

Horiba MIRA Technology Park, Southern Manufacturing Sector

Loss of Agricultural Land Assessment

January 2022



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1 Purpose of the Assessment

- 1.1 The terra firma Consultancy have been instructed by the Applicant to prepare an assessment of the extent and nature of any impact of the proposals on agricultural interests.
- 1.2 The area that would be affected by the proposed development extends to some 42ha of Application Site, most of which is currently agricultural land that would effectively be lost if all the area under consideration were to be developed (although this is likely to be in phases).

2 Legislative Framework

2.1 National Planning Policy

- 2.1.1 The National Planning Policy Framework (NPPF) 2021 emphasises sustainable development and in section 6 Building a strong, competitive economy suggests the 'need to support economic growth and productivity' and 'particularly important where Britain can be seen to be a global leader in driving innovation'. This aligns well with the nature of the proposal and there is not much in the document to suggest the importance of agriculture although it receives a mention under the need to support a prosperous rural economy while enabling 'the development and diversification of agricultural and other land-based businesses'.
- 2.1.2 However, in Section 15 Conserving and enhancing the natural environment para 174 it states; Planning policies and decisions should contribute to and enhance the natural and local environment by: a) protecting and enhancing valued landscapes, sites of biodiversity or geological value and soils (in a manner commensurate with their statutory status or identified quality in the development plan); b) recognising the intrinsic character and beauty of the countryside, and the wider benefits from natural capital and ecosystem services – including the economic and other benefits of **the best and most versatile agricultural land**, and of trees and woodland;
- 2.1.3 The national planning context for development on agricultural land was until 2012 set out in the now discontinued PPS7: Sustainable Development in Rural Areas. While no longer in force, this was more explicit in its description of the best and most versatile agricultural land, and it is perhaps helpful to quote Paragraph 28 of;

'The presence of best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification), should be taken into account alongside other sustainability considerations (e.g. biodiversity; the quality and character of the landscape; its amenity value or heritage interest; accessibility to infrastructure, workforce and markets; maintaining viable communities; and the protection of natural resources; including soil quality) when determining planning applications. Where significant development of agricultural land is unavoidable, local planning authorities should seek to use areas of poorer quality land (grades 3b, 4 and 5) in preference to that of a higher quality, except where this would be inconsistent with other sustainability considerations. Little weight in agricultural terms should be given to the loss of agricultural land in grades 3b, 4 and 5, except in areas (such as uplands) where particular agricultural practices may themselves contribute in some special way to the quality and character of the environment of the local economy. If any development agricultural land needs to be developed, any adverse effects on the environment should be minimised.'
- 2.1.4 The Agriculture Act 2020 sets out an agenda for post EU farming and states the government's duty to analyse food security including global food availability, domestic supply, and powers of intervention.
- 2.1.5 The Environment Act 2021 sets out legislation for environmental protection but does not mention agriculture once.

2.2 Development Plan Policies

- 2.2.1 The local planning context for the development of agricultural land is set out in the adopted North Warwickshire Local Plan 2021. Under policy LP39 a large part of the site sits within Employment Site Allocation E4 Land south of A5 /Horiba MIRA Technology Park and Enterprise Zone.
- 2.2.2 While the plan has plenty on countryside protection it has nothing specific on protecting agricultural land. However, it is acknowledged that the *'overwhelming land use is agriculture'* (under 'Environment' p46) and *'agriculture is a major influence on the character of the area'* ('Countryside' p24).

3 Assessment Methodology

- 3.1.1 Broadly, this study is intended to identify and predict the likely effects of the proposed development on agricultural resources and interests, and to recommend measures to mitigate those impacts.
- 3.1.2 Natural land use development policies (see legislative framework section previous) although becoming progressively silent on agriculture, do however, seek to safeguard scarce natural resources in the long-term national interest and give protection to the best and most versatile agricultural land under the NPPF. Little weight of protection is given to land of lower quality unless the land has other special environmental characteristics.
- 3.1.3 With regard to soils, the Government's objectives for the sustainable management of soil have been set out in 'Safeguarding our soils – a strategy for England' published by Defra in 2010 which includes measures to be put in place to ensure the Environmental Impact Assessment process takes soil protection and handling into account.
- 3.1.4 With farm businesses, although the emphases are changing, there still remains a need to maintain, as far as possible, a well-structured and organised farming industry in order that the nation's food supplies are produced consistently, efficiently and to appropriate standards of quality.
- 3.1.5 These policy objectives form the basis for the methodology of assessment and have defined the scope of the impacts to be identified and examined as follows:
 - i) the quantity and quality of agricultural land that would be taken;
 - ii) the impact of land loss and severance on family businesses;
 - iii) the impact on farm buildings and often farm infrastructure.

3.2 Study Area

- 3.2.1 The study area is 42 ha as defined by the red line of the Development Application site although a wider area has to be considered whenever dealing with Agricultural (and Landscape) issues. The plan at our *Figure 1* indicates the application area and the current ownership of the land which is all under arable agriculture. Those currently responsible for farming these areas were consulted in the assessment process.

3.3 Surveys & Data Sources

- 3.3.1 The wider landscape assessment allowed familiarisation with the area's character, visual aspects, and physical characteristics. This included observation on land use, vegetation, soils, and drainage.
- 3.3.2 A detailed soils survey by Tim O'Hare Associates was undertaken in December 2010 to assess the quality of the resource on the existing Horiba MIRA site to the north and advised on how best to guide a strategy for mitigation of impacts. This was submitted with the 2011 EIA and is appended here for reference as much of this is likely to be relevant to the current application area, albeit the intention is to commission a site-specific soils survey and strategy should planning permission be forthcoming and detail design commenced.
- 3.3.3 The Applicant assisted with historic and current information on agricultural use on the site including consultation with those who currently farm the areas concerned.
- 3.3.4 Natural England provided the Agricultural Land classification data.

3.4 Consultation

- 3.4.1 Consultation took place with both farm managers during the period November 2021 to January 2022.
- 3.4.2 These formulated the basis for assessing current tenure and significance of its potential loss.
- 3.4.3 A particularly good description of farming practice to the north of the A5 was given by the farmer for the 2011 Agricultural Assessment and forwarded by the ENSOR agent Trevor Wells. Trevor was again consulted ten years later as the agent for ENSOR's land to the south of the A5 that comprises the majority of the current application site and he feels much the same could be said of this land:

'The arable land at Lindley Grange Farm is typical of the area under crop cultivation. The soils are red clay loam without crops of heavier Keuper Marl on the higher knolls, with evidence of marl or brick pits used long ago across the farm. The classification is grade 3 and suitable for winter cropping of wheat, barley, and oilseed rape, with occasional spring crops of peas and spring barley.'

Yields of winter cereals are just above the national average and achievable providing the soils are not compacted and with adequate drainage. The same could be said for oilseed rape, but spring crops do not perform so well compared with the national average as the soils are on the heavier side. The farm is under drained with a scheme installed in the late 1950's. There is no ponding or winter water-logging'.

The land requires annual applications of phosphate and potash to raise the nutrient status to level 3, suitable for crop production, and lime to raise the pH to 6.5/7.0 at least every 4 years. The land is not deficient in these elements but requires this management to maintain the status quo.

Typical arable weeds are present, with blackgrass and ryegrass the main grass weeds to control. These need a comprehensive programme of pre and post emergence to achieve adequate control.

