

# JadeWeserPort Project: Langwarder Groden

(coherence zone for a deep-water port)

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## Brief Summary

Due to the constructional interference with nature that came along with the building of a new port, on behalf of the environmental protection JadeWeserPort forced different compensatory measures. One of these measures is the Langwarder Groden, which was heavily discussed.

The concept scheduled for opening the overflow dam to expose the agricultural lands to the natural tide dynamics.

This was to enable development of a salt marsh complex with natural creek structures and regular saltwater flooding as an intertidal zone. Today, salt marshes are among the especially rare and endangered habitats of the North Sea coast.

These measures enhance both the maritime habitats with their protected animals, plants and waters and the landscape.

## 1.1 INTRODUCTION TO JADEWESERPORT

JadeWeserPort Realisierungs GmbH & Co. KG was founded in 2003 by the federal state of Lower Saxony and the Free and Hanseatic City of Bremen in a cooperative project involving multiple federal states. Having completed building the infrastructure near the terminal for the JadeWeserPort deep-water port in Wilhelmshaven, the company's duties include management and technical support for the newly created port facilities. With some 1.7 km of quays, 130 ha of terminal area and an adjacent 160 ha freight village, the port offers major development potential for the port and logistics industry.

The federal state of Lower Saxony holds a 50.1% stake in JadeWeserPort Realisierungs GmbH & Co. KG, and the federal state of Bremen a 49.9% stake.

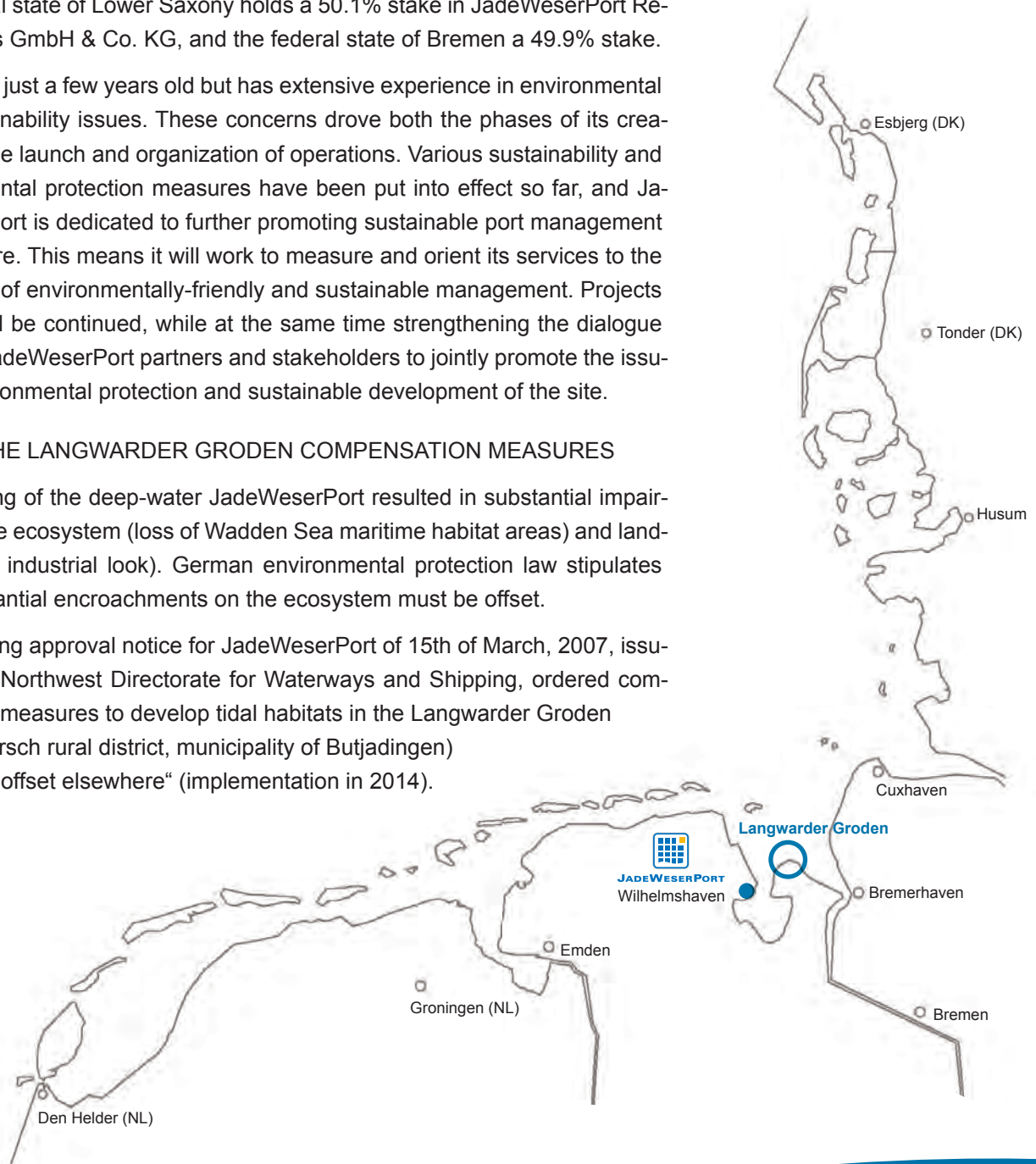
The port is just a few years old but has extensive experience in environmental and sustainability issues. These concerns drove both the phases of its creation and the launch and organization of operations. Various sustainability and environmental protection measures have been put into effect so far, and JadeWeserPort is dedicated to further promoting sustainable port management in the future. This means it will work to measure and orient its services to the standards of environmentally-friendly and sustainable management. Projects started will be continued, while at the same time strengthening the dialogue with the JadeWeserPort partners and stakeholders to jointly promote the issues of environmental protection and sustainable development of the site.

