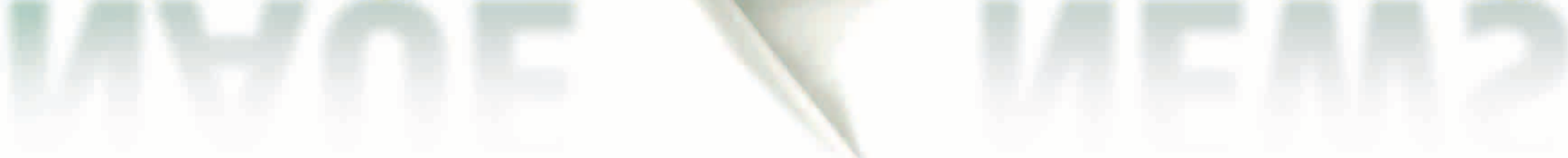


# NAUE

# NEWS



## Fun in the Snow in Winterberg

# NAUE Geosynthetics Secure Large Retaining Pond

### Dear Reader,

We are very pleased to present you NAUE News no. 34 today.

The management board, our marketing department and the media agency have redesigned the content approach and modernized the visual layout for our magazine.

So after 12 successful years of NAUE News, we are excited to bring you a new look! The content and images have been printed in a larger format for reading comfort and easier identification of important details in photographs and drawings. The number of technical project descriptions has also been increased.

We hope you agree with these changes and that you find this and future NAUE News issues as engaging as previous issues.

We welcome your feedback, suggestions and project, product and design questions at [info@naue.com](mailto:info@naue.com). Please add the keyword NEWS to the subject line.

[www.naue.com](http://www.naue.com)

Winterberg/Germany. The ski lift carousel at Winterberg in Sauerland, Germany is one of the country's busiest. Winterberg is located near the origins of the Ruhr and Lenne Rivers and is a major tourism and sport center. Skiing is particularly important to the city and region. According to the lift carousel operators, Winterberg is the largest ski area north of the Main river line. It offers seven kilometres of ski and toboggan runs. But for all the investment made in supporting these tourism and sport industries, ensuring the success of the area is, of course, dependent upon snow supply. Snow machines can be used for extending the recreational season or simply guaranteeing safe levels of snow.

Lined retaining ponds now play an important role in Winterberg's operations, and not only for the convenience and operational efficiency of drawing water into the extensive snow-making system. The lined ponds are also a much-appreciated source for water conservation; thus, allowing Winterberg and the region to continue to prosper but to do so in a more en-



vironmentally friendly and sustainable way.

The primary water system in Winterberg comes from three retention ponds that are sealed with geosynthetics, the largest pond of them which holds about 10,000 m<sup>3</sup>.

Carbofol® geomembranes have enabled the Winterberg area to operate successfully on precipitation alone. The lined ponds are arranged such that during the year's rainier months they collect water. The harvested rainwater is then saved and con-

verted into artificial snow during the main ski season (December through March). No additional water is required for the ponds.

The newest of these three large ponds is located on Bremberg mountain and utilizes 2-mm-thick Carbofol® geomembranes are smooth on both sides. Siwoplan, a well-established, WHG §191-compliant installer from Bad Zwischenahn, Germany performed the installation work.

Approximately 6,600 m<sup>2</sup> of Car-

bofol® 509 geomembrane were installed to secure the pond's permanent seal. Carbofol® has been certified by the German Institute for Construction Engineering (Deutsches Institut für Bautechnik [DIBt])

and fulfills the requirements of the German Act on the Management of Water Resources (Wasserhaushaltsgesetz), both qualifications of which are extremely important in an environmentally sensitive installation.

Carbofol® is permitted for numerous groundwater protection applications and shows very strong, high durability performance. In addition to the long-term resistance to chemicals, Carbofol® geomembranes also stand out by characteristics such as UV-resistance and resistance to animal damage (such as rodent gnawing), which makes them particularly suitable for retention ponds like Winterberg's. While geomembranes demonstrate great long-term durability in the applications for which they are specially designed, ensuring their performance begins with responsible protection of them during site preparation

and installation. Geomembranes must always be protected against mechanical damage from the ground material underneath. For this reason in mountainous Winterberg, the needlepunched nonwoven geotextile Secutex® R 804 was installed under the Carbofol® geomembrane. This particular Secutex®, with its robust mass per unit area of 800 g/m<sup>2</sup>, was designed into the site to prevent puncture damage of Carbofol® and that for decades not a single drop of water from the retention pond will be lost to seepage.

Winterberg's snowy fun continues, as does the region's economic success. And operations are now more efficient and environmentally responsible.

