Dear readers of the 49th NAUE News, As 2019 approaches its end, we can look back on an eventful year. A lot has happened in the NAUE Group:

On May 10 of this year, we celebrated the expansion of our production capabilities in Adorf, Germany, with a new geogrid manufacturing line. Together with the mayor, Mr. Rico Schmidt, the Vogtland district administrator, Mr. Rolf Keil, and the entire Adorf staff, the new line was successfully put into operation. Both the construction of the new production hall and the start-up of the new production line were completed in Asia. At our production site in Malaysia, we were able to secure the adjoining property. The construction works for another production hall and roofed warehouses began in May 2019. Another nonwovens production line is scheduled to go into operation in June 2020. In addition, the GCL plant will be completely improved and equipped with state-of-the-art technology. For the Bentofix® X product range, a new extruder will be integrated into the line. The manufacture of our Secutex® Soft Rock product range will be relocated to the new plant, so that the distances between these halls have been removed, a new complex will be established. This includes then new modern office and social rooms for the NAUE staff in Fiesel.

The expansion and optimization of the NAUE production facilities is not only taking place in Germany, but strong investments are also being made in Asia. At our production site in Espelkamp, Germany. This warehouse was necessary to take the next step in our location development. From November on, we will start with the dismantling of the old factory of a kitchen manufacturer on our purchased extension areas. Once these halls have been removed, importunately, it isn’t just our new Secutex® Green nonwovens that contribute to CO₂ reduction. Our classic geosynthetics provide sustainable engineering solutions too. Comparisons over the past decades show that much can be achieved with geosynthetics. The current climate debate makes it clear that the reduction of CO₂ emissions must already be taken into account during planning and tendering. It will be the task of the construction industry to accept this challenge. With our range of system solutions, we believe that we are well positioned from both an ecological and an economic point of view and look forward to the challenges of the coming year.

We would like to thank all our customers for the trust they have placed in us and all our employees for their dedicated work. We wish you, your families and all readers of NAUE News a relaxing, peaceful Christmas and a healthy, happy and successful year 2020.

The Management

NAUE GreenLine

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The City of Townsville in northern Queensland is Australia’s largest urban center north of the Sunshine Coast. The local Waste Services Department serves nearly 200,000 residents. When the time came to improve stormwater management and install capping on the city’s two largest waste facilities, engineers selected a multicomponent geosynthetic clay liner for the essential containment: Bentofix® X10F, a polyethylene (PE) extruded coated geosynthetic clay liner. In this, they took advantage of a next-generation barrier technology that provided even greater security than the geosynthetic clay liner (GCL) – also known as bentonite mat – approach they used in the past.

**FACILITY 1:**
**THE STUART LANDFILL**

The Stuart Landfill required a previous cap to be extended while surface water would be managed through berms and channels. Stormwater runoff would then be collected in sediment ponds and leachate ponds. The previous capping work on the site had used a Bentofix® GCL. Golder Associates’ new design also used Bentofix®, only this time with a polyethylene (PE) extruded coating. The PE coated GCL Bentofix® X10F offered a frictional surface for very good interface shear values on steep slopes, greater safety against bentonite desiccation, enhanced gas barrier performance and greater safety against potential ion exchange and root penetration. The barrier design also helped reduce the required cover soil thickness due to the presence of the extruded PE coating on the GCL, which protects the GCL against desiccation at low confinement.

**FACILITY 2:**
**THE HERVEY RANGE LANDFILL SITE**

On the Hervey Range Landfill, which also required capping and stormwater management updates, the long slope lengths, relative steepness, and adjacent waterway presented a challenge to the capping works.

Golder Associates handled the design, as with Stuart Landfill, and again used the same coated GCL, Bentofix® X10F, for similar reasons: enhanced frictional characteristics, strong gas barrier performance, resistance against desiccation with reduced cover soil thickness, etc. As is recommended for this variety of Bentofix® GCLs, the rolls were installed with the coating side faced upwards. A geosynthetic composite drain was also placed on top of the coated GCL for collection of surface water. The combination of these materials (the coated side immediately below the geonet) increased protection against potential bentonite erosion and guarded against the GCL intruding upon the geonet. The design smartly addressed one of the cautions expressed in the internationally influential GRI-GCLs guide (www.geosynthetic-institute.org/gripspecs/gcl5.pdf).

That document notes that multicomponent GCLs can mitigate this concern. Coated Bentofix® X types are part of those multi-component GCL solutions.

Bury tapes, applied to the GCL coated side, were used to seal the joins between adjacent Bentofix® panels to further strengthen the gas barrier performance.

Some 100,000m² of Bentofix® X10F BFG 5300 coated GCL were installed across the two Townsville sites.

