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Modeling and monitoring the hydrological effects of the Sand Engine.

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Since 1887, Dunea Water Company produces high quality drinking water using the dune area at Monster (Province of South Holland, the Netherlands). Annually, 8 billion liters of water is produced here using artificial recharge and recovery with shallow wells and infiltration lakes. The dunes are an important step in producing drinking water serving as an underground buffer, leveling fluctuating in temperature and quality and removing bacteria and viruses from the infiltrated water in a natural way. Since space is limited in the Netherlands, the drinking water production of Dunea is closely matched with surrounding land uses and natural constraints. This prevents groundwater nuisance, upconing and intrusion of salt water and, in this case, movement of a nearby groundwater pollution. This is especially true in the Monster area where the dunes are fairly low and small; the coast is less than 350 meters from the recovery wells. The coast of Monster was identified as a weak link in the coastal defense of The Netherlands. Because of this, two coastal defense projects were carried out between 2009 and 2011. The first project involved creating an extra dune ridge in front of existing dunes which leads to intrusion of a large volume of seawater. Directly after completion, the Sand Engine was constructed. This hook shaped sand peninsula will supply the coast with sand for the coming decades due to erosion and deposition along the coast. These two large coastal defense projects would obviously influence the tightly balanced hydrological system of Monster. Without hydrological intervention, the drinking water production would no longer be sustainable in this area. To study the effects of these projects and to find a solution to combine coastal defense and drinking water supply, field research and effect (geochemical) modeling were used interactively. To prevent negative effects it was decided to construct interception wells on top of the new dune ridge (28 in total). A comprehensive monitoring system was built to keep track of the salt groundwater and the groundwater heads. The zero measurement included groundwater heads, water samples, but also geophysical methods such as SkyTEM and CVES. We will also show the monitoring system we use to keep track of the groundwater heads and salt water intrusion in the future.