Arable cultivation can be based around min till in the autumn to achieve seedbeds, but areas need additional power harrowing to break down the heavier areas of Keuper marl. These areas are prone to slug activity and often need 4 applications of pellets to control the pest.

Ploughing is required once in 6 years to improve chemical control of grass weeds, without this activity the farm would soon become overrun with black grass, brome and ryegrass.

Subsoiling to 14 inches is necessary every 3 to 4 years depending on weather and moisture status of soils, to alleviate compaction. Mole draining can take place in parts, but not all areas can hold a mole due to sand pockets.

In summary whilst the land can produce good crops with careful management, it is by no means the most productive land we farm.'

- 3.4.4 Richard Newey of Brown and co, the land agents for the application area's remaining land, owned by the Williams family, reports that their land is also farmed as part of an arable rotation and also classified Grade 3 but quotes the Soilscape system classification as 'freely draining, slightly acidic base rich soil' which is somewhat less problematic than that reported on the ENSOR land. The land is freehold with vacant possession, is not under any agri-environmental schemes and contains no agricultural buildings. Forming only 18.5 hectares of the Williams family's overall 350-hectare agricultural holding, Richard states 'It is therefore viewed that the loss of the land will not have economic effect upon the Williams family business'.

3.5 Agricultural Land and Soils

- 3.5.1 The relative importance of the agricultural land that would be affected is scaled according to the ALC system as set out in Table 1.

Table 1: Sensitivity of Agricultural Land Based on Agricultural Land Classifications

Sensitivity	ALC Category
High	Grade 1
Medium	Grade 2 and 3a
Low	Grade 3b
Negligible	Grade 4 and 5

- 3.5.2 With regard to the area of land take, there is very little guidance as to the amount of area of land take which is considered to be significant. Some assistance on this point is given in the 'Town and county Planning (General Development Procedure) Order' which requires local planning authorities to consult Natural England about any planning application that is a) not in accordance with the development plan, and b) would involve the loss of 20ha or more of high-quality agricultural land Grade 1 and 2 and sub grade 3a. For this assessment therefore, land take of more than 20ha is considered to be 'Large', as scaled in Table 2.

Table 2: Scale of Impact of Land Take of Agricultural Land

Scale of Impact	Land take of Agricultural Land Area
Large	More than 20 hectares
Medium	5- 20 hectares
Small	Less than 5 hectares
Negligible	Less than 0.1 hectares

- 3.5.3 Significance is calculated by combining the scale of impact and the importance or sensitivity of the resource. Again, there is no published method which specifies how the significance of the effect should be scaled with regard to agricultural or other land use and hence a generalised approach has been taken as shown below in Table 3.

Table 3: Significance Matrix

Importance of Agricultural Land	Magnitude of Impact Upon Land Take on Agricultural Land			
	Large	Medium	Small	Negligible
High	Major Adverse	Major Adverse	Moderate Adverse	Negligible
Medium	Moderate Adverse	Moderate Adverse	Minor Adverse	Negligible
Low	Moderate Adverse	Minor Adverse	Minor Adverse	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

- 3.5.4 Impacts which are beneficial are regarded as positive, and impacts which are adverse are regarded as negative. Where no overall change results, impacts are regarded as neutral.

3.6 Land Holdings

- 3.6.1 There is no Standardised method for determining the effects of the development proposals on agricultural businesses and thus professional judgement, having regard to relevant legislation and advice, such as that set out in the Highways Agency's Design Manual for Roads and Bridges, has been used for this assessment and considers the impact on each of the businesses affected individually. Table 4 sets out the classification criteria.

Table 4: Guidance for Estimating the Significant of Effects on Agricultural Units

Significance Criteria	Definition
Major Adverse	The impact of the proposal would be likely to render the holding non-viable.
Moderate Adverse	The commercial viability of the holding should not be threatened but significant changes in day-to-day management may be required.
Minor Adverse	The commercial variability of the holding would not be threatened but minor changes in day-to-day management would be required.
Negligible	The financial impact would be insignificant in relation to net holding income and there would be an insignificant change in day-to-day management.
Beneficial (Minor, Moderate or Major)	The potential profitability of the holding would be enhanced and/or day-to-day management of the unit would be made easier.

4 Baseline Conditions

4.1 Background

- 4.1.1 A significant proportion of land in Warwickshire is used for agriculture, making it the predominant land use. Throughout the county these are predominantly class 3 and much of the soils are difficult to work, being heavy clay. Over the last quarter of a century there have been large changes in the structure of agriculture in the county coupled with a general decline in farming across the UK as a whole.
- 4.1.2 The higher profile given to environmental protection and sustainable development with policy and the emphasis on non-expensive, low-impact farming, and agri-environmental schemes, is leading to a move to more environmentally aware agricultural systems.

4.2 History of Farming on Site

- 4.2.1 The Area in which the Application Site sits is predominantly in agricultural use and according to the research undertaken for the wider area for the application, has been so since records began. Higham on the Hill takes its very name from 'High Farm'. The site itself has been farmed for as long as historic mapping can show, becoming progressively less enclosed with ever enlarging field patterns.

4.3 Land Tenure and current farming practice on site

- 4.3.1 There are currently two ownerships; Brian Williams (area hatched red) and land that is owned and farmed by the ENSOR Trust (hatched blue). This is all illustrated in **Figure 1**.
- 4.3.2 All the land farmed within the proposed development area is under arable production.

4.4 Agricultural Land Classification

- 4.4.1 Records obtained for this study from Natural England (See *Figure 2*) show a western part of site to be of Grade 2 status or 'Very Good', attributing a medium sensitivity under table 1. The central and eastern majority of site sits within Grade 3 'Good to Moderate' Classification but no data is available to subcategorise into 3a or 3b. The nearest more detailed ALC survey available (*Figure 3*) to the immediate east of the site, indicates majority 3b farmland and, while it includes significant pockets of 3a and a very small area of Grade 2, we are of the opinion, backed by the soil survey (to the immediate north) and those who farm the land, that the majority of land on the Application Site would be at the poorer end of the category arriving at a Low sensitivity under table 1. Averaging this across the whole area, taking the better western area into account, this would give **Medium/Low sensitivity under table 1**.

4.5 Soil Survey

- 4.5.1 Tim O'Hare Associates Soil Survey for the Horiba Mira Site north of the A5 in 2011 (See appendix) found a general pattern of 320mm thick lens of topsoil over a 1200mm bed of subsoil, this being a heavy loam/clay, subject to seasonal waterlogging. This means that careful husbandry is required to avoid compaction and heavier areas require subsoiling from time to time. The pH was found to range 6.3-7.2 making it neutral and requiring lime every now and again to raise it to desired crop production pH levels. The soils were found to be deficient in nutrients and require fertilizers.
- 4.5.2 This is all borne out within the farmer's statement provided via Trevor Wells where yields, drainage, weed control, chemical applications, ploughing, and subsoiling regimes are all expanded upon.
- 4.5.3 Richard Newey's report for the Williams land tells a slightly different story of 'freely draining, slightly acidic base rich soil' and the detailed soil surveys and strategies will need to be undertaken for the application area itself alongside detailed design, prior to any earthworks being undertaken, so as to ensure correct approaches are adopted for specific areas. For the purposes of this study, it needs to be borne in mind that there is variation in type and quality, improving to the west.

