

Richmond Chase TW10 5HH

Project Ref /1828 – 28th January 2019

Structural Report 1828-01 Rev D

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1.0 Introduction

At the request of our client Berkeley Homes St Edward, we have reviewed the design of the proposed temporary haul road to be installed at the above site and hereto provide an engineering commentary to the design and proposed installation.

We visited the site on the 28th January 2019 to survey the proposed layout of the haul road and review the other design information available.

2.0 Existing & relevant design information & plan observations

We had sight of tree:Fabrik Tree Protection & Arborocultural Method Statement – Construction drawing ; ref tf 913s1/TPP302. This shows the location of the proposed haul road in relation to 4No. existing trees under TPO’s over which the temporary haul road lies.

The drawing was at a large scale and had no set out information relative to the trees. Based on a proposed width of road of 5.35m (see section 3.0), we pegged out the proposed layout & noted the distance between the road edge and the face of the trees and applied the RPZ’s (root protection zones) as per tree:Fabrik drawing, see below table and Plan in Appendix A;

Ref	Species*	RPZ dia (m)*	Distance from tree to edge of proposed road
T99	Lebanon Cedar	26.7	3.8
T96	Norway Maple	13.55	4.7
T107	False Acacia	21.7	4.7
T109	Norway Maple	9.21	2.9

* : information from tree:Fabrik

Over marked on the plan in Appendix A we include the intersection of the temporary haul road and the RPZ’s. Below we summarise the % encroachment the temporary road will make with the RPZ’s;

Ref	RPZ Area (m)	Area of encroachment with the road	%- age encroachment
T99	540	121.5	21.7
T96	144	6.53	4.5
T107	370	74.1	20
T109	67	8.5	12.8

Referring to cl 7.4.2.3 of BS 5837:2012 – Trees in relation to design..., we note that for T99 the ratio of RPZ encroachment will be in slight excess of the 20% limit. However this limit applies to permanent hard surfacing regardless of its permeability. We understand that the envisaged life time of the haul road will be around 8 months, hence we believe this slight increase is justified given the impermanence of the road and the porosity of its surface.

3.0 Road build up and design

We confirmed the proposed road build up with the site team and tendering contractor. Please see Appendix B for the proposed road build-up.

The tree:Fabrik design calls for the use of a three dimensional cellular confinement system (geocell) to be incorporated in the road design. While these systems have various applications they have become synonymous with no-dig construction as the product ensures a good level of ventilation to the sub grade and the roots systems within. The geocell to be used in the construction has been confirmed as 'Techcell 150' by TCS Geotechnics, see Appendix C for spec-sheet. The product claims compliance with EN ISO 10319 which establishes minimum standards for the all-important tensile properties of geotextiles.

In addition to the geocell a sand layer and porous asphalt wearing course are to be applied. These layers will further increase the structural performance of the road build up.

There is a lack of practical design guidance in the specification of geocell systems, but we can assume functional equivalence with similarly EN ISO 10319 complaint Terram Geocell.

Regards the width of the proposed road, we assumed that the maximum width of vehicle will be as per the telehandler currently operating on site (Manito MT625: width is 1.813m) with a factor of 2 applied to account for tolerance on the operational width required. Thereafter we allowed for a curtilage each side of this operational width sufficient to ensure adequate load spread through the road build up layers, based on load spread through the permeable bit, sand and geocell of 2.5, 1.0, 4.0 respectively;

<u>Road Width Calculation</u>	m	Factor	m*F
width of vehicle	1.813	2	3.63
permeable bit (both sides)	0.075	5.0	0.38
coarse sand (both sides)	0.075	2.0	0.15
geocell (both sides)	0.15	8.0	1.20
Total Road Width =			5.35m

This width favourably compares with the width indicated on the tree:Fabrick drawing

4.0 Road loading regime

The only traffic to the haul road will be two telehandlers. Traffic across the haul road will be managed by a dedicated traffic martial, with only one vehicle at a time travelling on the road.

The telehandlers are used to move materials in the form of small pallets up to 500kg across the site and to remove small debris skips to collection at the front of the site. Based on our observation of current traffic requirements across the site and the proposed work areas either side of the road the telehandlers will use the road on average every 10 - 30 minutes. We would therefore characterise the road as minimal usage.

