NOTTINGHAMSHIRE MINERALS LOCAL PLAN CALL FOR SITES

SITE NAME: **LANGFORD QUARRY**

LOCATION: **NORTH EXTENSION**

	Plan Reference/Evidence	Additional Information
Proposed boundary of the site	Refer to red line on Plan L20N6A17.	Approximately 124 ha north of the existing quarry, bisected by Westfield Lane.
The extent of excavations	Refer to blue line on Plan L20N6A17.	/
Proposed access to the site	Internal access shown on Plan L206A17.	Existing dedicated quarry access road off A1133 Gainsborough Road. Internal access to proposed extraction area shaded brown on Plan L206A17.
Potential location of processing plant	Refer to Plan L20N6A17.	Existing processing plant and stock yard.
Phasing	Refer Plan L20N6A17.	Seven phases proposed (Phase 1-3 south of Westfield Lane and Phases 4-7 north of Westfield Lane).
An OS Map of the site	OS detail shown on all plans.	/
Estimated number of HGV Movements per day/month/year	/	Up to 110 loads per day.

Reserve Data

	Plan Reference/Evidence	Additional Information
Quality and quantity of recoverable reserves	Design Proposals document attached.	Estimated workable reserves of 8 million tonnes. Good quality Trent Valley sand and gravel suitable for production of concreting aggregate.
Estimated output per annum	/	As historical output, circa 450,000t per annum.
Estimated lifespan of the mineral working (years)	/	Circa 18 years production.
When will the site be ready to be worked?	/	From circa 2026 , to provide production continuity when South & West extension expected to be fully exhausted.

Role of Sites/Market

	Plan Reference/Evidence	Additional Information
Is the site a new Greenfield site or an extension?	/	Extension.
If a Greenfield site, is it replacing an existing mineral working within or outside the county	/	/
What is your planned market area?	/	As existing quarry, which has been operating since 1989.

Is the location of the site optimum in terms of serving the market?	/	Yes as evidenced by historical output. Access from the processing plant site onto A1133 and then onto main trunk road network via A46/ A17/ A1.

Availability of Mineral

	Plan Reference/Evidence	**Additional Information**
Do you have the legal rights to work all of the mineral including access to a public highway or any other transport route?	/	Tarmac control land to access from the processing plant site to the A1133 Gainsborough Road. Tarmac have leases in place for the majority of the extension area and are in negotiation with other owners to secure necessary working rights.

Landowner Consent

	Plan Reference/Evidence	**Additional Information**
Who is the legal owner of the site?	/	Tarmac own part of the site. Tarmac have a lease from two surface owners and one mineral owner covering the majority of the site. Tarmac have received support from two other surface owners and the mineral owner to promote the site with a view to granting Tarmac necessary working rights.
Is the legal owner of the site also a minerals operator?	/	Tarmac own part of the site.

		All other land within the site is not owned by a mineral operator.
Has the legal owner made a formal agreement with any mineral operator for minerals exploration and/or minerals extraction?	/	Tarmac hold leases on the surface and minerals of the majority of the site. Tarmac are in negotiation with all other necessary owners for the grant of working rights. All owners have confirmed in writing to Tarmac their support for the site to be promoted for inclusion in the MLP as a future sand and gravel working area.

Agricultural Land Classification

	Plan Reference/Evidence	**Additional Information**
Agricultural land classifications found within the site	Refer to the attached assessment of Soil Resources and Agricultural Use and Quality for the land north of Westfield Lane. Assessment of the land south of Westfield is underway.	In summary the land north of Westfield Lane is a combination of Subgrade 3a (36.7 ha/42%) but is limited by wetness, flooding and droughtiness and Subgrade 3b (50.7 ha/58%) limited by wetness. Non-agricultural land accounts for approximately 4.6 ha. No importation of inert infill material is proposed. With regard to land south of Westfield Lane, detailed assessment is underway but in summary agricultural land classification of the phases south of Westfield Lane is expected to be similar to that north of Westfield Lane.

Sensitive Receptors

	Plan Reference/Evidence	**Additional Information**
Is the site located within 250m of any sensitive receptors?	/	A small number of isolated dwellings are located within 250m of Phases 5 and 6 which have been taken into account in the site design with the inclusion of

(schools, residential dwellings, workplaces, healthcare facilities)		standoffs in excess of 100m between the proposed extraction areas and those properties closest to the site.

Reclamation

	Plan Reference/Evidence	**Additional Information**	
Proposed reclamation schemes – what opportunities for environmental benefits do you see arising from the scheme?	Refer to Plan L20N5A17.	Restoration to predominantly water based nature conservation in line with the published RSPB "Bigger Better" vision for the restoration and after use of sand and gravel workings in the Trent Valley north of Newark. The restoration scheme enhances the existing RSPB reed bed based nature reserve complex on the main quarry and creates a variety of open water and shallow water bodies within surrounding riverside pasture on other areas.	
Does the reclamation of the site depend on importing fill? If so, please indicate type of waste, main sources and timescales	/	Infill required?	No.
		Type of waste	/
		Main source of waste	/
		Timescales	/

Langford Quarry

Design proposals for a northern extension to the quarry

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Report ref:L020_Langford North_R2_2017

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Plans

Langford Quarry, Northern Extension Area. Summary Borehole Plan	L20NBH1A17.PDF
Langford Quarry. Northern Extension Area. Proposed phasing of extraction	L20N6A17.PDF
Langford Quarry. Northern Extension Area. Proposed Final Landform	L20N5A17.PDF

1.0 INTRODUCTION

1.1 This report presents design proposals for a future extension to the north of Langford Quarry.

1.2 The report estimates the potential reserves to be 7,964,000Tonnes which would provide an additional life of 17.7 years based on current output levels of 450,000 Tonnes p.a.

1.3 A concept restoration landform has been design based on achieving high quality wetland restoration linling Langford and Besthorpe Quarries to provide a regionally important nature conservation area.

2.0 SUMMARY OF EXPLORATION DRILLING

2.1 The results of exploration drilling of the Northern Extension area have been reviewed. A summary of the borehole results is shown on plan L20NBH1A17.PDF The results from the boreholes indicate the continuity of the high quality sand and gravel deposit between Langford Quarry in the south and Besthorpe Quarry in the north.

2.2 Two major potential reserve blocks have been identified these are:

a) North East of Langford Quarry to the south of Westfield Lane.

b) North of Westfield Lane up to Ferry Lane at the southern boundary of Besthorpe Quarry.

2.3 Overburden is generally less than 2.0m thick with local deeper clay filled channels present.

2.4 The sand and gravel generally varies in thickness up to 8 metres with the shallowest parts in the southern part of the proposed extraction area where some areas are less than 2 metres thick.

2.5 Laboratory test results from samples taken within the Northern Extension Area confirm that the gravel is a high quality durable quartzite rich deposit comparable to Langford and Besthorpe. The sand is also medium to coarse grained, generally clean and well graded. The sand and gravel can therefore be processed to produce high quality concrete sand and gravel products. It is anticipated that the product split will be approximately 55% gravel and 45% sand.

3.0 PROPOSED PHASING OF EXTRACTION

3.1 The proposed phasing of extraction is indicated on plan L20N6A17.PDF.

3.2 The Northern Extension area will be worked using the same extraction methods as are currently used at Langford.

3.3 Stripping of soils and overburden to expose the sand and gravel will be carried out on an annual basis using a team of contractors utilising excavators, dumpers and bulldozers with the soils placed directly into store or restoration.

3.4 The sand and gravel will be extracted usually as a single face operation using a long reach excavator that feeds the sand and gravel into a hopper and onto a field conveyor. The field conveyor will transport the sand and gravel back to the processing plant for processing.

3.5 The processing of the sand and gravel will be undertaken at the existing processing plant location ie there is no requirement for a new processing plant location. Any new plant that may be required in the future to replace the existing facility would be located on the same plant site footprint.

3.6 In order for the sand and gravel to be worked safely and efficiently the sand and gravel must be dewatered down to the level of the base of the sand and gravel. This will be achieved by cutting a sump into the marl at the base of the sand and gravel with a series of ditches progressively cut into the base of the extraction area. Water from the sump will be initially pumped back into the silt pond system within the existing quarry area. This will provide clean water for processing via the existing abstraction licence with the balance discharged via the water management system through the quarry to the new outfall on the River Trent or the permitted discharge point to the east of the quarry.

