ARBORICULTURAL SURVEY
and
ROAD CONSTRUCTION METHODOLOGY
at
Land Head Road
Cawthorne
Barnsley

Client:
Lancasters (1790) Ltd., Barnsley

Client Address:
Lancasters (1790) Ltd.
34 Eldon Street
Barnsley
S70 2EL

Client Telephone:
01226 205274
01226 202652 (Fax)

My Ref:
6950lB

Your Ref:
R. Steadman

Contents

Contents 2
1. Introduction 3
1.1 Purpose of the Report 3
1.2 Terms of Reference 3
1.3 Scope of the Report 3
2. Site Description 4
2.1 Land Use 4
2.2 Topography 4
2.3 Treescape 4
2.4 Amenity Value 4
2.5 Age Class Mix 4
2.6 Species Diversity 4
3. Survey Conditions and Methods 5
3.1 Date of Inspection 5
3.2 Name of Inspector 5
3.3 Weather Conditions 5
3.4 Data Collection Methods 5
4. Status of the Trees 7
5. Tree Descriptions and Recommendations 8
6. Road Building Techniques. 9
6.1 Scope of Recommendations 9
6.2 Considerations 9
6.3 Protecting Tree Roots 10
6.4 Site Preparation. 10
6.5 Construction Methods 12
6.6 Development and Post-Development . 14
7. Conclusion 16
Appendix 1: Site Plan 17
Appendix 2: Glossary of Terms & Abbreviations 18
Appendix 3: The Author's Qualifications 19
Appendix 4: General Guidelines 20

© JCA Ltd 2005

1. Introduction

1.1 Purpose of the Report

1.1.1 A report is needed at the above location to give detailed arboricultural advice on the trees present, and to give specific recommendations with regards to road construction sympathetic to trees. I understand that these are required in relation to proposals for development of the site.

1.2 Terms of Reference

1.2.1 I am instructed by Richard Steadman of Lancasters (1790) Ltd., Barnsley to visit the site and prepare my findings in a report.

1.3 Scope of the Report

1.3.1 This report includes only those two mature oak trees T3 and T5 as specified by Mr Steadman.

© JCA Ltd 2005

2. Site Description

2.1 Land Use

2.1.1 The site is currently unused.

2.2 Topography

2.2.1 The site is approximately level.

2.3 Treescape

2.3.1 On site are a conifer hedge, a mature ash tree and a mixed woodland. They make a significant contribution to the local treescape.

2.4 Amenity Value

2.4.1 The woodland has a high amenity value though individual trees within it have a low amenity value. Other trees on site have a moderate amenity value.

2.5 Age Class Mix

2.5.1 Both oak trees surveyed are mature specimens. Trees surrounding them vary from semi-mature to mature.

2.6 Species Diversity

2.6.1 Both oak trees are surrounded by a variety of other species.

© JCA Ltd 2005

3. Survey Conditions and Methods

3.1 Date of Inspection

3.1.1 The survey took place on the 6th October 2005.

3.2 Name of Inspector

3.2.1 Ivan Button NCH (Arb) BSc (Hons) PGCE.

3.3 Weather Conditions

3.3.1 It was clear and dry during the site inspection.

3.4 Data Collection Methods

3.4.1 The survey was carried out to British Standard 5837 using the categories explained below.

3.4.2 Inspection was made at ground level using visual assessment of the tree canopy, stem and rooting area. Where problems were noted the need for further climbing inspection is outlined in the recommendations. No digging or drilling was carried out on this occasion.

3.4.3 *AGE CLASS* of the tree is described as young, semi-mature, early mature, mature or over-mature. Increment borers are often used to extract core samples enabling us to age the tree and to discuss recent and future growth trends. Usually however, the age of a tree is based upon our experience.

3.4.4 *HEIGHT* of the tree is measured in metres using instruments including clinometers or hypsometers.