## 1.2 THE LANGWARDER GRODEN COMPENSATION MEASURES

The building of the deep-water JadeWeserPort resulted in substantial impairment of the ecosystem (loss of Wadden Sea maritime habitat areas) and landscape (an industrial look). German environmental protection law stipulates that substantial encroachments on the ecosystem must be offset.

The planning approval notice for JadeWeserPort of 15th of March, 2007, issued by the Northwest Directorate for Waterways and Shipping, ordered compensation measures to develop tidal habitats in the Langwarder Groden (Wesermarsch rural district, municipality of Butjadingen) as a „land offset elsewhere“ (implementation in 2014).

The JadeWeserPort and the Langwarder Groden are located at the Unesco Wadden Sea World Heritage





Location of the JadeWeserPort and the Langwarder Groden at the bay of Jadebusen (aerial photo: ADMINISTRATION OF THE LOWER SAXONY WADDEN SEA NATIONAL PARK, NPV)

### 1.3 LOCATION OF THE PROJECT AREA

The Langwarder Groden is located close to the fishing village Fedderwardersiel on the northern edge of the municipality of Butjadingen in the Wesermarsch rural district of Lower Saxony. It is a polder about 148 ha in size and is bounded to the south by the dedicated main dyke line and to the west, north and east by an overflow dam.

The Langwarder Groden is part of the intermediate zone of the Lower Saxony Wadden Sea National Park: the areas between the main dyke and the overflow dam (the so called “Binnengroden”, i. e. the inner polder) are identified as Quiet Area II of the national park. The salt marshes pointing offshore from the overflow dam (the so called “Aussengroden”, i. e. the outer polder) are protected as Quiet Area I. Since 2009, the Butjadingen coastal landscape has also been part of the Wadden Sea World Heritage Site, a distinction awarded only to extraordinary natural landscapes.

The JadeWeserPort Realisierungs GmbH & Co. KG commissioned the Bremen planning office „planungsgruppe grün“ (PGG) to do the planning project.



Project area of the Langwarder Groden: existence before implementation

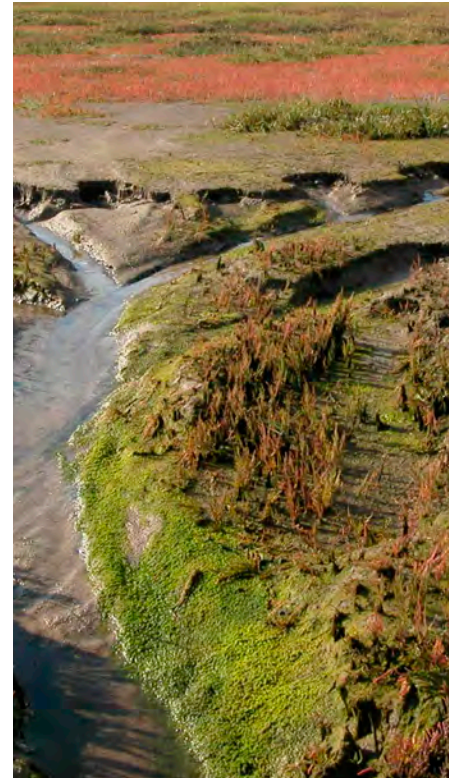


## 2.1 THE PROJECT'S GOALS

The planning concept provided for opening the overflow dam in Langwarder Groden to again expose the agricultural lands, which were taken off the sea by land reclamation by enclosure in the 1930s to be farmed, to the natural tide dynamics. This was to enable development of a salt marsh complex with natural creek structures and regular saltwater flooding as an intertidal zone. Today, salt marshes are among the especially rare and endangered habitats of the North Sea coast.