## Editorial - Steady as a Rock

### How NAUE battles the economic crisis and won against unfair competition

Espelkamp-Fiestel Germany. That 2009 would not be easy in view of the financial and economic crisis is something that all employees, customers and partners realized rather quickly. The management of NAUE realized early that this year which is now almost behind us would be a very complicated and insecure one. Privately financed building projects, in particular, fell off sharply. There were considerable differences, however, where government-financed projects were concerned. Some countries, among them Germany, consciously and increasingly invested in infrastructure projects and environmental measures. The stimulus programs certainly helped. Other countries expressed their desire to invest, but for the time being put projects on hold. Overall, when compared to the previous year, the market for geosynthetics shrank. It seemed obvious that NAUE would not be able to top its previous year's results. However, in comparison



to the market trend, our company did clearly better. The sales figures for 2009 are only slightly below those of 2008. NAUE management rightfully considers this to be good news. In a year of crisis, NAUE was

solid as a rock. It is highly likely that the employees also noticed this, for their jobs were not in danger, despite the financial and economic crisis. Management is approaching the coming year confidently. Incoming orders

have stabilised and are even showing a satisfying upturn. We see that some clients are restarting the projects they had delayed.









These relatively positive signals are encouraging, but they should not mislead anyone to become too presumptuous. That NAUE cannot be influenced by short-term effects and bleak prognoses is illustrated by the fact that our company adheres to a planned investment programme. The new warehouse and the logistics centre were completed in May, as planned. Further investment was made in machinery and the purchase of a new card machine. All production plants of the NAUE group for nonwoven materials have been updated. These investments have made NAUE more competitive for the long term and in markets around the world.

Tensor International Ltd. (United Kingdom) claimed that their new product TriAx was "scien-

tifically proven to functionally outperform biaxial geogrids". The ASA (Advertising Standards Authority) in the UK in its function as a watchdog noted "we had not seen robust evidence to show Tensor's biaxial geogrids were the 'best performing' geogrids compared to geogrids of Tensor's competitors, or that Tensor TriAx geogrids outperformed either their own biaxial geogrids in all instances or the biaxial geogrids of their competitors". Therefore the ASA upheld that the advert could appear again in its current form. (For the full adjudication go to [www.asa.org.uk](http://www.asa.org.uk))

A nice bit of success, by the way.

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-  The Gridator is back

Further information: [www.naue.com](http://www.naue.com)

We thank our customers and employees at all locations, and our partners for the trust and loyalty they gave us, even in difficult times.

We wish all of you and our readers a Merry Christmas and a Happy New Year!

The NAUE Management

# Noise Protection for our Dutch Neighbours

From Espelkamp to Utrecht. All motorways in the Netherlands, regardless of whether they are numbered with single or double-digits, are called Rijksweg. Those are the roads that the Dutch transportation ministry constructs and maintains. The A2 is one of these Rijksweg roads; it runs from Amsterdam via Utrecht and Eindhoven down to the Belgian border at Maastricht. Between Amsterdam and Utrecht, the A2 is the same as the European Road 35, which runs via Frankfurt am Main (Germany) to Rome (Italy). Currently, construction workers

are busy rebuilding the connection near Utrecht. Soon, both directions of this major European road will have five lanes each. Reinforced noise protection barriers are part of the project. The Dutch authority Rijkswaterstaat and Trajectum Novum are managing the project in an alliance of equals. "Rijkswaterstaat" was founded in 1798 as the Office of Water Architecture and today is a department of the Dutch Ministry of Transport, Public Works and Water Management. This ministry, in general, is responsible for the construction and maintenance of streets and waterways. The alliance is jointly responsible for the budget of the total construction measures and, thus, both participants are committed to its success.

"The Netherlands has never before seen anything like this," says Lars Vollmert, managing director of BBG Bauberatung Geokunststoffe GmbH & Co. KG, headquartered in Espelkamp (Germany). Short coordination and decision-making processes allow for plan-

ning during construction and swift implementation. In the qualification phase, Trajectum Novum, a project-related conglomerate of several construction companies and planning offices, made the decision to have NAUE supply the geogrids that are needed for the reinforced noise protection barriers and to have BBG

Bauberatung Geokunststoffe supply the technical support for the planning department of the alliance.

"We were able to gain ground due to the comprehensive delivery program, sophisticated reference projects and the cost effectiveness of the products," says

civil engineer Walter Ewert, NAUE's sales director for Germany and bordered countries "The total package, consisting of the preliminary design, delivered product and services as well as the promised technical support during the planning and execution phase made all the difference."

