



# Slope Stabilisation

Anchoring solutions for slope reinforcement and soil stabilisation



Time and labour saving

Immediate performance

Lightweight and flexible

Vegetated finish

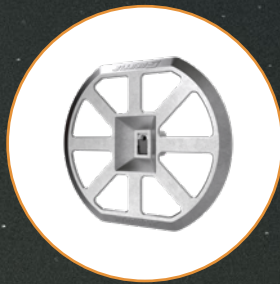
The Gripple Terra-Lock™ system provides secure fixing and anchoring points for erosion control and slope reinforcement systems. It acts to increase the factor of safety in design calculations and can be used with systems which:

- Reinforce slopes
- Mitigate slope failure
- Prevent formation of rills and gullies
- Protect arid slopes
- Eliminate wind erosion

### TL-100

Ideal for:

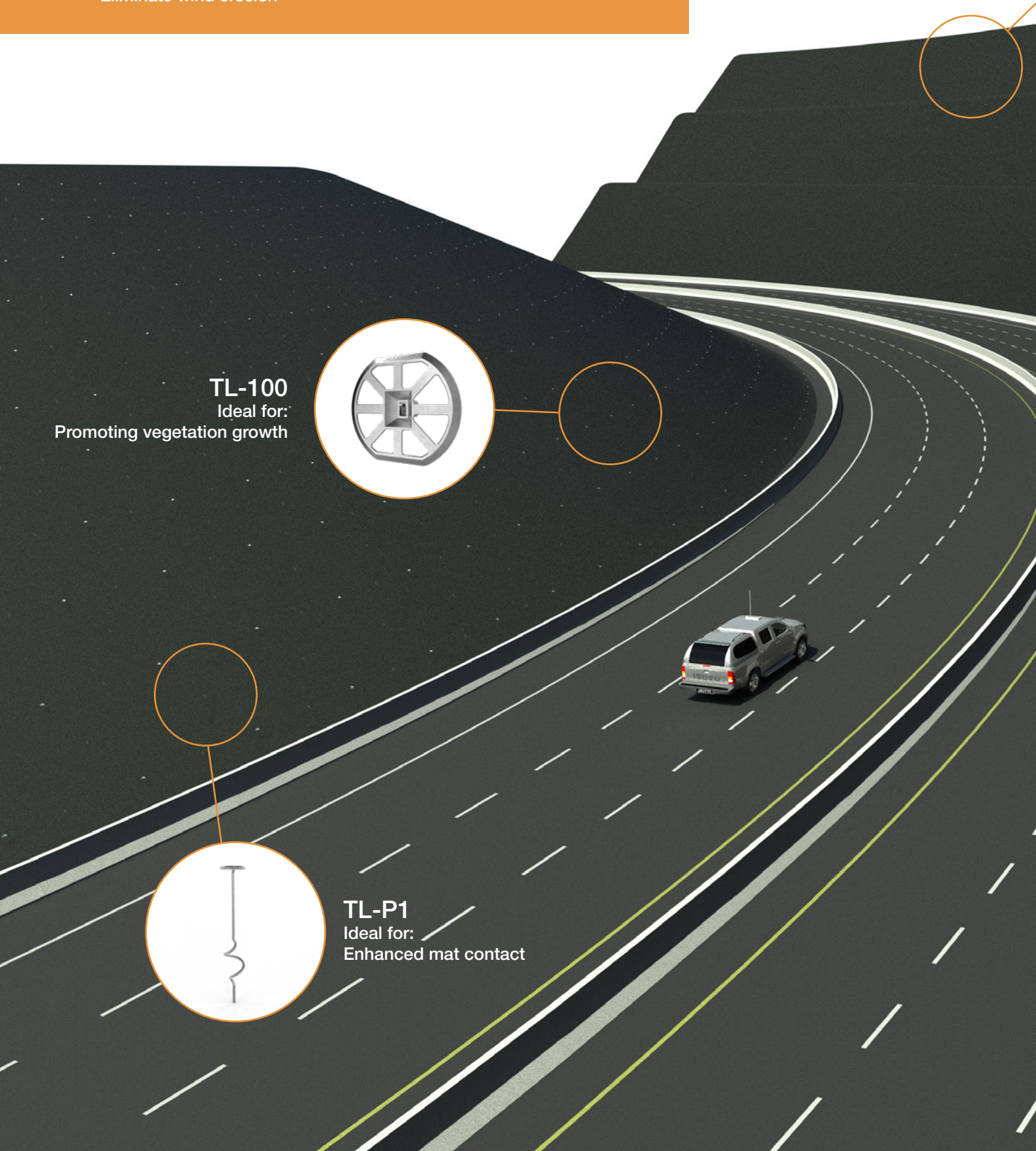
Promoting vegetation growth



### TL-P1

Ideal for:

Enhanced mat contact





### TL-304

Ideal for:  
Lightweight  
reinforcement



### TL-406

Ideal for:  
High load applications



### TL-606

Ideal for:  
Heavy load, long life  
applications

The use of anchor reinforcement increases the performance and safety factor of the following erosion control and slope stability solutions:

- Cellular Confinement
- Gabions
- Geogrids
- Geotextiles
- High Performance Turf Reinforcement Mat (HPTRM)
- Retaining Walls
- Sheet Piling

# System Benefits



## Green solution

Systems make use of on-site material minimising material transport to site. Gives immediate performance, with minimal pollution.



