

Integrated Sand Transfer System Redesign and Hydraulic Validation Using Fathom

CHALLENGE

The RSA23 Corridor Reclaim Project required a full redesign of the sand transfer system to support new discharge locations (DAR and RSA1S) and accommodate a future dry storage area. Existing pipeline routing, pressure ratings, and hydraulic performance were insufficient for the upgraded duty.

The system needed to handle wide variations in solids concentration (500–780 gpl), an increased PSD ($d_{50} = 369 \mu\text{m}$), and meet a target flow of $915 \text{ m}^3/\text{hr}$. Risks included inadequate deadhead pressure capacity in the existing North Stream polysteel pipework, velocities approaching settling limits, and the need to consolidate multiple pump stations into a single high-pressure pumping facility.

SOLUTION

Agilitus performed a comprehensive optioneering and hydraulic analysis using Fathom with the Settling Slurry Module and 4-component slurry model. The methodology incorporated PSD (particle size distribution)-driven settling behavior, Durand-based velocity correlations, ANSI/HI slurry pump limits, and detailed pump derating.

Multiple system configurations were evaluated, including field booster stations and a consolidated single-station design. The final configuration utilized 8 Warman 10/8 AH/AHPP pumps arranged in four series stages with duty/standby redundancy, supported by upgraded flushing pumps and new DN300 XXS carbon-steel lined slurry pipelines.

The calculation report validated velocity envelopes, deadhead pressures, safe operating windows, and NPSH margins across DAR, RSA1S, and North discharge paths.



- **Industry:** Mining
- **Region:** Australia
- **Focus:** Designing sand transport systems

RESULTS

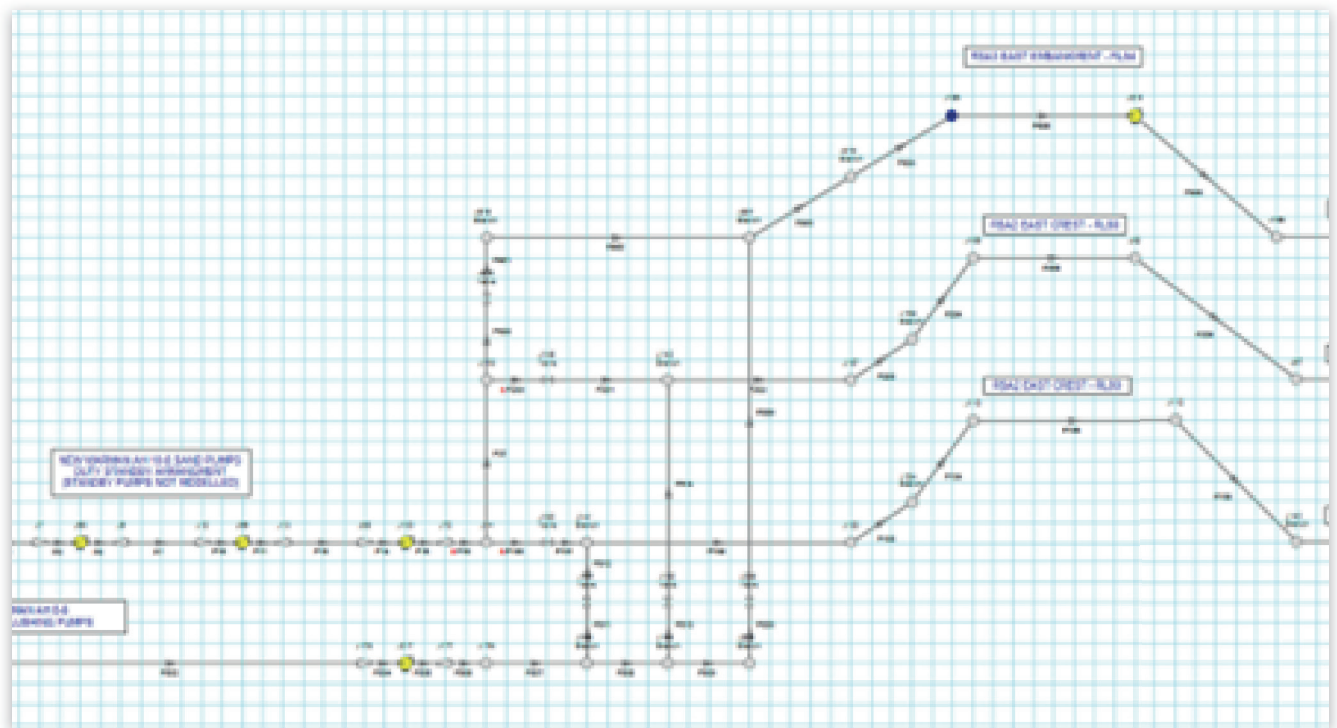
The combined Fathom optioneering and hydraulic calculation confirmed that the selected system configuration meets all flow, pressure, and settling-velocity requirements.

Pump staging was optimized to deliver $950 \text{ m}^3/\text{hr}$ at 500 gpl and $870 \text{ m}^3/\text{hr}$ at 780 gpl, with sufficient head developed across all four stages. The redesigned system ensures velocities exceed settling thresholds ($\geq 3.7 \text{ m/s}$) while maintaining acceptable wear rates. New CL300 pipe specifications and pressure-relief strategies—VSD-based pressure control and burst-disc redundancy—ensure compliance with deadhead requirements.

The design consolidates all pumps at the sand plant, reduces civil and operational complexity, and provides an accurate tender-level package supporting contractor pricing and detailed engineering.

TANGIBLE BENEFITS ACHIEVED

- Validated compliant slurry velocities across all discharge routes, preventing settling and blockages.
- Reduced capital and operational cost by eliminating remote booster stations and consolidating equipment at the sand plant.
- Improved safety and reliability through proper deadhead protection design and pressure-control systems.
- Higher design confidence via detailed Fathom modeling that matched pump limits, pressure envelopes, and NPSH requirements.
- Established a robust, future-proofed pipeline specification (DN300 XXS with lining) aligned with PSD-driven velocity demands.



Fathom Model of the Sand Transfer Pipeline

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