

## **Contractual Model for Dredging Projects to Avoid Disputes: Case Studies of the application of Performance Based Contracts in dredging projects around the world.**

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### **ABSTRACT**

The new application of **Performance Based Contract (PBC)** to dredging (also known as a “**draft guarantee contract**”) transfers to the contractor all sedimentation risks over long periods of time and pays for all his services via monthly fixed amounts. The method is so successful that in some cases the PBC has lead to novel financing via tolls of the waterway (a **concession contract**).

Up to now, most dredging by port and waterway authorities has been paid from public funds through, (1) surveyed volumes and fixed price or, (2) a charter contract paid directly by the agency. These methods are known to harbor the risk of disputes, primarily arising from the technical documents when encountering adverse site conditions. PBCs are especially advantageous to both the Owner and the Contractor when: (1) there is a stable level of policy, (2) where sedimentation can be evaluated within reasonable assumptions of risk, (3) where all other risks are covered with reasonable contractual limits (for example, extreme weather conditions), and (4) there is a sufficient yearly volume to be dredged that allows for competitive bidding.

This paper provides supporting information of three successful applications of PBCs in Argentina and The Netherlands in large dredging programs. In all instances, disputes have been absent throughout these three contracts (involving over 20 years of continuous dredging). Additional data is presented on the technical and quality aspects that are most significant to the PBC to preserve the quality and successful completion of the projects.

**Keywords:** Performance Based Contract, adverse site conditions, dredging.

### **INTRODUCTION.**

Performance Based Contracts are really a derivative form of Public Private Partnerships (PPP). This powerful financing method speeds up investments in intermodal infrastructure works and services. Although the PPP method has recently received wide coverage in the press and in technical magazines, it is now 355 years old!

In 1663, by Act of Parliament, a toll road was built via a PPP at Wadesmill in the Hertfordshire, United Kingdom. Throughout the 1800's, toll roads, bridges and tunnels were built in the USA using the PPP method, which was equally popular building railroads in France, the London subway, and even both major canals at Suez (1860) and Panamá (1880). The PPP method went out of fashion during the Great Depression (stemming from Wall Street's crash on 29 October 1929 and lasting through 1939). Following the Great Depression all infrastructure works became a state-owned monopoly until the resurgence of PPP in the 1980's when national budgets were allocated almost entirely on social programs and practically nothing on infrastructure.

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This paper discusses the use of the PBC method via data from three successful PBC dredging projects in Argentina and The Netherlands.

### CASE #1: Bahía Blanca, Argentina.



Figure 1: General location map of the two port areas using the PBC method in Argentina: (1) at Bahía Blanca and (2) from the Atlantic Ocean - Río de la Plata - Río Paraná to Santa Fé (red line).

The 97 kilometer length of the Bahía Blanca estuary has 45 major cargo terminals. In 2016, these terminals handled 27.400.000 tons of cargo from 1,051 vessels.

Port operations are greatly affected by very high tides, from 4.5 m (15 feet) at the port down to 2.5 m (8 feet) at the channel entrance in the Atlantic Ocean. The minimum draft is 13.7 m (45 feet), which must take into account these very high tides. The port's management identified a "window" of operations in order to reduce the annual cost of dredging, in combination with the use of Performance Based Contracts (PBC).

Before 1980, the national Argentinean government operated all of the ports in Argentina. From 1980 to 1999, port operations were transferred to their respective provincial governments through new local public agencies. These agencies let out dredging contracts based on pre-fixed volumes. These pre-fixed volumes led to problems maintaining their minimum drafts, and there was no guarantee that a vessel could traverse any particular channel without grounding.

For the above reasons, since 1999 the Port of Bahía Blanca adopted the use of Performance Based Contracts (PBC). That decision was based on:

- (1) The many year of experience of Bahía Blanca's port personnel;
- (2) The meticulous gathering of massive hydrodynamic data of the port's conditions throughout the year during 20 years, including detailed knowledge of the types of sediments;
- (3) Preparation of statistical analyses of that data to predict future volumes of sediments.

