



Drilling Contractors Association (DCA-Europe)

Back to the Danube: Engineering a Hard Rock Breakthrough

30th DCA Annual Congress Rome

2 October 2026

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Horizontal Drilling International



A Strategic Pipeline, A Critical Crossing

Black Sea Shore - Podișor Gas Pipeline

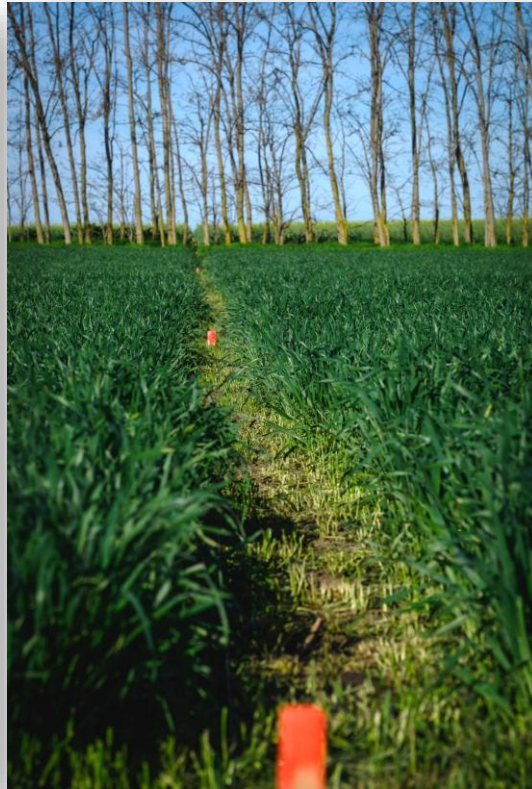


- Strategic infrastructure for Romania and Europe
- Multiple HDD crossings along the route
- Danube HDD: 2 x 1.8 km, 8 and 40-inch pipelines
- The most technically demanding crossings

A Peaceful River, A Difficult Subsurface



Assumptions → Reality → Engineering Response → Breakthrough → Consequences



Initial Study:

- Predominantly alluvial concept
- Carbonate bedrock expected below the profile

Revised Model:

- Shallower carbonate bedrock
- Irregular rock-alluvium interface
- Multiple geological transitions



TECHNICAL REPORT

Post Geotechnical & Geophysical Investigation on Danube River

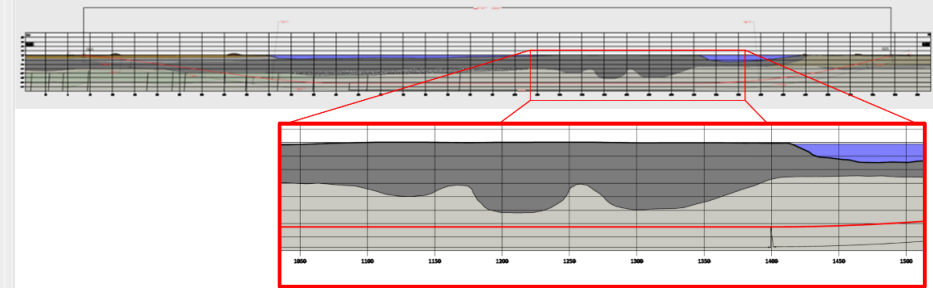
Contractor: Horizontal Drilling International SAS
 Document No. 2303-TEC-012-Technical Report – Danube river
 Contract Ref.: BlackSea-Podisor HDD – HDI Crossings
 Contract Name: Service Supply Agreement CIS GAZ HDI
 Location: Near Cochirleni
 Scope of Works: Danube River crossing by Horizontal Directional Drilling
 Client: CIS-GAZ
 Client Ref.: TBD