3.4.5 *DIAMETER AT BREAST HEIGHT (D.B.H.)* refers to the tree's stem diameter which is measured in centimetres at a height of 1.5m above ground level using tapes or calipers.

3.4.6 *CROWN SPREAD* is the highest total value of either north-south or east west distances measured in metres from the tree centre using tape measures.

3.4.7 *CROWN HEIGHT* is an indication of the average height at which the main crown begins and is measured in metres using a clinometer.

© JCA Ltd 2005

3.4.8 *CONDITION* of the tree is classed as good, fair, poor, or dead.

3.4.9 *VIGOUR* is an indication of how fast the tree is growing and is classed as high, average, low or dead.

3.4.10 *FORM* is an indication of the quality of the tree's shape/balance and is classed as good, fair, or poor.

3.4.11 *AMENITY VALUE,* classed as high, moderate or low, is assessed by taking into account how visible the tree is from public places, its setting in the landscape and how many other trees are present. It therefore follows that a high quality tree in a woodland of many similar trees will be classed as the same as a reasonable tree stood alone in a built-up area.

3.4.12 *LIFE EXPECTANCY* of the tree is given in years.

3.4.13 *RETENTION CATEGORY* values for the trees are as follows:

A (marked in green on the plan) = retention most desirable

1) Vigorous healthy trees, of good form and harmony with proposed space and structures;
2) Healthy young trees of good form, potentially in harmony with proposed development;
3) trees for screening or softening the effect of existing structures in the near vicinity, or of particular visual importance to the locality;
4) trees of particular historical, commemorative or other value, or good specimens of rare or unusual species;

B (marked in blue on the plan) = retention desirable

1) Trees that might be included in the high category but because of their numbers or slightly impaired condition, are downgraded in favour of the best individuals;
2) Immature trees with potential to develop into the high category;

C (marked in brown on the plan) = trees which could be retained

1) Trees in adequate condition or which can be retained with minimal tree surgery but are not worthy of inclusion in the high or moderate categories;
2) Immature trees or trees of no particular merit;

D (marked in red on the plan) = trees for removal

1) Dead or structurally dangerous trees;
2) Trees with insecure roothold;
3) Trees with significant fungal decay at base or main bole;
4) Trees with a cavity or cavities of significance to safety;
5) Trees that will become dangerous after removal of other trees for the reasons given in 1-4;

© JCA Ltd 2005

3.4.14 Some height and diameter measurements were estimated.

3.4.15 Values recorded for *VIGOUR, FORM, AGE CLASS, LIFE EXPECTANCY* and *CONDITION* are based upon our knowledge of trees and the way they grow. Trees grow at different rates and in different forms depending upon species, maturity, location, climate, altitude, weather, past management and many other factors.

4. Status of the Trees

4.1 I understand from our client that the two trees are protected by a Tree Preservation order.

4.2 Before any work is organised, all the necessary steps to get the permission of the Local Planning Authority should be taken.

4.3 ***No work should be done to any trees until this permission has been granted.***

4.4 Please advise us if you would like JCA Ltd to apply for consent to carry out any proposed works on your behalf. We are also able to organise and supervise professional contractors

© JCA Ltd 2005

5. Tree Descriptions and Recommendations

Please refer to attached plan (Appendix 1) and section 3.4 for a full explanation of the tables.

TREE 3

English Oak. *Quercus robur (Fagaceae)*

Age Class	Height (m)	D.B.H. (cm)	Crown Spread (m)	Crown Height (m)	Condition	Vigour	Form	Amenity Value	Life Expectancy	Retention Category
Mature	19'	84	10	2.5	Good	Average	Good	Moderate	40+	A

Single stemmed and vertical specimen becoming twin stemmed at 6m with good branch junctions.

Broken branch noted at 5m.

Some ***deadwood*** present in lower crown.

