## LOCATION OF MANAGED REALIGNMENT SITES IN SCHELDT ESTUARY HAS OPPOSING EFFECT ON SALT INTRUSION

This paper explores the effects of Managed Realignment Sites (MRS) on salt intrusion within the Scheldt Estuary. Estuaries, such as the Scheldt, are environments where freshwater and saltwater mix, and their salinity distribution is influenced by various factors, including tidal forces and river discharge. The process-based 2D depth-average numerical model 2D in this paper was modified to incorporate MRS locations determined by two pre-existing projects ("Dubbele Dijken" and "Sigmaplan"). A total of five scenarios were simulated: (1) a base scenario without any MRS open into the model, (2) a scenario where all MRS are open, (3) a scenario with only the MRS near the estuary's mouth open up to the Hedwige MRS, (4) a scenario where only the upstream MRS beyond the Hedwige MRS are open, and (5) a scenario where only the MRS connected to the Hedwige MRS, along with the Hedwige MRS itself, are open. The results indicate an impact on salt intrusion patterns: MRS situated near the estuary's mouth (3) led to a reduction in the average salt intrusion length (800 m) of 29 days, whereas upstream MRS (4) contribute to an increase in salt intrusion length (1700 m). Furthermore, when analyzing the average salinity along the estuary, a S-curve emerges (see Figure 1). In the scenario where the upstream MRS are open (4), the salinity decreases near the estuary's mouth (min -0.1 psu) and then increases further upstream (max 0.6 psu). Conversely, in the scenario where the MRS near the mouth are open (3), the salinity increases close to the mouth (0.4 psu) and decreases further upstream (min -1.8 psu). The scenario with all MRS open resulted in a combined effects of scenarios 3, 4, and 5. The scenario with the enlarged Hedwige MRS (scenario 5) shows changes of less than 0.1 psu. The tidal prism exhibits a comparable pattern. The results are consistent and align with existing literature, indicating that the findings can be considered robust. Given the growing importance of sustainable strategies in estuarine management, these findings provide initial insights into the effects of MRS in affecting estuarine salinity, highlighting the need for further research in this area to inform future realignment and restoration projects.



### Figure 1: Difference psu value plot compared to the All MRS Closed scenario averaged of the last 29 days of the simulation, in red showing the location of the Hedwige MRS



### **Marnix Riepen**

Graduation Date: 30 September 2024

#### Graduation committee:

University of Twente dr. ir. B. Borsje Supervisor J. Bootsma MSc Supervisor

Flanders Hydraulics dr. ir. J. Vanlede E.X.T. Advisor

# **UNIVERSITY OF TWENTE.**