## Failure prevention

Actively holds surface locking it deep into structure. Catches and retains surface failures.



## Increased factor of safety

Installation depth of anchors calculated to ensure system locks into structurally sound soil for an engineered solution.



## Steepened slopes

Allows slopes and embankments to be made steeper, reducing groundworks and maximising use of space.



## Lightweight

Easy to handle on site, adds minimal excess load to structure. Minimises settlement and subsidence, especially in poor soils.

## Easy & efficient installation

Can be installed quickly and economically, allowing fast asset protection and vastly reducing the time spent on-site.



## Promotes vegetation

Improving contact between surface stabilising products and the soil means vegetation can establish more quickly.

## Durable

Manufactured using corrosion resistant materials to create a long term solution.

# How It Works

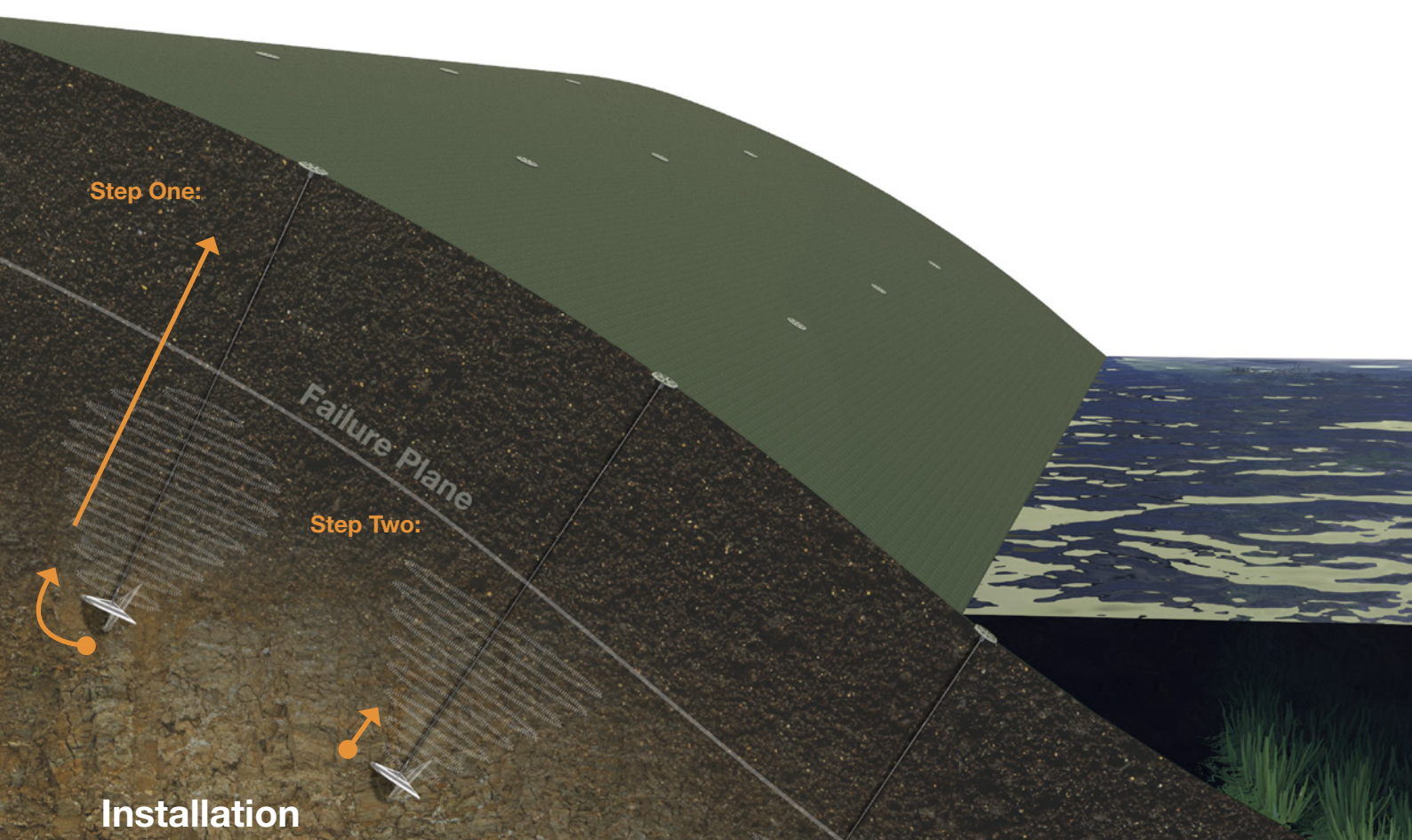
**The Terra-Lock™ system** gains its stability through the creation of a truncated cone of soil. This consolidated mass provides the resistive securing body and is formed in two steps:

**Step One:** After driving to the correct depth, the wire is tightened; this rotates the anchor so that the load bearing surface is parallel to the ground surface.

