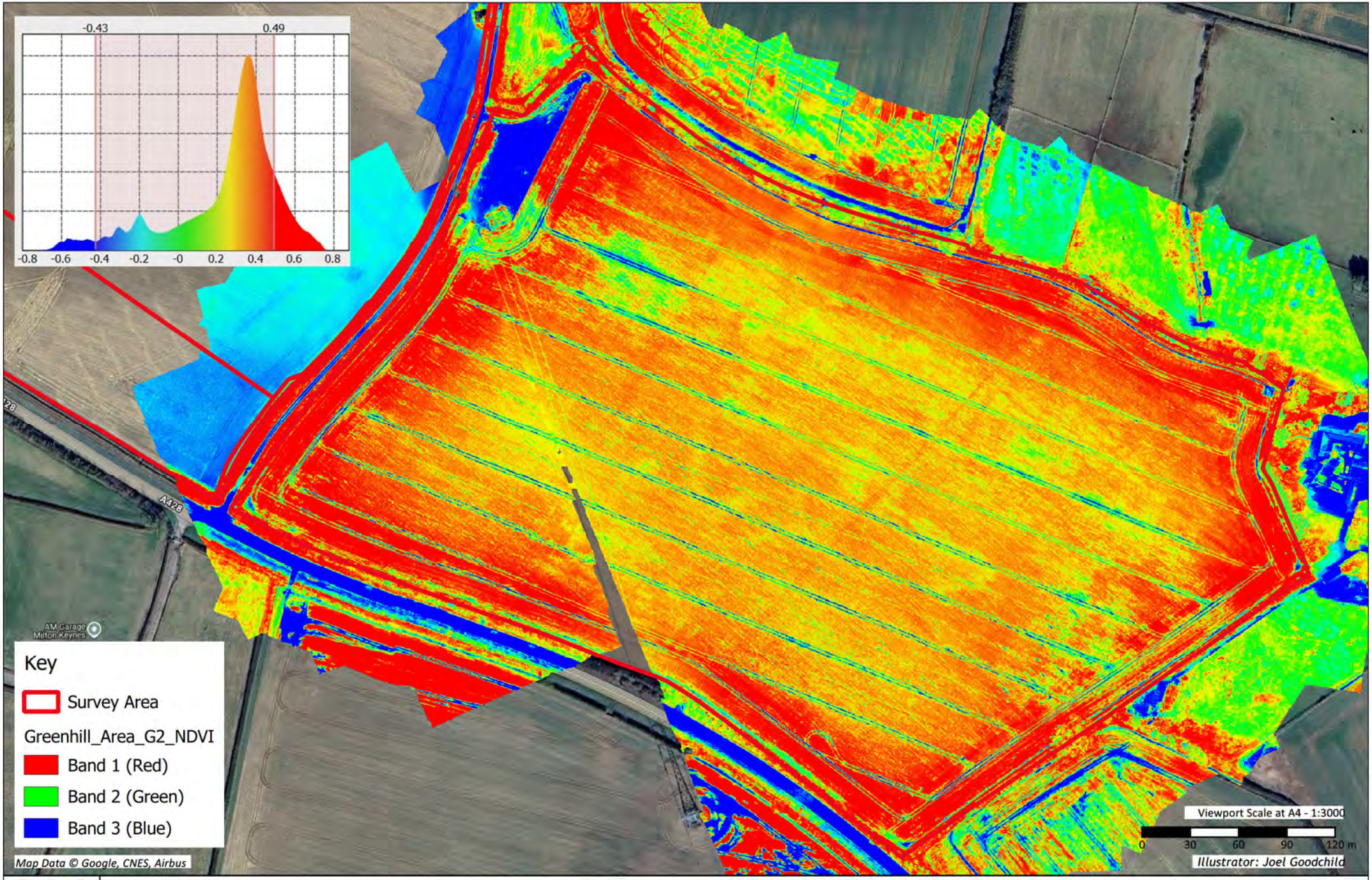

Figure 62 - Area G Aerial Transcription NDVI
10292 - Green Hill, Northampton

Figure 63 - Area G7, 11-12 Aerial Transcription RGB
10292 - Green Hill Northampton