Reviewed and Accepted by

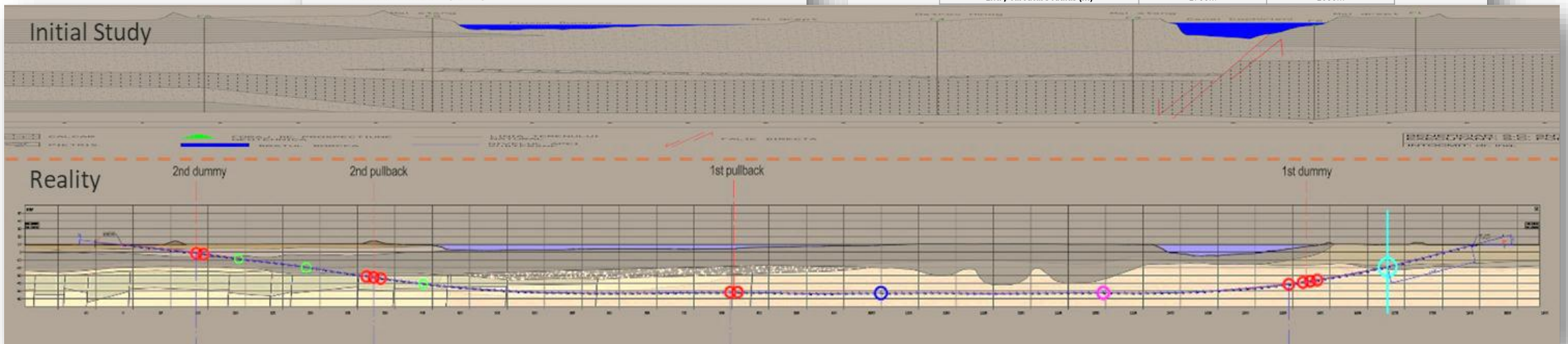


4. FEASIBILITY FOR EXECUTION

HDI's profile for execution



Parameters	Employer's design	Execution design
Elevation difference (m) Entry - Exit:	-0,9m	0,11m
Horizontal length (m)	1805,93m	1805,93m
Drilling length (m)	1812,14m	1815,24m
Entry angle (°)	10°	14°
Entry curvature radius (m)	1700m	1600m



The Downhole Tools Became Geological Evidence

- Higher-than-expected tool wear
- Changing torque, vibration and ROP
- Field evidence refined the ground model