5 Predicted Effects (The Assessment)

5.1 Impact during Construction Phase: Short to Medium Term

5.1.1 Quantity and Quality of Agricultural Land That Would be Taken

- 5.1.1 While the development is likely to be phased, once construction is set to commence in a particular zone, the land will inevitably have to come out of viable agricultural use. However, if smaller zones are developed incrementally rather than the site in its entirety, remaining areas might be maintained as farmland thus reducing the scale of the impact over different timescales.
- 5.1.2 The principal potential direct impacts would be loss of soil to the site, if capacity is not available to reuse on site or loss of soil quality, if it were handled inappropriately during removal (for example, handled or trafficked when wet; and by mixing topsoil and subsoil on stripping). Indirect impacts on the soil resource could accrue if it were re-used off site in a manner inappropriate to its quality.
- 5.1.3 The scale of significance of land loss will range from **small to large under table 2** during the construction phase as the area of take increases ultimately arriving at **Moderate Adverse significance under table 3** when combined with Medium/Low sensitivity.

5.1.2 The Impact of Land Loss and Severance on Family Business

- 5.1.1 The impacts on land tenure have been described as minimal by the current farmers, all of whom were consulted. When questioned they believed there would be no loss of jobs or significant loss of local production. In terms of quality, Trevor Wells' statement ends: *'In summary whilst the land can produce good crops with careful management, it is by no means the most productive land we farm'*.
- 5.1.2 The effects during both short and long term are unlikely to exceed **Minor Adverse under table 4**.

5.1.3 The Impact on Farm Buildings and Infrastructure

- 5.1.1 There are no ancillary farm buildings within the application site that would need to be removed.
- 5.1.2 The effects during both short and long term are unlikely to exceed **negligible**.
- 5.1.3 Utilising the methodology set out at the beginning of this section, tables would then read as follows for the Applicant's development proposals Agriculture Assessment:

TABLE 1:	Importance of Agricultural Land: MEDIUM LOW
TABLE 2:	Scale of Change: LARGE (based on more than 20ha)
TABLE 3:	Magnitude of Impact: MODERATE ADVERSE
TABLE 4:	Effect on Agricultural Units: MINOR ADVERSE

Table 5: Assessment Table (Short Term)

Scope of impacts	Effective Baseline Assessment
Quantity and quality of agricultural land that would be taken	Moderate adverse (Minor if less than 20 ha)
The impact of land loss and severance on family business	Minor adverse
The impact on farm buildings and infrastructure	Negligible

5.1.4 Impact during Operational Phase: Long Term

- 5.1.1 The Proposed Development, if constructed to its full capacity, would result in the permanent loss of some 45 ha of agricultural land of which approximately 34.2ha would be under buildings, roads or hard standing and the other 10.8ha would become 'Green Infrastructure or 'Landscape'. In terms of Scope of Impacts, the same issues stand as for the short to medium term, and the Assessment Table (see table 6 below) only differs from the previous (Table 5) by virtue of the full land take being fully implemented.

Table 6: Assessment Table (Long Term)

Scope of impacts	Effective Baseline Assessment
Quantity and quality of agricultural land that would be taken	Moderate adverse
The impact of land loss and severance on family business	Minor adverse
The impact on farm buildings and infrastructure	Negligible

6 Scope of Mitigation

6.1 Phasing

At its simplest, mitigation for loss of agricultural land is best achieved by limiting the extent of the development and by retaining maximum area of land in agricultural use. Provided pockets are retained at viable size and appropriate access is afforded to severed fields, production should be able to continue in areas not directly affected during a phased construction period.

6.2 Soils (Soils Resources Plan and proposed Green Infrastructure)

This is covered in detail within The Landscape and Visual Impact Assessment Scope of Mitigation 'Soils' section. A thorough approach to re-using site won soils in accordance with a detailed Soil Resource Plan would ensure volumes and quality are preserved, if not enhanced. If there is surplus, then selling off- site for appropriate beneficial re-use could be considered and still seen as sustainable. Generally, the approach with the landscape areas is to use this material for new landform and there is an aspiration to keep it all for re-use on site. With proper husbandry, soils could improve in quality with landscape green infrastructure, which there is generous provision for within the development proposals.

6.3 Alternative Land tenure

The current farmers have been consulted and voiced the opinion that they can find other land elsewhere to suit their needs.

6.4 Residual Effect Assessment

As an overall table to summarize the findings, the following can be set out, considering implementation mitigation measures described above (1.47, 1.48 and 1.49):

Table 7: Summary Table

Scope of impacts	Effective Baseline Assessment	Mitigation	Residual Effects Assessment
Quantity and quality of agricultural land that would be taken	Moderate adverse	Phasing Soil Resources Plan Significant percentage of development becomes landscape green infrastructure	Minor adverse
The impact of land loss and severance on family business	Minor adverse	Alternative Land tenure Phasing	Negligible
The impact on farm buildings and infrastructure	Negligible	Not applicable	Negligible

6.5 Monitoring

- 6.5.1 Areas continuing in agricultural use during phasing are left as viable, accessible entities.
- 6.5.2 Proposed Green Infrastructure Landscape provided, and Soils Resource Plan produced and adhered to.

6.6 Assumptions

- 6.6.1 Site would carry on in agricultural use if development was not to go ahead.

7 References

- 7.1.1 The terra firma Consultancy Agricultural Land Environmental Statement within Turley EIA for MIRA site north of A5 2011.
- 7.1.2 MIRA / farm tenants consultation November 2021 – January 2022.
- 7.1.3 Natural England: Agricultural Land Classification
- 7.1.4 National and District policies at November 2021.
- 7.1.5 Tim O'Hare Associates 2010 '*Soil Resources Survey*'. (See appendix)

