FIND AND FIX PROBLEM DIRT IN OLD STOCKPILES WITH ORESENSE®

EXECUTIVE SUMMARY

Across the mining industry, legacy stockpiles represent both a challenge and an untapped opportunity. Often accumulated over years or decades, these stockpiles contain material of unknown grade, uncertain moisture content, and poorly defined mineralogy.

This uncertainty reduces confidence in mine planning, creates inefficiencies in material handling, and risks sending the wrong material downstream. In extreme cases, multi-million-tonne stockpiles are sterilised, unable to be processed into useful material at a positive net present value. To compound the issue, collecting new information by drilling or sampling is often technically, operationally and commercially not viable.

OreSense® provides a proven pathway to transform these liabilities into assets. In recent deployments across commodities including hard rock lithium and iron ore, OreSense® has successfully characterised stockpiles and mining faces, delivering rapid, high-resolution insights into grade, mineralogy, and moisture content.

THE INDUSTRY CHALLENGE: LEGACY STOCKPILES

Mining operations globally continue to face persistent issues when dealing with legacy stockpiles:

- **Uncertainty of Grade:** Poorly tracked or undocumented material reduces confidence in blending strategies
- **Inconsistent Moisture Data:** Variable moisture impacts haulage, stockpile management, and customer performance
- **Inefficient Utilisation:** Stockpiles are often treated as waste due to uncertainty, leading to lost recovery potential
- **High Rehandle Costs:** Misunderstood material requires multiple handling cycles, increasing costs
- **Verification Gaps:** Traditional drilling and laboratory based methods are costly, slow, and not scalable across large volumes
- **Capital Intensity:** Available dry sorting methods are low productivity and high cost, resulting in intensive CAPEX outlay to implement

While options to do exist for characterising legacy stockpiles, the negatives typically outweigh the positives, and widespread uptake has been limited. Some examples include:

1. **Surface Sampling with Laboratory Analysis**
   - **Positives:** High analytical accuracy; benchmark-quality data
   - **Negatives:** Expensive, slow turnaround, poor representativity, safety concerns
   - **Why Not Attempted:** Impractical and unrepresentative - cannot realistically characterise millions of tonnes of material

2. **Handheld Analysers (e.g., Portable XRF)**
   - **Positives:** Low cost, fast spot checks, industry familiarity
   - **Negatives:** Poor insitu representativity/accuracy, limited mineral scope, safety concerns
   - **Why Not Attempted:** Inaccurate and unrepresentative - cannot generate high-volume, representative datasets

3. **Drilling of Broken Ground**
   - **Positives:** Subsurface data, traditional practice, high assay quality
   - **Negatives:** Costly, hazardous, slow, variable sample recovery, high risk of hole collapse/loss of bit and rods
   - **Why Not Attempted:** Cost, safety, and time barriers – impractical for legacy stockpiles

THE SOLUTION: ORESENSE®

OreSense® enables rapid re-evaluation and reclassification of stockpiles through optical non-contact, rapid measurements that deliver accurate results in near real time.

Key features include:

- **High-resolution LiDAR mapping and georeferencing**

- **Direct mineral measurement –** accurate and precise on insitu stockpiles across most conditions including surface moisture, dust and variable weather conditions

- **Quantitative –** every pixel an independent mineral abundance wt% measurement, enabling quantitative assessment of mineralogy

- **Production Ready –** capable of measuring surface stockpiles from 300m away with data collection completed in <5 minutes ensuring no impact on production operations

- **15-Minute Results –** from capture to results on Plotlogic's globally accessible web portal

- **Export-ready Outputs –** for seamless integration with mine planning and reconciliation software

- **Actionable Results –** available in 2D or georeferenced 3D, tailored for the specific workflow

