

## Soil Stabilisation

### Syntex® (GNP 180) Nonwoven Geotextile for bridge embankment project Yamuna River, India

**Client: Noida Toll Bridge Company, New Delhi**

**T**his major Indian project is centred on the construction of an 8 lane bridge across the Yamuna river linking Delhi & Noida in New Delhi, India. Noida is a prosperous industrial town on the periphery of East Delhi currently experiencing rapid population growth. The Yamuna river flows between Noida and New Delhi and all commuter traffic from Noida must use an existing 4 lane bridge in a neighbouring town which links East Delhi with New Delhi. In peak hours, it takes more than an hour to travel from Noida to New Delhi or vice versa.



The new 8 lane bridge will reduce traffic congestion during peak hours between Noida and New Delhi. The whole project has been awarded by the Noida Toll Bridge Co, New Delhi to M/s Mitsui Marubeni Corporation, a Japanese Company, who have sub-contracted the work of approaches to the bridge to Oriental Structural Engineers Ltd, New Delhi and 8 lane main bridge work to M/s Gammon (India) Ltd, New Delhi.

Oriental Structural Engineers Ltd is responsible for the construction of huge sand embankments by dredging sand from the Yamuna riverbed. The contract includes hydraulic filling, construction of slab culverts, pipe culverts, retaining wall construction and protection work along the roadway, or guide bund.

The scope of work also includes the construction of road crust protection works consisting of gabions filled with stone boulders and placed over Syntex GNP B1 (Strength Class B) nonwoven geotextile on slopes and apron.

The embankments will also be protected with Syntex GNP B1 covering and gabions. Syntex GNP B1 nonwoven geotextile was supplied by Permatherne Ltd of New Zealand.

The total cost of work awarded to Oriental Structural Engineers Ltd is NZD 34.8 million.

The duration of the job was 24 months. This is one of the largest bridge projects in India and Permatherne is pleased to supply the total geotextiles (over 250,000 m<sup>2</sup>) required for this project.

Whether designing an erosion control plan, constructing a roadway or planning a subsurface drainage system, Syntex needlepunched nonwoven geotextiles are certain to benefit your project.

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**Syntex® (GNP 115) Nonwoven Geotextile for hockey field  
Hamilton, New Zealand**

**Client: Waikato Hokey Association**

**S**yntex GNP 115 (Filtration) nonwoven geotextile was used as a solution to separate weak pumping subgrade and clean gravel base. The actual subgrade CBR achieved on site was seven. Syntex nonwoven geotextile was laid on the subgrade which enabled the subbase and base course to remain clean and maintain its strength, with the primary function to allow water to pass quickly and lower pore pressure build up in the subgrade.

The total area of approximately 6000 m<sup>2</sup> was properly compacted and covered with Syntex GNP 115 before putting 150 mm of clean gravel drainage blanket overlaid with GAP 40 to a depth of 125 mm. After proper compaction, 25 mm of open graded asphalt was spread on the top before finally placing the Astro Turf on it.

By placing Syntex GNP 115, which is a light grade fabric, at the interface between the subbase and a soft subgrade, contamination was avoided and bearing capacity was improved.



## Geomembrane Protection

### Syntex® (GNP E1) Nonwoven Geotextile for landfill Rotorua Landfill, New Zealand

**Client: Rotorua District Council**

**P**ermathene was involved in designing the geomembrane liner and cushioning fabric with Worley Consultants for this project. We also assisted with project specification and the QC procedures.

Syntex GNP E1 (Strength Class E) nonwoven geotextile was recommended by Permathene to go on top of the 1.5mm HDPE liner. By virtue of its chemical composition, molecular structure and thermodynamic properties, polypropylene is one of the most resistant raw materials known today.



Syntex GNP E1 has been specifically designed for use in landfill or waste disposal facilities. United States Environmental Protection Agency (EPA) 9090 accelerated testing performed on this product has demonstrated an excellent chemical compatibility with landfill leachate. It is highly resistant to puncture, impact and abrasion, which greatly reduces the potential damage from sharp objects during and long after the construction process.

In a separate study, properly stabilised and buried Syntex polypropylene geotextiles have been estimated to have a functional longevity of nearly 200 years in an oceanic or marine application.