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**IGS WORKSHOPS**
**JANUARY 2020**

**MARK THE DATE IN YOUR CALENDAR!**

The Technical Committee (TC) of the International Geosynthetic Society (IGS) is hosting another workshop series in Barcelona, Spain, in 2020.

- 20 – 21 January 2020 on Reinforcement (TC-R)
- 22 – 23 January 2020 on Barrier Systems (TC-B)

Under the chairmanship of Gerhard Bräu from the Technical University of Munich the TC-R has planned the following sessions:

- Reliability based design and analysis of geosynthetic reinforced structures
- Geosynthetic reinforced columns
- Serviceability limit states: analyses, design, specification
- Advancements, developments and state of the practice for international codes of geosynthetics in reinforced soil structures

Under the chairmanship of Kent von Maubeuge from NAUE the TC-B has planned the following sessions:

- Re-cap of Munich 2018 Workshop, geomembrane puncture protection, welding of geomembranes, digital quality control systems
- Advancements with geosynthetic clay liners
- Performance and durability of geomembranes
- Case histories of novel and innovative barrier applications

**WE LOOK FORWARD TO SEEING YOU IN BARCELONA!**

For more information check: www.geosynthetic-society.org/tc-reinforcement-tc-barriers-workshops-in-barcelona

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**Two Australian landfills benefit from the advantages of coated GCLs**

The historque Schwaben­torwerche (Swabian Gate Weir) on the Dresiam River in Freiburg/Brigau was a listed building for monument protection. However, the 1873 constructed building was not only in disrepair but was an obstacle to the migration of fish, including salmon, which were being reintroduced to the river ecosystem. To improve the site while preserving historical character, a natural fish ladder was added.

One of the things that makes the site so unique is that a special geosynthetic clay liner (GCL) was installed under the revetment to act as a water barrier and seal the protected structure. Several of the GCL panels even had to be installed under flowing water.

The EU Water Framework Directive stipulates ecological connectivity, but the old 2.5m high and 42m long Schwabian Weir Ramp with its 10 steps could not be surmounted by fish. While fish bypasses were used in other locations along the river, the layout of the Schwabian Gate Weir in the middle of Freiburg prevented this. There was a public footpath, a cycle path, the federal road B31 on both sides of the site, and residential buildings. Planners had no other choice but to re-build the structure.

A 115m long and approx. 19.5 to 23.8m wide near-natural side structure was erected as a river-side drainage channel with a basin structure. The revetment of the new weir consists of hydraulic armour stones in set­stone and transom construction. The actual channel is 98m long and has 21 basins with a height difference of 15cm each. This allows fish and invertebrates to overcome the height difference of 3.3m upstream.

Groundwater seal with Bentofix® BX 13-B

It was important for the designers of UNGER ingenieure Freiburg to seal the building downwards in order to reduce surface water losses (extration from surface water or infiltration into groundwater). This was especially critical at low water levels in the river Dresiam and in groundwater. Bentofix® BX 13-B GCL was installed directly under the existing sub­soil and the revetment. It was the only GCL able to meet the conditions specified in the tender, including the main requirements of exhibiting a very high puncture resistance and having the ability to be installed under water.

Bentofix® BX 13-B is a needle­punched GCL and is a combination of a GCL with an additional sand protection and ballast layer. The additionally integrated sand layer acts as a ballast for underwater installation and protection layer for rock placement.

The supply order came from Walther Krone-Bau, Freiburg, and the laying technique was agreed on between all parties. Bucher/ant Gesuchstinkte (BBG) – a geosynthetic consultant – then prepared the installation map.

The GCLs were installed under the revetment from the middle of the second basin to the upper end of the sole structure. Towards the side slopes, the panels were laid directly under the upper edges of the crossbars and the foot protection. They were laid directly on the subgrade with an overlap of 1 m in flow direction. Due to the family bonded nonwoven layers, no additional protection measurements were necessary.

The GCL panels were covered with a 10cm gravel-sand layer Q/32mm, followed by a 30cm gravel-sand mixture Q/120mm to Q/150mm and the revetment. The entire bottom structure was constructed in two sections, half on one side and half on the other, as the river Dresiam could not be diverted outside the water cross-section due to the lack of space. The dam was laid approx. 2.50m off-centre and then converted to the finished revetment for the second construction phase. The GCLs are therefore located in the flow direction approximately in the middle of the river with an overlap of approx. 2m. The panels were then installed in the middle of the river.