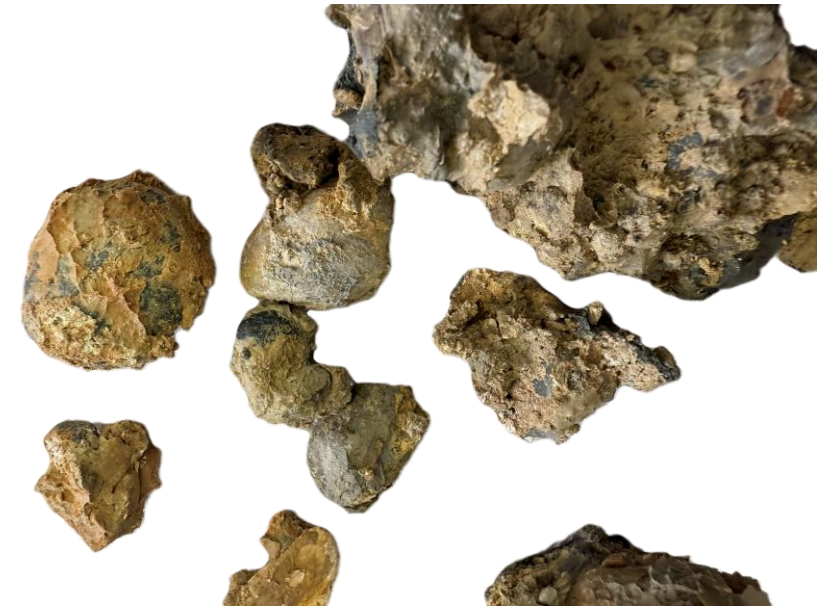


Engineering Became Part of Field Operations

Observe → Interpret → Reassess → Act



Geological Variability, Not Simply Hard Rock

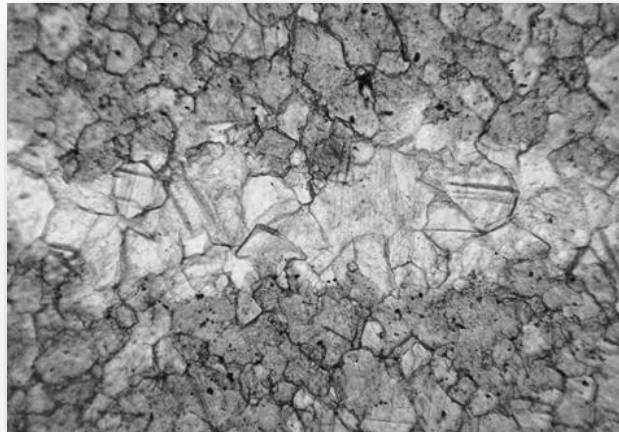


- Rapid hard-to-soft transitions
- Variable cementation and weathering
- Clay seams and fracture infill
- Changing torque, ROP, vibration and fluid behaviour

Dolomitisation Increased Abrasivity



- Harder and more abrasive intervals than anticipated
- Reduced penetration rate
- Accelerated cutter wear
- More frequent inspection and tool replacement



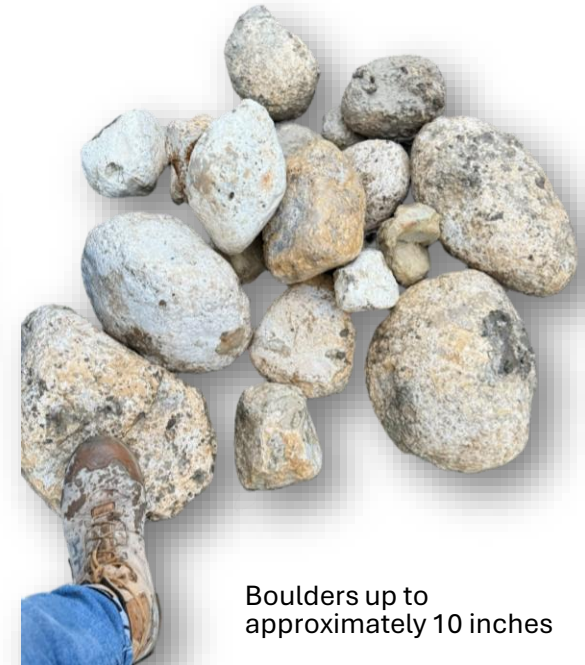
Local Anomalies, Major Consequences

- Large limestone boulders recovered during fishing
- Some exceeded effective cutter damage
- Increased torque and reduced drilling efficiency
- Repeated conditioning and reaming required

50-inch hole opener



40-inch stone catcher



Boulders up to approximately 10 inches

Completing the Borehole Was Not the End of the Risk

- Drilling and reaming progressed
- Inspection and conditioning continued
- Installation became the defining challenge



