

GEOSYNTHETICS FOR RAILWAY ENGINEERING

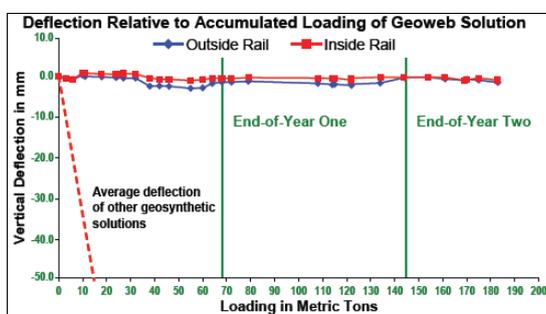
BENEFITS OF USING GEOSYNTHETICS IN RAILWAY LINES – LEVEL CROSSINGS

Whole of life cost on rail track has become increasingly important as rail asset owners and operators look for ways to maximise their maintenance budgets whilst maintaining safety and serviceability.

An independent life cycle cost analysis conducted by industry leading cost engineers, WT Partnership, has shown that geosynthetics can significantly reduce whole of life costs when compared to traditional track formations and construction methods.

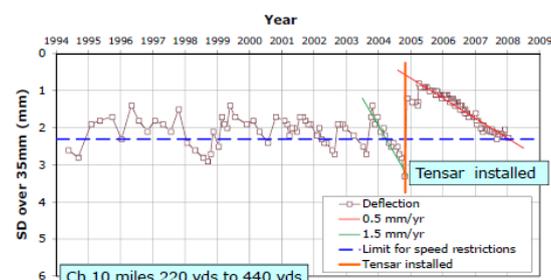
WT Partnership's report, *Track Formation Rehabilitation Options (Geofabrics) – Cost Options and Whole of Life Comparisons (June 2016)*, was carried out comparing a range of different scenarios using Geosynthetics and comparing them to conventional track formation practices which do not utilise Geosynthetic solutions.

At Open Level Crossings, rail tracks experience high impact loads from both road and rail vehicles and there is also a high impact zone where the rail vehicles transition from the "stiff" asphalt surface onto a ballasted "flexible" formation. Both the actual roadway and the transition zone are high maintenance areas where "mud-pumping" and vertical deflections are common. Rail authorities utilise various methods of controlling these problems including the use of the Geoweb Cellular Confinement system, Tracktex and Tensar TX190L.



The Geoweb system is selected based on 30 years of rail industry use and independent testing conducted in 1998 at AAR FAST High Tonnage Loop in Pueblo, Colorado, USA. The testing examined soft sub grade solutions for tracks subjected to heavy loads and determined that the Geoweb load support system significantly improves load distribution, therefore reducing the vertical stresses reaching the sub grade. The system's three-dimensional structure performs like a semi-rigid slab.

Ballast stabilisation Case study: Maintenance at Coppull Moor, UK (2005)



Further transitioning from the end of the Geoweb section can be achieved with Tensar TX190L Ballast Geogrid as was proven by a trial in the UK in 2005. Figure 1 Maintenance at Coppull Moor, shows the benefits that can be achieved by the inclusion of a ballast geogrid which provides a greater than three times improvement to tamping cycles. The use of ballast geogrids are further enhanced by a study conducted a Penn State University by the inclusion of a Smartrock into a test bed.

Figure 1 Maintenance at Coppull Moor

An independent report on mud pumping in a rail line was carried out in February 2017 at a trial site location at Bradley Junction, UK. This report considered a 6 year performance of Tracktex to prevent mud pumping and compared it to the performance of an adjacent control section. Photos below clearly highlight the performance of Tracktex to prevent mud pumping.