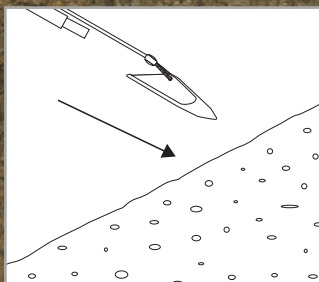
**Step Two:** The wire is further tightened to compress the soil above the anchor's bearing surface. The compression transfers towards the surface to form a cone of soil which prevents further anchor movement.

The load bearing capacity of the system is determined by: anchor size, anchor depth and soil shear angle. Due to the complex interaction between these factors, it is advisable that a geotechnical report is utilised as part of the engineering plans to ensure the appropriate anchor size and drive depth are selected.

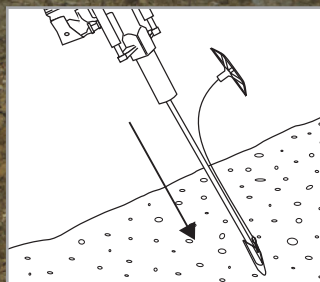
Bulk earth movement is prevented by locking into stable soil below potential failure planes, thereby increasing factor of safety of the slope.



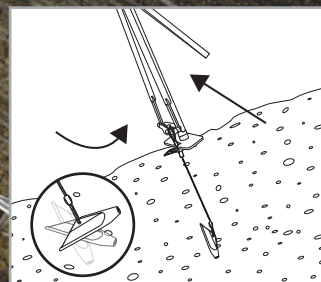
## Installation



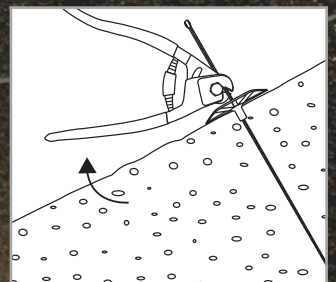
**Drive:**  
Insert Drive Tool through the anchor and place against surface.



Use GPD to install the anchor at the required depth.



**Lock:**  
Use JackJaw® to remove Drive Tool and load lock system.

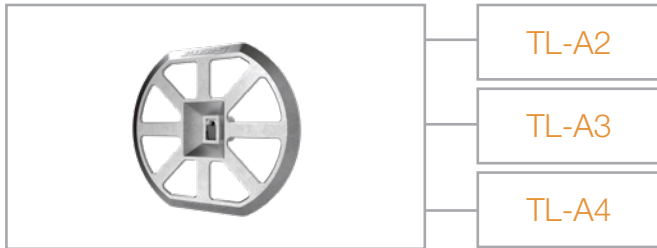


Use Gripple Wire Cutter to cut wire below grade if required.

# Terra-Lock™ System

## Terra-Lock Terminations (above ground)

A variety of terminations are offered to secure a variety of TRM & HPTRM matting.



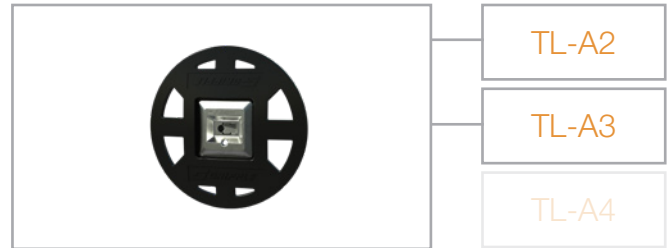
TL-A2

TL-A3

TL-A4

### TL-100

Secures TRM and HRTRM whilst promoting vegetation regrowth in erosion control and soil stabilisation applications.



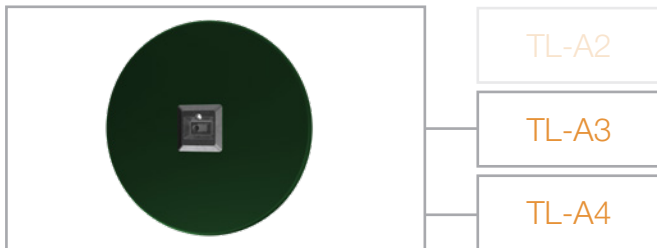
TL-A2

TL-A3

TL-A4

### TL-304

Two piece, low profile design, with a multi-purpose, injection moulded load bearing plate.



TL-A2

TL-A3

TL-A4

### TL-406

Two piece design incorporation a rubber coated steel bearing plate and a 4 mm wire tendon for higher load applications.



