

Cognitive Geology & Selective Leaching

From Mass Extraction to Precision Resource Intelligence

A mining operation faced mounting pressure to improve resource efficiency while reducing environmental impact. Traditional "crush-and-grind" methods required moving massive volumes of waste rock, driving up energy consumption, capital intensity, and environmental risk. With declining ore grades and stricter ESG expectations, leadership sought a breakthrough approach—one that could shift mining from bulk extraction to precision, intelligence-driven resource recovery.

40%

Energy Reduction

Up to 40% reduction in energy consumption through precision extraction



Grade Precision

Higher grade recovery precision targeting only high-value ore zones



Waste Rock

Minimized waste rock movement and reduced tailings generation



ESG Impact

Reduced environmental footprint across land and water use

The future of mining is not about moving more material — it is about extracting only what matters, guided by intelligence.

The Strategic Challenge

The operation was efficient at scale — but deeply inefficient in precision. Traditional mining methods created a fundamental disconnect between geological knowledge and extraction execution, resulting in significant waste, energy overuse, and growing regulatory exposure. Five core challenges defined the problem landscape that demanded transformation.

High Energy Consumption

Crush-and-grind processes demanded enormous energy inputs regardless of ore grade, making operations increasingly uneconomical as grades declined.

Waste Rock & Tailings

Large-scale waste rock movement and tailings generation created compounding environmental liability and capital expenditure with every extraction cycle.

Limited Targeting Precision

Without spatial intelligence, drilling and blasting targeted broad zones rather than high-grade veins, diluting recovery quality and increasing processing burden.

Environmental & Regulatory Pressure

Stricter ESG expectations and land and water use regulations created urgent need to reduce the physical footprint of extraction operations.

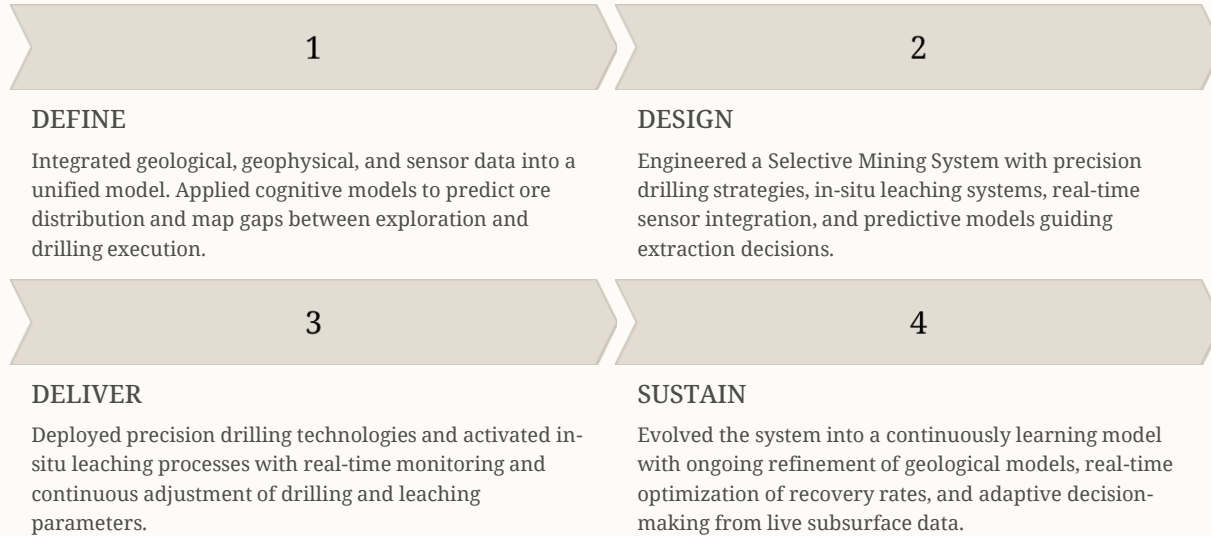
Data-Execution Disconnect

Geological data from exploration was not effectively linked to drilling execution, leaving valuable subsurface intelligence unused at the point of extraction.



Transformation Powered by 3D&S + NEXORA™

Fortis & Peak deployed a two-platform transformation architecture: **NEXORA™**, the cognitive geology engine that converts exploration data into actionable extraction intelligence, and **3D&S**, the four-phase execution framework that structures the journey from insight to sustained performance. Together, they replaced mechanical intuition with data-driven precision at every stage of the mining lifecycle.



NEXORA™ links subsurface modeling directly to drilling and leaching systems — enabling predictive, precision-based resource recovery that improves continuously with every extraction cycle.

Transformation Architecture: Traditional vs. Cognitive Mining

The architectural shift from traditional to cognitive mining represents more than a technology upgrade — it is a fundamental redesign of how value is extracted from the earth. Where traditional mining follows a linear, volume-driven sequence, cognitive mining powered by NEXORA™ replaces physical force with data intelligence at every step, dramatically reducing the physical footprint while improving recovery precision.

Traditional Mining Sequence

01

Exploration

Broad geological surveys with limited spatial resolution

02

Drill & Blast

Mass blasting of wide zones regardless of grade variability

03

Haul & Crush

Massive material movement and energy-intensive grinding

04

Process

Bulk processing with high tailings and waste generation

Cognitive Mining with NEXORA™

01

Data Integration

Unified geological, geophysical, and sensor intelligence

02

Intelligence Modeling

Cognitive models predict ore distribution with spatial accuracy

03

Precision Drilling

Surgical targeting of high-grade veins only

04

In-Situ Extraction

Minerals extracted without excavation, minimizing disruption

The cognitive mining model eliminates the most wasteful stages of traditional extraction. In-situ leaching dissolves and recovers minerals directly within the ore body, removing the need for large-scale excavation, haulage, and crushing entirely. Real-time sensor integration ensures that every drilling and leaching decision is informed by live subsurface data — creating a self-correcting, continuously optimizing extraction system that improves with every operational cycle.

Measurable Impact & Strategic Positioning

The deployment of NEXORA™ and the 3D&S framework delivered quantifiable results across energy, environment, and recovery performance. The operation achieved up to a **40% reduction in energy consumption**, a significant decrease in waste rock movement, reduced need for large-scale tailings dams, improved precision in high-grade ore recovery, and a materially lower environmental footprint across all operations.

NEXORA™ Platform

The cognitive geology engine transforms exploration data into actionable extraction intelligence, linking subsurface modeling directly to drilling and leaching systems for predictive, precision-based resource recovery.

3D&S Methodology

The execution-driven transformation framework — Define, Design, Deliver, Sustain — structures every phase of the mining transformation from geological intelligence through to self-optimizing extraction performance.

Intelligent Systems Leadership

Fortis & Peak is positioned as the firm that transforms mining from mechanical extraction to intelligent systems — enabling low-impact, high-efficiency resource recovery at scale.

Fortis & Peak: Creator of NEXORA™, owner of 3D&S, and the definitive leader in enabling precision, low-impact, intelligence-driven resource recovery for the mining industry.



This case establishes Fortis & Peak as the firm that transforms mining from bulk mechanical extraction to surgical, data-driven resource intelligence — setting a new standard for ESG-aligned, high-efficiency mining operations globally.