The results of using PBC since 1999 has been that the minimum draft of 13.7 m (45 feet) has been maintained during 24 hours a day, 365 days of the year. That draft was paid solely from the tariff fees levied upon the port users.

These PBCs were granted in 5-year increments. Their implementation was based on three phases:

- Phase One: In **Year-1**, the channel was fully **surveyed** (bathymetry) to establish the pre-dredging conditions. The contractor **mobilized equipment and personnel**, pulled all the required **permits**, established field and office operations, etc.
- Phase Two: **Capital dredging also in Year-1 to attain the minimum draft and channel width**, with an initially pre-estimated volume of 1 million m<sup>3</sup> based on hydrodynamic studies. This phase also included placing all navigational aids. After this phase was concluded and the actual volume dredged was ascertained to reach the minimum draft of 13.7 m (45 feet), then the payment was adjusted accordingly.
- Phase Three: **Years 2 through 5 involved maintenance dredging, improving the navigational aids and performing correctional studies to adjust the channel.**

The contract consisted of 60 equal monthly payments, plus the initial adjusted capital dredging.

The consequences of this PBC was that the contractor assumed all the sedimentation risks over longer periods of time and was paid for his services with monthly fixed amounts.

As the contract evolved, the PBC converted to a Concession Contract, where, in addition to sedimentation and draft risks, the contractor's monthly payments were made entirely via user tolls.