3.7 The field conveyor will be located between the existing clean water pond and the wood to the north of the plant site. New conveyor crossing points will be required in the areas of the public rights of way to the north of the plant site and also in the area of Westfield Lane. Conveyor crossing points will also be required to gain access across various drainage ditches.

3.8 The scheme has been designed to protect the hedges and trees that surround the proposed extraction area. For this reason a standoff of 20m from the centre line of any perimeter hedge has been included in the extraction design.

3.9 All final overburden and extraction slopes have been designed at a gradient of 1 in 2 prior to re-grading and restoration.

3.10 The sand and gravel extraction will commence within the southern part of the proposed Northern Extension Area and progress in a systematic and phased direction towards the north. This will be achieved using a wing conveyor orientated in a NE-SW direction that will extract cuts approximately 20m wide. This wing conveyor will feed directly onto a main conveyor orientated in NW-SE direction that will run all the way up to Westfield Lane. The existing hedge provides very good screening of this operation from the public right of way.

3.11 Soils and overburden will be progressively stripped ahead of the advancing sand and gravel face and placed directly into the worked out quarry void to the south. The proposed restoration scheme has been carefully designed to avoid the requirement for soils and overburden to be stored above ground level within the flood plain.

3.12 Some additional clay will be extracted from the base of the proposed lake areas (underdig) in order to provide additional restoration materials to create agricultural land and lake margin shallows.

3.13 The current proposals recognise Westfield Lane as an important track and public right of way linking Collingham to the River Trent. There are therefore no proposals as part of this design to extract the sand and gravel beneath Westfield Lane. A crossing point for the conveyor and a gated access to allow site vehicles to cross the lane will be required. There will be a conveyor tunnel culvert with bridge over for the lane.

3.14 Sand and Gravel Extraction will be no closer than 20m either side of Westfield Lane.

3.13 Sand and gravel extraction to the north of Westfield Lane will be using a similar technique to the extraction to the south of Westfield Lane. The initial soil and overburden will be utilised to restore the northern parts of the extraction area south of Westfield Lane.

3.14 Following completion of the Westfield Lane conveyor crossing point the conveyor will be extended in a northerly direction. The extraction will initially be to the west of the main conveyor using a wing conveyor orientated in a westerly direction and moving progressively north. The proposed extraction standoff from the existing floodbank of the River Trent is 50m.

3.15 Extraction will progress to the north to the limit of the proposed extraction leaving an appropriate standoff to the existing properties on Ferry Lane. The current design assumes extraction to within 150m of the hedge forming the boundary to the nearest property on Ferry Lane.

3.16 Extraction has been designed to be within 20m of the hedgerows around the perimeter of the site. The public right of way on the eastern boundary of the site is within the proposed 20m standoff and therefore lies outside the proposed extraction area.

3.17 The extraction of sand and gravel will then occur to the east of the main north south conveyor with extraction progressing back towards Westfield Lane. Soils and overburden will be progressively used to complete the restoration.

4.0 RESERVE POTENTIAL OF NORTHERN EXTENSION

4.1 The potential sand and gravel reserves that would be released by the Northern Extension to Langford Quarry have been calculated based on the known thickness of overburden and mineral and the assumed extraction limits shown on phasing plan L20N6A17.PDF.

4.2

Extraction phase	Area	Potential reserves (Tonnes)	Years extraction based on 450,000 Tonnes pa.
Phase 1	Southern Area. South of Westfield Lane	311,000	0.7
Phase 2	Central Area. South of Westfield Lane	1,068,000	2.4
Phase 3	Northern Area. South of Westfield Lane	725,000	1.6
Phase 4	SW Area. North of Westfield Lane	1,385,000	3.1
Phase 5	NW Area. North of Westfield Lane	1,500,000	3.3
Phase 6	NE Area. North of Westfield Lane	1,416,000	3.1
Phase 7	SE Area. North of Westfield Lane	1,299,000	2.9
Phase 8	South of Westfield Lane, Conveyor access	260,000	0.6
TOTAL		**7,964,000**	**17.7 Years**

5.0 SITE ACCESS, PROCESSING PLANT, STOCKPILES AND SILT PONDS

5.1 The Northern Extension will be worked via the current access on to the A1133 with no access for lorries through Collingham

5.2 The existing processing plant (or if required a new replacement in the same location) will be used to process the sand and gravel.

5.3 Product stockpiles will continue to be placed in the current area surrounding the processing plant. There will be no product stockpiles within the proposed Northern Extension Area.

5.4 The sand and gravel deposit within the Northern Extension at Langford is relatively clean with a low proportion of silt within the sand fraction. Additional silt ponds will however, still be required to dispose of the silt from the Northern Extension. This is likely to be in the current lake area to the south of the processing plant. This would lead to further shallows in this area of the current quarry which will further enhance the restoration.

6.0 CONCEPT RESTORATION

6.1 Regionally important high quality restoration has already been undertaken within the existing Langford Quarry area. During 2017 a major new outfall has been constructed from the Phase 1 restoration area into the River Trent to allow the sustainable management of water from the site particularly after a flood event.

6.2 Also during 2017 the agricultural restoration on the eastern side of the quarry and the Phase 3 earthworks have been completed in accordance with the existing permitted restoration scheme.

6.3 The key to the success to existing restoration works at Langford is based on the following criteria:

a) Landholding arrangements to acquire land and partnership with RSPB to manage restoration.

b) Understanding of hydrology and restoration and design of scheme to incorporate lake areas to provide clean gravel filtered groundwater (not River Trent Water) into the reed bed areas by sluice gravity feed. Also ability to draw down water by gravity via the new outfall to allow management of reeds.

d) Creation of cells (ie dividing Phases 1, 2 and 3 and Main Lake Area) with stable separating dam walls to allow different parts of the restoration to adopt different water levels to support reed growth.

c) Design of detailed restoration landform and safe construction to the restoration design profiles to achieve the optimum levels to support a sustainable reed bed.

d) Detailed volumetric calculations to assure that materials are available on site to achieve the design proposals.

e) The current restoration designs also give considerable attention to providing appropriate and good quality access to the restoration areas.

f) All restoration materials generated from site to guarantee volumes and reduce transport disturbance.

6.4 All of the above criteria have been incorporated into both the Southern Extension Application area as well as within the current proposals for a Northern Extension to Langford Quarry. The proposed restoration landform for the Northern Extension is shown on plan L20N5A17.PDF. The main points to note regarding the restoration proposals in the Northern Extension are as follows:

6.5 **Langford North Extension, Area South of Westfield Lane**

The restoration of the proposed extraction area to the south of Westfield Lane will be a combination of agricultural restoration and conservation lakes.

6.6 The phasing of extraction is considered to be optimum by working progressively from south to north. In order to avoid soil and overburden storage and to minimize the timescale between extraction and restoration this leads to areas of backfill of the southern parts of the extracted void. This southern area also contains the thinnest sand and gravel therefore more land can be put back to original ground levels and agriculture.

6.7 The agricultural restoration incorporates some restoration back to original ground level with field boundaries replaced on their original lines. Some of the proposed agricultural restoration will be to levels lower than the original ground levels. These lower level fields will be similar to the recently completed restoration on the eastern side of Langford Quarry to the south of the processing plant. The fields will be designed as meadows which will contain shallow seasonal winter pond areas.

6.8 The proposed extraction phasing scheme incorporates the temporary diversion of the public right of way that crosses the proposed extraction area south of Westfield Lane. Following sand and gravel extraction of the public right of way, overburden and soils will be used to backfill this area to allow the public right of way to be replaced back along its original line.

6.9 There are insufficient overburden materials in the area to the South of Westfield Lane to restore all the area to agriculture. Two lakes have therefore been incorporated into the restoration design. The lakes have been designed with shallow margins to enable a reed fringe to develop. The boundary position between the two lakes is based on a landholding boundary which gives the opportunity to replace the original hedge line.

6.10 The two lakes will have a water level at approximately 3.5mAOD and be in continuity with the surrounding water table within the sand and gravel. The two lakes will be linked by an open ditch and the northern lake could contain an overflow pipe linked to the Phase 1 Restoration

area in the current quarry thus giving an outlet to flood waters via the new outfall to the River Trent.

6.11 The restoration of the main conveyor route through the Area South of Westfield Lane will be completed on retreat following extraction of the area north of Westfield Lane.