This objective provoked public controversy, mainly about dyke safety, generating substantial political pressure. As a result, from the outset the Langwarder Groden project also included reinforcing the main dyke. The soil required for this had to be obtained locally in the inner polder (Binnengroden) to avoid unnecessary stress to the local residents from the hauling of soil. Since not all the ground in the Binnengroden was suitable for building dykes, distributing suitable soil inside the project area also meant constraints on the project's design.

The public criticism was dealt with by creating an interdisciplinary working group and holding consultation meetings with all participants, examining planning alternatives and projecting their landscape impact, as well as inspecting exemplary projects in the Netherlands.



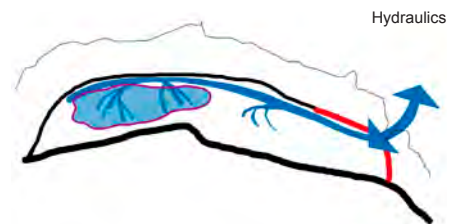
Objective: development of salt marsh as a habitat and a landscape for nature experience

## 2.2 DESCRIPTION OF THE COMPENSATION MEASURES

To meet the goal of developing a natural, tidal salt marsh complex, a compromise solution was developed by the planning office ‚planungsgruppe grün‘ in coordination with the awarding authority, the administration of the Lower Saxony Wadden Sea National Park, the municipality, and the associations of the dykes that can guarantee compliance with nature conservation objectives and planning rules while gaining the approval of all participants in the process:

### TIDE CONNECTION AND HYDRAULICS

The overflow dam is opened at a certain place for a length of some 900 m. The inland drainage channel is connected with the most efficient outer creeks and designed such that the daily tide can flow in and out and the largest possible portions of the Binnengroden can be flooded to initiate salt marsh development.



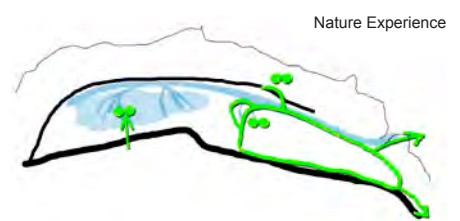
### RELIEF CREATION

To obtain sufficient land of intertidal zone with daily flooding, large parts of the Binnengroden are stripped and modelled to a height necessary for the salt marshes. For the relocated soil, soil management within the inner polder assures its removal and installation according to its properties, compliance with required plan heights, and avoidance of soil transport outside the project area. Higher-lying areas of land not exposed to the daily tide are managed by extensive grazing. Farmers who already used the land previously in the Binnengroden are involved in this.