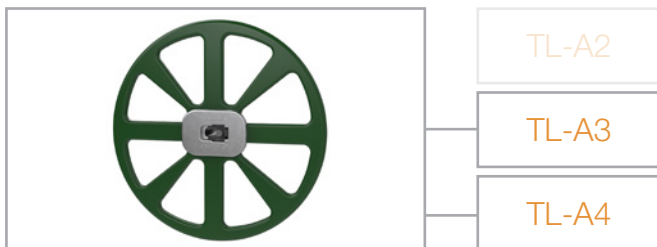
TL-A2

TL-A3

TL-A4

### TL-40A

Bespoke high load design for use with Articulate Concrete Block (ACB) installations.



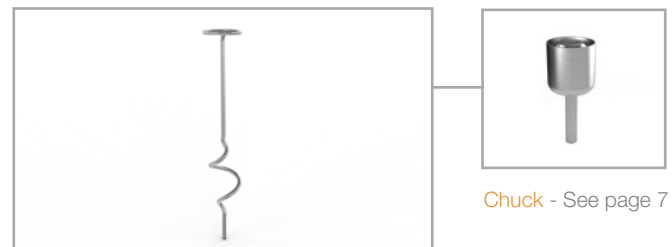
TL-A2

TL-A3

TL-A4

### TL-606

Heavy duty, designed for high level security. Open face aids vegetation growth whilst maintain strength.



Chuck - See page 7

### TL-P1

The high load anchoring pin is designed to hold all types of turf reinforcement matting, erosion blankets, geotextiles and landscaping fabrics.

## Terra-Lock Anchors (below ground)

Anchors provide drive efficiency and maximum load capacity across a range of ground anchoring solutions. Pre-assembled kits require no crimping, ensuring significant time and labour savings delivered by easy and efficient installation.



### TL-A2

**Surface area** - 1,940 mm<sup>2</sup>  
**System Working Load** - 225 kg  
**Ultimate Load** - 500 kg



### TL-A3

**Surface area** - 3,870 mm<sup>2</sup>  
**System Working Load** - 1,250 kg  
**Ultimate Load** - 1,800 kg



### TL-A4

**Surface area** - 7,740 mm<sup>2</sup>  
**System Working Load** - 1,250 kg  
**Ultimate Load** - 2,250 kg

# Tools & Related Products

## System Installation

We offer a range of tools to ensure that the Gripple Terra-Lock™ system is installed with ease and efficiency.



### GPD

The Gripple Petrol Driver provides quick installation of Gripple's range of anchors. Weighing only 15 kg, it is lightweight and portable.



### JackJaw®

Multi function tool extracts Drive Tool and load locks system. Available with load cells for immediate testing.



### Drive Tool

Purpose engineered for toughness and durability. Capable of installing anchors in hard ground.

## TL-P1 Installation



### Standard Chuck

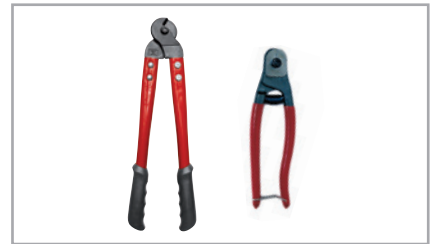
Installs pins to full depth without damaging mat. Automatically disengages when pin reaches full depth.



### Extended Chuck

Installs pins where long reach is required. Automatically disengages when pin reaches full depth.

## Accessory



### Wire Cutters

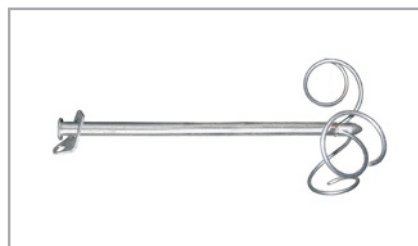
The Wire Cutters are suitable for cutting wire rope. Available in two sizes: up to 4 mm diameter and up to 6 mm diameter.

## Other Products



### Contractor Tool

The all-metal tool can be used with minimum effort to apply tension.



### Rock Anchor

Stand alone anchor for use in rock or other tough soils.



### Dynamic Range

The Dynamic Range of fasteners and tensioners is ideal for high load anchoring and structural bracing.

# Other Anchoring Solutions



## Rootball Kit

Tree anchor system designed to stabilise newly planted trees using strap tensing system.



## Tree Bracing Kit

Enables newly transplanted semi-mature trees to be braced and guyed to stabilise and prevent leaning.



## Anti Buoyancy Kit

Anchor system which prevents the flotation of pipes or duct in wet concrete and soils.

# Technical Support

Gripple provides engineering design support to ensure you specify the optimum Terra-Lock™ system to meet your project requirements. Once ground characteristics have been established, our technical team can calculate anchor loads and design performance; whether through initial site evaluation, preparation of technical drawings, supporting submittals or onsite testing to validate designs. The Gripple Technical Support Team can work with you at every stage of a project to realise the complete turn-key solution.