At present, nonwoven polypropylene geotextiles are used in more than 80% of all waste containment applications.

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### Syntex® (GNP A1) Nonwoven Geotextile for street realignment project Mairangi Bay, New Zealand

**Client: North Shore City Council**

In this project, Sidemouth Street was realigned with a reconfigured roundabout at the southern end to improve traffic flow and relieve congestion. Along Beach Road four thresholds (narrowing of the road/kerb extensions) provide conveniently located pedestrian crossing points.

Subgrade was extremely weak with saturated fine grained silt and clayey soils with a CBR value less than 3. The consultant opted to install a lightweight nonwoven needlepunched geotextile on existing subgrade overlaid with GAP 60 to a depth of 600 mm. On top of this 150 mm of M4 was placed.



Syntex GNP A1 (Strength Class A) nonwoven, needlepunched, staple fibre geotextile was used as the lightweight subgrade separation fabric to improve bearing capacity.

Laboratory study demonstrated that Syntex geotextiles offer substantial improvement to the performance of pavements constructed over weak and moderate subgrade. This improvement is attributed to the separation capabilities of the Syntex geotextiles and their ability to prevent the development of a transition layer (intermixing layer).

Common failure of secondary roads, is often due to differential settlement and premature rutting. Also, subgrade fines migrate into the base course layer, or aggregate from the base course penetrates into the soft subgrade. This jeopardises structural capacities and compromises drainage capabilities of the pavement system. Thus accelerating the rutting failure mode and leading to a reduction in the pavement service life.

When a Syntex geotextile is placed at the interface between the base course and a soft subgrade, contamination is avoided and a transition layer may not form. Annual cost savings ranging from 5 to 15 percent can be expected when using an appropriate separation geotextile with low volume paved roads.

Early indications are that the road is performing well and there is tremendous improvement in the bearing capacity, says James Walsh, Contracts Engineer of Blackmor Earthmoving Contractors.

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### Syntex® (GNP D1) Nonwoven Geotextile for soil stabilisation Te Rapa, New Zealand

**Client: Te Rapa Dairy Company**

**T**he new Powder Plant, an expansion of the Te Rapa Dairy Factory, is the largest milk powder plant in the world. The project centred around the construction of a new drier building and drier plant. Additional contracts resulting from the expansion included the construction of a new underpass off State Highway 1, wastewater treatment works, roading, drainage, and various electrical and mechanical installations.

Permatherne Ltd supplied Syntex GNP D1 (Strength Class D) nonwoven geotextile for use in 2 contracts associated with the expansion work: the Main Civil Contract, awarded to Pemberton Construction Ltd of Hamilton which included construction of the stormwater diversion pond and the Waikato River Outfall Contract, awarded to McConnell Dowell Ltd. of Tauranga with Pemberton Construction as subcontractor on the gully. John Crawford and Alan Muller of Opus International Consultants Ltd, Hamilton oversaw these contracts.

The Stormwater Diversion Pond, 57 m long and 41 m across with a depth of 4.5 m was lined with Syntex GNP D1 before putting a Flexible Membrane Liner (FML) on top of it. FML are generally prone to damage from even isolated and infrequent protrusions in the subgrade onto which they are deployed. Syntex GNP D1 provides security to FML against damage during installation and throughout the life of the facility. It also helps to increase the puncture resistance of the FML and if properly stabilised and buried, Syntex Nonwoven Geotextiles are expected to last up to 200 years.

The laying of the 6 m wide stormwater channel and 2 m wide treated wastewater gully necessitated construction over a very soft swamp. Site investigations indicated the proposed subgrade was comprised of black topsoil with large rotting tree stumps and logs, underlain by extensive peat deposits. David Ward, Contracts Manager of Pemberton Construction Ltd, described the site as marshy and difficult to walk on. A 1 m deep "V Drain" was constructed and filled with metal. Syntex GNP D1 was laid on top of the metal, covered with 300-400 mm of rip rap (100-300 mm size aggregates) and levelled.

Syntex GNP D1 acts as a "separation" layer stopping the rip rap material from pushing down into the soft wet subgrade and preventing mud from contaminating the clean aggregate. This gives a more stable, wearing and sturdy solution for the drainage problems.