Recommendation: *Remedial Prune*

TREE 5

English Oak. *Quercus robur (Fagaceae)*

Age Class	Height (m)	D.B.H. (cm)	Crown Spread (m)	Crown Height (m)	Condition	Vigour	Form	Amenity Value	Life Expectancy	Retention Category
Mature	22	88	15	3	Good	Average	Good	Moderate	40+	A

Single stemmed and vertical becoming twin stemmed at 10m.

Branch stubs are present on the stem at a height of approximately 4m.

Recommendation: *Remedial prune.*

© JCA Ltd 2005

6. Road Building Techniques.

6.1 Scope of Recommendations

6.1.1 This report outlines the options available for constructing roads and drives over existing tree roots. Two methods are outlined; the *No-Dig Method* and the *Minimum Excavation Method*. Either technique would be acceptable over the roots of the oak trees surveyed at Land Head Road.

6.1.2 The design of such a construction needs to be sensitive to the requirements of tree roots, substantial enough to withstand the expected levels of traffic and practicable in terms of ease of fabrication. The methods suggested in this report are intended to fulfil all of these requirements. However any proposed road construction should be approved by a qualified structural engineer prior to implementation.

6.1.3 This report should not be regarded as exhaustive. Research into this subject is ongoing, new products and materials are continually becoming available, and new designs conceived.

6.1.4 We are not qualified to recommend any particular construction method in terms of durability or structural integrity.

6.2 Considerations

6.2.1 The following points need to be considered before opting for a particular construction design:

6.2.2 **Department of Transport.** The D.O.T. have specifications for standard highways which need to be adhered to if they are to adopt the road or drive. If the road or drive is not to be adopted by the D.O.T., but is to remain private, then a far greater range of construction options are open to the developer. For the purpose of this report it is assumed that the road is not intended to be adopted.

6.2.3 **Nature of Traffic.** The design needs to take into account whether the traffic is likely to be heavy or light duty. Most roads or drives need to be able to withstand at least the weight of a Fire Engine. For the purpose of this report it is assumed that only light traffic will be using the driveway.

6.2.4 **Ground Characteristics.** A geo-technician may occasionally be required to assess the ground characteristics of the particular site, particularly the load bearing capacity of the subsoil. For the proposed driveway at Land Head Road I do not deem this to be necessary.

© JCA Ltd 2005

6.2.5 **Vigour and Proximity of Nearby Trees.** The oak trees T3 and T5 have enough vigour and are situated at a sufficient distance from the proposed driveway such that they are likely to cope well with a sympathetically planned construction.

6.3 Protecting Tree Roots

6.3.1 In constructing a road or drive with a sympathetic approach in terms of tree roots, the following criteria need to be met:

6.3.2 Severance of roots should be avoided. However if it is necessary to sever roots or if they are severed accidentally, the situation must be assessed by an arboricultural consultant.

6.3.3 Soil compaction must be minimized. This will involve the use of hand tools wherever practicable. Where machinery is used, the lightest machine available which is capable of the task should be selected. Ideally construction should be undertaken in dry weather between May and October when the ground is driest and least prone to compaction.

6.3.4 Oxygen and water must be able to diffuse into the soil beneath the engineered surface.

6.3.5 Toxic substances which could leech into the ground must be avoided, as should substances which affect the P.H. value of the soil, for example limestone.

6.3.6 Roots should be prevented from infiltrating and ultimately breaking up the engineered surface.

6.4 Site Preparation.

6.4.1 To construct a road or drive with a sympathetic approach in terms of tree roots will require either no excavation or minimal excavation. Example illustrations of the *No-Dig* and *Minimum Excavation* methods of construction are to be found on page 10.

6.4.2 **The No-Dig method:** See Figure 1 This involves the construction of a road surface with no excavation, soil stripping or site grading. All construction takes place above ground level. Preparation is as follows:

6.4.2.1 Ground vegetation is killed using a translocated herbicide. Care must be taken to select a herbicide which does not damage the tree roots within the treated area. One such product suggested by the Arboricultural Advisory and Information Service is *Glyphosate* It is essential that product labels are read and understood before use.