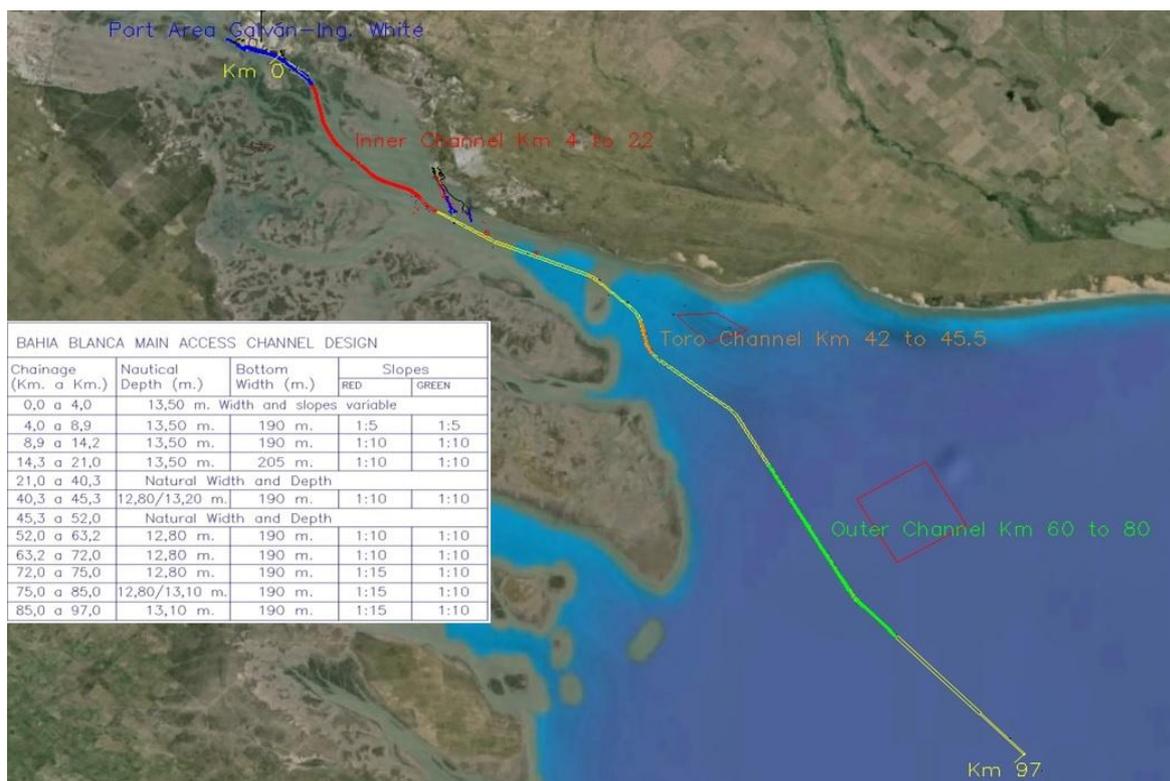


Figure 2: The access channel for Bahia Blanca is 97 kilometers long with 45 major cargo terminals.

The latest 5-year PBC was signed on the 17<sup>th</sup> of February 2012 (renewed last year) with Royal Boskalis Westminster n.v., and notice to proceed (NTP) was issued on the 4<sup>th</sup> of April 2012. The PBC required dredging 3 million m<sup>3</sup> each year, which was equivalent to a cost of USD 72,000,000 per year. The cost of dredging was paid entirely by the tariffs levied on each ship that used the channel.

The PBC was made up of two parts: (1) the Technical Offer, and (2) the Financial Offer.

The Technical Offer required the bidder to fulfill a number of formal requirements and comply with the Technical Specifications. For example, there were two types of dredging; (1) the main channel was dredged with a trailing suction hopper dredge (TSHD) whereas the piers and wharfs were dredged with a water injection dredge (WID). When the contractor presenting the best Technical offer was identified, then the evaluation process passed to the Financial Offer.

### The Payment Mechanism.

As an example, assume the project has an initial volume to be dredged of 2 million m<sup>3</sup> at a bid price of USD 10.50 per m<sup>3</sup>, which has to be a competitive price included in the Financial Offer.

$$\text{Monthly payment} = \frac{\left(\frac{\text{USD } 10.5}{\text{m}^3}\right)(2 \times 10^6 \text{ m}^3) + \text{Annual maintenance costs}}{60 \text{ months}}$$

$$\text{Monthly payment} = \frac{(\text{USD } 21,000,000) + (4 \text{ years})(\text{USD } 4,500,000/\text{year})}{60 \text{ months}}$$

$$\text{Monthly payment} = \frac{\text{USD } 39,000,000}{60 \text{ months}} = \text{USD } 650,000/\text{month}$$



Figure 3: The dredging of the main channel for Bahia Blanca's 97 kilometer estuary was done by the TSHD "Shoreway" from Royal Boskalis Westminster n.v. (hopper capacity 5,600 m<sup>3</sup>).



Figure 4: Dredging of the piers, wharfs and quays was done by a water injection dredge (WID).

In conclusion, the Port operators attribute the success of the PBC method at Bahia Blanca to the following reasons:

- (1) The PBC method guaranteed the safe navigation of all their client ships with an insured minimum draft in the entire length of the 97 kilometer channel, during the entire year without exclusion times;
- (2) A major factor that insured the method's success was having accumulated data during several decades of good and bad experiences of every aspect of the port terminals and the entire estuary.
- (3) The accumulated data of the last 20 years of port operations was then statistically analyzed and the results of the analyses predicted the rates and types of sedimentation, which were shared with the bidders for their use.
- (4) The PBC experience has shown that much lower bid prices are obtained when the contracts are at least five (5) years long.
- (5) The PBC was further enhanced if the port authority guaranteed monthly payments in-full.
- (6) It is important to maintain a cordial relationship with the contractor. For example, the port personnel did not rush to impose penalties for infractions. It was better to establish simple legal rules to resolve all contractual problems in an atmosphere of mutual respect and partnership.

In parallel to the Bahia Blanca experience, Royal Boskalis also held similar PBCs to dredge the Paraná and Uruguay rivers close to Diego García Island on the Río de la Plata, with equal success.