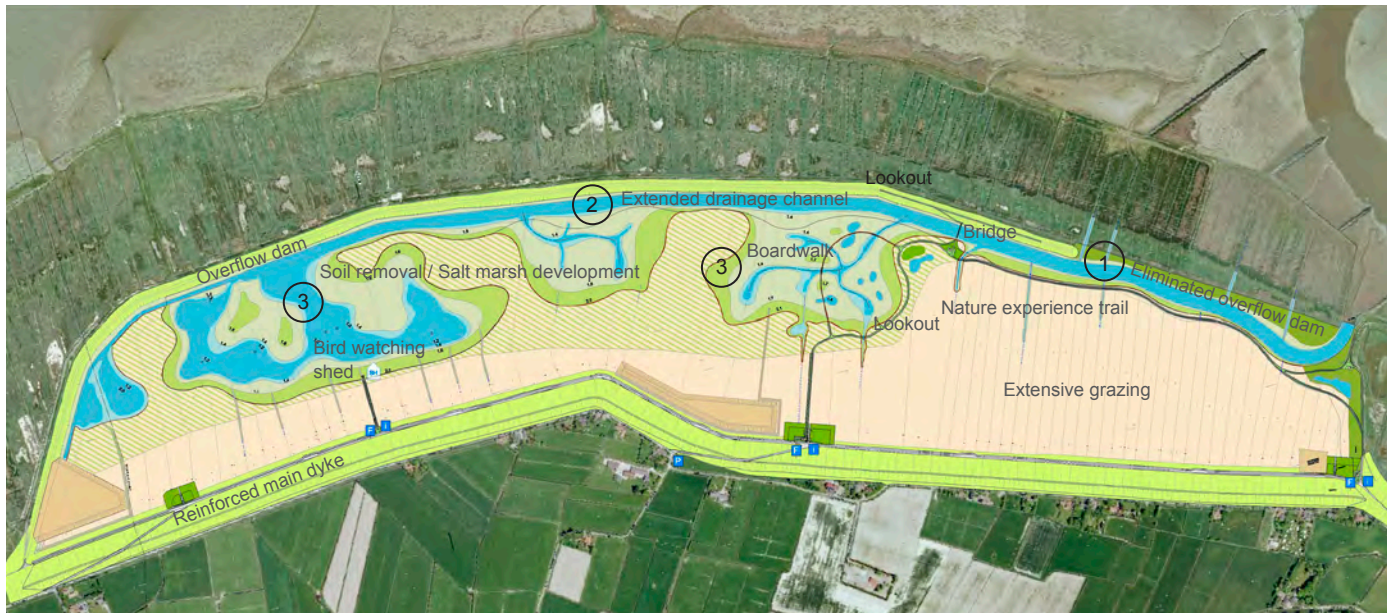
### EXPERIENCING NATURE

To enable the local population, recreation seekers and tourists to experience the project's future development (creation of salt marshes, settlement with coastal birds, and emergence of a natural creek system), a nature experience trail is being built and maintained by the municipality.



## 2.3 BENEFICIARIES

These measures in the Langwarder Groden enhance both the maritime habitats with their protected animals, plants and waters and the landscape. Local residents and tourists can visit the Lower Saxony Wadden Sea National Park and get a picture of the nature conservation measures, directly experience the development processes and tides, or simply enjoy nature and the scenery. The actual core regions of the salt marsh development lands are protected by guided pathways for visitors.



The Langwarder Groden - measure plan, PGG 2014

### 3.1 TIDE CONNECTION / HYDRAULICS AND RELIEF CREATION

The measures planned and carried out to initiate the compensation goals - creation of salt marsh complexes and tideland areas with a tidal effect - on the previous grassland sites of the Binnengroden were:

1. Opening of the overflow dam near the fairway "Fedderwarder Tidal Creek";
2. Extension of the drainage channel of the inner polder as the main supply ditch with connection to the creek system of the outer polder;
3. Extensive soil removal with deep-water zones.

The removal of earth and design of the creeks and drainage channel had to be done in such a way as to guarantee the general conditions (target biotope flood frequencies) necessary from the ecological point of view. A total of 650,000 m<sup>3</sup> of earth were moved in the ground removal, including 330,000 m<sup>3</sup> of material suitable for dykes that were reused locally for building the main dyke reinforcement.

The flood heights and durations to be achieved depend largely on the design of the drainage channel (its cross-sectional width and extension depth), the creeks, and the height of the future vegetation areas. A two-dimensional model of the Langwarder Groden was produced in order to dimension the drainage channel and the flow conditions simulated for the entire plan region. The necessary geometry of the drainage channel was estimated beforehand using a one-dimensional non-stationary hydraulic model. The hydraulic models were based on close-mesh laser scan data (1x1m raster) of the Langwarder Groden and the tideland and sea areas in front of the Groden. Additional surveys were used to „calibrate“ and adjust the geometric bases.



As part of the hydraulic calculation, various tide scenarios were investigated taking into consideration the Fedderwarder Tidal Creek's tide line from the salt marsh zoning depending on the flooding frequency.