Submittals



CAD



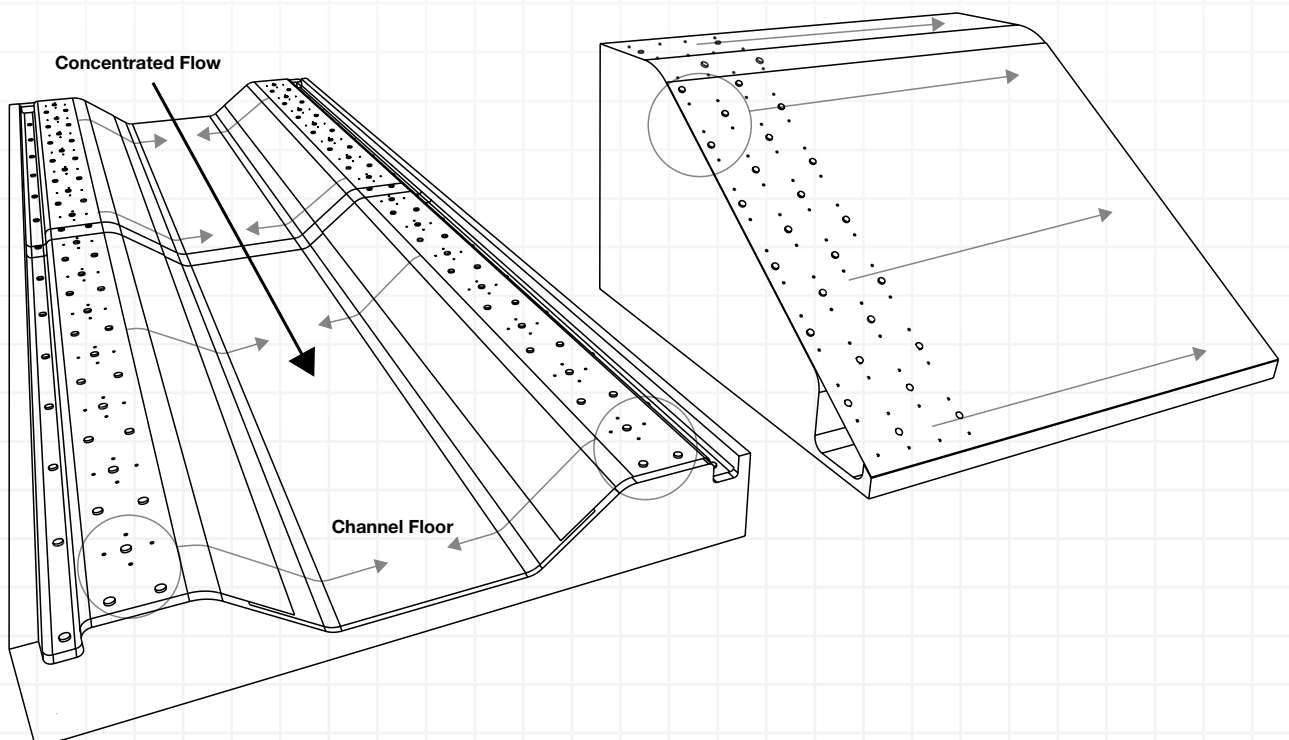
Specifications



Testing



On-Site







# Case Study

## Blackmoss Reservoirs

<b>Client</b>	Askam Construction - Civil Engineering Division on behalf of United Utilities
<b>Contractor</b>	GHA Livigunn
<b>Gripple Terra-Lock™ System</b>	TL-100 TL-A3
<b>Application</b>	Securing HPTRM for Slope Reinforcement
<b>No. of Systems</b>	420 Systems (TL-100, TL-A3) Area equal to 2100 m <sup>2</sup>

Two dwellings situated below the Blackmoss Reservoirs in Barley, Lancashire were identified as at risk from flooding should either or both reservoirs burst their banks after heavy rainfall. The Terra-Lock™ System was installed in conjunction with an erosion control mat to reinforce the slope that was situated in the new flood water path.

The objective of the project was to create a new emergency spillway below the reservoirs. Any flood waters would be directed away from the dwellings and in to an existing waterway, so they could drain safely.

The site included an area significantly steeper than the surrounding land and formed part of the route for diverted flood water. Due to the severe incline, passing flood water could reach speeds of approximately 6 m<sup>3</sup> per second. The area could not be reinforced by planting trees, as this method would impede water flow and take an unacceptable amount of time to become effective. The specification required the mat to be mechanically anchored and the Terra-Lock™ System was selected to prevent uplift, protect the subsoil and withstand the high flows in the event of a breach.

The ease and speed of installing the Terra-Lock™ System provided a quick and secure solution. The open face of the TL-100 would allow vegetation to grow through over the course of the product's 50 year design life, so that when the root systems began to establish themselves, the Terra-Lock™ System would support rather than compete with natural securing methods.