**CASE #2: Atlantic Ocean, Río de la Plata, Río Paraná to Santa Fé, Argentina.**



Figure 5: (Left) Location of project's influence area in South America; (Right) Location map covering the PBC from the Atlantic Ocean, up the Río de la Plata, Río Paraná to the port of Santa Fé.

An even older PBC success (by four years) took place on the Río Paraná, managed by the contractor Hidrovía Waterway Concession (led by the Belgian dredger Jan De Nul) between 1995 to 2013. That contract covered the much longer 800 kilometer channel: from the Atlantic Ocean to Río de la Plata to Río Paraná up to the port of Santa Fé. This navigational channel carried over 80% of Argentina's exports, and included not only ocean-going traffic but also heavy local river barges..

In most respects, the PBC had the same elements as the Bahia Blanca PBC. The contractor assumed the risks of sedimentation and the consequent increase in channel traffic.

The first and second phases were similar to Bahia Blanca's, with the capital dredging of 22 million m<sup>3</sup> performed from 1995 to 1996 to deepen the draft of the 800 kilometer main channel from 9.8 m (32 feet) to 10.4 m (34 feet). In parallel, the entire length was covered with navigational aids (buoys, radio beacons, etc.). The PBC called for the maintenance of the minimum draft all 24 hour per day year-round without interruptions. A toll system was created to pay for the dredging and the navigational aids.

The contractor had operating three full-time trailing suction hopper dredges (TSHD) with hopper capacities ranging from 3,400 to 6,000 m<sup>3</sup> to maintain the channel year-round, but in peak sedimentation periods it brought in an additional large cutter suction dredge (CSD) to work heavily shoaled areas of the channel. The CSD also created sedimentation traps in the Río de la Plata estuary to capture peak sedimentation and guarantee the minimum draft at all times. Hidrovías also continuously maintained the buoys and electronic equipment along the entire length of the concession. Five (5) survey vessels continuously mapped the draft of the entire channel.

The tolls are paid by all commercial vessels based on their tonnage and length of channel navigated. These tolls are continuously revised to balance the costs versus the revenues to reach a net zero income. The costs for the typical user is about 1 USD/ton of grain exported or 16 USD/TEU.

### CASE #3: The Rijkswaterstaad (RWS) of The Netherlands.

The Rijkswaterstaad (RWS) is the public executive agency of the Dutch Ministry of the Infrastructure and the Environment that manages all of the nation's territorial waters.

The Rijkswaterstaad dredges 30 million m<sup>3</sup> each year, with about half representing maintenance dredging (see Figure 6), whilst the remaining half is divided between capital dredging and beach nourishment. All dredging contracts are done by private contractors (the RWS has zero dredges) and all contracts are PBCs.