## Reinforcing the Future

In cooperation with the technical department of Trajectum Novum, the BBG Bauberatung Geokunststoffe worked out the technical drafts and execution details. For guaranteeing the stability of street on-ramps and in the construction of noise protection barriers, geosynthetics play a key role. Engineers planned a unique, 4-km-long noise protection barrier and numerous steep embankments, all of which are being constructed with geosynthetic reinforced mechanically stabilized earth (MSE) structures. These structures are built in part on solid ground but ground that is prone to subsidence. Partial areas thereof would have to be pre-

consolidated ahead of construction by means of hydraulic-fill sand and vertical drains.

Lars Vollmert from BBG explains: "The MSE will be constructed using either the wrap-around method and planted with grass or vegetation, or it will receive an outer skin comprised of steel grid elements that is backfilled with stones. Upon request of the designer, the steel grid elements were not galvanized, and the diameters of the steel elements had to be adjusted to meet the required service life".

In order to achieve the required stability, geosynthetics from NAUE are being used, such as Secugrid® geogrids, to create a long-term, secure and economical MSE structure.

This project phase included the entire infrastructure measures, from draft to construction of the part of the A2 between Leidsche Rijn Tunnel and the Autobahn cross at Oudernijn. The new construction started in 2008 and will be ready for traffic by December 2010.



## INTUTHUKO – (" TO ADVANCE ") EMBROIDERIES

NAUE supplies a wide range of geosynthetic products to Southern Africa and to diverse landfill sites operated by EnviroServ Waste Management. In 2002 EnviroServ was approached by community leaders to assist in alleviating poverty in the rural townships close to the outlying HOLFONTEIN landfill site in ET-WATWA, EKURULENI, EASTERN GAUTENG, SOUTH AFRICA, and so with the assistance of Celia de Villiers and Susan Haycock EnviroServ provided generous sponsorships, backup support as well as liaison with community leaders to start the INTUTHUKO EMBROIDERIES PROJECT.

Presently the group consists of 30 previously unemployed African women and 1 youth who occasionally makes drawings for them.

Each creation of INTUTHUKO tells a story or highlights an issue important to the African women who designed and embroidered it. All these pieces are embroidered with export quality South African hand-dyed thread on 100% pure South African cotton fabric.



The previously unemployed women are proud of their work which has received both local and international acknowledgement in many parts of the world. The resulting income from their work represents much needed assistance in the upliftment of their prevailing circumstances. Their main aim, however, is to retain the naïve quality and integrity of the product while drawing attention to their situation without appearing to evoke pity.

NAUE, within their corporate social responsibility program, is proud in supporting the INTUTHUKO (" TO ADVANCE ") PROJECT by having this beautiful African art work embroidered on to the NAUE bags soon to be seen at our NAUE exhibition stands at national and international exhibitions and conferences throughout the world. These bags will become real "collectors' items".

# Recultivating the Aemilienhausen Landfill

## Completed in time with Secudrain®

When compared to traditional landfill-capping systems, a geosynthetic drainage system used within a landfill surface seal offers a number of advantages, such as high-quality standards, low cost and markedly faster progress in construction.

synthetic drainage systems for the replacement of traditional 30-cm thick gravel mineral drainage layers.

In 2004, Secudrain® R201Z WD601Z R201Z was the first product in Germany to receive a BAM Certificate of Approval in

principal waste landfill. For NAUE, the Aemilienhausen Landfill was a very familiar construction site: ten years earlier, NAUE had supplied the Secudrain® RW201 DS601 R201 drainage system and Bentofix® DZ 6000 geosynthetic clay liners to this same site (with

nonwoven geotextile, compacted clay liner, geomembrane, protection nonwoven geotextile, mineral drainage layer and separation and filtration nonwoven geotextile. The second version envisioned the use of a geosynthetic drainage system with a so-called

rain® R201Z WD601Z R201Z and would provide the hydraulic performance of the drainage mat as well as the filter-stable separation for the recultivation soil, an emergency drainage system would not be required for this site.

With one product, a great deal of the cap's complexity and cost could be resolved—without sacrificing any safety or long-term performance.

In light of these construction and engineering advantages and the simple installation Secudrain® enabled, the owner had no difficulty in making a decision. The geosynthetic drainage system was planned for the recultivation of the landfill surface. The contractor for this construction was HEILIT Umwelttechnik GmbH from Chemnitz (Germany), who in turn subcontracted NAUE Sealing GmbH & Co. KG to deliver and install the geosynthetics.

Everything happened quickly from there. Construction started after the test field had been set up and the initial conformance tests had been performed on the materials. Swift and skilled installation of the BAM-approved geomembrane Carbofol® and the drainage mat Secudrain® R201Z WD601Z R201Z ensured that the construction was completed on time. The Unstrut-Hainich-District waste authority was fully satisfied.