This combination delivers independent, actionable insights fast enough to feed operational decision making. An example 3-minute scan of a legacy stockpile is shown in Figure 1 with over 300,000 measurements displayed.
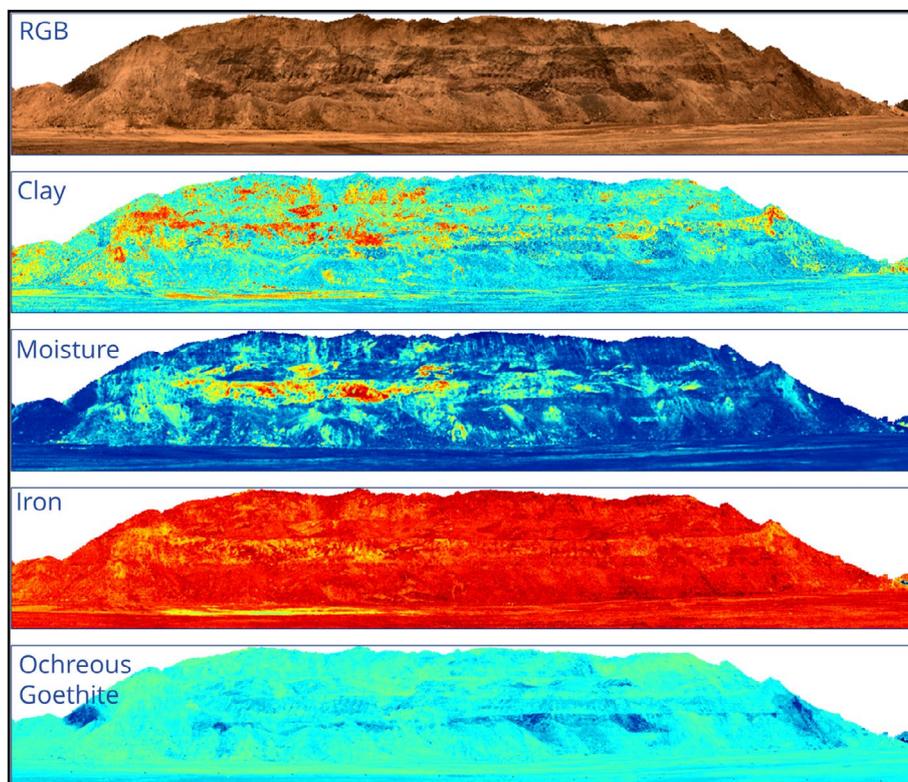

Figure 1 Example OreSense® 2D Stockpile Outputs

DEMONSTRATION CAMPAIGN & RESULTS

A multi-site demonstration campaign showcased OreSense®'s ability to tackle stockpile uncertainty:

- **20M+ square metres of terrain mapped over 2 years,** covering stockpiles and mining faces
- **10,000 unique open cut mine face and stockpile scans** completed with zero safety incidents
- **Capacity to map up to 80,000 m² per shift** suitable for large open cut operations
- **Applications at multiple commodities** including hard rock lithium, iron ore and copper
- **Quantitative results for many common minerals and chemistries including:**
  - Iron Ore – Fe, Al_2O_3, Kaolinite, Ochreous Goethite, Quartz, Moisture
  - Hardrock Lithium – Pegmatite, Basalt
  - Copper – Chlorite, Biotite, Oligoclase, Carbonates
- **<15-minute results turnaround** providing actionable legacy stockpile insights