6.12 **Langford North Extension, Area South of Westfield Lane**

The area to the north of Westfield Lane offers great scope to link the restoration areas of Langford and Besthorpe Quarries.

6.13 The restoration scheme has been designed as a large reed bed area similar to those created at Langford. The scheme also incorporates a large meander loop that will provide some open water in amongst the reeds in order to provide greater habitat diversity and a topographic feature to reflect the natural river system prior to agricultural drainage and river flood management.

6.14 The volume of restoration materials needed to create the reed bed shallows has been calculated in a 3d digital model. In order to achieve the proposed design clay will be required to be excavated from below the sand and gravel. This will be provided by underdig excavations in the eastern part of the area north of Westfield Lane. This eastern area will therefore have to be restored to a relatively deep lake. The anticipated lake level is at 3m AOD. The lake margins of this lake will be backfilled with overburden and soils to create shallows. This deep lake will be linked to the reed bed area via a system of ditches and sluices in order to provide a head of pure gravel filtered water to drain off into the reed bed. A pipe will also be installed beneath Westfield Lane to link the reed bed with the new outfall to the River Trent so that flood waters can be drained off in the most sustainable way.

6.15 **Langford North Extension, Access route south of Westfield Lane**

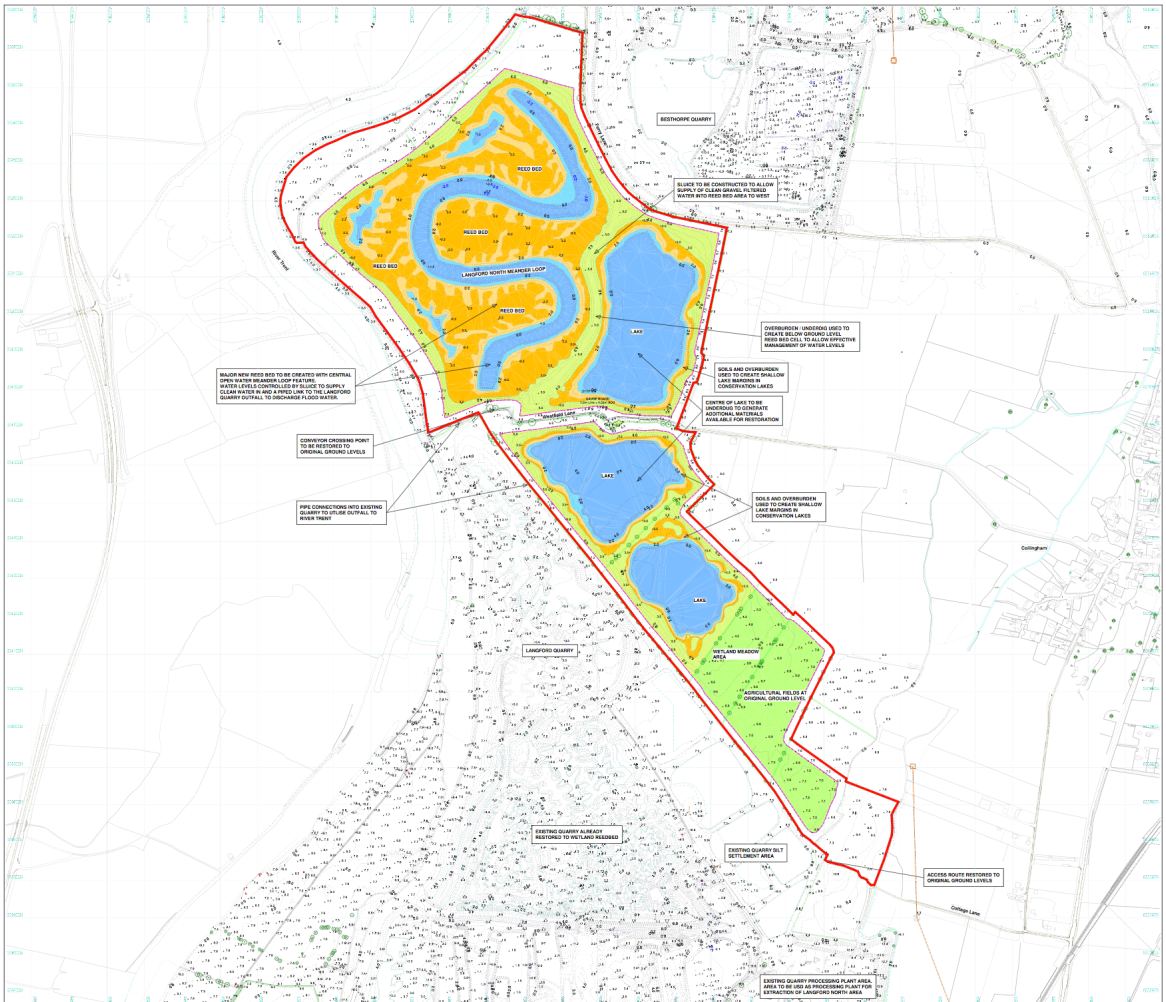
The final phase of restoration will be the restoration of the conveyor route on a southerly retreat.

N.G.Jones

Senior Geologist

Tarmac Central and Wales Region

3RD December 2017



LEGEND

- Lake margin restoration
- Shallows in lake margins with less than 0.8m of water depth at optimum lake levels.
- Shallows in lake margins with between 0.8m and 1.2m of water depth at optimum lake levels.
- Shallows in lake margins with between 1.2m and 2m of water depth at optimum lake levels.
- Deeper water areas with greater than 2m of water depth at optimum lake levels.
- Areas of restoration to agriculture or managed wetland meadows
- Langford North Area Proposed allocation boundary for Nottinghamshire MLP

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Site Name:
Langford Quarry

Drawing Name:
Langford Northern Extension
Proposed Final Landform

Drawn By:	Scale:
N.G.Jones	1 : 5000
Date:	**Drawing No:**
04/12/2017	L20N5A17.PDF

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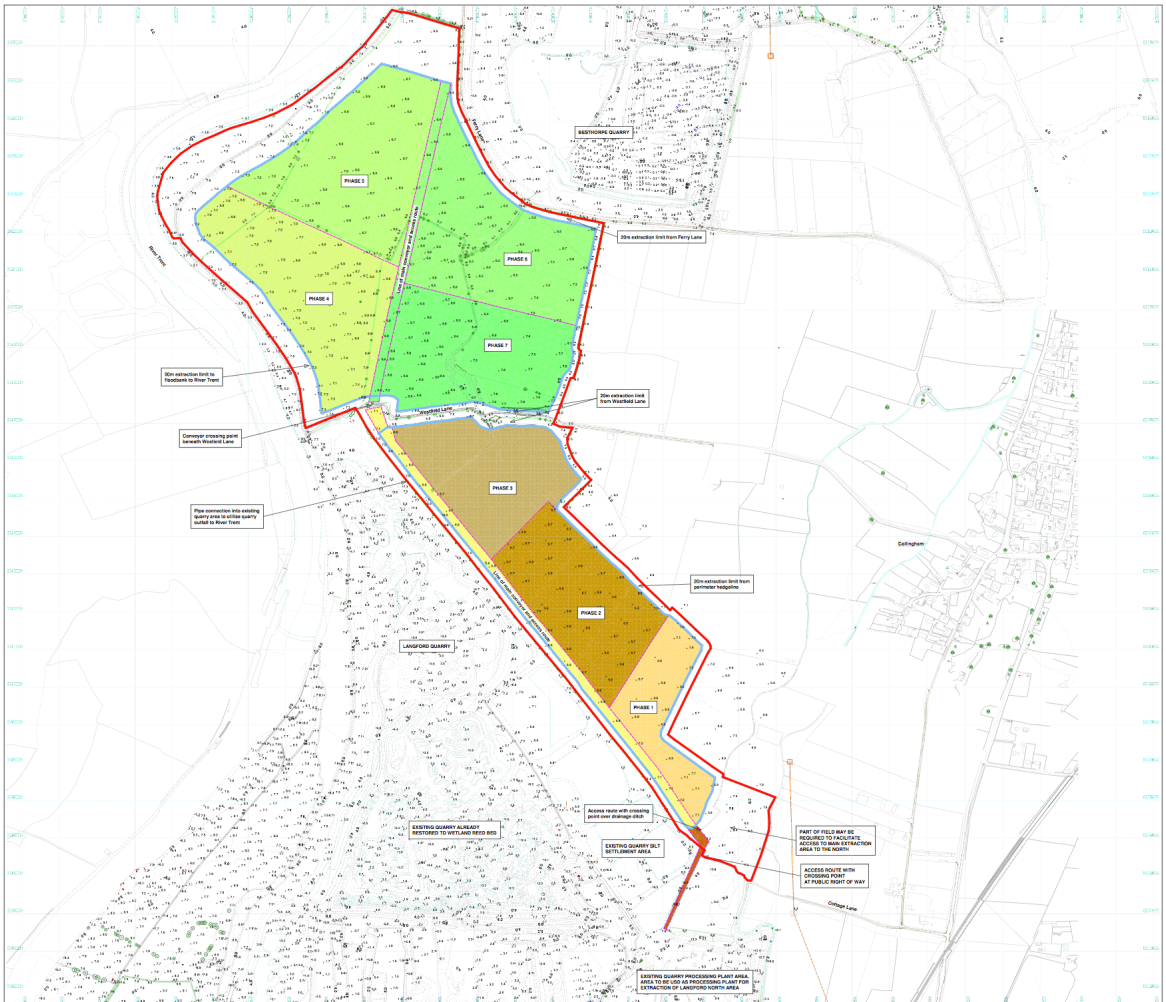