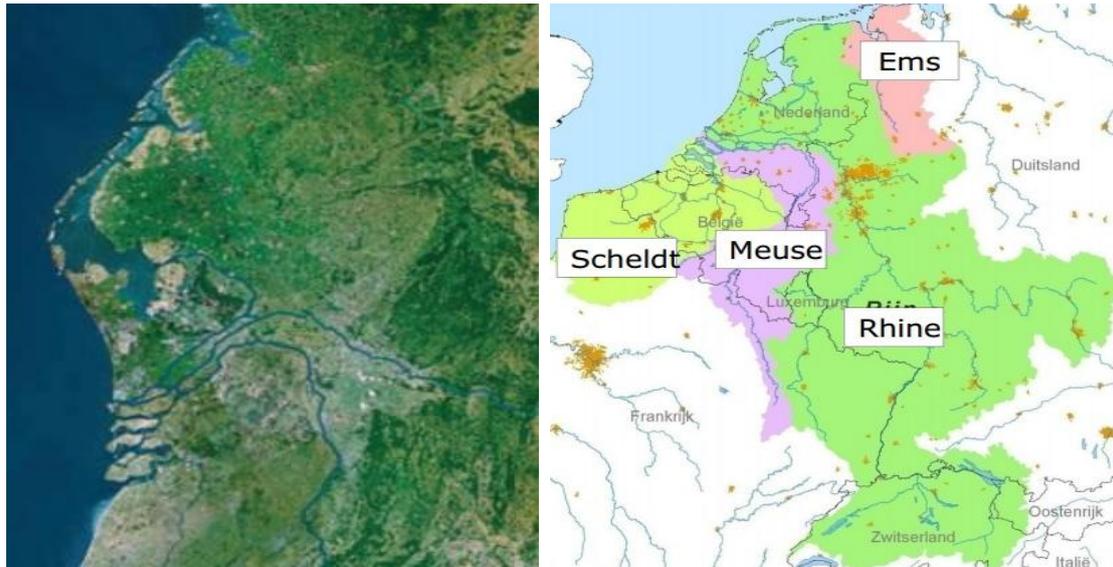


Figure 6: The Netherlands occupy the delta of four rivers with a population of 17.1 million (2016).

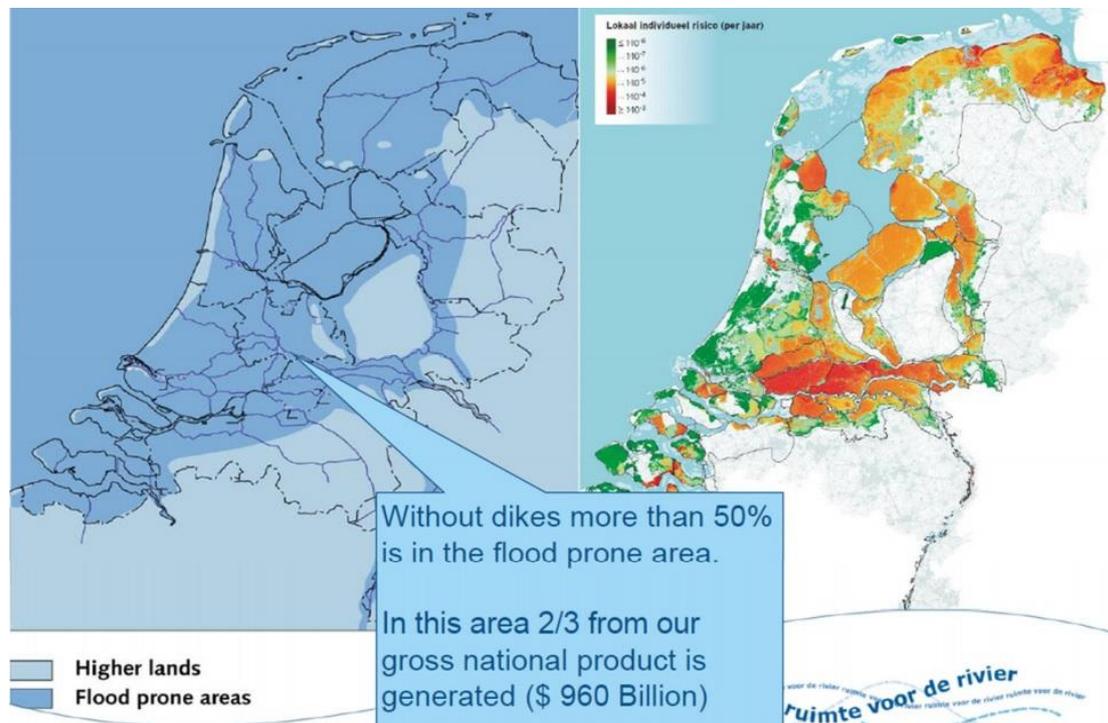


Figure 7: Without its dikes, over 50% of The Netherlands would be under water.

Like all PBCs world-wide, the RWS requires that their contractors assume all the risks of a dredging project. A typical organizational chart is shown in Figure 8, where most of the activities belong to the contractors who are thus responsible for all risks.