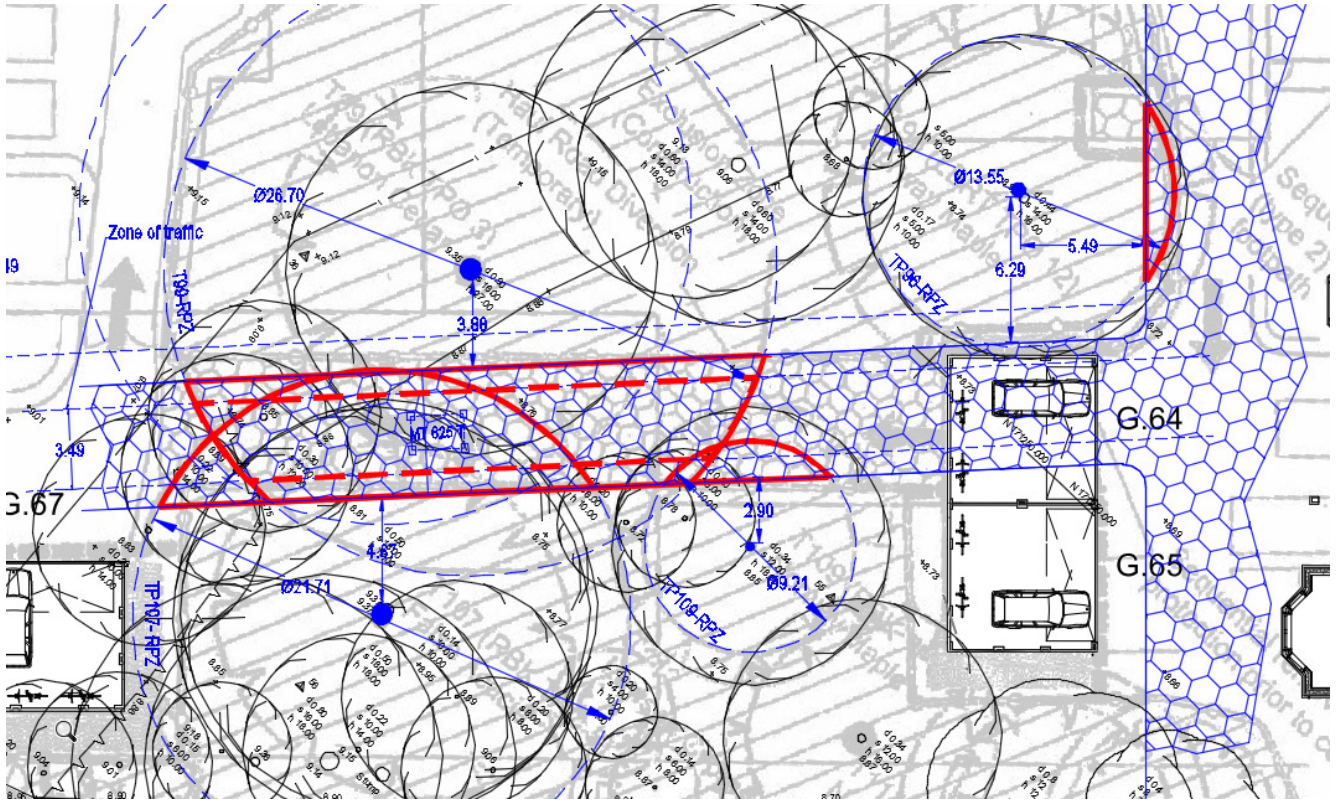
Gerry Corrigan BEng Feb 19

GvB Engineering

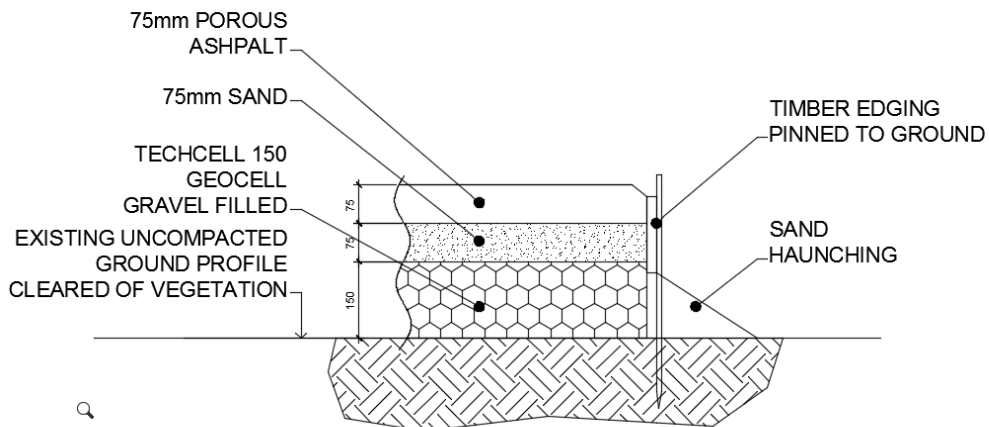
Appendix A – Plan on proposed haul road in relation to TPO’s

Blue : Tree Root protection zones (as per tree:Fabrik)

Red : haul road encroachment



Appendix B – Temporary road proposed build up



Appendix C – Applicable Geocell design guidance



Specification, Design & Installation Guidance

Table 1 Geocell TRP thickness

APPLICATION/LOAD	CBR (%) STRENGTH OF SUBGRADE SOIL (see Chart 1)	GEOCELL/Sub-base thickness (mm) (see notes 2-4)	GEOCELL GRADE	TERRAM GEOGRID reinforcement layer	TERRAM GEOTEXTILE filter/seperator layer
Pedestrian/Cycles	3≤	100	25/10	TX160	T1000
	1<3	100	25/10		T1000
Cars/Light vehicle	3≤	150	25/15	TX160	T1000
	2<3	150	25/15		T1000
	1<2	200	22/20		T2000
HGV's	3≤	200	22/20	TX160	T1000
	2<3	200	22/20		T1000
	1<2	25/15	25/15	TX160	T2000
		(2 Layers)			