NAUE's geosynthetic drainage system Secudrain® R201Z WD601Z R201Z combines filtration, protection and drainage in a single product. It possesses a long-lasting, high-water drainage capability as well as a high resistance to chemical and microbial influences. The multi-faceted Secudrain® system has been independently tested for its suitability by the German Federal Institute for Materials Research and Testing (Bundesanstalt für Materialforschung und -prüfung [BAM]) in compliance with the "Guidelines Regarding the Verification of Suitability of Geosynthetic Drainage Elements in Cap Sealings of Landfills and Brownfields" ("Richtlinie zum Eignungsnachweis für Kunststoff-Dränelemente in Oberflächenabdichtungen von Deponien und Altlasten" [Berlin, 2003]). This guideline establishes the general conditions for testing and determining the suitability of geo-

these designs. Based on this, and according to the German Landfill Act (Deponierecht), Secudrain® will achieve a functional lifespan of more than 100 years. Since BAM published the suitability test in 2004 for the Secudrain® system, it has been used in more than 60 major projects, each with a certified functional lifespan of more than 100 years.

## The Aemilienhausen Landfill

The use of this easy-to-install and cost-effective alternative to the typical, traditional landfill cap system is exemplified by the installation performed for the Aemilienhausen Landfill, which is located at the northern edge of the Thuringian Basin (Thüringer Becken).

In June 2007, the Unstrut-Hainich-District opened for tender the landfill cap construction and recultivation work of the third construction phase of this muni-

approval issued by the Deutsches Institut für Bautechnik (DIBT) [German Institute for Construction Engineering].

For the current, third construction phase, two landfill cap versions for the 110,000 m<sup>2</sup> (1,184,000 sq.ft.) landfill were being considered.

First, there was the complex "traditional solution," with its gas-permeable, load-bearing layer and a levelling layer, a separation

"emergency drainage layer" above that. The emergency layer would consist of silty sand to replace the mineral drainage layer.

Numerous factors favoured the use of the geosynthetic drainage element. Notably, it would replace the mineral drainage layer, the protection nonwoven geotextile, and the separation and filtration nonwoven geotextile. Also, because the geosynthetic drainage system would use NAUE's Secud-

## Exhibition and seminar schedules

### December

03. – 04.12.2009 International Symposium

06. – 08.12.2009 Gulf Traffic

Bangkok, Thailand

Dubai, U. A. E.

### January

12. – 13.01.2010 Gulf Waste Management Conference Bahrain

29.01.2010 ASTM-GRI Durability Workshop San Antonio, Texas, USA

www.naue.com

## NAUE assists a major paper company Building up a landfill in Poland

Kwidzyn/Espelkamp-Fiestel. International Papers is a privately-owned Polish company. One of its main production plants is in Kwidzyn, located in northern Poland about 100 km south of the Baltic seaport city of Gdansk. The manufacture of paper products can be intensive, and at the very least produces residues and wastes that must be responsibly handled. Many paper industry companies operate their own landfills to manage the waste. In the case of the Kwidzyn plant, the landfill used by the company had reached its limit. This left the company in a difficult situation. Expanding the current site's landfill was not feasible due to space constraints.

conditions and the nature of the plant's waste. The waste consists of residues that are biologically inactive. The technical parameters are very similar to those of clay. The main issue in this site's paper waste burial is that the waste soaks and softens in conjunction with water and, accordingly, becomes very unstable. The solution for the new design included the recultivation of the old waste body and the construction of 4 new fields on top of the old landfill.

During construction of the new landfill, which was built over the existing waste cell, the old slopes needed to be levelled. The top of the old existing landfill was then also levelled and reinforced with Secugrid® 40/40

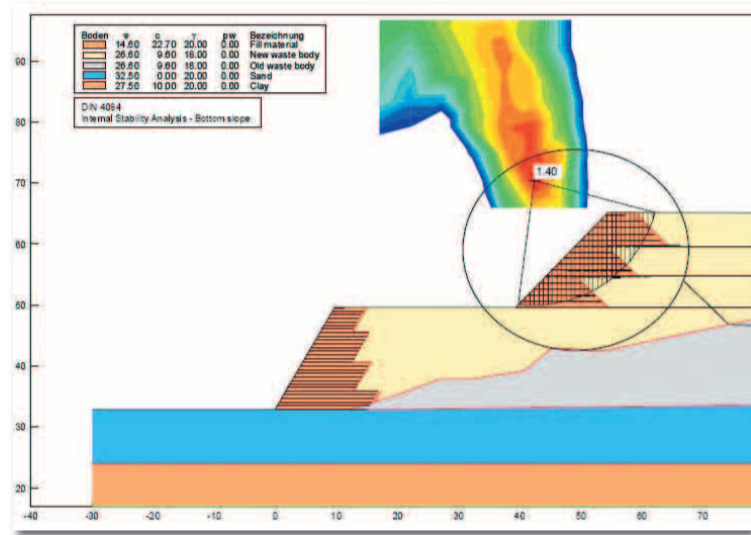
new slope was then covered with 50 cm sand, a needlepunched Bentofix® NSP 4900 geosynthetic clay liner (GCL), a geosynthetic drainage system (Secudrain®) and cover soil material (50 cm). This area was now the capping of the old landfill.

