# Procurement of Dredging Works

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## Summary

Port management teams irregularly procure capital dredging works, which by their nature have a unique character. Geotechnical [1], [2] and environmental conditions are the main causes of uncertainty. Contract drafters must appreciate these uncertainties when selecting contract-type and properly allocating the risks and opportunities between parties. Tender evaluators should check the feasibility of budgets and programs in relation to likely dredging equipment, by developing budget and schedule shadow estimates and allowing for the risk of uncertainties. Employers should closely monitor execution progress using software tools to ensure projects come in on time and within budget.

*Keywords: marine construction, dredging, contract-type, tender, contractor*

## Introduction

Most ports procure capital dredging works on an irregular basis. Due to the nature of these unique works, procurement of port dredging works is not straight forward. Disputes arise mainly due to dealing with uncertainties surrounding the execution of port projects.

This is a short paper on what is a relatively complex topic and consequently, it only provides an overview. The lists and discussions provided herein are not exhaustive, further reading in [3] and [4].

## Conceptual Dredging Design

Having realistic and robust conceptual dredging designs from a project's outset is important to develop realistic budgets and programs.

Conceptual dredging designs should include:

- Dimensions – of e.g. channels, slopes;
- Borrow and/or disposal area(s);
- Soil or rock type;
- Dredgeability; and
- Social or environmental constraints.

## Risk and Opportunity Analyses

Risk and opportunity analyses should be carried out throughout a project, but should start in the very early stages of a project's lifecycle [5]. This is to ensure that all owners and stakeholders are aware of the risks and can plan accordingly.

## Site Investigation

At project instigation stage, site investigations must be carried out to provide sufficient definition on the physical conditions present onsite so as to avoid cost blowouts, claims and/or delays. Site investigations that are invariably needed include [6]:

- Geotechnical
- Bathymetry
- Environmental
- Social

Large datasets that are easy to combine, for example bathymetry data with geotechnical models, should be combined in Geographic Information Systems (GIS) to make the data easier to visualise and more accessible to the project team. Figure 1 shows an example of two datasets, sub bottom profile surface and cone penetration testing and are combined in a GIS.

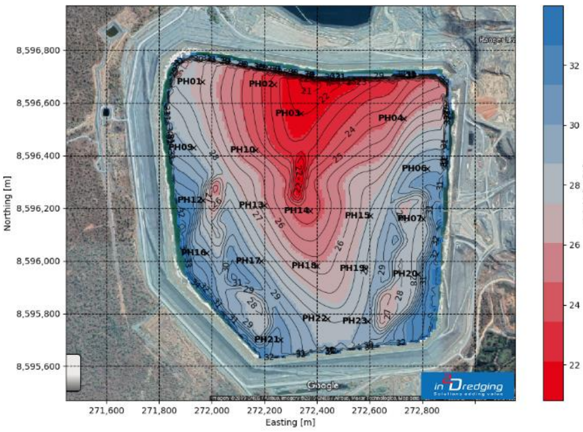


Figure 1 Combined survey and geotechnical data (Source: in2Dredging)

Marine soil investigations are expensive and time consuming. Nonetheless, they are an essential step in a dredging project's success by ensuring that appropriate dredging equipment are selected for the project, programs and budgets are better defined and owner's risks are better protected.
Dredging involves either cutting, jetting or blasting soil and/or rock. As geotechnical engineers are not usually familiar with these destructive soil mechanical processes, it is important to consult with and rely on dredging engineers to deliver the

appropriate geotechnical data to be used for production estimates [2].

### Contract-Type Selection

Table 1 shows the multi-criteria analysis tool used for contract selection. Main contract types are shown on the left with the main criteria across the top. Weighting values are set to suite each projects' risk allocation. The scores assigned in the matrix can range from -2 unfavourable to +2 favourable.

Once analysis is complete, the contract-type selected is the one with the highest weighted rating, which in this example would be a Charter contract.

Table 1 Multi-criteria analysis for contract-type selection

| | HSE | Budget | Schedule | Definition | | Rating | Weighted Rating |
|---|---|---|---|---|---|---|---|
| Weighting | 5 | 1 | 3 | 1 | | | |
| | | | | | | | |
| Charter ($/hr) | 2 | 0 | -1 | 0 | | 1 | 7 |
| Unit Rates ($/m$^3$) | 0 | 1 | 0 | 0 | | 1 | 1 |
| Lump Sum ($) | 0 | 1 | 1 | -1 | | 1 | 3 |
| Design and Construct ($) | 0 | 0 | 1 | 1 | | 2 | 4 |

The main contract types mentioned in the table above require little explanation.

Safety first, right? When it comes to contract-type selection, however, Health, Safety and Environment (HSE) is often overlooked by contract drafters. Therefore, it is important to put HSE at the forefront when drafting contracts.

The level to which risks can be defined at an early stage depends on the extent and quality of site investigations and the level of detail in the Scope of Works. If the scope is less defined, Design and Construct contracts become more favourable.

### Tender Evaluation

Multi criteria analysis can also be used for qualitative assessments of tenders, but in this case, the main criteria in Table 1 are usually further defined. It must be kept in mind that focusing too much on a contract price is unlikely to bear the lowest price over the project's life, especially when this leads to HSE, programs and cost overruns.

Programs depend on the production capacity of the equipment mobilised to site. Consequently, for clients to be able to create their own reliable shadow estimates and programs, the likely dredging equipment needs to be considered. Quantitative assessments of production estimates are essential to a project's success and come at negligible cost.

### Project Execution

A project's execution phase should be considered during the procurement phase. Project specifications should stipulate that enough data be provided to make permit compliancy reviews possible and allow contracts to be administered successfully.

An important factor in project execution is performance. These days, almost all dredges have onboard data acquisition systems, whose data can be used by software tools like i2D's Equipment Performance Review (EPR) to allow daily performance monitoring. This in turn safeguards budgets and programs. Figure 2 below shows a sample graph produced by EPR to monitor vessel speed.

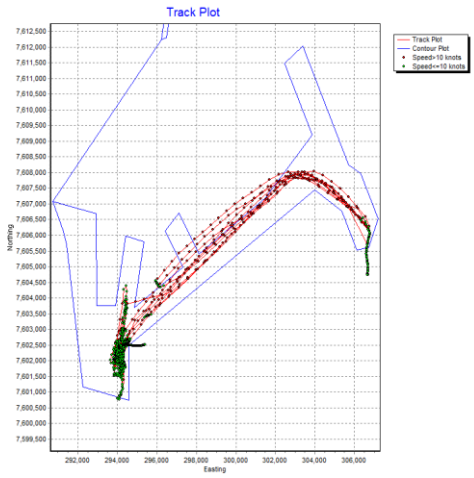


Figure 2 Vessel speed monitoring graph (Source: EPR)

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