Summary

In 1995 the Dutch and Belgium government made an agreement on the second deepening of the Westerschelde to keep the dock of Antwerp reachable. With these actions for deepening the fairway valuable nature will be lost. In the agreement decisions for consequent actions for compensation were made. Rijkswaterstaat, a part of the Dutch Ministry of Public Works and Water Management is responsible for the realisation of the unembanked projects. In these projects an opening is created in the existing dike and an intertidal zone with considerable natural value will be given back to the Westerschelde. One of these unembanked projects is the compensation project Perkpolder.

With the opening of the Westerscheldetunnel the ferry between Perkpolder and Kruiningen ended and the ferry dock became useless. By reconstructing the former ferry dock and surrounding polder regions it is possible to create unembanked nature within reasonable costs. An area of 70 hectares will be given back to the Westerschelde. The creation of unembanked nature will be combined with reconstructing a new landward flood defence. These plans are combined with plans from the city council of Hulst to create recreational zones, which will provide an economic impulse to the area.

In this report two Hbo-students Civil Engineering will design the project as an example for Rijkswaterstaat. The target of this thesis is to develop a plan for the realisation of the compensation project Perkpolder. The goal is to develop Westerschelde-related nature under influence of full tide, creating a dynamic intertidal zone with considerable natural value.

In the current situation the planning area is divided in three polder regions: the Kleine Perkpolder, Noordhofpolder and Noorddijkpolder. Secondary flood defences with historic value, the Kalverdijk and the Noorddijksedijk, separate the polder regions. To reach the desired situation a global plan is set up. The development of Westerschelde-related nature has a central role in this process. Westerschelde-related nature stands for a dynamic intertidal zone with considerable natural value with a multi-channelled system including low and high areas. The area will be developed under influence of the tide of the Westerschelde. The area will be placed under a gradient between the low waterline and the high waterline.

For the development of the area, four alternatives are designed. The alternatives are tested on a list of demands summed up in a scoring card. These demands are broken up into 14 criteria, divided into four categories. The four categories are: design of the area, waves, water and sedimentation. The alternative that scores highest will be elaborated as a design for the area. The resultant design will contain the measurements of the breach and the design of the dikes.

In the first alternative the length of the area is fully used. By placing the breach in the north of the planning area a very dynamic natural zone can be created. The breach in the middle of the current dike is the main point of the second alternative. From here on the water will be directed to the north as well as the south. In alternative three the breach will be placed in the south of the planning area. From here on the water will be directed to the north as well as the southwest. The fourth alternative differs from the other alternatives by making two breaches in the current dike. One will be placed in the north, the other will be placed in the south of the planning area. The first alternative resulted in the highest score.

The final design is based on the first alternative with the breach in the north of the planning area. To get enough water in the planning area the Kleine Perkpolder will be excavated to 1,00 meter under NAP. Openings will be made in the secondary dikes. The breach in the current dike has a width of 100 meters. The dike revetment of the current dike and the breach are designed for a high storm tide of 5 meters above NAP. A granular filter will protect the breach.

The storm surges that appear with a storm tide of 5 meters above NAP will damage the inside of the current dike. Therefore the inside of the current dike will not comply. Looking at the hydraulic conditions the inside of the current dike needs a revetment and must be reachable for maintenance. A shoulder including a maintenance road will be placed on the inside of the current dike. At the location of the breach a protection will be situated to protect the primary dike against the current velocity in the planning area. The inside of the current dike will be protected with a concrete revetment. At the location of the breach, the current revetment will be re-used.

To protect the inland a new primary dike must be constructed surrounding the planning area. It will be designed for a representative situation in 2060. The available hydraulic conditions are translated into waves and water levels inside of the planning area. For these hydraulic conditions the crest level of the primary dike is dimensioned. The crest level is based on the design level with an additive for rising of the sea level, wave run-up or wave overtopping, shower oscillation and settlement and setting of the dike body. The crest level varies between 9,50 meter and 10,40 meter above NAP. A revetment of concrete will protect the outside slope of the primary dike. The height of the concrete elements varies between 0,25 meter and 0,35 meter.

As a finishing touch a global account valuation is made, based on the design. The total cost is estimated on 25,0 million euros including tax (21,0 million euros tax excluded). The account valuation is based on characteristic values with unit prices.