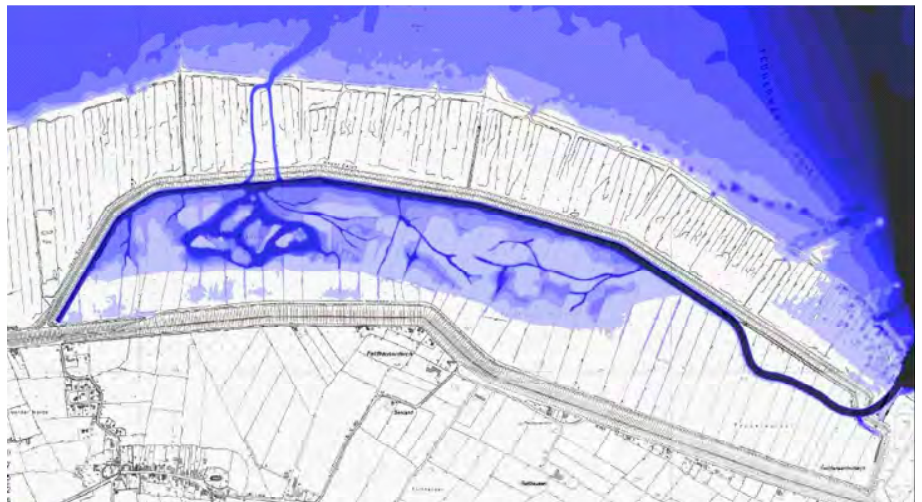
Normal tide/average high tide +1.70 m mean sea level (pioneer zone/lower salt marsh)

High tide 2.10 m mean sea level (lower/middle salt marsh, 95 flooding/year)

High tide 2.20 m mean sea level (middle/upper salt marsh, 60 flooding/year)

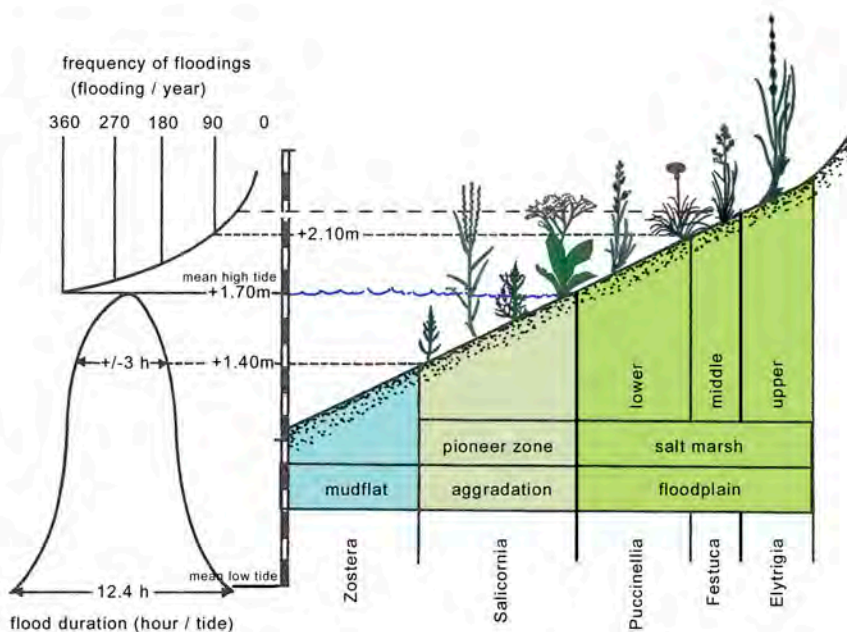
The investigations showed that with the optimized width of the drainage channel (between 10 m to 25 m in the outflow area) the open water levels are reached so that the tide process of the tidal gauge of Fedderwardersiel could be used as the basis for the planning variants and development of the salt marsh target biotope in the Langwarder Groden.

On the right: hydraulic model with maximum depths of water (optimized planning variant with vegetation, high-water spring tide 2.10, mNN) )



Below: salt marsh zoning: dominant species of plant, altitude, flood frequency and flood duration.

To ERCHINGER 1985, in: DIJKEMA et al. (1990), modified.



### 3.2 EXPERIENCING THE NATURE AREA

The „Langwarder Groden Nature Experience“ project created an attractive possibility unique in Germany for experiencing nature: following a circular footpath (nature experience trail) leading straight into the project area, visitors can directly experience the creation of a new salt marsh, associated birdlife, and tidal processes, and learn about all the project measures in Langwarder Groden.

Close cooperation with the national park administration assured that a memorable nature experience is possible without negatively affecting nature with its species and biotic communities. The nature conservation goal is also to guide visitors in order to protect the actual core areas (quiet areas of the national park) from being disturbed. The Langwarder Groden nature experience concept is integrated into the region's existing hiking and bicycling network.

Various structural elements form the focal points of the roughly 4 km circular footpath that is particularly attractive for families with children:

A plank boardwalk of roughly 350 m with footbridges leads directly into the 70 ha salt marsh development area and thus makes it possible to enter the wet and periodically flooded border area with fascinating insights into the salt marsh succession.