LEGEND

- Langford North Area Proposed allocation boundary for Nottinghamshire MLP
- Langford North Area Extent of proposed sand and gravel extraction area
- Langford North Area Proposed Phasing of Extraction

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Site Name:
Langford Quarry

Drawing Name:
Langford North
Proposed phasing of extraction

Drawn By:	Scale:
N.G.Jones	1 : 5000
Date:	**Drawing No:**
08/01/2018	L20N6A17.PDF

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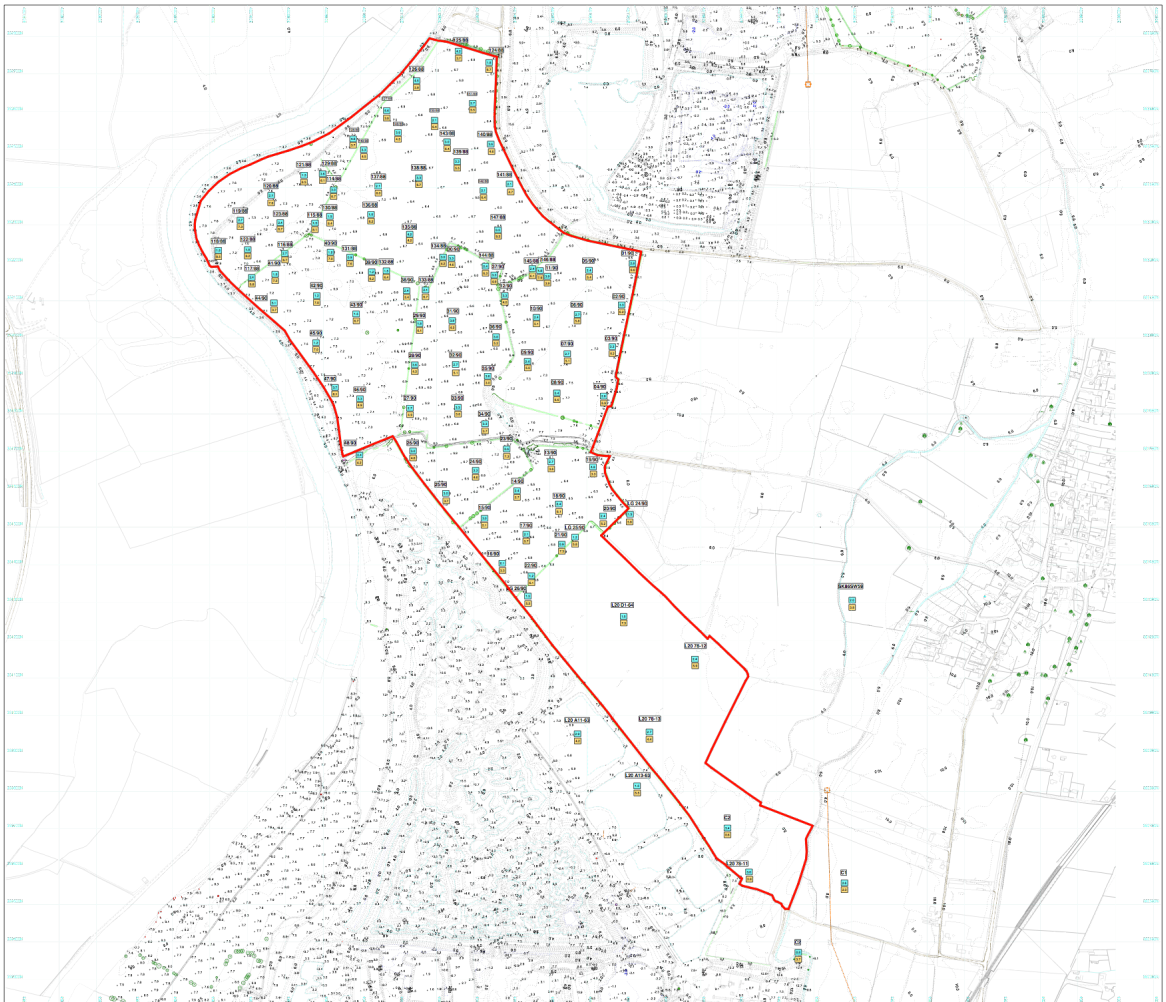

LEGEND

Langford North Area
Proposed allocation boundary
for Nottinghamshire MLP

Exploration borehole number

LG 26/90

Location of exploration borehole

1.5 — Thickness of soils and overburden in metres

5.5 — Thickness of workable sand and gravel in metres

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Site Name:
Langford Quarry

Drawing Name:
Langford Northern Extension Summary Borehole Plan

Drawn By:	Scale:
N.G.Jones	1 : 5000
Date:	Drawing No:
04/12/2017	L20NBH1A17.PDF

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SOIL RESOURCES AND AGRICULTURAL USE & QUALITY OF LAND OFF CARLTON FERRY LANE (LANGFORD NORTH)

Report 1109/2

4th December, 2017

Land Research ASSOCIATES
www.lra.co.uk

SOIL RESOURCES AND AGRICULTURAL USE & QUALITY

OF LAND OFF CARLTON FERRY LANE

(LANGFORD NORTH)

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Report 1109/2

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4th December, 2017

SUMMARY

A soil resources and agricultural land quality survey has been undertaken of 92 ha of land off Carlton Ferry Lane, north of Langford Quarry, Nottinghamshire.

The survey has shown there to be three main soil types at the site: slowly permeable clayey soils; permeable loamy soils; and sandy soils. The loamy and sandy soils provide land of subgrade 3a agricultural quality limited by wetness, droughtiness and flooding. The slowly permeable clay soils provide agricultural land of subgrade 3b quality, limited by wetness.

The permeable loamy and sandy soils have reusable topsoil resources of moderate and high quality respectively, although the proposed water-based restoration scheme would be best achieved without the use of topsoil.

1.0 Introduction

1.1 This report provides information on the soil resources and agricultural quality and use of 92 ha of land off Carlton Ferry Lane, to the north of Langford Quarry, which has been proposed as an extension. The report is based on a survey of the land in November 2017.

SITE ENVIRONMENT

1.2 The site comprises eight arable fields. It is bordered to the north by residential housing, to the north-east by Carlton Ferry Lane, to the west by the River Trent and on other sides by adjoining agricultural land.

1.3 The land is level, at an average elevation of approximately 5 m AOD.

AGRICULTURAL USE

1.4 Land at the site was mainly in arable use at the time of survey, with two fields under an oilseed rape crop and land in the north in stubble following the harvest of a cereal crop. Land in the south-west was in grassland used to graze sheep.

1.5 Land in the south of the site is registered to an Entry Level plus Higher Level Stewardship (HLS) scheme as part of a wider 150 ha holding. None of the other land is registered to any agri-environment schemes.

PUBLISHED INFORMATION

1.6 1:50,000 BGS geological information shows the basal geology as Mercia Mudstone Group (mudstone). Superficial deposits of alluvium (clay, silt, sand and gravel) are recorded to overlie the majority of the site, with an area of Holme Pierre Point Sand and Gravel Member in the north.

1.7 The National Soil Map[1] (1:250,000 scale) shows the land as within Fladbury 2 Association. These soils are described as stoneless clayey soils with some sandy and / or fine loamy soils, found on flat land at risk of flooding.