One challenge was the narrowness on the construction site. There was no storage space, so every Bentofix® GCL roll was only taken from the storage yard of Walther Krone-Bau to the construction site just prior to installation. The project was executed between June and August 2019.
Flood protection: Rehabilitation of the Oder dyke in Uckermark

The flood disaster of 1997 is still remembered by many Germans. To this day, dykes are gradually being upgraded to minimize the consequences of flooding. One of the big questions in these upgrades is: What if the subsoil is not conducive to stability? A high-strength geogrid — Secugrid® HS — is the answer. The high robustness and long-term tensile strength of Secugrid® HS is on display in the long-term flood protection solution at the German-Polish border.

In the summer of 1997, the Oder River flood occurred. It was the largest known flood along this border’s major waterway, and the flooding lasted several weeks. Numerous dykes broke and around 5,500ha of agricultural land and settlements with around 400 residential buildings were flooded. Several thousand people were evacuated.

This disaster and subsequent weaker floods damaged the dykes in many places. Weak points in the dyke geometry and subsoil problems were identified as causes of many of the breaks.

In order to eliminate these potential danger points and withstand future flood events, the dyke between the municipality of Friedrichshthal and the town of Gartz was reinforced over a length of 7km. However, investigations of the subsoil below the old dyke had revealed relatively thick, soft layers of peat, mud, and clay — not good conditions for the stability of a dyke. For the new dyke, NAUE Secugrid® HS 1000/100 R6 geogrid was installed in the contact area.

Secugrid® HS is a laid geogrid made of high-tensile polyester filaments with an extruded polyethylene protective coating and welded knots for soil reinforcement.

The individual panels of the reinforcement element were installed across a traverse with the main tensile direction transverse to the dyke axis. The next panel was overlapped by 50cm at right angles to the laying direction. In the entire dyke section between Friedrichshthal and Gartz, approximately 63,000m² of NAUE Secugrid® geogrids were installed in 2018 and 2019.

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Heavy rain destroyed a road in Adorf-Freiberg in Vogtland region (Germany) in 2018. With the help of the NAUE Steel P system, the road embankment has been rebuilt to withstand future extreme weather events.

Secugrid® geogrids protect embankment from extreme weather conditions

The reconstruction of the dyke was carried out by partial removal of the damaged section and reconstruction as a 3-zone dyke. A geosynthetic clay liner (GCL) was installed as a water-side sealing element.

The Brandenburg State Office for Environment (Lfu Brandenburg) was responsible for the redevelopment of the Oder dyke. The engineering consortium WTV GmbH (Bad Liebenwerda) served as planners and Striecher Tierf- und Ingenieurat Jena GmbH & Co. KG was the construction company.

The NAUE Steel P system was used to design the facing of the embankment.

The system consists of galvanized steel grid elements that are adapted to the shape of the embankment. The steel grid element is connected to the horizontal Secugrid® geogrid reinforcement by friction. Secugrid® is a laid geogrid made of stretched, monolithic flat bars. The junctions are welded together in order to stabilise and reinforce the soils in the best possible way.

A total of 11 geogrid layers of Secugrid® 80/20 R6 in combination with Secugrid® 40/20 R6 were installed for the maximum structure height of 7.7m. Each geogrid layer was anchored up to 7m into the embankment, covered with 500mm fill soil each, and compacted.

To prevent soil erosion at the embankment front, a Secumat® erosion protection mat was installed between the steel grid element and the fill soil. The three-dimensional mat also supports the subsequent greening of the embankment surface so that the MSE wall blends perfectly into the existing landscape. With the selected MSE solution, an economical and ecological rehabilitation has been achieved that can safely withstand extreme weather events.

The project was planned by Ökoplan Bauplanung GmbH, Plauen. UTR Umwelt-, Tiefbau und Recycling GmbH, Schönbrunn/Vogtland, was the general contractor. The installation on site was carried out by GGS TerraCon GmbH, Moritzburg. In total 475m² of Secugrid® 40/20 R6, 1,425m² of Secugrid® 80/20 R6 and 240m² of Secumat® were installed.

Vivid impression of climate change: On May 24, 2018, a storm front hit the Vogtland region with full force. Up to 150 litres of rainwater fell in just one hour. This heavy rain caused the greatest damage in Adorf-Freiberg. A culvert in Leubethaer Straße could no longer absorb the enormous quantities of water. There was a water accumulation inside the road embankment, fine parts of the filling soil were successively washed out, and, finally, the undermined embankment on the slope side slipped down completely over a length of 30m.

With great financial support from the state of Saxony, the embankment was rehabilitated. The dam was rebuilt as a geogrid-reinforced mechanically stabilised earth (MSE) wall system. The road embankment with a slope inclination of 70° was rebuilt over a length of approx. 54m. The embankment was then reinforced with NAUE Secugrid® geogrids.