# Case Study

## Via Alternativa del Sur, Guatemala

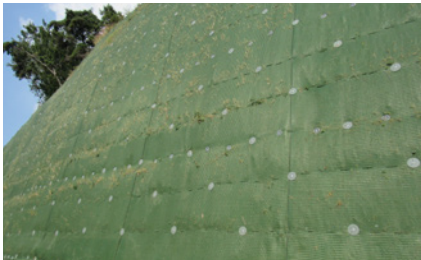
<b>Client</b>	Integradora Tecnológica de Soluciones. Sergio Prah, Rodrigo Prah and Pablo Rodriguez
<b>Contractor</b>	Constructora Nacional, S.A. (Conasa)
<b>Gripple Terra-Lock™ System</b>	TL-406 & TLA3 TL-100 & TL-A2
<b>Application</b>	Securing 25,000 m <sup>2</sup> of HTPRM for Slope Reinforcement
<b>No. of Systems</b>	24,785 systems

As part of a major infrastructure development a large ring road has been built around GuatemalaCity in order to relieve city congestion and improve transport links to surrounding areas. The highway systems have been built through mountainous terrain, with large scale earth movement and cuts into slopes.

Cutting through major hillsides in order to build the road system resulted in creating new steep slopes at the side of the highway. The slopes were structurally stable however due to the nature of the ground they were susceptible to minor surface slips. The Terra-Lock™ system, when used with a HTPRM were able to hold back any failures and capture any surface movement from falling into any of the infrastructure below. Roadside drainage could be kept clear, as well as the road itself, providing a safer highway.

The Terra-Lock™ system was ideal due to the extremely steep nature of the slops. It allows for fast and easy installation with lightweight equipment. The soil itself was very hard, however the tough nature of the Terra-Lock™ anchors allowd appropriate depths to be reached on installations to hold back surface planes.

The heavy duty nature of the TL-406 made it ideal for the task of holding and capturing potential failures. Where the TL-100 has added further security to the matting systems and aids in promoting re-vegetation of the slope by maintaining close contact between the ground and the matting.





# Case Study

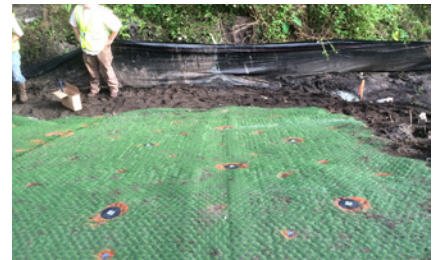
## St Augustine State Trail

<b>Client</b>	Florida Department of Transportation
<b>Contractor</b>	Commercial Industrial Corporation
<b>Gripple Terra-Lock™ System</b>	TL-100 3 mm (1/8") Zinc Aluminum Wire TL-A2
<b>Application</b>	Securing HPTRM
<b>No. of Systems</b>	8,854 Systems

The Palatka-to-St. Augustine State Trail currently runs through North-eastern Florida and stretches throughout the communities of Armstrong, Elkton, and Vermont Heights. The majority of the trail follows State Route 207, hence its former name as the State Road 207 Rail-Trail. Along the trail the scenery transitions between a mix of woodlands and rural landscapes.

Parts of the Palatka-to-St. Augustine Trail that pass through the woodlands are being compromised due to soil erosion. The slopes on which the trail was built upon started to fail. In certain areas, erosion caused parts of the asphalted path to crumble and rendered the trail unsafe for community members to use.

The Florida Department of Transportation searched for a solution to their erosion problem and ultimately decided on installing HPTRM along the slope of the trail. To secure the slopes and ensure intimate contact between the soil and the HPTRM, the Gripple Anchor System was utilized. The Gripple Anchor was used in junction with the TL-100, which allowed a quick and easy installation of the HPTRM and provided security to the HPTRM and the slope. By installing the HPTRM using the Gripple Anchor System and Gripple Installation tools, vegetation will be allowed to grow and stabilize the slopes. This will allow the Palatka-to-St. Augustine Trail to be enjoyed by the community members once again.





# Case Study

## Matanhail Pump House Link Drain Canal, India

<b>Client</b>	Haryana Irrigation Department
<b>Gripple Terra-Lock™ System</b>	TL-100-TLA3, TLP2 Pins and G-MAT C350
<b>Application</b>	Slope stability of drainage channel

After successfully completing Phase I of the Jhajjar Drain Canal project at Beri-Dujana Drain Canal, Gripple was commissioned for Phase II of the project at the Matanhail Pump House Link Drain Canal.

Located in Jhajjar - Haryana in India, the channel had been eroding due to inflow from surrounding fields and from water passing through the drain. There were failures of the embankment due to the water pressure and there was clear evidence of undermining causing instability along the channel. There was also rill and gully erosion encroaching to the road above.

A solution was needed to provide erosion control, prevent scouring and to provide dimensional stability. Most importantly, the solution needed to comply with National Green Tribunal (NGT) guidelines regarding non-use of concrete lining for drain canals by providing a permeable media for water flowing into the canal alleviating pore water pressures.

The Gripple Terra-Lock™ system, comprising of TL-100-TLA3 Anchors, TLP2 (Helical) Pins and G-MAT C350 (erosion control mat of 100% coconut fiber matrix incorporated into 3-Dimensional turf reinforcement matting) was proposed and installed for a length of 130 meters and 7 to 8 meters in height at an inclination of 45 degree to 50 degree slope. The solution met all of the above requirements as the system allows water flow without soil loss and by design stabilises the structure.