8 Figures

Figure.1: Current Agricultural Land

Figure 2: Agricultural Land Classification

Figure 1

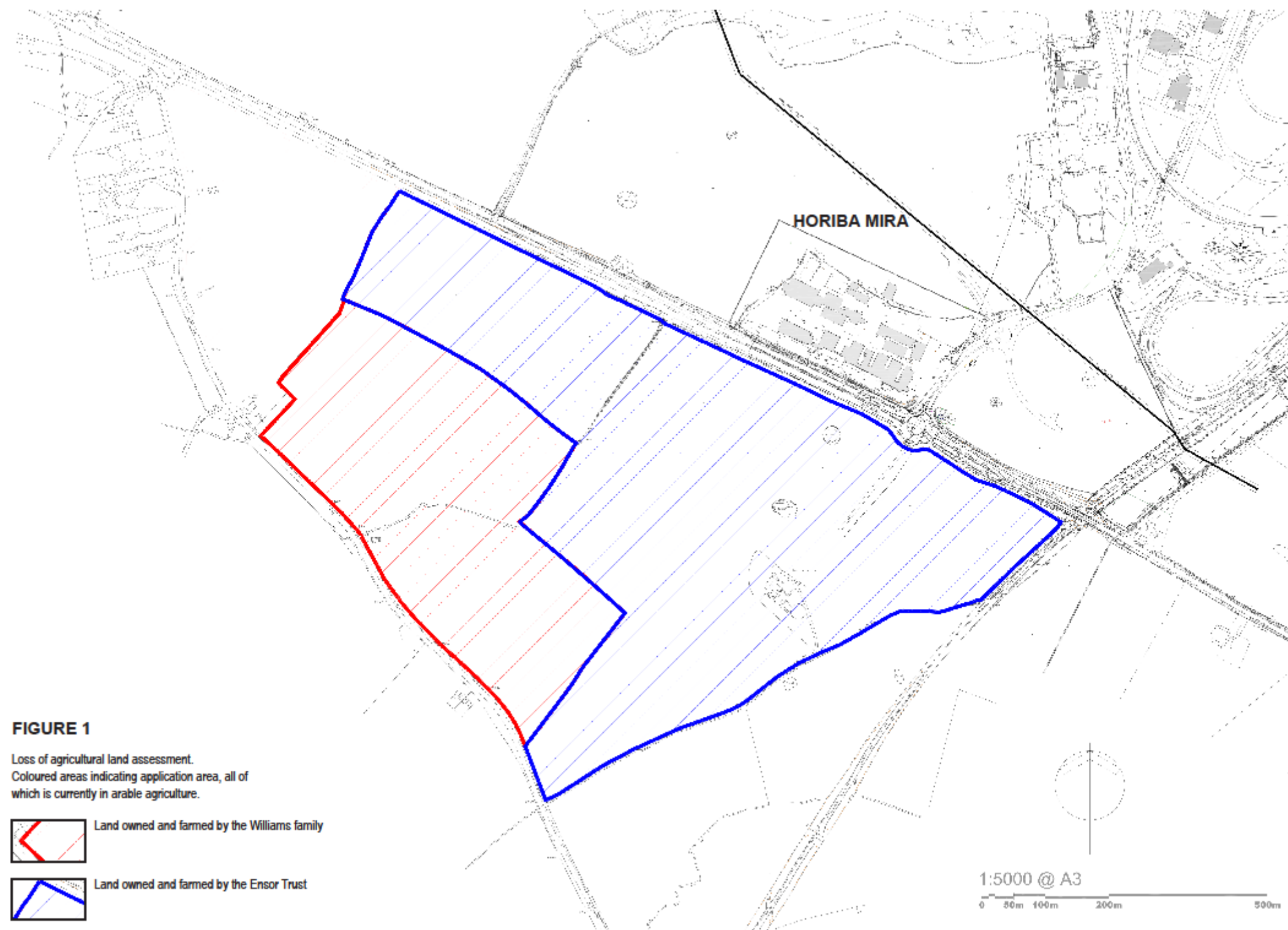
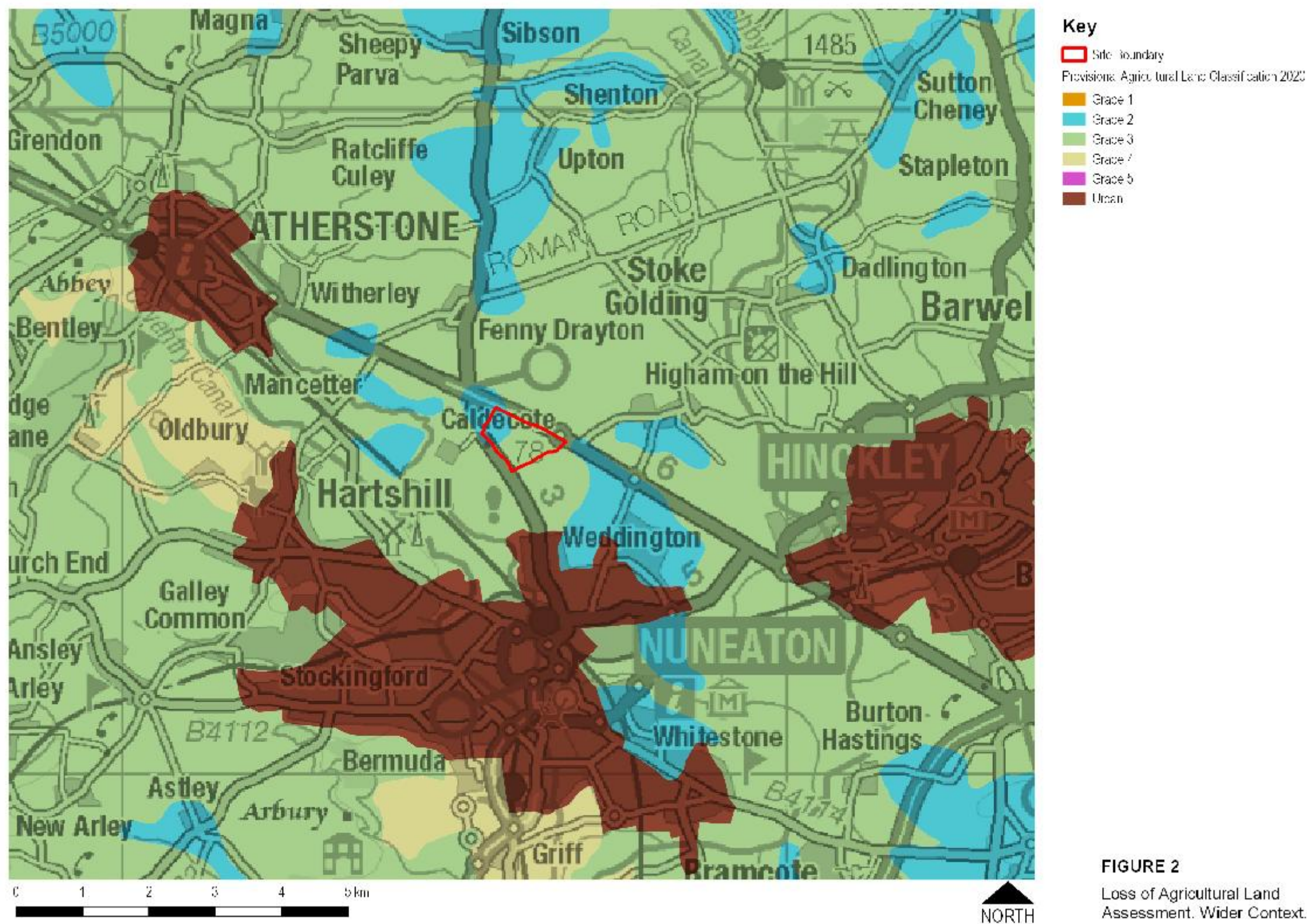


Figure 2



Appendix 1 – Soil Resource Survey, Tim O’Hare Associates



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

SOIL RESOURCE SURVEY

For the

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HINCKLEY, WARWICKSHIRE**

On behalf of

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Appendix 1 - Site Plans Showing Trial Hole Locations

Appendix 2 – Laboratory Analysis Results

EXECUTIVE SUMMARY

Tim O'Hare Associates LLP was commissioned by The Terra Firma Consultancy to undertake a soil resource survey at the Mira Ltd site near Hinckley, Warwickshire. A large portion of this site is to be developed, for which it is proposed to submit an outline planning application and carry out an Environmental Impact Assessment (EIA).

The existing site is largely under agricultural production or pasture with wooded boundaries and, as such, appears to have large reserves of topsoil and subsoil. There is currently no information available on the horticultural quality, variability and suitability of the soils for landscape purposes within a business park development.

The protection of soil as a natural resource is of increasing importance, driven by the requirements of European and national environmental impact legislation, the EU Soil Framework Directive, Defra's Soil Action Plan and the emerging Soil Strategy for England. These initiatives have prompted Defra to develop *The Code of Practice for the Sustainable Use of Soils on Construction Sites*. The Code of Practice indicates that Soil Resource Survey should be carried out to determine the nature and quality of site soil resources (topsoil and subsoil). The findings should be subsequently incorporated into a Soil Resource Plan for the site.

The site soil resources were consistent over four identified areas and may be described as slightly acid to slightly alkaline, heavy textured topsoils (*heavy clay loam* to *clay* soil texture classes), with low to moderate levels of fertility and low stone contents. The topsoil was an average of 320mm deep, overlying slightly acid *clay* subsoil.