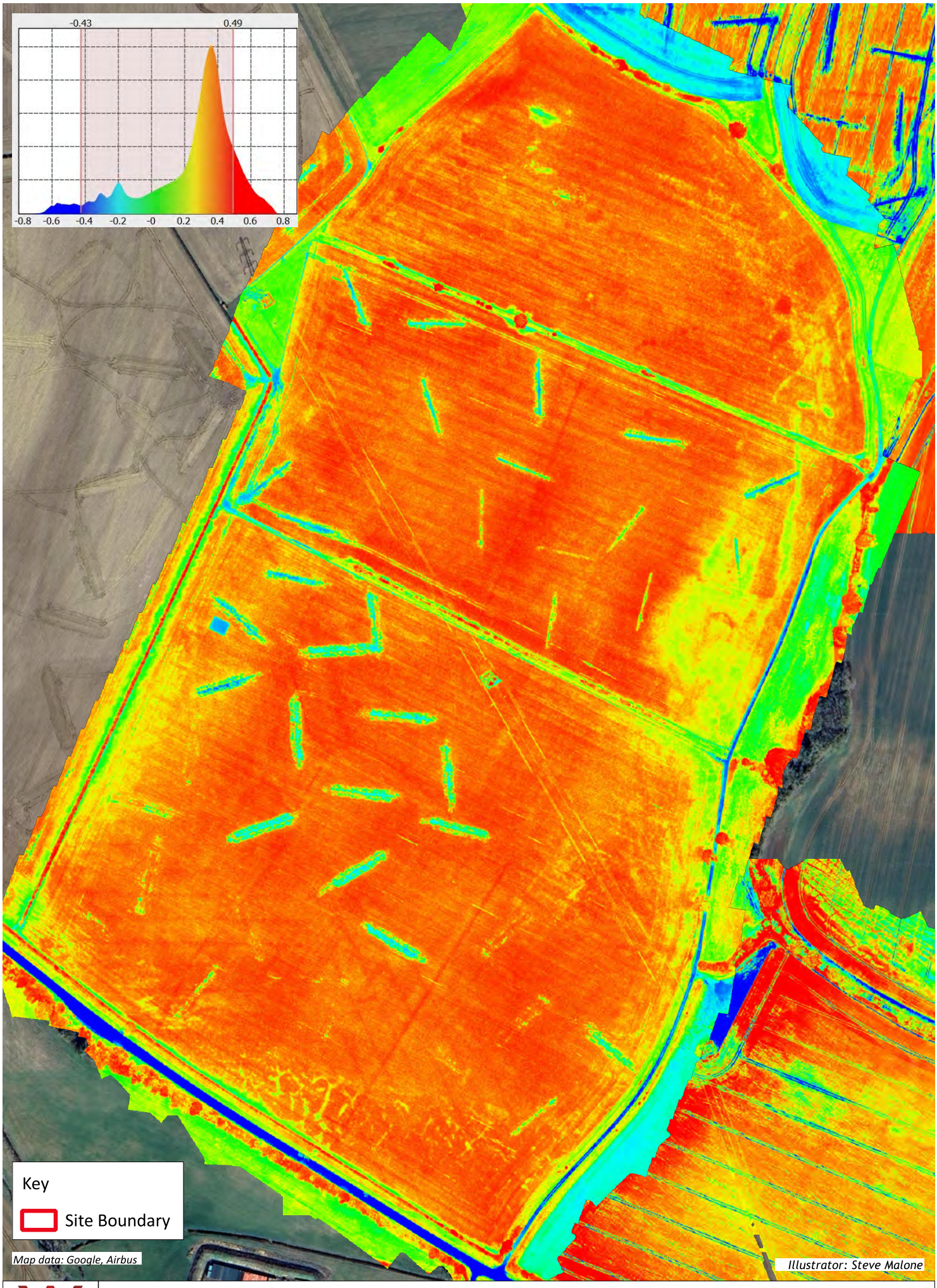

Figure 64 - Area G7, 11-12 NDVI
10292 - Green Hill Northampton