6.4.2.2 Once the vegetation has died, the dead organic matter should be gathered up. This helps prevent the future build up of anaerobic conditions due to decomposition.

© JCA Ltd 2005

6.4.2.3 Major protrusions such as tree stumps need to be removed with minimum disturbance to the soil. Stumps should be ground out rather than excavated. Resulting hollows should be filled with *sharp sand.*

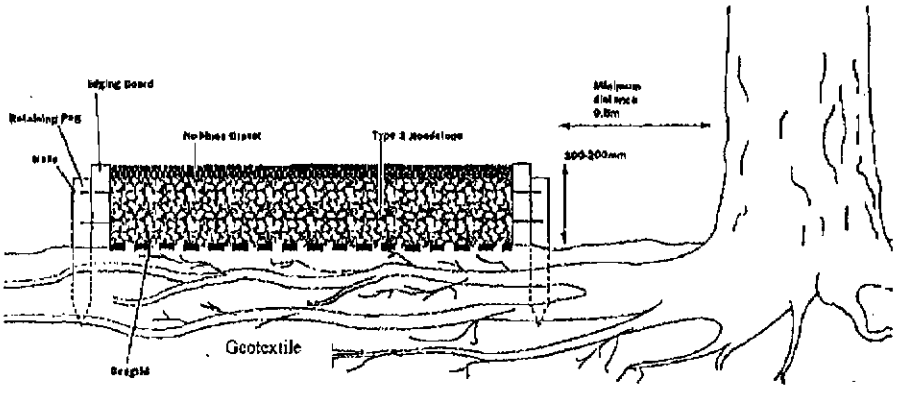


Figure 1. A light duty drive constructed using the *No Dig Method*

6.4.3 **The Minimum Excavation Method:** See Figure 2. In some instances it may be deemed acceptable, even preferable, to excavate a small amount of soil. This will depend upon the proximity, size and species of the trees, and the nature of the soil at the particular site. For the proposed driveway over T3 and T5 at Land Head Road this method is deemed to be acceptable.

6.4.3.1 Preparation should be the same as for the N*o Dig Method.* Application of the herbicide should be done at least 4 weeks before the vegetation is removed.

6.4.3.2 Layers of soil should then be removed carefully and in the presence of an arboricultural consultant. No more than10cm of soil should be removed before the ground is inspected by the consultant. Depending on the presence of roots it may then be acceptable to remove a further 10cm of soil.

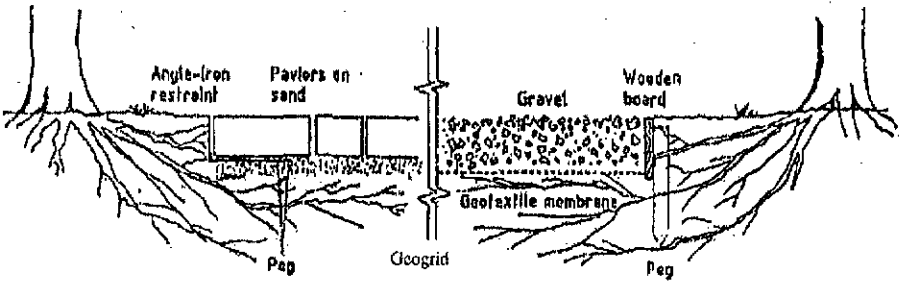


Figure 2. A light duty drive constructed using the *Minimum Excavation Method*

© JCA Ltd 2005

6.5 Construction Methods

6.5.1 For both the *No-Dig* and *Minimum Excavation Methods* of construction the principles of road or drive design sympathetic to tree roots remain the same. The road or drive can be divided into three basic layers (see figure 5 on page 13); the *Root Barrier*, the *Sub-Base* and the *Finished Surface:*

6.5.2 **The Root Barrier.** In order to protect the construction from future infiltration by tree roots it will be necessary to first lay down a *root barrier* or *geo-textile*. The *geo-textile* should have the following properties:

6.5.2.1 **Strength** - to resist puncture by tree roots and granular sub-base material.