The Scale of the Installation

- 40-inch pipeline
- More than 1.8 km
- Single continuous pullback



Two Installation Attempts Failed



Attempt **1**

- Extensive bore conditioning
- Pipe Pusher deployed
- Installation unsuccessful



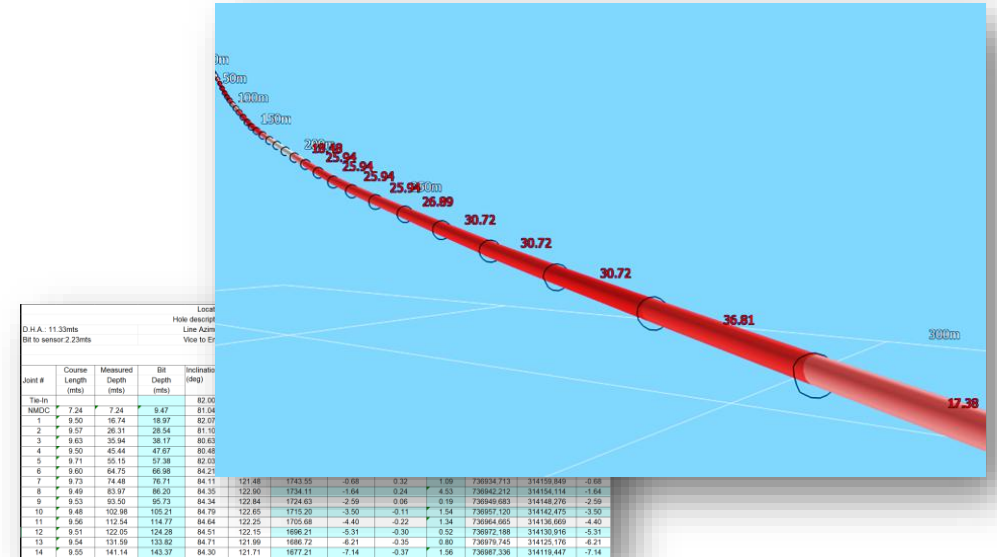
Attempt **2**

- Additional intervention
- Installation unsuccessful again

Bend Wizard: Modelling the Bore That Actually Existed

Project-Specific 3D Pipe-to-Bore Contact Analysis

- Final steering-tool re-survey
- Actual three-dimensional bore geometry
- 40-inch pipe-to-bore contact analysis
- Local installation constraints visualized



Target the Constraint, Not the Entire Borehole



- Critical sections identified by 3D analysis
- Selected sections enlarged from 50 to 56 inches
- Remaining alignment retained at 50 inches
- Additional cleaning and conditioning

Physical Verification Before the Third Attempt



- Multiple cleaning and swabbing runs
- 40-inch dummy pipe runs
- Bore condition assessed after remediation
- Results broadly supported the 3D analysis



Residual uncertainty remained.

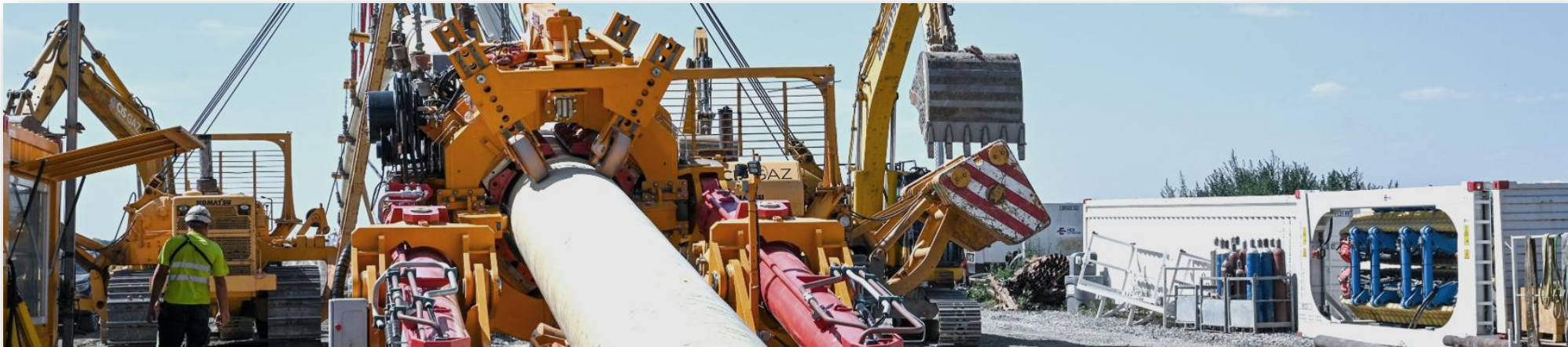
Operational Support for the Final Pullback

- 550t Pipe Thruster support
- Controlled axial assistance
- Updated strategy for critical sections



The Third Pullback Succeeded

- Localised 56-inch reaming completed
- Bore reconditioned
- Installation strategy updated



The Third Pullback Succeeded

Investigate → Observe → Interpret → Model → Intervene → Verify



Successful Does Not Necessarily Mean Optimal

- Successful installation confirmed feasibility
- It did not validate the original corridor as optimal
- More favourable geology existed downstream
- Route selection must precede detailed HDD optimisation





*The greatest challenge in HDD construction isn't rock hardness.
It's the geological uncertainty that must be managed.*