1.8 A detailed survey of the southern part of the site carried out to current guidelines by the former Ministry of Agriculture, Fisheries and Food (MAFF)

[1] Ragg, J.M., *et al.,* (1984). *Soils and their Use in Midland and Western England,* Soil Survey of England and Wales Bulletin No. 12, Harpenden.

records the land as mainly of subgrade 3b agricultural quality, with smaller areas of subgrade 3a land.

2.0 Soils

2.1 A detailed soil resource and agricultural quality survey was carried out in November 2017. It was based on observations at intersects of a 100 m grid, giving a sampling density of one observation per hectare. During the survey soils were examined by a combination of pits and augerings to a maximum depth of 1.2 m. A log of the sampling points and a map (Map 1) showing their location is in an appendix to this report.

SOILS

2.2 Three soil types, varying in texture and drainage, were identified. They are shown in Map 2 (see appendix) and are described below.

Slowly permeable clayey soils

2.3 These soils dominate at the site and comprise clay topsoil that lies directly over a slowly permeable gleyed clay subsoil.

2.4 An example profile from a pit at observation 20 (see Map 1) is described below:

0-30 cm	Dark greyish brown (10YR 3/2) clay with distinct common reddish yellow (7.5YR 6/8) root channel mottles; stoneless; moderately developed medium subangular blocky structure; firm; smooth clear boundary to:
30-70 cm	Greyish brown (10YR 5/2) clay with common distinct yellowish red (5YR 5/8) and grey (10YR 7/1) mottles; stoneless; weakly developed coarse prismatic structure; very firm; smooth gradual boundary to:
70-120 cm+	Grey (Gley 1 6/N) clay with few fine prominent reddish yellow mottles; stoneless; massive (structureless); very firm.

2.5 These soils are imperfectly-draining (Soil Wetness Class III) and have a low capacity to absorb excess winter rainfall.

Permeable loamy soils

2.6 These soils are located in the west of the site. They comprise heavy silty clay loam or clay loam topsoil over permeable subsoil of the same texture. In places the upper subsoil overlies a slowly permeable clay at greater than *c.* 60 cm depth.

2.7 An example profile from a pit at observation 16 (Map 1) is described below:

0-30 cm	Dark greyish brown (10YR 4/2) heavy silty clay loam; stoneless; medium subangular blocky structure; friable; smooth clear boundary to:
30-80 cm	Brown (10YR 5/3) heavy silty clay loam with common diffuse fine light reddish yellow (7.5YR 6/6) and strong brown (7.5YR 5/8) mottles; stoneless; well developed fine subangular blocky structure; friable; smooth gradual boundary to:

80-120 cm+	Greyish brown (10YR 5/2) clay; common prominent brownish yellow (10YR 6/8) and pale brown (10YR 6/3) mottles; stoneless; weakly developed coarse prismatic structure; firm.

2.8 These soils are freely to moderately freely-draining (Soil Wetness Class I/II) and have a high capacity to absorb excess winter rainfall.

Sandy soils

2.9 These soils are located in the north-east of the site. Broadly the soils comprise sandy loam or loamy sand topsoils over a subsoil of the same texture that usually becomes sandier at depth.

2.10 An example profile from a pit at observation 61 (Map 1) is described below:

0-30 cm	Dark brown (7.5YR 3/3) medium sandy loam; very slightly stony with small rounded hard stones; moderately developed fine subangular structure; very friable; smooth clear boundary to:
30-50 cm	Reddish brown (5YR 4/3) loamy medium sand with common faint fine reddish yellow (7.5YR 6/8) mottles; stoneless; weakly developed fine subangular blocky to single grain structure; smooth clear boundary to:
50-120 cm+	Pale brown (10YR 6/3) medium sand with bleached grains; stoneless; loose single grain (structureless).

2.11 These soils are freely-draining (Soil Wetness Class I) and have a high capacity to absorb excess winter rainfall.

3.0 Agricultural Quality

3.1 To assist in assessing land quality, the former Ministry of Agriculture, Fisheries and Food (MAFF) developed a method for classifying agricultural land by grade according to the extent to which physical or chemical characteristics impose long-term limitations on agricultural use for food production. The MAFF Agricultural Land Classification (ALC) system classifies land into five grades numbered 1 to 5, with grade 3 divided into two sub-grades (3a and 3b). The system was devised and introduced in the 1960s and revised in 1988.

3.2 The agricultural climate is an important factor in assessing the agricultural quality of land and has been calculated using the Climatological Data for Agricultural Land Classification.[2] The relevant site data for an average elevation of 5 m is given below.

• Average annual rainfall:	570 mm
• January-June accumulated temperature >0°C	1432 day°
• Field capacity period (when the soils are fully replete with water)	112 days early Dec – early Apr
• Summer moisture deficits for:	wheat: 117 mm potatoes: 112 mm

3.3 The survey described in the previous section was used in conjunction with the agroclimatic data above to classify the site using the revised guidelines for Agricultural Land Classification issued in 1988 by the Ministry of Agriculture, Fisheries and Food.[3] There are no climatic limitations in this locality.

SURVEY RESULTS

3.4 Land of grade 3 exists on the site. Land quality is determined by wetness, flooding and/or droughtiness.

[2] *Climatological Data for Agricultural Land Classification*. Meteorological Office, 1989
[3] *Agricultural Land Classification for England and Wales: Guidelines and Criteria for Grading the Quality of Agricultural Land*. MAFF, 1988.

Subgrade 3a

3.5 This subgrade is made up of the permeable loamy soils and sandy soils within the site. The loamy soils are limited by flood risk and/or wetness. The land is located within the flood plain of the River Trent. This land suffers occasional long winter floods when the river overtops the embankments which effectively protect the land during most flood events. The land also suffers slight wetness limitations, as the relatively high clay content topsoil and clay at depth will restrict access with machinery in winter, constraining cultivation flexibility.

3.6 The sandy soils in the north-east of the site are equally limited by flood risk and droughtiness. The sandy nature of the subsoils will hold limited moisture reserves in summer for crop uptake which will reduce crop yields.

Subgrade 3b

3.7 This subgrade accounts for most of the agricultural land at the site, comprising the clayey slowly permeable soils limited by wetness. The combination of high topsoil clay content and imperfect drainage results in restricted machinery access to the land in winter and spring, with arable land use mainly limited to autumn-sown crops.

Non agricultural

3.8 This land comprises river embankments, hedgerows and farm tracks.

Grade areas

3.9 The boundaries between the different grades of land are shown on Map 3 and the areas occupied by each are shown below.

Table 1. Areas within the survey area occupied by the different land grades

Grade/sub-grade	*Area (ha)*	*% of agricultural land*
Subgrade 3a	36.7	42
Subgrade 3b	50.7	58
Non agricultural	4.6	-
Total	92	100

4.0 Soil resources and their use

4.1 Government policy as outlined in the Defra Soil Strategy for England and Department of Communities and Local Government's National Planning Policy Framework (paragraphs 109 and 143) is to protect valuable soil resources from loss or damage during land disturbance and ensure that stripped soils are used either for land reinstatement after quarrying or other beneficial use off-site.

4.2 The identified soil resources are shown on Map 2 and described below.

Topsoil

TS1 – Heavy clay loams / silty clay loams

4.3 This topsoil occurs in the west of the site. The soils are of moderate quality for reuse as a landscaping resource. Due to their relatively high clay content the topsoils are difficult to handle with machinery and susceptible to compaction damage when wet. Therefore soil handling would be best performed between March and November when the soils are likely to be drier.

Estimated maximum potential yield TS1: 70,500 m^3

TS2 – Sandy loams / loamy sands

4.4 This topsoil occurs in the north-east of the site where the sandy loam soils are located and makes up a high quality resource comprising medium sandy loams or loamy sands (**TS2**). These soils should be stripped as a single resource to a thickness of **300 mm**. The soils are relatively resistant to structural damage, although handling with machinery should be avoided during or shortly after heavy rainfall.

Estimated maximum potential yield TS2: 39,900 m^3

Other topsoils

4.5 These soils make up the rest of the site and are predominantly clays. These soils are difficult to handle with machinery and have a poor structure which will likely worsen with stripping. This topsoil is approximately **300 mm** thick over the whole site.