Compared to traditional concrete and riprap methods, the Gripple Terra-Lock™ system is more flexible, lightweight and faster to install. Minimum excavations are required, and there are reductions in material and labour costs. Gripple systems are also more environmentally friendly and aesthetically pleasing.



*Erosion in the channel before Gripple install*



*During the installation of Gripple solution*



*Completed installation*



# Case Study

## Beri-Dujana Drain Canal, India

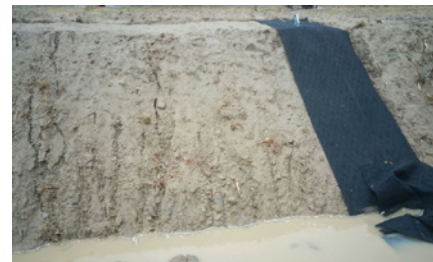
<b>Client</b>	Haryana Irrigation Department
<b>Gripple Terra-Lock™ System</b>	TL-304, TL-A3, TL Pins and G-MAT T50
<b>Application</b>	Hydraulic and Slope Stability, Erosion control

The Beri-Dujana Drain Canal is located in Jhajjar - Haryana in India. Previously concrete was used to line the bed and embankment of the drain canal, however over time it started to fail in various places due to erosion caused by water inflow from the surrounding fields and from water passing through the drain. There were failures of the embankment toe and concrete lining on the bed of the channel due to pore water pressure, and failure to the entire concrete lining along the embankment.



*Failure of the concrete in drain canal*

To solve the problem a solution was needed to provide erosion control, prevent scouring and provide dimensional stability. Most importantly, the solution needed to comply with National Green Tribunal (NGT) guidelines regarding non-use of concrete lining for drain canals by providing a permeable media for water flowing into the canal alleviating pore water pressures.



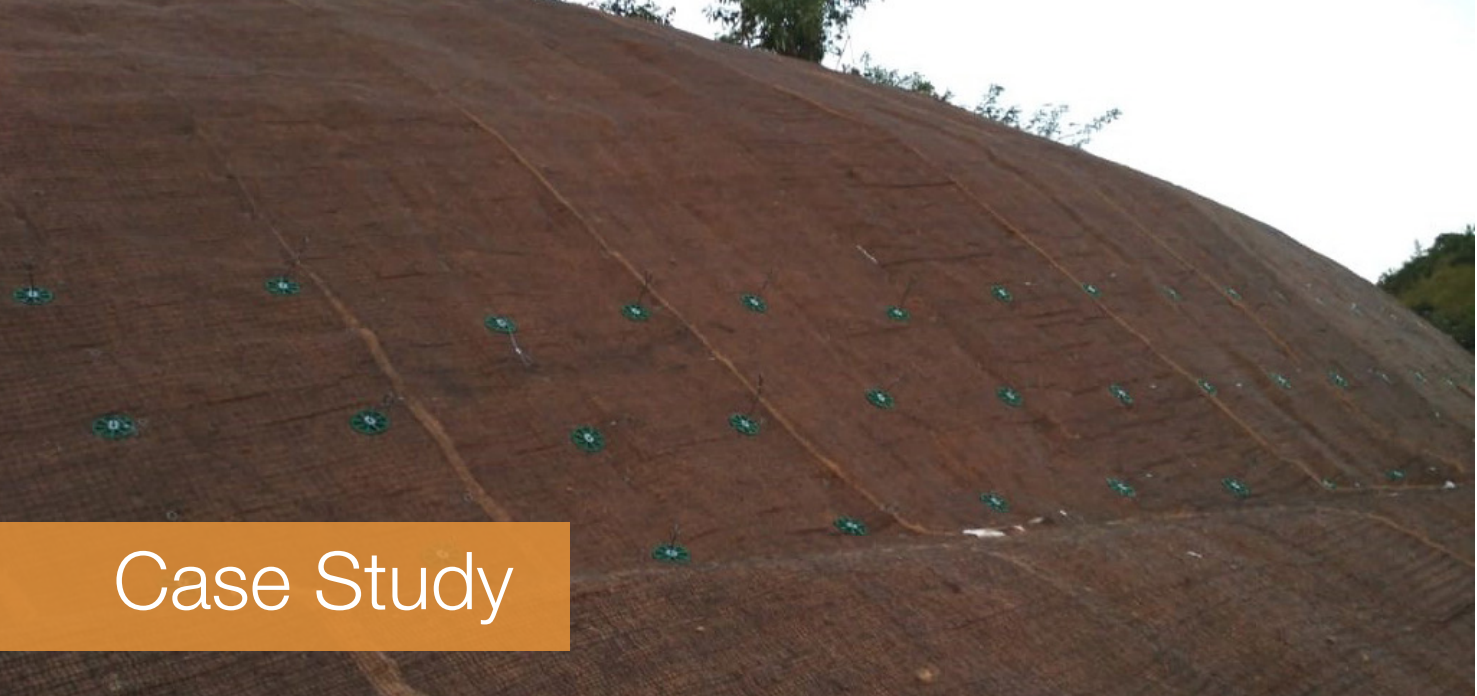
*During installation of Gripple solution*

The Gripple Terra-Lock™ system, comprising of TL-304 Anchors, TL Pins and G-MAT T50 was proposed and installed for a test length of approximately 15 meters and 3.5 to 4 meters high. The solution met all of the above requirements as the system allows water flow without soil loss and by design stabilises the structure.



