

# Black Sea Pipeline Landfall Seabed Dynamics

The Blue Stream pipeline is part of a system to transport processed gas from a station in southern Russia across the Black Sea to Ankara, Turkey. The Turkish landfall is located near Samsun.

An important aspect of the design of pipeline through a morphologically dynamic area, such as the landfall, is the required burial depth. The burial depth is the result of an optimisation between:

- Safety of the pipeline (which often requires a large burial depth), and
- Environmental impact and trenching costs (a small burial depth means less dredging and less environmental impact).

The objective of this study was to assess the extreme seabed depth in the morphologically dynamic landfall area. This is required to determine the burial depth of the pipeline.

Client: **Snamprogetti**

Carried out in: **2000**



Project description

## Introduction

The Blue Stream pipeline is part of a system to transport processed gas from a station in southern Russia across the Black Sea to Ankara, Turkey. The Turkish landfall is located near Samsun.

The objective of this study was to evaluate stability of the seabed in the area of the Turkish shore approach. The area of interest was along the pipeline between the coastline and the 40-m depth contour.

## Study Approach

The following approach was followed:

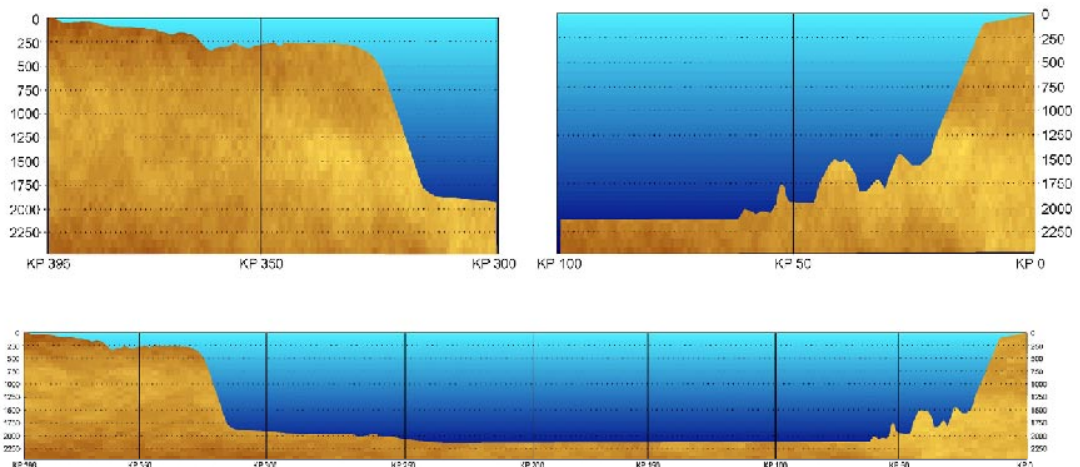
- Collection and analysis of relevant historical information.
- Review of the historical coast development.
- Long-term seabed stability was studied based on longshore transport calculations and coastline evolution simulations.
- Short-term seabed stability was studied based on cross-shore transport calculations and cross-shore profile evolution simulations.
- A design seabed profile was proposed based on both short term and long term seabed variations.

Both short term and long term coast evolution were assessed to quantify the expected lowest seabed level along the pipeline route in the landfall area during the pipeline lifetime of 50 years. The results were used to determine the required pipeline burial depth.

The long term morphological changes originate from long term variations in the morphological system (e.g. river input), gradient in the longshore sediment transport and long term variations in the hydrodynamic conditions. The short-term morphological changes originate from beach profile variations due to cross-shore sediment transport as a result of seasonal and yearly variations in the wave and current conditions.

Numerical modelling was applied to compute the longshore and cross-shore sediment transport rates and the resulting coastline evolution and cross-shore profile evolution. The longshore transport model was validated using the available data on the coastline changes in the past 20 years, which was derived from the satellite images.

The 50-year lowest seabed level was determined as the sum of: lowering associated with the coastline retreat in combination with the extreme (short-term) cross-shore evolution.



### Turkish landfall

### Russian landfall

(seabed profile including detail plots at landfalls)

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