The potential to re-use these soils for landscape purposes is restricted by their heavy soil texture and high clay content. Heavy textured soils, such as these, are particularly vulnerable to damage if handled when moist and plastic in consistency. Therefore soil moisture content during handling operations (soil stripping storage, resspreading and preparation for planting/seeding) will be a crucial factor in determining final soil quality. This should be taken into account when determining the earthworks programme and should target what are typically drier months (May/June to September/October) for these operations.

In their current condition, the soils are suitable for most of the proposed landscape types including shrub beds, woodland establishment, woodland coppice, amenity lawns (low foot traffic) and wildflower meadow seeding (topsoil from existing paddocks/grassed areas only). This is providing the physical condition of the soils is maintained and species tolerant of heavy, moisture retentive soils are selected.

The topsoil and subsoil is not suitable for backfilling tree pits, where imported free draining sandy soils would be required. Given the impaired soakage characteristics of the subsoils, it is likely that provision for land drainage or other improvement will need to be included in the design of tree pits and shrub beds so that they do not act as sumps for surface draining water.

1.0 INTRODUCTION

Tim O'Hare Associates LLP was commissioned by The Terra Firma Consultancy to undertake a soil resource survey at the Mira Ltd site near Hinckley, Warwickshire. Our authority to carry out the work is contained in an email instruction from The Terra Firma Consultancy dated 23rd November 2010.

1.1 Purpose

We understand that it is proposed to submit an outline planning application for the project and to carry out an Environmental Impact Assessment (EIA).

The existing site is largely under agricultural production or pasture with wooded boundaries and, as such, appears to have large reserves of topsoil and subsoil. However, there is currently no information available on the horticultural quality, variability and suitability of the soils for landscape purposes within a business park development.

The protection of soil as a natural resource is of increasing importance, driven by the requirements of European and national environmental impact legislation, the EU Soil Framework Directive, Defra's Soil Action Plan and the emerging Soil Strategy for England. These initiatives have prompted Defra to develop *The Code of Practice for the Sustainable Use of Soils on Construction Sites*. The aim of the Code of Practice is to give the construction sector (including planners and designers) guidance on the ways in which damage and loss of soils should be minimised and managed on construction sites. The Code recommends the preparation of two documents:

- Soil Resource Survey – to determine the location, composition and overall quality of on-site soil resources (topsoil and subsoil).
- Soil Resource Plan – showing the areas and type of topsoil and subsoil to be stripped, haul route, the methods to be used, and the location, type and management of each soil stockpile.

This Soil Resource Survey is intended to form part of the planning submission and to assist the EIA. It should also guide on-going design and cost analysis by providing information on the existing site soil resources and their potential for re-use within the new landscape scheme.

With reference to the *Project Trinity Masterplan* document, a significant portion of the development will be soft landscaped with a range of landscape types, including specimen trees, formal shrub planting, amenity grass, wildflower meadows and coppice woodland.

1.2 Actions

Tim O'Hare Associates LLP has evaluated the quality and suitability of the soils by assessing a number of key chemical and physical soil properties, through on-site investigation and laboratory analysis.

This report issues the findings of the soil investigation, including our site observations and soil descriptions, results and interpretation of all analyses, discussion on soil quality and implications for soil management on this site.

2.0 REFERENCE MATERIAL

We have reviewed the published geological and soil survey data for this site.

Geology

The British Geological Society (BGS) categorises the geology of the site under the following classifications for bedrock geology and superficial geology:

Bedrock Geology - Mercia Mudstone Group	Triassic rocks (undifferentiated) mudstone, siltstone and sandstone
Lithological Description	Dominantly red, mudstones and subordinate siltstones with thick halite-bearing units in some basinal areas. Thin beds of gypsum/anhydrite widespread; sandstones are also present.
Definition of Lower Boundary	Gradational on Sherwood Sandstone Group, taken where mudstone and siltstone become dominant over sandstone.
Definition of Upper Boundary	Overlain sharply by Penarth Group (incoming of marine lithologies).
Thickness	1350m+
Geographical Limits	British Isles.
Parent Unit	NEW RED SANDSTONE SUPERGROUP
Superficial deposits - Diamicton	Poorly-sorted sediment with wide particle size range. Composition not defined.

Soils

The Soil Map of England and Wales (1:250,000 scale) classifies the soils as:

Major Group	<i>Brown soils</i>
Group	<i>Argillic brown earths</i>
Subgroup	<i>Stagnogleyic argillic brown earths</i>

Brown soils are widespread and are mostly in agricultural use. *Argillic brown earths* are loamy or loamy over clayey soils with a subsurface horizon showing significant clay enrichment.

Further definition places the site within an area of the *WHIMPLE 3* Soil Association, which is described as 'Reddish fine loamy and silty soils with slowly permeable subsoils and seasonal waterlogging.'

3.0 SITE INVESTIGATION

3.1 Site Visit

We visited the site on the 9th and 10th December 2010 during a period of freezing and bright weather. The site was located to the north east of Hinckley in Warwickshire and was accessed from the A5.

3.2 The Site

Four distinct areas were identified for the survey, comprising:

Area 1 – agricultural land adjacent to the A5. This area is irregular in shape and divided into 2 no. plots. The area slopes downwards from west to east (total fall is around 10m) and at the time of our visit, had been sown with a winter cereal crop.

Area 2 – soft landscape adjacent to Track 1. This area is long and thin (tapering at both ends) running north to south along the west edge of Track 1. The majority of this area is roughly level, with a series of landscape bunds located on its west boundary. A mown grass sward was present over much of this area, whilst the tops of the bunds were vegetated with established trees and scrub.

Area 3 – agricultural land and paddocks, north of Lindley. This roughly square area is divided into agricultural fields and number of horse paddocks, bounded by fences. This area was generally level and had been sown with a winter cereal (fields) or was vegetated with a short grass sward (paddocks).

Area 4 – grass pasture, north west of Lindley. This area is irregular in shape and is divided into a number of unequal sized fields. The area was roughly level and vegetated with a grass sward.



Plate 1 : Area 1 – agricultural land adjacent to A5



Plate 2 : Area 2 Soft landscape next to Track 1

3.3 Soil Conditions

We examined the soils by constructing a total of 43 no. hand-dug trial holes (TH) at representative locations within the survey areas to a maximum depth of 1200mm where possible. The locations of our trial holes are indicated on site plans in Appendix 1.

At each trial hole, the soils were examined with reference to the Soil Survey Field Handbook. Important physical soil characteristics were recorded, including texture, structure, compaction, waterlogging, anaerobism, topsoil depths and the presence of deleterious materials. At the same time, representative soil samples were taken for laboratory analysis.

Soil Descriptions

The soil profiles were generally consistent between locations, comprising reasonably undisturbed topsoil over subsoil and were typically described as:

Topsoil GL – 210/410mm Average depth : 320mm	Brown to dark reddish brown (Munsell Colour 7.5YR 4/2 to 7.5YR 3/2) moist to wet, plastic HEAVY CLAY LOAM to CLAY, with a moderately developed, granular and blocky structure. Slightly stony with occasional rounded to subangular stones (up to 60mm). No observable deleterious materials. Rusty root mottles were frequently observed at the topsoil/subsoil interface.
Subsoil 210/410mm – 1200mm	Brown to yellowish red to reddish brown (Munsell Colour 7.5YR 4/2 to 5YR 5/6 to 2.5YR 4/4) moist, plastic CLAY with a moderately developed, granular and blocky structure to poorly developed columnar structure becoming massive (structureless). Stoneless to virtually stone-free and no observable deleterious materials. Manganese concretions and prominent reddish grey mottles were frequently observed within the subsoil.



