



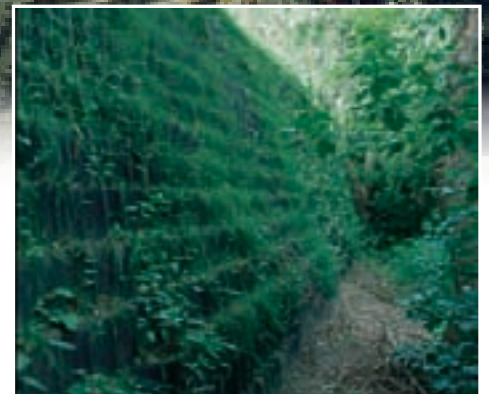
*creating  
sustainable  
environments™*



#### THE VEGETATED EARTH RETENTION SYSTEM

In many earth retention designs, engineers must accommodate unstable soils and adverse site conditions, while preserving a natural environment. The multi-layered Geoweb® system is used for a wide range of earth retention design requirements and site conditions. The system's flexibility allows it to withstand large differential settlements and conform to a contoured landscape while typically using on-site infill materials. The system's outer cells, filled with topsoil, provide an ideal environment to support sustainable vegetation.

Examples where the Geoweb system has provided unique solutions to earth retention problems are illustrated inside.



**GEOWEB®**  
*earth retention system*

CASE STUDY SUMMARY 1

*providing sustainable earth retention solutions*



## case study 1

**TANNER/MOFFETT CREEKS • THE DALLES, OREGON • FALL 1998**  
**AWARDED 1999 INDUSTRIAL FABRICS ASSOCIATION AWARD OF EXCELLENCE**

### THE CHALLENGE

A plan to connect two sections of an old highway right-of-way in the Columbia River Gorge area included a section that would become part of a 100-mile bike and pedestrian pathway from Portland to The Dalles. Oregon DOT faced a considerable challenge of designing a series of switchbacks to gradually bring the bike path from the highway down to creek level and pass under I-84. Retaining wall



Project photos courtesy Soil Stabilization Products Co.

structures were necessary to keep the newly steepened side slopes in place. A vegetated fascia was desired to blend naturally with an environment that provides spectacular views of the river and Cascades. A geocomposite solution combining the Geoweb® system with high-strength woven geotextile soil reinforcement was chosen.

### THE INSTALLATION

Six wall structures were required, one over 5 m (16 ft) in height. Green outer face panels blend naturally with the surrounding landscape. Perforated interior cell walls allowed drainage of the infill material. To establish vegetative cover quickly, ODOT hydroseeded the completed walls.

### THE RESULTS

After installation, a substantial natural spring was discovered behind one wall. Lower outer fascia panels were simply removed, exposing the perforated interior cell walls and allowing drainage without damage to the wall structure. A drainage system was later installed to reduce the potential for hydrostatic pressure buildup.



## case study 2

**BROADMOOR ROAD • BAYSIDE, WISCONSIN • SEPTEMBER 2000**

### THE CHALLENGE

Signs that the soil behind an existing aging sheet pile wall supporting Broadmoor Road and an adjacent railroad track was moving forced the village of Bayside to seek a solution. Challenges included:

1) building a 9-m (30-ft) high structure across a 56-m (185-ft) wide, steep, wooded ravine with limited site access, 2) minimizing the size of the footprint to reduce impact on a stream flowing through the culverts, and 3) having the ability to support natural vegetation to blend with the surrounding ravine.

Using granular soil and geogrid layers, a reinforced earth embankment was built with the Geoweb® system fascia and a front face batter of 0.75h:1v.



a green fascia panel and perforated interior cells to improve drainage and increase frictional interlock between the cells and the infill. Biaxial geogrid was sandwiched between the cellular layers every fourth course as a reinforcement layer. A trackhoe and clamshell bucket were

used to place infill on the lower wall layers. On the upper layers, infill was dropped some 3-3.7 m (10-12 ft) from the road above by a front-end loader.

### THE RESULTS

The finished structure included a four-pipe culvert to increase stormwater flow capacity through the embankment. The wall measured 20 m (65 ft) wide at the base, 56 m (185 ft) wide at the top with 381 face m<sup>2</sup> (4,100 face ft<sup>2</sup>). The finished embankment was hydroseeded with a mixture of annual rye cover, prairie grasses and flowers. All involved parties agreed that this vegetated geocomposite wall system was a success.

Project photos courtesy GeoSynthetics, Inc.