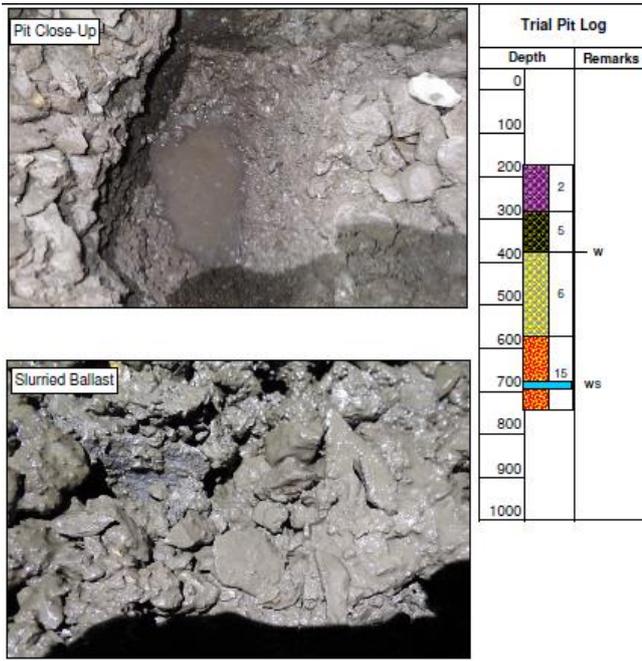


Figure 2 Control Section

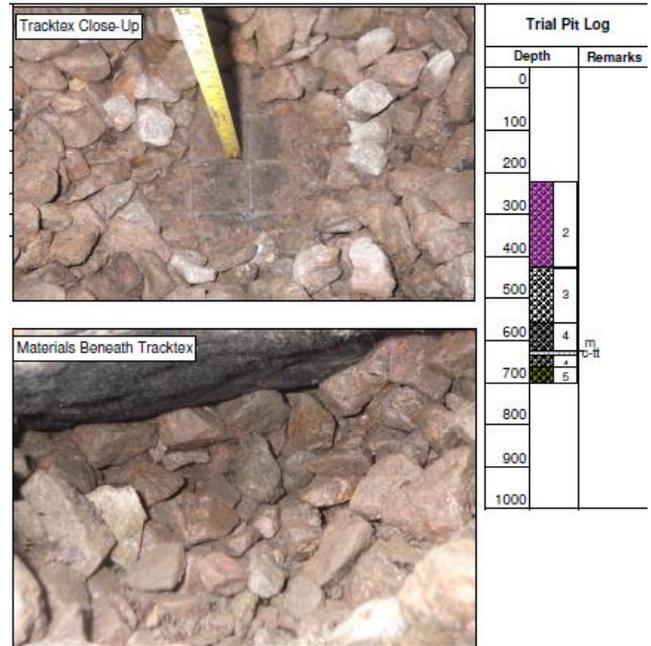
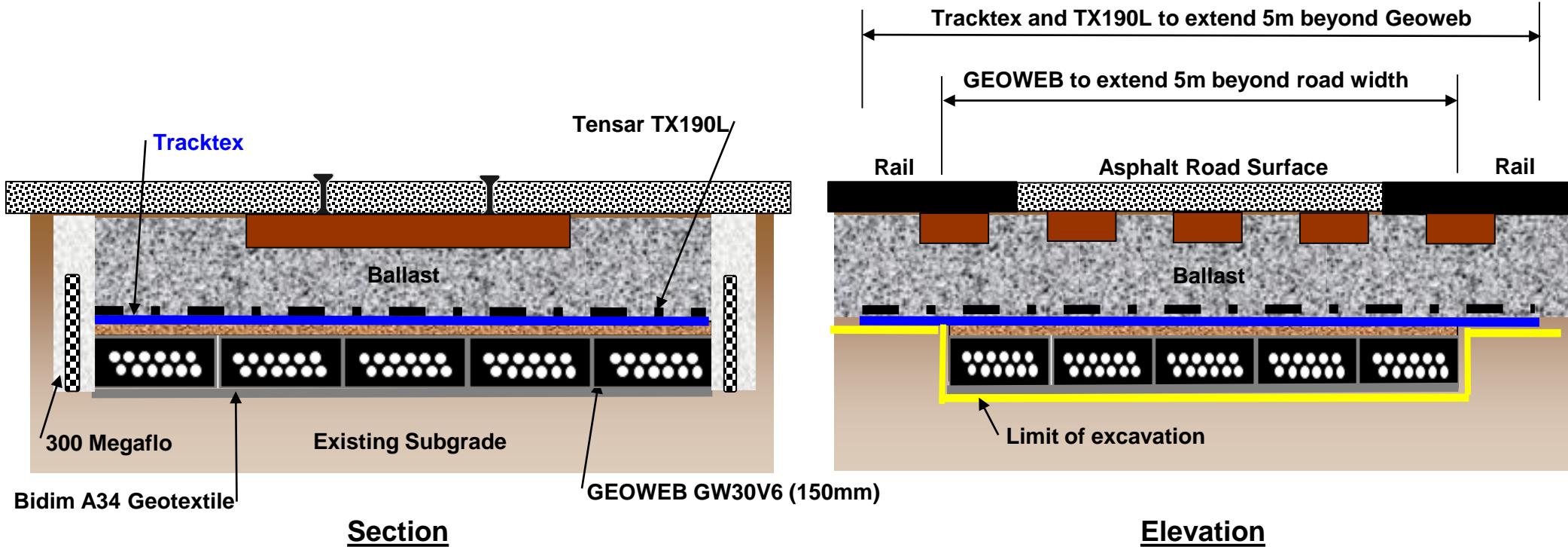