Plate 3 : Area 1 – Occasional stones at surface



Plate 4 : Area 1 - Typical soil profile (TH1)



Plate 5 : Area 2 Typical soil profile (TH30)



Plate 6 : Subsoil

3.4 Topsoil Depths

The following topsoil depths (mm) were recorded during our survey

TH1	290	TH16	310	TH31	310
TH2	320	TH17	270	TH32	260
TH3	380	TH18	360	TH33	410
TH4	240	TH19	290	TH34	220
TH5	310	TH20	360	TH35	390
TH6	270	TH21	330	TH36	210
TH7	350	TH22	320	TH37	310
TH8	360	TH23	320	TH38	290
TH9	250	TH24	320	TH39	340
TH10	330	TH25	380	TH40	330
TH11	310	TH26	340	TH41	290
TH12	340	TH27	360	TH42	310
TH13	350	TH28	340	TH43	330
TH14	340	TH29	370		
TH15	320	TH30	290		
<u>Average Topsoil depth : 320mm</u>					

4.0 LABORATORY ANALYSIS

4.1 Analytical Schedule

A total of 7 no. representative samples of topsoil and subsoil were submitted to the laboratory for analysis.

The samples were analysed in accordance with the following schedule:

- particle size analysis and stone content;
- pH and electrical conductivity values;
- major plant nutrients - N, P, K, Mg (Topsoil only);
- organic matter content.

The results are presented on the Certificates of Analyses in Appendix 2 and our interpretation of the results is given below.

4.2 Results of Analysis – Topsoils

Particle Size Analysis and Stone Content

The topsoil samples fell into the *heavy clay loam* to *clay* texture classes, and are described as heavy in texture. Such soils usually have good water and nutrient retention capacities, but they are slow-draining and can suffer from seasonal waterlogging following periods of prolonged or heavy rainfall. They are also prone to structural degradation and compaction during handling, and especially when plastic in consistency. Given the high clay content of these topsoils, they will tend to form strong structures when dry that may be difficult to break down by mechanical cultivation.

The soils would be only suitable for less-demanding planting types, including shrubs, whips and native transplants (including most species normally used for woodland coppice) and amenity grass, provided the structural condition of the soil is satisfactory and provided only plant species tolerant of moisture retentive, heavy soils are selected.

These soil texture classes are not suitable for species or landscape types which demand free-draining conditions, including tree pits, where a lighter, sandy soil would be required.

If it is desired to plant non-robust species, it would be essential that the topsoil is in its optimum physical condition at planting. However, these species are unlikely to achieve their maximum growth potential if planted into heavy soil such as this and are likely to be more prone to damage from environmental factors such as frost.

The structural condition of all the topsoils is currently moderate, and would need to be maintained by careful handling and management to ensure they are fit for planting/seeding. In particular, stripping the *Topsoil* in its current *plastic* state would cause severe damage to the soil structure.

The samples were virtually stone-free to slightly stony and stone content should therefore not restrict the use of these soils for landscape purposes.

pH and Electrical Conductivity

The samples were slightly acid to slightly alkaline in reaction (pH 6.3 – 7.2) with a pH range that would be ideal for general landscape purposes.

The electrical conductivity (salinity) values were all low, indicating that soluble salts were not present at levels that would be harmful to plants.

Organic Matter and Nutrient Status

The topsoil samples contained moderate levels of organic matter and total nitrogen, with high levels of extractable magnesium. All of the samples were deficient in extractable potassium. Samples from Area 2, Area 3 (Paddock area) and Area 4 were all deficient in extractable phosphorus. Both samples from Area 1 contained moderately high levels of extractable phosphorus.

For planting and amenity grass establishment, the deficiencies will need to be remedied by appropriate applications of compost or fertiliser.

The topsoils within Area 2, Area 3 (Paddock area) and Area 4 are considered to be *infertile* in relation to species-rich grassland establishment (wildflower meadows). As such, the fertility status of these soils is suitable for this purpose and should help to encourage floristic diversity over time.

The topsoil within Area 1 is considered to be *fertile* in relation to species-rich grassland establishment, where a low fertility soil is needed, particularly in relation to levels of phosphorus. Infertile soil is required to prevent domination of the sward by grasses and aggressive weeds such broad-leaved dock (*Rumex obtusifolius*) and stinging nettle (*Urtica dioica*).

4.3 Results of Analysis – Subsoils

Particle Size Analysis and Stone Content

The samples of *Subsoil* all fell into the *clay* texture class and, as such, are heavy in texture. These soils are typically slow-draining and often suffer from seasonal waterlogging following periods of prolonged or heavy rainfall. They are also prone to structural degradation and compaction during handling, and especially when plastic in consistency. As such, they are restricted in terms of their potential for re-use for landscape purposes.

The site subsoils would be suitable for less-demanding planting, including whips and transplants, shrub planting, amenity grass seeding and species-rich grassland establishment, provided the structural condition of the soil is satisfactory and provided species tolerant of water retentive soils are selected. The site subsoils are unsuitable for plant species or landscape environments that require or prefer light or free-draining soils. Furthermore, there is likely to be a need for additional subsoil drainage to promote a healthy rooting environment, particularly in tree pits and any ornamental planting beds.

The subsoil samples were virtually stone-free and so stones will not constitute a limitation for the proposed landscape scheme.

pH and Electrical Conductivity

The samples were slightly alkaline in reaction (pH 7.2 – 7.4) with a pH range that is suitable for a wide range of plant species.

The electrical conductivity (salinity) values were all low, indicating that soluble salts were not present at levels that would be harmful to plants.

Organic Matter Content

The subsoil samples were found to contain low levels of organic matter.

5.0 DISCUSSION

It is proposed to expand the site of Mira Ltd into the agricultural land adjacent to the A5 at the south of the site (Area 1). It is envisaged that the required site preparation work will strip, temporarily store and re-use topsoil from these fields for soft landscape purposes. At this stage, the emerging landscape scheme is to include a number of planting types and landscape environments including:

- Specimen trees
- Formal shrub planting
- Coppice woodland
- Wildflower meadows
- Amenity grass

There is currently little detailed information on the quality, variability and suitability of the site soils, so the purpose of the investigation was to assess the existing soil conditions, and advise on their potential for re-use.

5.1 Summary of Findings

From our investigation, the site contained significant reserves of topsoil and underlying subsoil. As such, the site soils were found to be reasonably consistent in nature, comprising a *heavy clay loam* to *clay* topsoil, overlying *clay* subsoil.

The visual examination and subsequent laboratory analysis confirmed that the composition of the site topsoils were largely consistent and, as such, can be described as slightly acid to slightly alkaline, non-saline, slightly stony *heavy clay loams* to *clays*, with low to moderate fertility levels.

From our site observations, the current *physical condition* of the topsoil was considered to be adequate. However, examination of the soil profile found signs of restricted drainage and aeration.

The site subsoils can generally be described as slightly alkaline, stone-free, CLAYS, with moderate to poor soil structures.

5.2 Re-use of the Site Soils

The following section considered the potential to re-use the site soils for landscape purposes.