## case study 3

PHOENIX PARK RESORT • KANGWON-DO, KOREA • SUMMER 1995

### THE CHALLENGE

Construction in a popular tourist resort area posed several site challenges, including the building of a retaining wall structure to protect a cut embankment up to 14 m (46 ft) high. The rugged mountainous terrain demanded the embankment have several key characteristics: 1) the ability to resist the effects of erosion, 2) the flexibility to conform to anticipated differential settlement, 3) the aesthetic quality to blend with the natural environment, and 4) the cost-effectiveness to meet strict budget guidelines.

The Geoweb® system met the criteria by: 1) providing a nearly vertical surface while controlling erosion, 2) remaining

structurally stable through differential settlements, 3) allowing a vegetative facia that blends in naturally with the environment, and 4) meeting project budget requirements by completing construction in only two months.



Project photos courtesy E & S Engineering

### THE INSTALLATION

The retaining wall structures were formed by layering tan-faced Geoweb sections. For soil reinforcement, geogrid or high-strength woven geotextile layers were placed at required design intervals. The largest of the structures measures 200 m (650 ft) in length, with heights varying from 6-14 m (20-46 ft). Slopes range from 1h:8v to 1h:2.5v for all walls.

### THE RESULTS

The resort owners are pleased with the performance of the Geoweb system and the positive aesthetic appeal of the large vegetated structure.

## case study 4

KRESSVIEW SPRINGS • CAMBRIDGE, ONTARIO, CANADA • WINTER 1989

### THE CHALLENGE

Unstable soils, steep embankments, limited right-of-way and site access were construction challenges developers faced during the design and construction of a condominium embankment situated on the side of a steep river valley.

The project required constructing a 260-m (850-ft) long driveway embankment rising from grade level at the site entrance to a maximum height of 11 m (36 ft) at the top. A 2.5-m (8.2-ft) deep peat deposit under a 30-m (100-ft) section of the site created an unstable area. Removing the peat and replacing it with quality foundation materials was cost-prohibitive and would destroy several large willow trees along the stream bank. The Geoweb® system was an ideal solution, as it conforms to steep,



contoured landscapes, tolerates differential settlements, can support heavy vehicles during construction, and provides a vegetated facia.



### THE INSTALLATION

The site was prepared and Geoweb sections were placed, infilled and compacted. Subsequent layers were placed with a 25 mm (1 in) set-back until the wall height was achieved. At required design intervals, a geogrid or woven geotextile soil reinforcement layer was placed.

### THE RESULTS

The completed geocomposite embankment totalled 238 m (780 ft) long and 11 m (36 ft) high, with a total wall surface of 1,400 face m<sup>2</sup> (15,000 ft<sup>2</sup>). Wall face batter varied from 1h:2v to 1h:8v. Even after years of exposure to a northern climate, the Geoweb system has performed successfully.





## case study 5

KRESSVIEW SPRINGS, PHASE II • CAMBRIDGE, ONTARIO, CANADA • SUMMER 1998

### THE CHALLENGE

At the upper end of the Kressview property, a cut in the natural slope produced a soil face that was stabilized 10 years earlier using soil nailing to hold a geogrid / geotextile layer over the exposed surface. Water lenses in the embankment had caused significant soil destabilization and movement – a safety concern for residents. With the successful application of the Geoweb® wall system on the lower embankment, a similar solution was proposed to repair the upper level.



### THE INSTALLATION



The original 2h:1v slope was excavated to a near vertical cut 10 m (33 ft) high. The slope cut was made with three terraces 2 m (6.5 ft)

wide that were vegetated for aesthetic appeal. During rehabilitation, the geosynthetic facing and all vegetation were removed, leaving the soil-nail system intact. The reconstruction utilized the existing soil nails, replacing the geosynthetic facia with the layered Geoweb system. The new 9-m (30-ft) high wall system permitted drainage through the structure's face while controlling potential soil movement. At the appropriate lifts, Geoweb sections were attached to the soil nails using a polyester geogrid, steel pipes and special soil nail heads.

### THE RESULTS

In total, 460 m<sup>2</sup> (5,000 ft<sup>2</sup>) of wall face was reconstructed in three wall lifts varying in height from 2-9 m (6-30 ft). Groundcover plantings were placed in the open front facia cells and a variety of small shrubs were planted on the terraces. The developer and condominium owners are pleased with the natural look and stability of the repaired wall.



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At Presto, we're committed to helping you apply the most cost-efficient solution to your earth retention needs. Contact Presto Geosystems or our worldwide network of knowledgeable distributors/representatives for assistance with your project needs.

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GW/RW001 JUNE 2008  
Printed in the U.S.A. 2008  
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AP-3273 R1