On the left: the Boardwalk at high tide; below: the wood bridge over the drainage channel, and information panels



The roughly 35 m wood bridge leads over the widened drainage channel. The water flowing in and out and its dynamics can be experienced particularly clearly at higher tides. On the overflow dam, the visitor has a magnificent view of the salt marsh vegetation of the outer polder, the Wadden Sea, and the shipping channel of the outer Weser.

A bird watching shed (an elevated wood shed) on the southern border of the salt marsh development zone offers a clear view of the newly created water surfaces and landing areas with a likely high probability of observing wading and water birds.



Lookouts with installed binoculars invite visitors to observe the fascinating world of birds. Numerous information panels explain clearly and in plain language topics like landscape, local animal and plant species, the history of the Langwarder Groden, and international shipping. At prominent junctions small square-like, paved expansions with benches were created and supplemented by interactive exhibits on the topics of the Langwarder Groden, tides, and animal tracks.

The trails, footbridges and bridge are reserved to walkers to avoid interference with bicyclists. Bicycle parking facilities were created at the outside edges of grass tracks and the access points to the Nature Experience. The municipality of Butjadingen assumes maintenance and operation of the facilities for the „Langwarder Groden Nature Experience“ in close coordination with the national park administration.



Impressions of the „Langwarder Groden Nature Experience“ implemented in 2014 (aerial photos by T. SANDER, 2015)



#### 4.1 EFFECTS ON HYDRAULICS

Langwarder Groden has been tidal since the opening of the drainage channel to the Fedderwarder tidal creek on 8th of September, 2014. The locally measured difference between the tidal gauge in Fedderwardersiel and the water level at the new bridge above the widened drainage channel is around – 10 cm. A flow speed of 0.5 to 1.0 m/s was measured depending on the tide-water level. This speed can be expected to decline in the next few years as vegetation grows in so that the hydraulic gradient to the Fedderwarder Tidal Creek will increase slightly.

Overall, the areas have developed consistent with the hydraulic simulation and models. The predicted target water levels are being reached, thus guaranteeing a natural development of the salt marshes.

Tide stream into the drainage channel generating a new creek's system



#### 4.2 DEVELOPMENT IN TERMS OF NATURE CONSERVATION

Before this project was carried out, the Langwarder Groden consisted completely of cultivated grassland areas. A saltwater effect was not visible in the vegetation. There were reed borders along both sides of the permanent water-bearing drainage channel. However, the outer polder (Aussengroden) is characterized by salt marsh vegetation. The various types of vegetation are largely distributed following the land elevation and therefore the frequency of flooding. This foreshore quite obviously has a positive sediment balance and is growing.

The measures carried out achieved the following nature conservation goals:

The Binnengroden areas are now subject to a regular saltwater effect. Opening the overflow dam by about 900 m and expanding the drainage channel according to hydraulic guidelines have guaranteed the daily inflow and outflow of the tide.

On about 54% of the area of the Binnengroden, soil removal created an elevation that allows the vegetation zones of salt marsh development from the pioneer zone to the upper salt marsh. The other areas are wetlands and are evolving into the upper salt marsh through extensive managed grazing.



The extensive grazing also prevents bush growth and development of brackish water reeds on the lands not regularly flooded.

Given the elevation conditions in the Binnengroden, upper salt marshes would have become established on only about 13% of the lands by demolition of the complete overflow dam. A development of typical salt marsh habitats from tideland soil through the pioneer zone to the lower, middle and upper salt marshes on about 48% of the area was only made possible by building up the drainage channel to a much higher hydraulic capability in combination with extensive soil removal and the shaping of drainage creek systems.

The predicted development of vegetation connected with the significant reduction and/or abandonment of farming offer an ideal habitat in particular to coastal birds like redshanks, avocets, ringed plovers, and meadow pipits. In addition, in the migration and overwintering season the lands offer high water resting places for waders and geese. A typical benthic community for these marine habitats will form in the creek systems and tidewater areas.

A monitoring program is tracking the success of the measures over a 10-year period after the construction work in the Langwarder Groden is concluded. A black stork and seals have already been spotted in the project area.

## 4.3 NATURE EXPERIENCE

The concept implemented offers a unique nature experience in the Langwarder Groden and is already being positively received by locals and tourists. The changing high water events visible daily following the opening of the drainage channel confirm the plan's intended goal of making it possible for both holidaymakers and locals to experience a tidal natural salt marsh development, the natural fluctuations of the water level itself, and the associated birdlife „up close“.



From above down: information panel, oystercatcher, lookout, project area (aerial photo: NPV, G. SCHEIFFARTH, 2015).