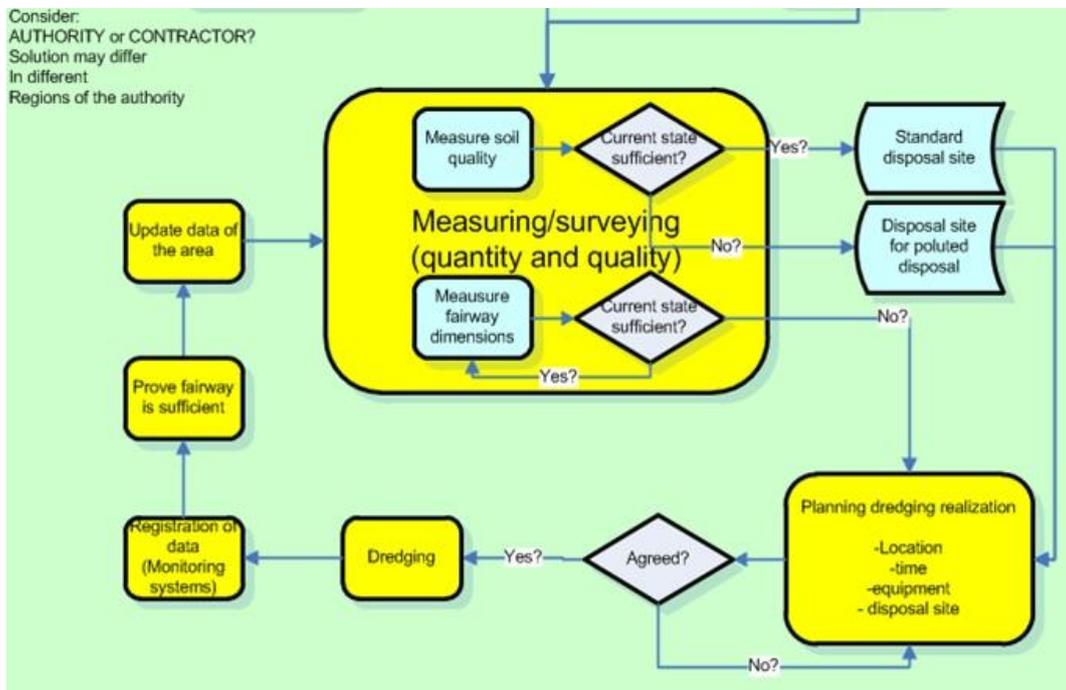


Figure 8: The RWS demands that all major decisions in dredging (yellow rectangles) must be taken by the contractor (the grey rhombs are decisions made by the RWS).



## Procurement trends Rijkswaterstaat

- Shift from traditional contracts to innovative contracts where the contractor has more responsibilities
- Example performance contracts where contractor is responsible for guaranteed depth of fairway
- maintenance for a long period can be part of the construction contract



Figure 9: The RWS has stopped using traditional contracts and have moved to Performance Based contracts (PBC) where the contractor has most responsibilities. For example, their PBS requires the contractor to guarantee drafts in their canals and ports in exchange for maintenance contracts over longer periods of time.

## The World Bank and Port reform.

The World Bank continues to be a major force in reforming the port sectors of emerging economies. Their **Service Port to Landlord Governance** model has found wide application, where the Landlord model has resulted in a clear separation between public and private responsibilities embedded in concession contracts. This includes the investments, tasks, revenues, and risks.

The World Bank provides decision support tools to undertake reforms of public institutions that provide, manage or regulate port services in developing countries. The Bank also helps to choose options for private sector participation and assists in the analysis of the relationships between public and private parties, suggests legislation, contracts and institutional charters to govern the private sector's participation.

The World Bank is currently implementing a PBC for the dredging in Bangladesh of a major navigational channel between Chittagong and the capital Dhaka. The small country is formed by the confluence of three huge rivers merging into a single delta: the Brahmaputra (Jamuna), Ganges (Padma) and Meghna rivers that discharge into the Bay of Bengal.

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