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850 Soft Rocks protect historic Scottish golf course

Ennigerloh central landfill focuses on continuity

Sealing systems made of mineral components and geosynthetic materials are used as technical barriers in landfills. As a base seal, these engineered systems prevent polluted liquid seepage into groundwater. As a landfill cap, they prevent the infiltration of precipitation into the landfill while also preventing leachate from percolating out and polluting surface waters.

The Ennigerloh landfill in Münsterland, Germany, exemplifies how these barrier systems succeed. The site is operated by AFW Landesbetriebe Nordrhein-Westfalen mbH (AWG), which continuously invests in the extension of the site’s technical barriers. These investments not only meet the historical base sealing requirements but minimize leachate generation, both for environmental and operational efficiency reasons.

Leachate can require complex treatment before it is considered clean enough for discharge. It can add considerable operational cost to landfills during active fill stages and in post-closure care.

In 2019, the landfill capping system for Ennigerloh’s Section IVa was expanded. The cap involved a surface area of 50,000m², both on the flat top and on the slopes 1 : 3 (V : H). The use of geosynthetics as technical functional layers in the sealing system proved to be the most economical alternative for the sealing system. Benofix® NSP 4900 (LAGA) geosynthetic clay liner (GCL) was used as the mineral component of the sealing system. A Carbofix® PEHD 2.5 MF/MF geomembrane was included to provide the system’s polymeric barrier.

Secuda® with RZ231 WDE301 RZ261 drainage products were used above the sealing components to manage water in the soil cover layer. This prevented the harmful build-up of precipitated substances in the soil cover, which could otherwise impose mechanical stress on the geomembrane or lead to cover particles’ erosion, and to provide protection against future erosion. The layered structure was designed to effectively reclaim the land which had been eroded, and to provide protection against future erosion.

To complete the structure, a layer of Secute® R1201 was wrapped around the sand along the crest of the dune before being covered by a top dressing of sand, at least 1 m deep, in preparation for planting Marram Grass to re-establish a natural dune environment. NAUE geosynthetics are widely used in the construction of coastal erosion control structures and are designed to allow the passage of water in both directions, but filter fine sand particles. This approach provides a highly effective, robust, and economical method of construction and excellent erosion control performance.

The reputation and history of North Berwick’s club and coastal course continue to grow with the support of this innovative coastal protection plan that also permits the restoration of natural ecological processes.

EXHIBITION AND SEMINAR SCHEDULES

JANUARY
09. - 10.01.2020 50. Int. Wasserbau-Symposium (IWAS) Aachen, Germany
14. - 16.01.2020 Infratech Berlin, Germany
21. - 22.01.2020 12. Kolloquium Bauen in Boden und Fels Osthildern, Germany
20. - 21.01.2020 ISOS Strengthening Workshop Moscow, Russia
22. - 23.01.2020 ISO TC Barrier Systems Workshop Barcelona, Spain
29. - 30.01.2020 Bautex - 14. Bautextilien-Symposium Chemnitz, Germany

FEBRUARY
02. - 03.02.2020 IGS TC Reinforcement Workshop Barcelona, Spain
03. - 04.02.2020 IGS TC Barrier Systems Workshop Barcelona, Spain

MARCH
03. - 04.03.2020 16. Leipziger Deponiefachtagung Leipzig, Germany
05.03.2020 - 07.03.2020 GoFuture Munich, Germany
19. - 21.03.2020 IFAT Munich, Germany

APRIL
04. - 08.04.2020 JFAT Munich, Germany
14. - 16.05.2020 BAM Berufsausbildungsmesse Munich, Germany

JUNE
05.06.2020 - 05.06.2020 Diaphoerner Berufsmesse Detmold, Germany
05.06.2020 - 06.06.2020 Diaphoerner Berufsmesse Detmold, Germany

SEPTEMBER
06. - 09.09.2020 Eurogeo 7 - 7th European Geosynthetics Congress Warsaw, Poland
27.09.2020 - 30.09.2020 Eurogeo 7 - 7th European Geosynthetics Congress Warsaw, Poland
16. - 19.09.2020 Baugrundtagung Berlin, Germany
22. - 25.09.2020 wroclaw, Germany
25. - 27.09.2020 wroclaw, Germany

OCTOBER
07. - 09.10.2020 Deutscher Straßen- und Verkehrsentscheidung Dortmund, Germany
07. - 10.10.2020 30. Karlsruher Deponie- und Altlastenseminar Karlsruhe, Germany
09. - 12.10.2020 29. Windenergietage Linstow, Germany

Founded in 1832, the North Berwick Golf Club in the UK is the oldest in the world. There is no implied or expressed warranty. © 2019 NAUE GmbH & Co. KG, Espelkamp, Germany · All rights reserved. · NAUE News 49 · Status 18.11.2019