Before the retaining wall side slopes of the new landfill could be constructed, the secure base seal of the landfill had to be built. The designers required a composite sealing system that consisted of (from bottom to top) a 50 cm sand level layer over Secugrid® 40/40 Q1; a needlepunched Bentofix® NSP 4900 GCL; a 2-mm-thick, HDPE, chemically resistant Carbofol® geomembrane; an 800 g/m² Secutex® R804 nonwoven geotextile; and the mineral leachate collection layer. The retaining walls were then ready for installation.

The use of mechanically stabilized earth (MSE) walls has become very important in many waste storage facilities. The use of geogrid-reinforced retaining walls helps maximizing air space and increasing waste storage area. For International Papers, this solution provided significant cost management and operational savings.

The slopes of the new landfill were constructed in the form of 15-m-high retaining walls. The design utilized a three-tiered solution, with each tier built at an angle of 45° and reinforced with

Q1 to minimize differential settlement. For stability reasons, the slopes of the new landfill were moved approximately 20 m away from the old slope area. The area between the old and



Together with the geosynthetic consulting office BBG Bauberatung Geokunststoffe, the NAUE subsidiary in Poland, Geosyntetyki NAUE, worked out a solution that considered the local

## Bali's First Modern Landfill Design

Espekkamp/Denpasar. Bangli Regional Landfill in Indonesia's Bali province is located about 60km outside of Denpasar, the provincial capital and home to more than 500,000 residents. The region hosts Ngurah Rai International Airport—the main entry point into Bali—and numerous tourist destinations along Bali's popular white sands beaches.

When the Indonesian central government approved funding for the Bangli landfill project, the Ministry of Public Works put the country on a new path for landfill design: Bangli would become the first landfill in Indonesia to be designed with a modern lining system. It would serve as both a pilot project and the benchmark for future designs throughout the country.

Though the Ministry wanted a geosynthetic containment and drainage system in the landfill, the original consultant's design did not demonstrate a full understanding of geosynthetic systems. The plans, which were submitted two years before the installation work was performed, indicated only a basic layout with plumbing. Of note, the geotechnical needs for the project, including a stability analysis, were absent.

When NAUE became the geosynthetic supplier for the project, the company also took on the role of providing the necessary geotechnical and analytical support that would enable proper system per-

formance. The project would serve as a future standard for Indonesia's waste infrastructure, so it was vital to provide a thorough example for designing with and installing geosynthetics.

NAUE proposed some immediate changes. First, the slope angle of the landfill cell was reduced from 70° to 45°. The stability analysis



Materials	Quantity
Bentofix® NSP4900	32,000 m²
Carbofol® 406	32,000 m²
Secutex® R804	29,500 m²
Terrafix® R609	10,300 m²
Secugrid® 40/40 Q1	8,600 m²

Over this cushioning and separation layer, a 40cm-thick drainage layer (rounded gravel) was installed. The piping system was installed inside this drainage layer system, and over it was placed a filtration layer that uses Terrafix® R609 geotextile. A 30cm cover-soil layer forms the top of the system.

As a final piece of insurance for the site, an access road that runs between two cells at this difficult-to-design-for site was reinforced with Secugrid® 40/40 Q1.

From the initial concept to modernize Indonesia's landfill practice to the final installation and construction quality assurance (CQA) measures, a great many aspects of geosynthetic design were showcased. The Bangli Regional Landfill is a welcomed and impressive construction for the country.

## Did you know ... ?

...that NAUE GmbH & Co. KG supports an international center for research, development and training?

On 1 July 2009 the CREED e.V. (Center for Research, Education and Demonstration in Waste Management) was founded to act as a support association for the new international research and training center located at the landfill in Pohlsche Heide in, Germany. The six-member board of CREED consists of delegates from key areas that influence opportunities and growth in the areas of the association:

- Research and development (representative of university and research institutes) - Prof.-Dr. Ing. Klaus Fricke, TU Braunschweig/ANS e.V., Chairman of the Board.
- Politics (public authorities) - Mr. Burkart Schulte, GVoA mbH & Co. KG - assistant chairman; and Mr. Hartmut Haeming, AVG Köln mbH
- Economy (Industry, service providing industries) -

Mr. Jürgen Balg, Tönsmeier Dienstleistung GmbH & Co. KG, Treasurer

• Alliances - Prof. Dr.-Ing. Armin K. Melsa DWA e.V.; and Mr. Michael Balhar ASA e.V.