*80 days after installation*

Compared to traditional concrete and riprap methods, the Gripple Terra-Lock™ system is more flexible, lightweight and faster to install. Minimum excavations are required, and there are reductions in material and labour costs. Gripple systems are also more environmentally friendly and aesthetically pleasing.



# Case Study

## Imphal-Kangchup-Tamenglong Road Project, India

<b>Consultant</b>	SMEC
<b>Main contractor</b>	Hindustan Construction Company
<b>Gripple Terra-Lock™ System</b>	TL606-A4, TL100-A3, GMAT C-350, TLP2
<b>Application</b>	Slope Stability and Erosion Control

A new road between Imphal and Tamenglong stretching 109,970 km faces many difficulties due to the mountainous terrain it passes through. Limited Rights of Way (ROW) meant large steep cuts were needed to be stabilised and held back from the utility zone.

A lack of protection on the cut slopes meant they were susceptible to weathering, erosion and growing instability. This coupled with a steep batter meant proper protection was needed to maintain the structure and prevent debris / fines running into other utilities.

Gripple were asked by the main contractor HCC and the client PWD Manipur to propose an alternative solution to the cost and labour intensive traditional methods. A Gripple engineer visited the site to carry out an initial inspection and to provide concepts for the 50 m length (CH 17+270 to CH 320), further backed up with provided site details and soil conditions.

Several slope stability calculations were carried out for the varying slope profiles, to ensure the correct and most cost effective system, depth and spacing was selected to meet requirements of the project. Gripple's Terra-Lock™ system, consisting of, TL-606-TL-A4, GMAT-C-350 and TLP2 were proposed to protect the slopes.

Gripple's Terra-Lock™ system is an innovative method of controlling heavy erosion and slope stability, which creates a sustainable and durable green structure by reinforcing nature. The GMAT-C-350 is an erosion control mat with a combination of 100% coconut fibre matrix incorporated into permanent three dimensional turf reinforcement matting.

The Terra-Lock™ system is ideal due to the extremely steep nature of the slopes. It allows for fast and easy installation with lightweight equipment. The soil itself was hard, however the nature of Terra-Lock™ anchors allowed for appropriate depths to be reached on installation to hold back surface planes. The Terra-Lock™ anchors aid in promoting revegetation of the slope by maintaining a close contact between ground and the matting.



*Before construction with the Gripple install*



*During the installation of Gripple solution*

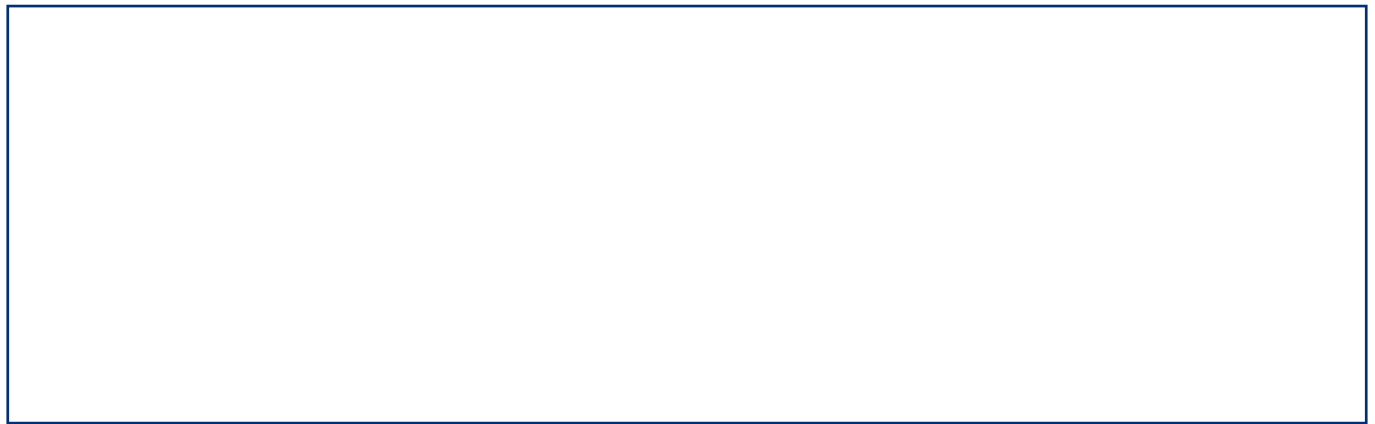


*Completed installation*



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