Topsoils

The *Topsoils* all contained moderately high to high clay contents and for a significant proportion of the year, these soils will be vulnerable to compaction caused by soil handling. In their current condition these soils would be described as *imperfectly drained* and may be expected to be seasonally waterlogged for approximately 3 months of the year. Once disturbed and respread, the damage caused to these soils would further reduce their drainage characteristics, making them 'Poorly Drained to Very Poorly Drained', depending on their final physical condition. As such, once disturbed, these soils may remain waterlogged for up to 6 months of the year.

Based on our findings, the topsoils have potential for re-use for most of the proposed planting environments, provided their physical condition is adequate at planting or seeding and plants tolerant of heavy, moisture retentive soils are selected. For shrub planting, woodland establishment, woodland coppice and amenity grass areas, the deficiencies in major plant nutrients should be remedied by appropriate applications of fertiliser and/or compost.

The topsoil found at Area 2, Area 3 (paddocks) and Area 4 appears to have the greatest potential for species rich grassland establishment on account of their *infertile* fertility status. The topsoils within Area 1 and Area 3 (agricultural fields) are *fertile* and have a low potential for this purpose.

The topsoils are not suitable for areas of amenity grass which would receive high levels of foot traffic, on account of their vulnerability to compaction and waterlogging.

Subsoils

The subsoils across the site were heavy in texture and, as such, will demonstrate restricted drainage characteristics, particularly if left in a compacted condition. This will therefore present their own limitations with respect to landscaping the site as tree pits could act as sumps for surface and subsurface draining water.

The subsoils have potential for re-use as subsoil for most of the proposed planting environments, including shrub planting, woodland establishment, woodland coppice, amenity grass areas and species-rich grassland establishment. To reduce periods of waterlogging, it will be important that the subsoils are cultivated using appropriate tillage equipment to break up any panning (compaction) before planting/seeding.

Given the impaired soakage characteristics of the subsoils, it is likely that provision for drainage or other improvement will need to be included in the design of tree pits and shrub beds so that they do not act as sumps for surface draining water. The level of modification required would depend on the level of soakage achieved during soil preparations.

In addition, the subsoils will be prone to self-compaction if placed below the weight of a tree root ball and so are not considered suitable for use as backfill in tree pits. We recommend that an appropriate free-draining sand or sandy subsoil is used to backfill the lower portion of all tree pits.

5.3 Soil Structure & Physical Degradation

It is essential to provide a structured, uncompacted topsoil for the successful establishment and subsequent growth of plants and grass. Adequate soil structure is a key element for healthy plant growth to ensure aeration and drainage within the rootzone. If the site's development programme requires the soils to be disturbed by activities such as excavation, storage and resspreading, soil structure can easily be destroyed by compaction. Any damage to soil structure will reduce the drainage rate of this topsoil.

Almost all soils are physically degraded during intensive handling and the potential quality and the ultimate suitability of the topsoil for re-use will depend on how well its soil structure is preserved during the earthworks phase. These heavy topsoils will be particularly prone to structural damage if handled and moved when wet. In this situation, the larger (air containing) soil pores are destroyed and replaced by smaller (water retentive) pores. This will restrict gaseous exchange with the atmosphere and cause the topsoil to become anaerobic (oxygen depleted). In addition, the lack of larger pores prevents effective drainage and results in an increased risk of waterlogging.

Waterlogged and anaerobic conditions, if they persist, can be severely detrimental to plants in two main ways. Firstly, aerobic bacteria are replaced by anaerobic bacteria that produce ammonia and methane gases which are harmful to plants. Secondly, without oxygen plant roots are unable to take up water and nutrients.

5.4 Topsoil Handling & Programming

Despite the inevitable degradation caused by stockpiling, provided the topsoils are stripped, stored and resspread correctly and cultivated to break up any compacted lumps, these topsoils should return to a healthy, aerobic state in a matter of days.

If the site topsoils are to be re-used successfully, structural degradation must be kept to a minimum. In order to achieve this, it is best practice for topsoil to only be handled when it is dry and non-plastic in consistency. The most appropriate time to carry out the topsoil strip will therefore be during the summer months (May/June to September/October), and then only when the topsoil is dry. If the topsoil is dry when it goes into the temporary stockpile, it can be kept dry until it is resspread.

If the development's programme requires the topsoil to be stripped and stockpiled when wet, it is inevitable that significant damage is likely to occur to the structure of the topsoil. This damage will be potentially irreparable (particularly in the short to medium term), and planning the programme of earthworks should therefore be carefully considered by the project team at the earliest stage.

Even if the topsoil is stripped when wet, it may still be possible to repair the damage provided there is sufficient time and dry weather. It will therefore be essential that the *Topsoil Respreading Phase* take place during a summer season, to allow enough time for the soil to dry out effectively and be thoroughly cultivated before soil cultivation and planting/seeding takes place in autumn (grass seeding) and winter (planting).

If the project's programme results in topsoil having to be stripped and stockpiled when wet, and then respread for planting/seeding in the wetter/colder, winter or following spring months, there is unlikely to be any opportunity to recondition and prepare the topsoil to address the structural degradation caused by the stripping/stockpiling process. Planting into such adverse conditions is likely to result in poor establishment rates of both planting stock and grass.

5.5 Soil Quality

The best scenario for re-using this topsoil would be to strip and stockpile it dry, as it will then be dry when it is to be re-used. When dry, the soil will be relatively easy to spread and cultivate, and should re-aerate rapidly. If the soil is stockpiled when wet, the soil will suffer from physical degradation that will have to be repaired before further work is carried out. This remediation work will be difficult to achieve in the short term, requiring favourable weather conditions and possibly a series of cultivations.

5.6 Vegetation Removal

Before the topsoil is stripped, it is important to take action to minimise the amount of organic material that is incorporated with the topsoil and, this will involve removing as much of the existing vegetation as is practical.

6.0 RECOMMENDATIONS

In accordance with the *Code of Practice for the Sustainable Use of Soils on Construction Sites*, we recommend that the information from this Soil Resource Survey is used to prepare a Soil Resource Plan to inform best practice in the management and protection of the site soil resources. This document should identify opportunities and constraints of re-using the existing soils within the new development, with consideration for the proposed range of landscape types (street trees, planting beds, grass lawns, wildflower meadows, native woodland establishment, woodland coppice).

The Soil Resource Plan should also cover the following topics:

1. Maps showing topsoil and subsoil types and the areas to be stripped and left in-situ.
2. Methods for stripping and stockpiling soils.
3. Location of soil stockpiles and content.
4. Schedules of volumes for each material.
5. Methods for respreading soils.
6. Soil treatment techniques to ensure a well structured, uncompacted rooting zone is provided for future landscape construction.
7. Soil amelioration measures including options to improve the quality of the soils by adding fertiliser, compost or sand etc.

We would like to thank The Terra Firma Consultancy and Mira Ltd for entrusting our practice with this commission. We trust this report meets with your approval and provides the necessary information. Please do not hesitate to contact the undersigned if we can be of further assistance.

