

3D HYDRODYNAMIC MODELING TO CHARACTERISE THE BEHAVIOUR OF THE DISPOSAL OF DREDGED MATERIAL USING A VERTICAL TREMIE PIPE

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INTRODUCTION

Dredge plume modelling forms an integral part of the supporting studies for EIA applications for both capital and maintenance dredging projects. The behaviour of dredge plumes is function of many variables, many of which are unknown at the time of undertaking the studies. As such engineering judgment, previous project experience (including engaging dredging contractors) and available literature form part of the tools used to characterize the behaviour of dredge plumes. This paper summarises two case studies where underwater disposal (using a vertical tremie pipe) of dredge material from a cutter section (CSD) was simulated in order to meet the regulatory standard at the edge of mixing zone.

DREDGING METHODOLOGY & PLUME MODELLING

The preferred method to deepen the access channel and dredging pipe was using a combination of CSD (with barges) for the soft rock material.

However, extensive engagements with the environmental agencies led to the requirement for underwater disposal of the dredge material (instead of using barges), at designated locations.



Figure 2 - 3D rendition of the underwater disposal to be simulated.

The following challenges were encountered in the modelling:

- Estimating the fine sediment release during in-channel disposal (including behaviour of dredge material in the disposal pipe)
- Disposing the material at the specific tides in order to achieve regulatory limits
- Ensuring the dredge material slurry was confined within the access channels, with no resuspension.

Various literature references, previous project experience and engagements with dredging contractors provide realistic estimates of the fines release. DHI MIKE suite of software was used to characterize the behaviour of the dredge plume. The following conclusion can be made:

- Environmental agencies require robust engagement to highlight the practicalities in order to minimise project overruns.
- Selection of representative conditions and characterisation of the fines sediments released is critical in the modelling - shown via sensitivity runs.
- Correct feedback of the waves, currents and sediment plumes is critical especially in shallow waters, hence the use of DHI MIKE 21/3 Coupled Model, where possible, is recommended.
- Where innovative methodologies are required, engage dredging contractors early on.

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REFERENCES

Advisian (2017): Appendix F - Seawater Recirculation and Dredge Plume Modelling Report (Client Confidential)

WorleyParsons (2016): Appendix I - Dredge Modelling Report (Client Confidential).