Estimated maximum potential yield: 152,100 m^3

SUBSOIL

SS1 – Permeable heavy clay loams

4.6 The permeable heavy clay loams in the west of the site would provide a good substrate for low nutrient planting schemes. This resource should be stripped to a thickness of **500 mm.**

Estimated maximum potential yield SS1: 65,650 m^3

SS2 – Loamy sands and sands

4.7 Loamy and sandy subsoils found in the north-east of the site (see Map 2) are also high quality, low nutrient resources for use planting schemes. **SS2** should be stripped to a thickness of **900 mm.**

Estimated maximum potential yield SS2: 119,700 m^3

Clay subsoils

4.8 Clay subsoils (which cover most of the site) may be utilised as liners for open water areas.

5.0 Soil Handling and Restoration

STRIPPING & STOCKPILING

5.1 Soil resources can be damaged by being stripped or moved when wet. Consequently, stripping should only take place in the driest parts of the year and avoided during or just after heavy rainfall. Soils should be stripped using the excavator and dumper method as described by Sheet 1 in the MAFF Good Practice Guide for Handling Soils[4].

5.2 The resources should be stripped to the depths recommended in Section 4 of this report, and stored separately in low bunds (no more than 3 m high for topsoil). Topsoil should be stripped from areas designated for storing subsoil. The bunds should be constructed either by excavator or bulldozer (Sheets 2 and 14 in the MAFF Good Practice Guide) avoiding over-compaction. They should be sown with grass to help maintain biological activity and prevent water erosion if in situ for greater than six months.

5.3 The soils should be removed from storage (Sheet 3 in the MAFF Good Practice Guide) and replaced by excavator during the summer using the loose tipping technique (Sheet 4 in MAFF Good Practice Guide), which avoids traffic on the restored surfaces

RESTORATION

5.4 The proposed water-based restoration scheme (open water with areas of reedbed/extensive shallows) would be best achieved by excluding the topsoil resources which, having been in intensive agricultural use, are likely excessively high in available nutrients and would result in an excessive nutrient loss to wetland areas.

5.5 It is recommended that **SS1** and **SS2** are emplaced at a minimum thickness of **300 mm** on top of the lake lining to provide a low nutrient, permeable planting substrate for the reed plugs.

[4] MAFF Good Practice Guide for Handling Soils, (www.defra.gov.uk/farm/environment/land-use/soilguid/)

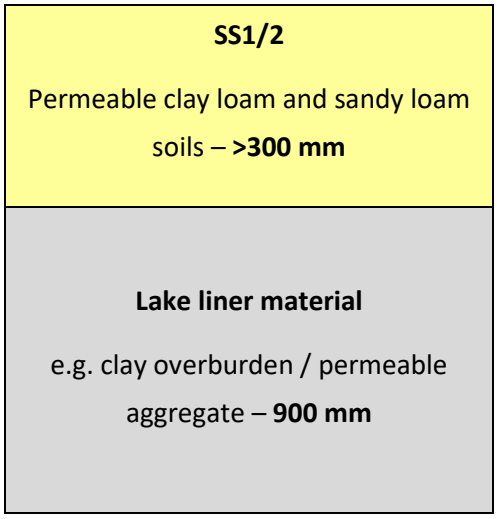


Figure 1: Reinstated reed bed soil profile to 1.2 m.

APPENDIX

MAPS AND DETAILS OF OBSERVATIONS

Land north of Carlton Ferry Lane (Langford North): Details of observations at each sampling point

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
1	0-31	C	<5	31-100+	C	xxx				0	III	3b	W
2	0-26	C	<5	26-100+	C	xxx				0	III	3b	W
3	Non-agricultural – river bank												
4	0-32	C	<5	32-80+	C	xxx				0	III	3b	W
5	0-36	C	<5	36-100+	C	xxx				0	III	3b	W
6	0-30	C	0	30-80+	C	xxx				0	III	3b	W
7	Non-agricultural – river bank												
8	Non-agricultural – path												
9	0-30	C	0	30-90+	C	xxx				0	III	3b	W
10	0-28	C	<5	28-80+	C	xxx				0	III	3b	W
11	0-32	C	<5	32-100+	C	xxx				0	III	3b	W
12	0-29	HCL	<5	29-90+	C	xxx				0	III	3b	W
13	Non-agricultural – river bank												
14	0-28	HCL	<5	28-90+	HCL	x				0	II	3a	Fl/W
15	0-32	HZCL	<5	32-100+	HCL	x				0	II	3a	Fl/W
16	0-30	HZCL	<5	30-80	HCL	x	80-120+	C	xxx	0	II	3a	Fl/W
17	0-26	C	<5	26-58	HCL	x	58-80+	C	xxx	0	II	3a	W/Fl
18	0-30	C	<5	30-90+	C	xx				0	III	3b	W
19	0-29	C	<5	29-80+	C	xxx				0	III	3b	W
20	0-30	C	0	30-80+	C	xxx				0	III	3b	W
21	0-31	C	<5	31-80+	C	xxx				0	III	3b	W
22	0-29	HZCL	<5	29-110+	HZCL	o				0	I	3a	Fl
23	0-28	HCL	0	28-64	HCL	x	64-100+	HZCL/SZL	o	0	II	3a	Fl/W
24	0-30	HCL	0	30-90+	HZCL	x				0	II	3a	Fl/W
25	0-33	HCL	<5	33-80	HCL	xx	80-120+	C	xxx	0	II	3a	W/Fl
26	0-34	HCL	0	34-100+	C	xx				0	III	3b	W
27	0-32	C	0	32-100+	C	xxx				0	III	3b	W
28	0-30	C	0	30-100+	C	xxx				0	III	3b	W
29	0-28	HHCL	0	28-100+	C	xxx				0	III	3b	W
30	0-27	HCL	0	27-80+	C	xxx				0	III	3b	W
31	0-22	C	<	22-80+	C	xxx				0	III	3b	W
32	Non-agricultural – river bank												
33	0-28	HCL	0	28-100+	C	xxx				0	III	3b	W
34	0-30	HCL	<5	30-50	HCL	o	50-100+	C	xxx	0	II	3a	WFl
35	0-30	HCL	0	30-80+	HCL	o				0	I	3a	Fl
36	0-3-	HCL	<5	30-70	HZCL	o	70-100	HCL	xxx	0	I	3a	Fl

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
37	0-29	C	-	29-100+	C	xxx				0	III	3b	W
38	0-26	C	0	26-80+	C	xxx				0	III	3b	W
39	0-27	C	<5	27-100+	C	xxx				0	III	3b	W
40	0-30	C	0	30-80+	C	xxx				0	III	3b	W
41	0-26	HCL	0	26-80+	C	xxx				0	III	3b	W
42	0-30	SCL	<5	30-52	MSL/SCL	xx	52-75 75-100+	MSL MS	xx(x) xxx	0	I	3a	D/FI
43	0-34	SCL	<5	34-100+	SCL	o				0	I	3a	D/FI
44	0-30	HCL	<5	30-80+	HCL	o				0	I	3a	D/FI
45	0-30	HCL	0	30-80+	C	xx				0	III	3b	W
46	0-30	HCL	0	30-55	HCL	x	55-100	SC	xxx	0	II	3a	W/FI
47	0-28	HCL	<5	28-80+	C	xxx				0	III	3b	W
48	0-28	CL	<5	28-100+	C	xxx				0	III	3b	W
49	0-28	C	0	28-100+	C	xxx				0	III	3b	W
50	0-30	C	<5	30-100+	C	xxx				0	III	3b	W
51	0-25	HCL	0	25-80+	C	xxx				0	III	3b	W
52	0-33	MSL	0	33-60	LMS	x	60-100+	MS	xx	0	I	3a	D/FI
53	0-32	MSL	0	32-76	SCL	o	76-110+	MSL	o	0	I	3a	D/FI
54	0-2	SCL	0	28-100+	SCL	o				0	I	3a	FI
55	0-30	HCL	<5	30+	Tree root					0	I	3a	FI
56	0-30	HCL	<5	30-55	HCL	x	55-100+	SCL	xxx	0	I	3a	FI
57	0-30	HCL	<5	30-100+	C	xxx				0	III	3b	W
58	0-28	C	<5	28-80+	C	xxx				0	III	3b	W
59	0-32	SCL	0	32-80	HCL	xx	80-100	C	xxx	0	II	3a	W/FI
60	0-32	MSL	0	32-62	LMS	o	62+	Stopped on stone		0	I	3a	W/FI
61	0-30	MSL	0	30-50	LMS	o	50-120+	MS	xxx	0	I	3a	D/FI
62	0-30	SCL	0	32-120	SCL	x				0	II	3a	FI/W
63	0-32	HCL	<5	32-100+	HCL	x				0	II	3a	FI/W
64	0-30	HCL	<5	30-100+	C	xxx				0	III	3b	W
65	0-26	C	<5	26-100+	C	xxx				0	III	3b	W
66	0-30	HCL	<5	30-80+	C	xxx				0	III	3b	W
67	0-32	SCL	<5	32-71	MSL	x	71-100+	MS	xxx	0	I	3a	D/FI
68	0-31	MSL	<5	31-58	MSL	x	58-70 70-110+	LMS MS	x x	0	I	3a	D/FI
69	0-34	LMS	<5	34-80	LMS	x	80-110+	MS	xxx	0	I	3a	D/FI
70	0-25	HCL	<5	25-78	HCL	xxx	78-100+	C	xxx	0	II	3a	W/FI
71	0-40	C	0	40-100+	C	xxx				0	III	3b	W
72	0-29	HCL	<5	29-50	HCL	xxx	50-100+	C	xxx	0	II	3a	W/FI
73	0-28	C	0	28-80+	C	xxx				0	III	3b	W