Figure 3 Tracktex Section

The WT Partnership study showed that over a 40 year period the use of a Geoweb, Tracktex and Tensar 190L geogrid combination for a track renewal could potentially save \$19.85 million per km in ongoing maintenance costs.

Application Suggestion Open Level Crossing Geoweb Option



Bidim A34 Geotextile

GEOWEB GW30V6 (150mm)

Section

Elevation

Construction Procedure:

1. Undercut and remove existing ballast.
2. Excavate 200mm below formation level.
3. Install Geotextile **Bidim A34** directly on excavated surface.
4. Lay **Geoweb (150mm)** directly over **Bidim A34**, infill the **Geoweb** with
 - a) Imported capping layer material.
 - b) An infill of the contaminated excavated ballast and formation could be considered in lieu of imported capping layer. A well graded mixture of fines and old ballast is required.
 - c) Geoweb to extend 5m beyond Asphalt surface to provide transition.
5. Overfill and compact to max. 50mm.
6. Install **Tracktex** anti-pumping geocomposite as protection to a) or b) above.
7. Install the **Tensar TX190L** geogrid directly on **Tracktex**.
8. **Tracktex** and **Tensar TX190L** to extend 5m beyond **Geoweb** to provide further transitioning
9. Install new ballast.
10. Relay track and install Asphalt to finished road level.

Advantages:

1. Save approx. 50% in excavation.
2. Save approx. 50% in imported Capping layer depth.
3. If option b) is adopted
 - i. There is no requirement for disposal of excavated fouled ballast and formation.
 - ii. No testing of excavated material to prove safe to dispose outside of rail corridor (if required).
 - iii. No requirement to import new capping layer material.
 - iv. **Geoweb** will provide a stiff platform similar to the imported capping material, Refer test data AAR FAST High Tonnage Loop (TTCI) in Pueblo, Colorado
5. **Tracktex** will provide a protection layer to prevent ingress of rain water and prevent pumping.
6. **Tensar TX190L** will stabilise the new ballast and prevent ballast movement and breakdown, Refer Penn State Smartrock summary and IB/TriAx Trackbed attached.

DESCRIPTION:

All dimension in mm

This drawing is a suggestion only. The suggestion needs to be approved by a certified professional engineer with appropriate site specific knowledge prior to implementation. Geofabrics Australasia P/L takes no responsibility for the inappropriate use of this design suggestion.

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PROJECT TITLE:

DRAWING TITLE:

**Level Crossing Solution
Geoweb option**

SCALE:
Not to scale

DATE:
23rd Sept 2017

DRAWING NO: 1

FILE:
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