The center is currently developing a demonstration plant for German environmental technologies. NAUE'S ROLE

To help facilitate discussions and exchange beyond German borders, NAUE received a delegation of landfill engineers, decision-makers and governing mayors from around the Philippines. This visiting group was on a training course organised by the GTZ (Gesellschaft technischer Zusammenarbeit [Association of Technical Partnership]) and CREED e.V.

Prof. Dr.-Ing. Heerten, MD from NAUE gave a lecture on the latest technologies of landfill engineering and a lecture on safe dyke design and construction.

Secugrid® geogrids (400/40 R6, 200/40 R6 and 60/60 Q6). The four new landfill sections, each with a minimum area of 11,000 m², are meanwhile in operation. The safe, long-term storage of at least 120,000 m³ of additional waste from the paper production has been secured.

Materials	Quantity
Bentofix® NSP4900	64,044 m²
Carbofol® 2,0 mm s/s	46,248 m²
Secutex® R804	45,240 m²
Secudrain® R201 WD601 R201	19,627 m²
Secugrid® 40/40 Q1	64,044 m²
Secugrid® 200/40 R6	19,475 m²
Secugrid® 60/60 Q6	27,075 m²



## Stamping out noise pollution with a geogrid-reinforced embankment Peace and Quiet Returns to Boele

Hagen, Boele - The Boele area of the town of Hagen in Germany is an administrative district. It's located in the eastern part of the Ruhrgebiet (North Rhine-Westphalia). The heavily travelled county road (Hagener Straße and Dortmund Straße) that connects the two interstate highways A1 and A42 bisects the city of 27,000 into two parts. However, this division will soon belong to the past. The city council of Hagen resolved several years ago to construct a bypass road around the town.

The first section from the Hagener Straße (Straße = Street) to the Schwerter Straße has been completed. The responsible Department of Planning (Fachbereich Planen und Bauen für Grün, Straßen und Brücken) started the work on the second section in May 2006. This second section starts at the roundabout at Dortmund Straße/Hengsteyer Straße (north of the Schwerter Straße) and ends at the intersection Schwerter Straße/Lütkenheider Straße, where it connects to the completed first section.

After completion of the bypass, the life of the citizens of Boele will become considerably quieter since, for one, the through-traffic will no longer disrupt its quiet streets and, for another, traffic noise will be kept to a minimum thanks to a reinforced noise-reduction embankment. Walling off the Noise

Noise pollution is an often under-discussed type of pollution but one that has a strong effect on public happiness and health. For example, a Swedish study published in September 2009 by the journal Environmental Health ("Road traffic noise and hypertension: results from a cross-

sectional public health survey in southern Sweden") revealed increased rates of hypertension in middle-aged adults who lived in near proximity to prolonged traffic noise. Hypertension is associated with a number of serious health problems, such as stroke and heart failure.

Not only can city planners help counter this health threat with better road planning but trans-

many) for NAUE GmbH & Co. KG. The Boele system uses soil reinforced with geosynthetic materials and steel grid elements. A wrap-around method is used to provide this support on both sides of the embankment. "This construction method is an environmentally friendly and economical alternative to the traditional method", says Mr. Besser.



portation engineers can use reinforced embankments to attenuate sound. In Boele, the combination of new road planning and reinforced embankments was called for.

On both sides of the new roadway, the Schmidt Construction Company from the town of Kirchen-Freusberg (in the Siegerland) is constructing the engineered noise protection barrier over a length of approximately 700 m and at a planned height of 5 m.

"Here, the geometry of the wall varies according to the local conditions, where embankment slopes of up to 60 degrees have been attained", says Jörn Besser, the Central/West area supervisor (Sales manager Mid/West Ger-

NAUE supplied approximately 40,000 m² of Secugrid® 30/30 Q1 geogrid, 6,600 m² of Secugrid® 40/40 Q1 geogrid, and 9,000 m² (96,878 ft. 2) of Secumat® ES 601 G4 erosion control mats. Galvanized steel grid elements from the Rothfuss company and custom-construction steel mats are also being used in the embankment reinforcement. These elements were prefabricated to meet the requirements of the desired embankment slope. The Boele construction work is expected to be completed by the end of 2009. The citizens of the suburb of Hagen will be able to celebrate Christmas in peace and will only have to put up with the noise of the fireworks on New Year's Eve.

## The Next Generation of Geogrids Debut in the US

Typically, geogrids are used to reinforce weak subgrade and improve long-term road performance and economy. But reinforcement is not always the only need for a road with a poor bearing capacity. The Kansas Department of Transportation (KDOT), Reno County and the city of Hutchinson, Kansas discovered this during an important development project. The solution they found not only provided them the geogrid reinforcement they sought but the additional filtration and separation support they needed. And they found it in a single, cost-effective material: NAUE Combigrig®.