Table 2 – Geocell specifications

GEOCELL GRADE	PANEL SIZE	CELL DIAMETER AND DEPTH	PANEL WEIGHT	MATERIAL	WALL PERMEABILITY (Li/m ² s)	JOINT BOND
25/10	5m x 7m	250mm x 100mm	17kg	Non-woven polypropylene	20	Chemical
25/15	5m x 7m	250mm x 150mm	25kg	Non-woven polypropylene	20	Chemical
22/20	6m x 3m	220mm x 200mm	20kg	Non-woven polypropylene	20	Chemical

Chart 1: Field guidance for estimating sub-grade strengths

CONSISTENCY	INDICATOR			STRENGTH	
	TACTILE (feel)	VISUAL (observation)	MECHANICAL (test) SRT	CBR (%)	CU (kN/sqm)
Very Soft	Hand sample squeezes through fingers	Man standing will sink >75mm	<2	<1	<25
Soft	Easily moulded by finger pressure	Man walking sinks 50-70mm	2-4	Around 1	Around 25
Medium	Moulded by moderate finger pressure	Man walking sinks 25mm	4-8	1-2	25-40
Firm	Moulded by strong finger pressure	Utility truck ruts 10-25mm	8-15	2-4	40-75
Stiff	Cannot be moulded but can be indented by thumb	Loaded construction vehicle ruts by 25mm	15-30	4-6	75-150

Appendix D – Geocell datasheet

TECHNICAL DATASHEET

TECHCELL 150 CELLULAR CONFINEMENT SYSTEM

PRODUCT DESCRIPTION

Techcell confinement system utilizes a three dimensional honeycomb structure to provide stabilisation across a wide variety of applications like erosion control, soil stabilisation, load support earth retention and tree root protection.

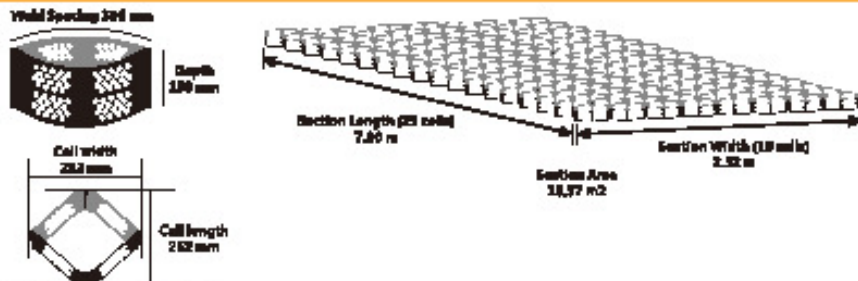
Techcell is manufactured with ultrasonically-welded virgin High-Density Polyethylene (HDPE) with Ecoloy® Formula that are expanded on-site and filled with sand, soil, rock or concrete, etc.



APPLICATION



PROPERTY	TEST METHOD	VALUE
CELL		
CELL DEPTH	-	150mm (+/- 0.5 mm)
WELD SPACING	-	356mm (+/- 1.0 mm)
COLOUR	-	black
MATERIAL		
MATERIAL	-	VIRGIN HDPE BASIC (ECOLOY® FORMULA)
DENSITY	ASTM D1505	0.945-0.960 g/cm³
THICKNESS	ASTM D5199	1.50 mm (-5% +10%)
CARBON BLACK	ASTM D1603	≥1.5%
SEAM PEEL STRENGTH	USACE GL-86-19	≥2400N
TENSILE STRENGTH AT BREAK	ASTM D638	≥32000 kN/m² (TD) / ≥30000 kN/m² (MD)
TENSILE STRENGTH AT YIELD (kN)	EN ISO10319	≥2.55
TENSILE STRENGTH AT YIELD (KvM)	EN ISO10319	≥12.80
EXTENSION (%) AT MAX. LOAD (YIELD)	EN ISO10319	≥9.5
ELONGATION AT BREAK	ASTM D6693	≥900% (TD) / ≥680% (MD)
OXIDATIVE INDUCTION TIME	ASTM D 3895	≥150 min
DURABILITY	RESISTANCE TO WEATHERING EN12224, RESISTANCE TO OXIDATION EN ISO 13438 (25 YEARS), TO BE COVERED WITHIN 1 MONTH AFTER INSTALLATION. PREDICTED TO BE DURABLE FOR A MINIMUM OF 25 YEARS IN NATURAL SOILS WITH 4-PH-9 AND SOIL TEMPERATURE <25°C	
DIMENSIONS		
EXPANDED CELL SIZE	-	252 mm x 252 mm
SECTION SIZE	-	2.52 m x 7.30 m
SECTION AREA	-	18.37 m²
DRAWING		



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1. TCS Geotechnics Ltd reserves the right to alter product specifications without prior notice.
2. It is the responsibility of all users to satisfy themselves that the above data is current.
3. The above figures are average values obtained from testing to current EN ISO standards
4. TCS Ltd cannot accept responsibility for the performance of these products as the conditions of use are beyond our control.
5. Installation details are available on request.