6.5.2.2 **Porosity** - to allow adequate passage of water and oxygen across the geo-textile. This should not be assumed, but should be confirmed with the manufacturer.

6.5.2.3 **Durability** - Once installed the geo-textile cannot easily be replaced and therefore needs to maintain these properties in the long term.

6.5.3 **The Sub-base.** A system needs to be adopted which obtains maximum strength, load spread and porosity with minimum depth. In order to do this construction should incorporate an aggregate sub-base with either a geogrid or a geo-web:

6.5.3.1 **The Geogrid.** Geogrids are high tensile strength synthetic grids, designed to support roads on soft ground.

When placed on a geogrid the granular sub-base material penetrates the mesh but is unable to pass through it, forming a positive interlock (Figure 3).

This interlock between aggregate and geogrid provides a reinforced platform and improved load spread, helping to reduce the compaction of the underlying ground

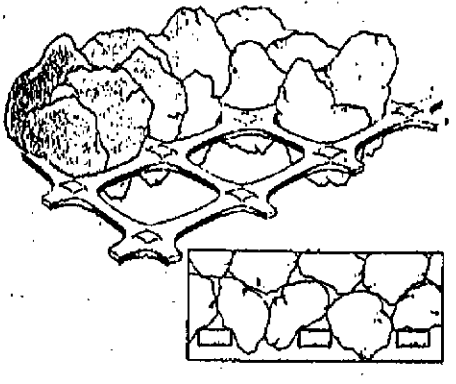


Figure 3. The Geogrid.

© JCA Ltd 2005

6.5.3.2 **The Geoweb.** The geoweb is a 3-dimensional polythene product, which uses established principles of cellular confinement to maximise strength, and spread load (Figure 3).

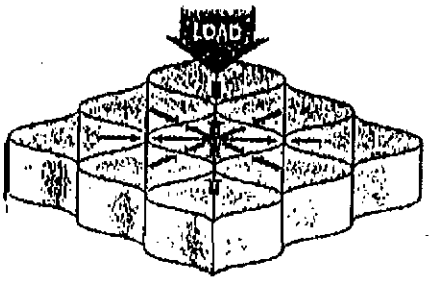


Figure 4. Cellular confinement and load spread.

Manufacturers claim that over soft compressible soils a geoweb reinforced sub base has equivalent performance to an un-reinforced sub-base five times its thickness.

6.5.3.3 Perforations in the cell walls allow water and air to migrate laterally throughout the reinforced layer. These perforations also greatly increase the friction between granular infill and the geoweb which greatly increases the ability of the structure to spread any load from above.

6.5.3.4 **Infill Material.** A *No-Fines* aggregate infill is required in order to maintain porosity. The Department of Transport recommend *Granular Sub-Base Material Type 1* (D.O.T. Manual of Contracts for Highway Works. Vol 1. 1991. Clause 803), this is sometimes still referred to as *MOT1*. I understand that this has relatively low fines content thus remaining freely draining and allowing oxygen to diffuse into the soil, even when compacted. Limestone aggregate should be avoided as this is likely to leech into the soil below and alter the P.H. value, which is critical to many species of trees. Particle size must not exceed 50mm. **The Aggregate Sub-base.** A *No-Fines* aggregate sub-base is required beneath the geoweb. Granular Sub-Base Material Type 1 is again recommended.

6.5.4 **The Finished Surface.** The ideal road surface would be hard wearing and durable, it should have long-term permeability to both, air and water as well as maintaining high friction, i.e. be non-slippery. To my knowledge there is no available road surface, which fully satisfies all of these requirements. In practice a compromise has to be made:

6.5.4.2 Tarmac meets these requirements initially, providing a *No-Fines* grade is specified. However over time the surface can become less and less porous as minute particles of debris infiltrate any gaps, in effect sealing the surface.