Obs	Topsoil			Upper subsoil			Lower subsoil			Slope	Wetness	Agricultural quality	
No	Depth (cm)	Texture	Stones (%)	Depth (cm)	Texture	Mottling	Depth (cm)	Texture	Mottling	(°)	Class	Grade	Main limitation
74	Non-agricultural – ditch												
75	0-28	SCL	<5	28-34	MSL	o	34+	Stopped on stone		0	I	3a	D/Fl
76	0-30	MSL	<5	30-40	LMS	o	40+	Stopped on stone			I	3a	D/Fl
77	0-30	C	0	30-80+	C	xxx				0	III	3b	W
78	0-28	HCL	0	28-80+	C	xxx				0	III	3b	W
79	0-30	C	0	30-80+	C	xxx				0	III	3b	W
80	0-30	C	0	30-80+	C	xxx				0	III	3b	W
81	0-31	C	0	31-100+	C	xxx				0	III	3b	W
82	0-35	C	0	35-100+	C	xxx				0	III	3b	W
83	0-35	C	0	28-80+	C	xxx				0	III	3b	W
84	0-30	C	0	30-80+	C	xxx				0	III	3b	W
85	0-32	C	0	32-100+	C	xxx				0	III	3b	W
86	0-28	C	0	28-100+	C	xxx				0	III	3b	W
87	0-30	C	0	30-100+	C	xxx				0	III	3b	W
88	0-28	C	<5	28-100+	C	xxx				0	III	3b	W
89	0-31	HZCL	0	31-78	HZCL	xxx	78-100+	C	xxx	0	II	3a	W/Fl
90	0-32	C	0	32-100+	C	xxx				0	III	3b	W

Key to table

Mottle intensity:
o unmottled
x few to common rusty root mottles (topsoils) or a few ochreous mottles (subsoils)
xx common to many ochreous mottles and/or dull structure faces
xxx common to many greyish or pale mottles (gleyed horizon)
xxxx dominantly grey, often with some ochreous mottles (gleyed horizon)

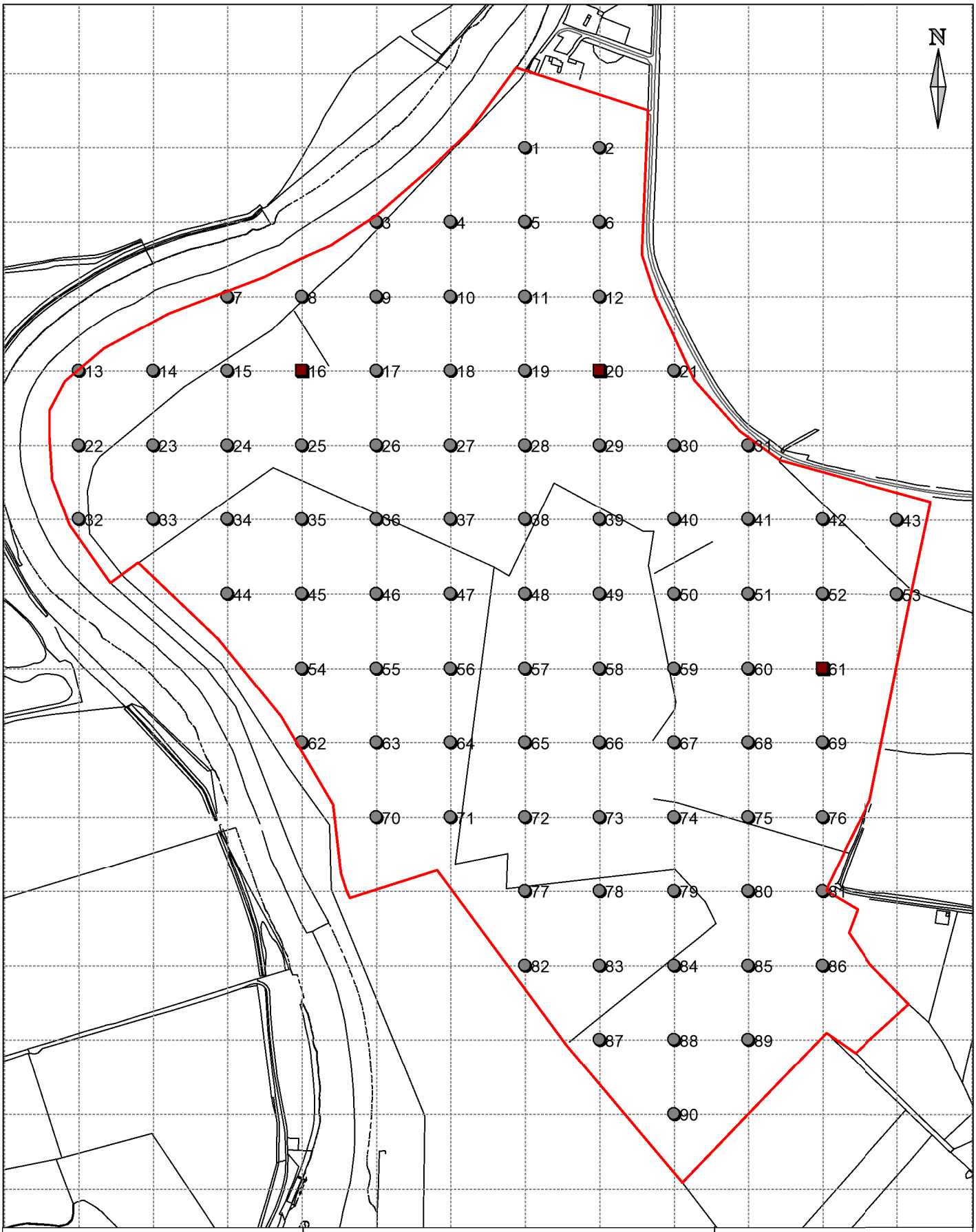
sl-slightly

a depth underlined (e.g. 50) indicates the top of a slowly permeable layer

Texture:
C - clay
ZC - silty clay
SC - sandy clay
CL - clay loam (H-heavy, M-medium)
ZCL - silty clay loam (H-heavy, M-medium)
SCL - sandy clay loam
SZL - sandy silt loam (F-fine, M-medium,C-coarse)
SL - sandy loam (F-fine, M-medium, C-coarse)
LS - loamy sand (F-fine, M-medium, C-coarse)
S - sand (F-fine, M-medium, C-coarse)
P - peat (H-humified, SF-semi-fibrous, F-fibrous)
LP - loamy peat; PL - peaty loam
lst – Limestone, chk - Chalk

Limitations:
W - wetness/workability
D - droughtiness
De - depth
St – stoniness
Sl – slope
Fl - Flooding
T – topography/microrelief

Texture suffixes & prefixes:
ca – calcareous: x-extremely, v-very,
(ca) – marginally calcareous
st – stony, v st – very stony
h –organic
gr – greyish, br – brownish, r - reddish