OreSense® has demonstrated it can quickly and cost-effectively characterise stockpiles that would otherwise require expensive drilling or remain underutilised. Throughout the demonstration campaign OreSense® insights were used practically by frontline mine schedulers, geologists and process personnel through integrated workflows, such as that shown in Figure 2.
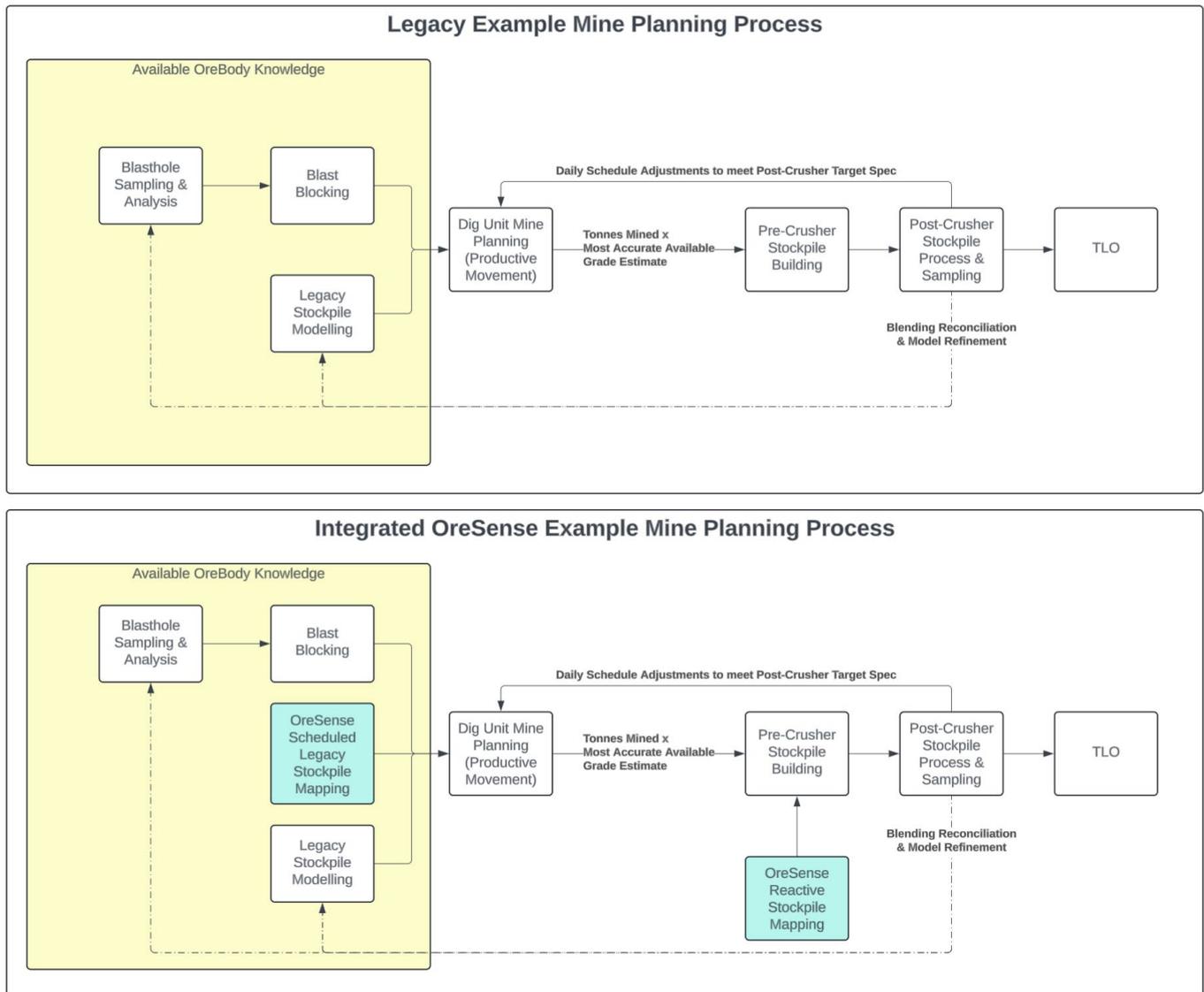

Figure 2 Example Integrated Workflow Comparison

Across the demonstration campaign, integrated workflows were versatile and extensive, including:

Reclaiming Value from Unknown Material

Mine schedulers often face uncertainty when deciding whether legacy stockpiles can be fed back into the blend. OreSense® scanning provided confidence by identifying recoverable ore within material previously assumed to be waste. This improved visibility helps increase recovery and reduces the need to draw solely on new ore sources.

Reducing Rehandle and Sorting Costs

Operations teams need to know where material should go - ROM, dump, or blending stockpiles. OreSense® delivered quantitative discrimination between ore and waste, ensuring trucks were directed correctly the first time. This reduced rehandle, minimised stockpile sorting, and supported more efficient haulage planning. Additionally, compliance to plan is validated through scanning of destination stockpiles, enabling site management to close the loop between planning and execution.