Tim White
BSc MSc MSoilSci CSci
Senior Associate

For and on behalf of Tim O'Hare Associates LLP

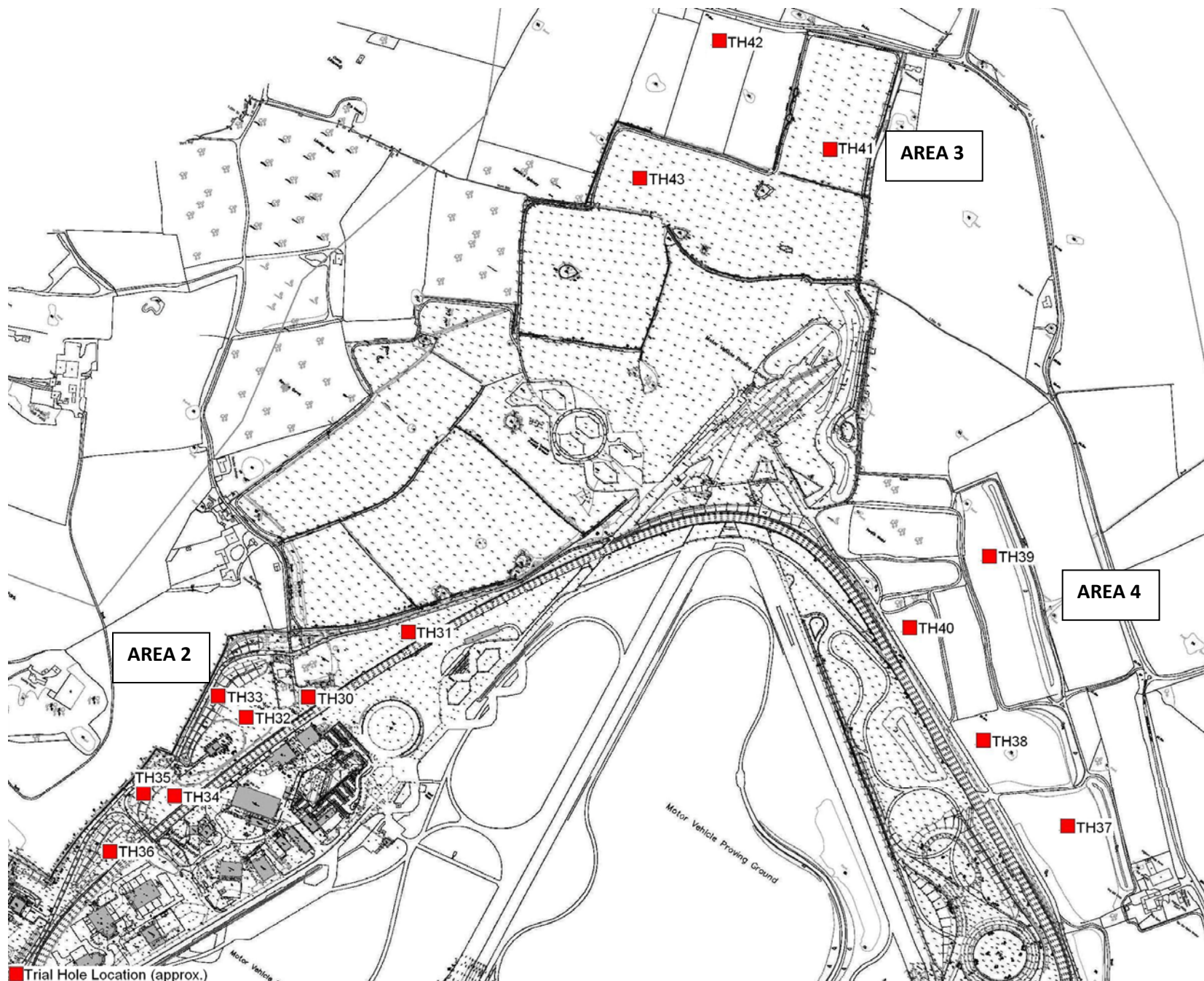
Report Qualifications

Our interpretation of the soil conditions is based on observations made during our site investigation and the results of laboratory tests. This report presents our site observations and test results and our interpretation of those observations and results. On any site there may be variations in soil conditions between these exploratory positions. We can therefore not accept any responsibility for soil conditions that have not been exposed by this investigation.

This investigation considers the re-use of the soils for landscaping. It should not therefore be relied on for alternative end-uses or for other schemes. This report has been prepared solely for the benefit of our client The Terra Firma Consultancy. No warranty is provided to any third party and no responsibility or liability will be accepted for any loss or damage in the event that this report is relied upon by a third party or is used in circumstances for which it was not originally intended.

Appendix 1

Site Plans Showing Trial Hole Locations



■ Trial Hole Location (approx.)

■ THx
Trial Hole Location
(approximate)



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client:	The Terra Firma Consultancy		
Project:	Mira Site		
Job ref no.:	TOHA/10/2774/Dec/TW		
Drawing no.:	TOHA/10/2774/2		
Drawing title:	Mira Soil Survey – Area 2-4		
Date:	Dec '10	Scale:	NTS
Drawn by:	TW	Checked by:	TOH

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■ THx
Trial Hole Location
(approximate)



TIM O'HARE ASSOCIATES
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Client:	The Terra Firma Consultancy		
Project:	Mira Site		
Job ref no.:	TOHA/10/2775/TW/Dec		
Drawing no.:	TOHA/10/2775/1		
Drawing title:	Mira Soil Survey – Area 1		
Date:	Dec '10	Scale:	NTS
Drawn by:	TW	Checked by:	TOH

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Appendix 2

Laboratory Analysis Results



TIM O'HARE ASSOCIATES
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Client: **The Terra Firma Consultancy**
Project: **Mira Project**
Job: **Soil Resource Survey**
Date: **December 2010**
Job Ref No: **TOHA/10/2774/TW**

Sample Reference		Area 1 TH11	Area 1 TH26	Area 2 TH30	Area 3 TH42	Area 4 TH40
Sample Description		Topsoil	Topsoil	Topsoil	Topsoil	Topsoil
Clay (<0.002mm)	%	34	41	37	39	31
Silt (0.002-0.063mm)	%	30	31	40	31	28
Sand (0.063-2.0mm)	%	36	28	23	30	41
Texture Class (UK Classification)	--	HCL	C	C	C	HCL
Stones (2-20mm)	% DW	1	1	6	1	3
Stones (20-50mm)	% DW	0	0	2	0	0
Stones (>50mm)	% DW	0	0	0	0	0
pH Value (1:2.5 water extract)	units	6.5	6.3	6.5	7.2	6.3
Electrical Conductivity (1:2.5 water extract)	uS/cm	274	252	217	185	150
Electrical Conductivity (1:2 CaSO4 extract)	uS/cm	2130	2139	2160	2118	2093
Organic Matter (WB)	%	2.8	3.7	3.5	3.5	3.5
Total Nitrogen (Dumas)	%	0.17	0.21	0.20	0.26	0.10
Extractable Phosphorus	mg/l	48	29	7	12	8
Extractable Potassium	mg/l	179	174	102	76	142
Extractable Magnesium	mg/l	177	121	298	131	340

HCL = HEAVY CLAY LOAM

C = CLAY



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

Client: **The Terra Firma Consultancy**
Project: **Mira Project**
Job: **Soil Resource Survey**
Date: **December 2010**
Job Ref No: **TOHA/10/2774/TW**

Sample Reference		Area 1 TH1	Area 2 TH30
Sample Description		Subsoil	Subsoil
Clay (<0.002mm)	%	44	44
Silt (0.002-0.063mm)	%	26	37
Sand (0.063-2.0mm)	%	30	19
Texture Class (UK Classification)	--	C	C
Stones (2-20mm)	% DW	1	1
Stones (20-50mm)	% DW	0	0
Stones (>50mm)	% DW	0	0
pH Value (1:2.5 water extract)	units	7.2	7.4
Electrical Conductivity (1:2.5 water extract)	uS/cm	165	161
Organic Matter (WB)	%	0.8	1.1

C = CLAY