Client: TARMAC A CRH COMPANY

Project: Land north of Langford Quarry

Map title: Map 3 Agricultural Land Classification

KEY

- Survey observation
- Soil/land grade description pit
- Survey area

1109/2

Scale: 1:7,000 at A4

Date: 04/12/2017

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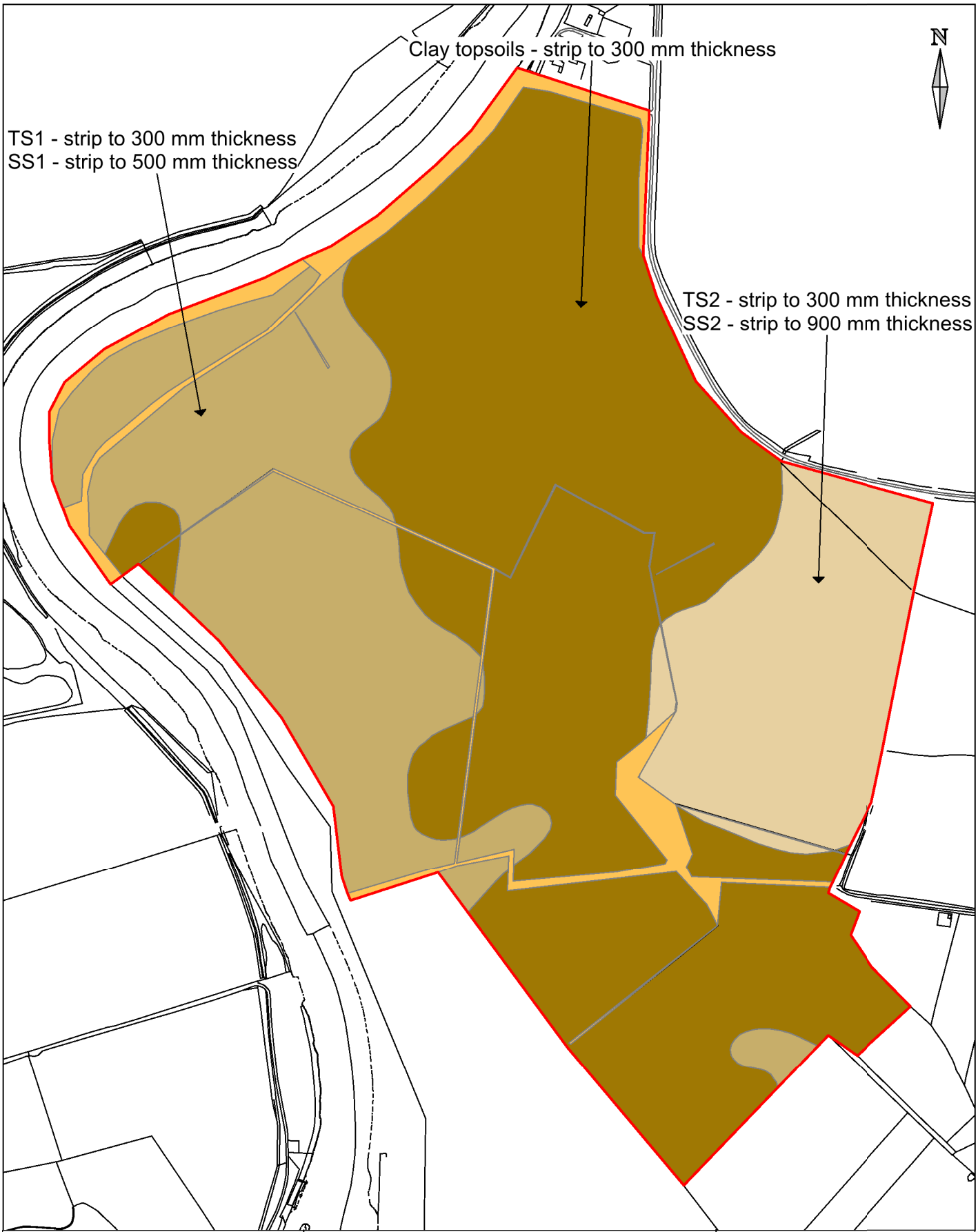

Client: TARMAC A CRH COMPANY

Project: Land north of Langford Quarry

Map title: Map 2 Soil types

KEY

- Sandy soils (TS2/SS2)
- Permeable loamy soils (TS1/SS1)
- Clayey soils
- Non agricultural
- Survey area

1109/2

Scale: 1:7,000 at A4

Date: 04/12/2017

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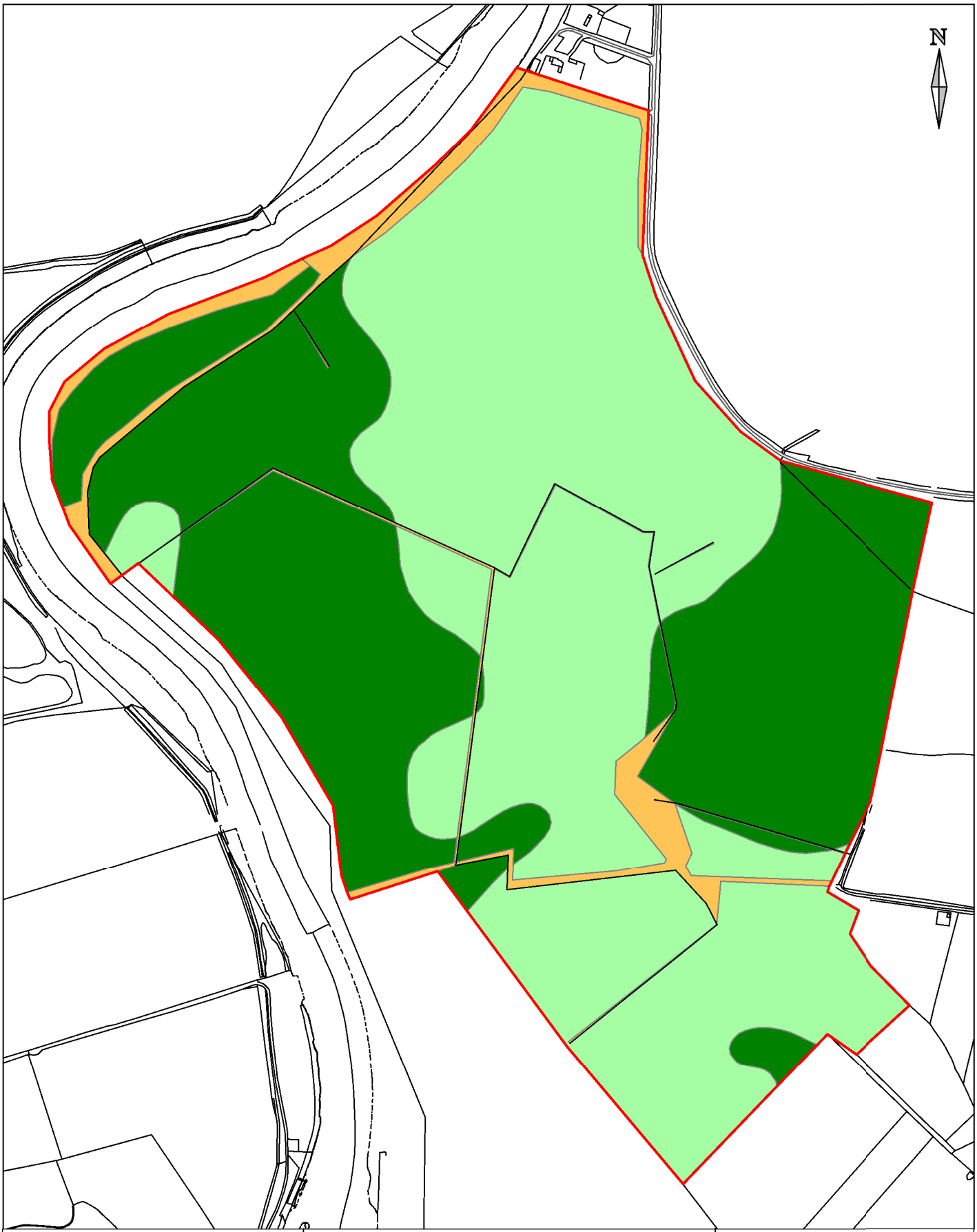

Client: TARMAC A CRH COMPANY

Project:
Land north of Langford Quarry

Map title:
Map 3
Agricultural Land Classification

KEY

- Subgrade 3a
- Subgrade 3b
- Non agricultural
- Survey area

1109/2

Scale: 1:7,000 at A4

Date: 04/12/2017

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