Moisture and Quality Verification for Handling and Sales

Moisture and quality variability in stockpiles affects both material handling on site and product consistency for customers. By mapping moisture and quality distribution across stockpiles, OreSense® enabled teams to make informed blending and scheduling decisions. This reduced handling difficulties and supported delivery of more consistent product quality. An example workflow is shown in Figure 3.
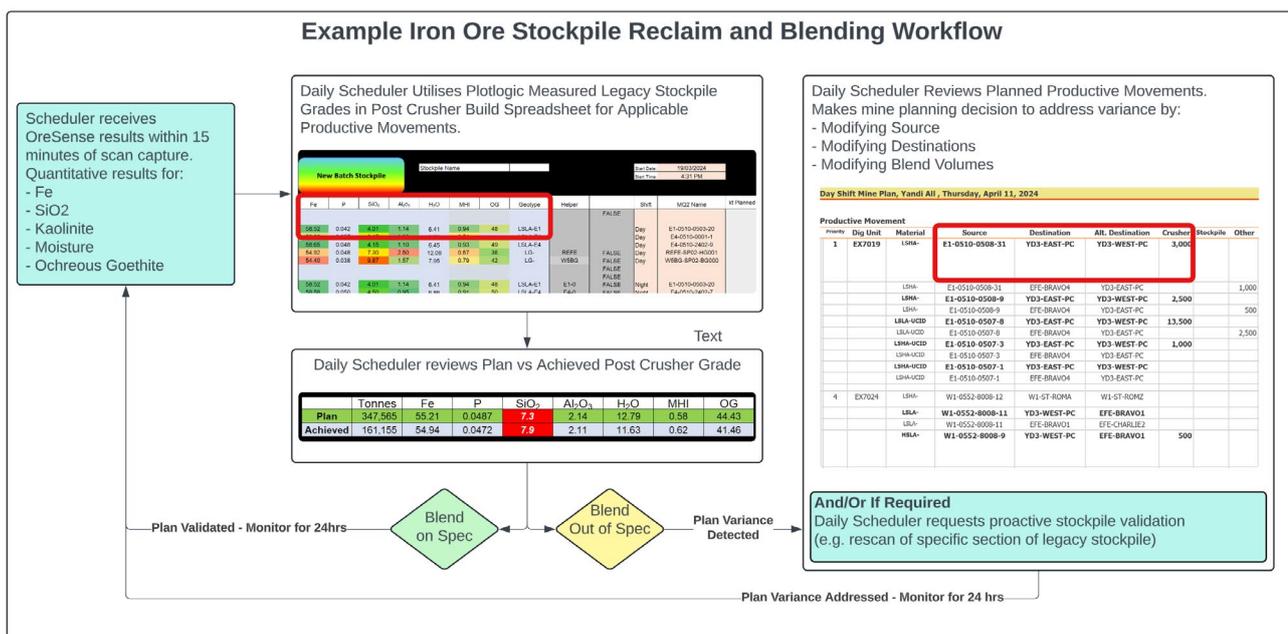

Figure 3 Example Iron Ore Mine Planning Workflow

PERMANENT RECORD OF STOCKPILE QUALITY

Legacy stockpiles are often poorly documented, making reconciliation and planning difficult. OreSense® generated georeferenced datasets of grade, mineralogy, and structure, creating a permanent record of stockpile characteristics. This provided geology teams with a reliable dataset for ongoing investigations and mine planning activities.