The bearing capacity of the subgrade at the 56th and Plum project near Hutchinson was deemed much too low to support the expected traffic load. A significant amount of fill was thought to be needed, and there were more than 7,500 cubic yards of embankments within the project zone.

The contractor and Reno County personnel found that the subgrade had root structures 6-inches down from the vegetation

that had been stripped for the site preparation. From 6 inches to 3 feet, fine sands were found but very little clay. From 3 to 4



feet, gray-colored clay and fine sands were discovered. Water began seeping in at about the 2 foot mark.

They considered a very costly over-excavation scheme which would have required hauling off the unsuitable soils and then replacing them with higher CBR soils, a separation geotextile with 8 inches of granular base under the PCCP, fly ash, concrete, and geogrids. KDOT requested that the project

team instead considers using a new composite geogrid, NAUE Combigrig® that could minimize the cost and extent of site im-

provement measures while still meeting all of the site engineering needs. It was agreed that with 8" of aggregate base (crushed concrete), Combigrig® was the best solution for the problem.

Combigrig® is the next generation in geogrid technology, a truly unique product that delivers four key geosynthetic functions in one composite material. Patented\* manufacturing techniques combine a reinfor-

cement geogrid (NAUE Secugrid®) and a nonwoven, needle-punched geotextile for filtration, separation and drainage (Secutex®). The Secugrid® provides excellent stress/strain characteristics and strength transfer in the geogrid bars, high strength and a high modulus at low elongations, durability and stiffness to promote radial interlocking, and much more. The robust Secutex® geotextile has a high elongation capacity to accommodate irregular and soft subgrade. The Secutex® is bonded firmly between the geogrid reinforcement bars, and the resulting three-dimensional nonwoven fibre matrix acts as the vital separation layer between different grain size soils and ensures long-term separation and filter stability.

The 4.75 m wide Combigrig® rolls were delivered to the job-site within 3 days of the order. The project foreman was very impressed with the ease of handling and installation, and how the 4.75 m roll widths made it very convenient to install the grid with fewer overlaps than other products. This product selection saved the project partners significant time and money while guaranteeing immediate and long-term safety and quality.

## The Four Dimensions Secugrid® 4D



1 September 2009 - The four dimensions of length, width, depth and time greatly influence civil engineering: project scope, design, product selection, expected service life. Today, NAUE introduces you to a new four-dimensional way of understanding reinforcement applications: the Four Dimensions of Secugrid®.

NAUE's new Secugrid® publications are divided into four key reader interest areas (Customer, Quality, Technics, and Ecology) and all four are subdivided into four discussions, such as maximising land use while minimising site disturbance, the importance of manufacturing methodology, and sustainable practices in construction. Running throughout the entire series are four main "dimensions" one needs to understand when using geogrids in reinforcement applications:

- Dimension 1: the individual bars
- Dimension 2: joining bars to form the geogrid
- Dimension 3: how geogrids interact with soil
- Dimension 4: how geogrids extend the service life of installations and lower costs over time

These dimensions reveal the most vital concerns for geogrid reinforcement use and why they must be defined this way for long-term value.

For example:

- Excellent stress/strain characteristics and strength transfer in the geogrid,
- Superior torsional rigidity and radial interlocking with its high junction strength,
- high strength and a high modulus at low elongations (less than 2%),
- Greener, more sustainable constructions.

Other advantages of geogrid reinforcement explored in the "Four Dimensions" series include how durability and product stiffness promote radial interlocking, installation longevity, the decreased need for maintenance, and much more.

To obtain a free copy of the NAUE Secugrid® "Four Dimensions" binder, please contact:

Sandra Walz  
Phone +49 5743 41 570  
swalz@naue.com, or visit  
www.secugrid.com and fillout  
the PDF request form.