6.5.4.3 Block Paving is also suitably porous initially, providing that it is laid dry

© JCA Ltd 2005

jointed and on *sharp sand*. There is a danger though, that like Tarmac, the joints can become relatively sealed over time, due to infiltration of debris.

6.5.4.4 Unbound decorative gravel remains porous, but is often deemed unacceptable due to the problems of rutting, over-spill into neighbouring areas, and the eventual exposure of the Sub-base.

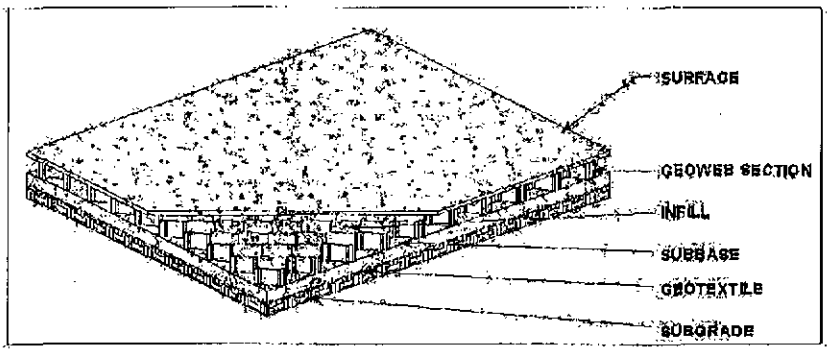


Figure 5. Material layers used in the Geoweb cellular confinement system.

6.6 Development and Post-Development

6.6.1 Soil compaction must be avoided during the construction of the drive and at all phases of the development.

6.6.2 The drive should be constructed prior to the commencement of the development and the arrival of heavy machinery and lorries. A significant amount of damage can be caused to the tree roots upon the arrival of the first construction vehicle. Construction materials for the proposed driveway need to be stored away from the tree rooting zone and if possible, delivered without driving over the rooting zone.

6.6.3 Once the driveway is constructed it should only be used for light traffic. Materials and machinery to be used in the subsequent development stage should be delivered via alternative routes. If this is not possible then smaller vehicles than are conventionally used should be employed for delivery.

6.6.4 Additionally good forward planning may be able to reduce the number of journeys made over the new surface. Consideration should be given to contractor parking, number of site visits required by heavy machinery etc.

6.6.5 Large quantities of mud or other building aggregates are likely to build up on the road surface during the construction phase. These will in effect seal the surface and reduce

© JCA Ltd 2005

its porosity. This will in turn reduce oxygen and water availability to the tree roots. The best way to avoid such a build up is to find alternative routes during the development stage.

6.6.6 If it is not possible to adhere to all the recommendations given above then it is likely that significant soil compaction, or reduced surface porosity will have occurred upon completion of the development. In such circumstances it may be necessary to remove the driveway, aerate the soil and inject specialist compounds which facilitate nutrient uptake. The driveway will then require replacement with another of similar construction. This process can be very costly and is not guaranteed to eliminate the stress caused to the tree. Clearly all possible precautions should be taken to avoid the necessity of such remedial action.

© JCA Ltd 2005

7. Conclusion

7.1 Two mature oak trees were surveyed and found to be in good structural condition with good vigour and form. Minor tree works were recommended for reasons of good arboricultural practice. These works are of low priority. These trees are expected to have a useful life expectancy upwards of 40 years.

7.2 A driveway is proposed to be constructed at a distance of no less than 4m from the oak trees. Conventional road construction methods are likely to sever tree roots and cause significant ground compaction. The resulting stress caused to the trees is likely to lead to a significant deterioration in health.

7.3 Recommendations are given for the sympathetic construction of such a driveway. Two alternatives are proposed – the *No Dig Method* and the *Minimum Excavation Method.* Both of these methods are expected to cause minimal impact on the two oak trees, assuming that the guidelines recommended in section 6 are strictly adhered to.

© JCA Ltd 2005