IDENTIFICATION OF PROBLEMATIC GANGUE

Copper oxide applications have demonstrated a need for identification of High Gangue Acid Consuming (HGAC) materials in legacy or production stockpiles. These applications also span other commodities, where a problematic gangue mineral is not readily detectable through existing cost-effective methods. OreSense® enables production teams to implement closed loop systematic control of these gangue minerals based on quantitative, objective measurements. An example of an integrated workflow is shown in Figure 4.
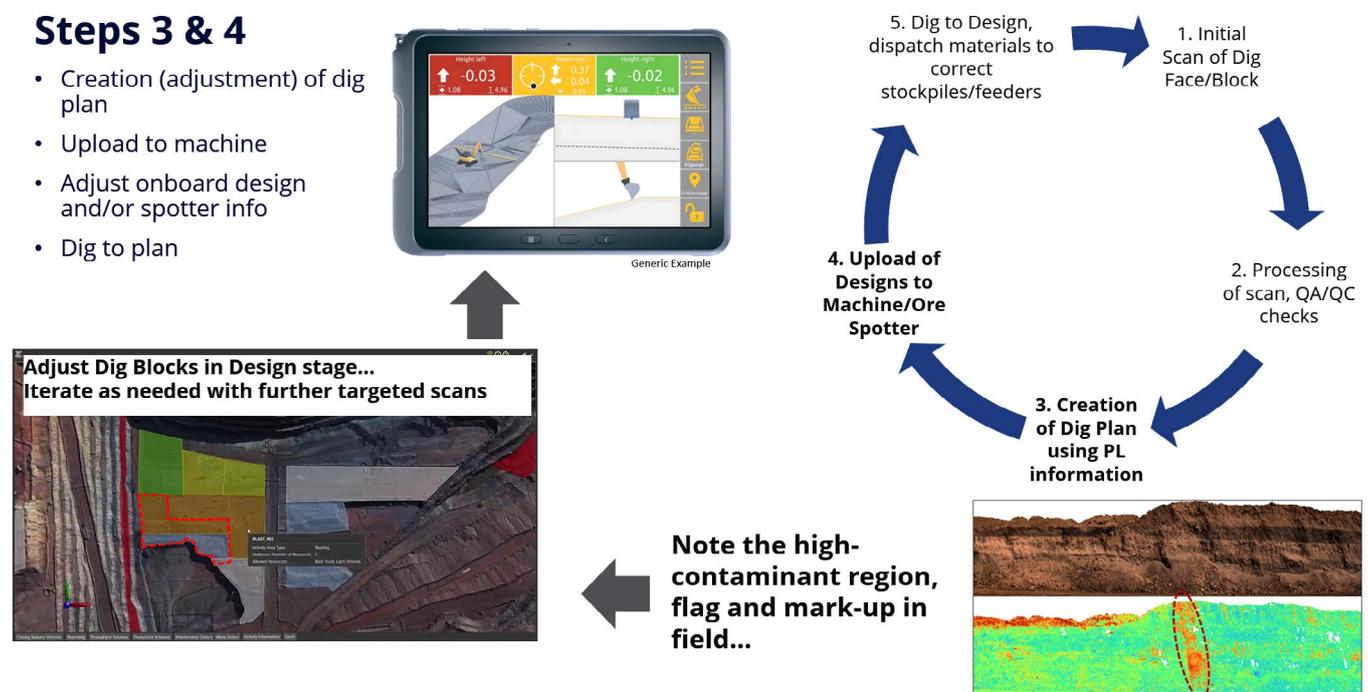

Figure 4 Copper Oxide HGAC Integrated Workflows

STRATEGIC IMPACT

By applying OreSense® to legacy stockpiles, mining operations can:

• Identify and control problematic gangue minerals and moisture

• Recover high-grade tonnes without expanding mining areas

• Reduce operational risks by quantifying moisture and mineral variability

• Optimise blending strategies with confidence in stockpile contribution

• Cut costs versus drilling and laboratory assays

• Build a permanent, scalable dataset that evolves with each scan

CONCLUSION

Legacy stockpiles no longer need to be treated as liabilities. With OreSense®, mining companies can transform stockpiles of uncertain grade and quality into valuable feed sources, including scaling back capital investment in sorting methodologies through truck/ shovel upgrading of stockpiles.

OreSense® provides the automation, speed, and accuracy needed to solve one of the industry's most persistent challenges, a practical method for identifying and mitigating problem gangue materials in Legacy stockpiles enabling commercially viable processing.

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