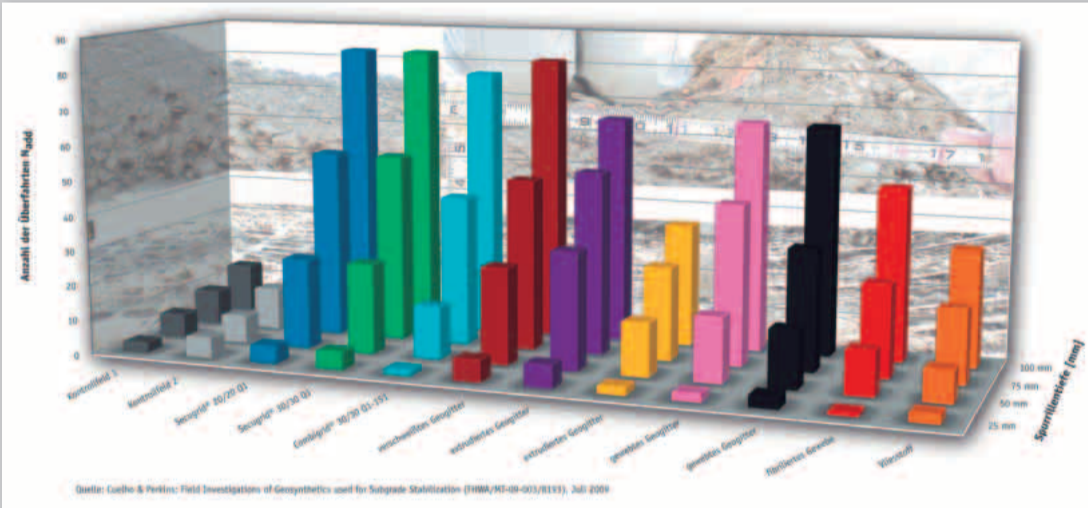
12<sup>th</sup> year, issue 34  
18<sup>th</sup> English translation  
Publisher:  
NAUE GmbH & Co. KG  
Gewerbestr. 2  
D-32339 Espelkamp-Fiestel,  
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## Independent Field Study Confirms NAUE Secugrid® and Combigrig®'s Great Performance

9 September 2009 - From March 2008 to March 2009, NAUE GmbH & Co. KG, Germany cosponsored the construction of test cells for an independent field study of geogrid reinforcement in roadway subgrade stabilization. The Montana Department of Transportation was the other cosponsor.

tical to the success of a reinforcement geogrid's survivability. Secugrid®'s individual bars showed a survival rate of more than 99% after significant rutting and traffic passes. Secugrid® 20/20 Q1, 30/30 Q1 and Combigrig® 30/30 Q1 151 GRK 3 outperformed almost all other products in

On the basis of the obtained data for the different test sections, the researchers concluded that the performance of the geogrid at a stress/strain ratio in the range of 2% is as important as their robustness. Secugrid® and Combigrig® excelled in this range. The study found that a tensile strength at 2% axial



The study and subsequent forensic evaluation of exhumed materials from numerous manufacturers, which included numerous product manufacturing methods, was carried out by the Western Transportation Institute of Montana State University. The data show that welded geogrids, such as NAUE Secugrid and Combigrig®, perform extremely well, especially in the critical performance range of up to 5% geogrid elongation, which are cri-

the study, even when rut depths reached 50, 75, and 100 mm. Due to variations in the site conditions between test sections, an empirical approach was used to normalize small differences in subgrade strength and base course thickness so that a more direct comparison between test sections could be made. Here, the NAUE products showed their strength and were rated as top-performing soil reinforcing geogrid products.

strain in the cross-machine direction of the geogrids likely plays a significant role in suppressing rut formation under these conditions. Since Secugrid® and Combigrig® have excellent tensile strength at low elongation and demonstrate their advantage in the critical elongation ranges, it was clear that they would perform very well under the tested realistic soil conditions.

The results of the Montana study are available for free at:  
<http://www.westerntransportationinstitute.org/research/infrastructure/completed/4w2005.aspx>

## The first landfill with a GCL is under construction in Pirot Serbia trusts in Bentofix®

Pirot/Espelkamp-Fiestel. For the first time in the history of the Balkan states, a local waste facility is being built with the use of a geosynthetic clay liner (GCL) instead of a 1-m-thick clay layer as part of a combined base sealing system. The needle-punched, reinforced geosynthetic clay liner is called Bentofix®, and it's produced by NAUE GmbH & Co. KG from Espelkamp-Fiestel, Germany.

Pirot, Serbia is a municipality with about 65,000 inhabitants. The landfill site also serves several cities and townships in the surrounding region. The mayors of Pirot and the European Agency for Renewal gave the order to the Austrian construction corporate group Alpine to construct the landfill. They collaborated with Belmont—a Belgrade-based NAUE reseller.

Engineers with Belmont and from NAUE were involved with Alpine in the planning process from the very first. "This collaboration was very successful

The use of NAUE products completely replaces the conventional mineral base lining approach in the Balkans. The

Materials	
Carbofol® 406	50,000 m <sup>2</sup>
Bentofix® NSP 4900	50,000 m <sup>2</sup>
Secutex® R 1204	76,000 m <sup>2</sup>

and allowed the application of a lining system consisting of Bentofix®, Carbofol® geomembrane and Secutex® protection geotextiles", says Mario Maric, the regional sales manager of NAUE. The installation of Bentofix® started in the beginning of October 2009 and will end in early 2010.



contractors are happy with the fast installation and the project cost reduction.

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