



# LIFE OF MINE HAUL ROUTE NETWORK OPTIMISATION

Client: *Confidential*  
Duration: 5 Months (2021)

Project Team:

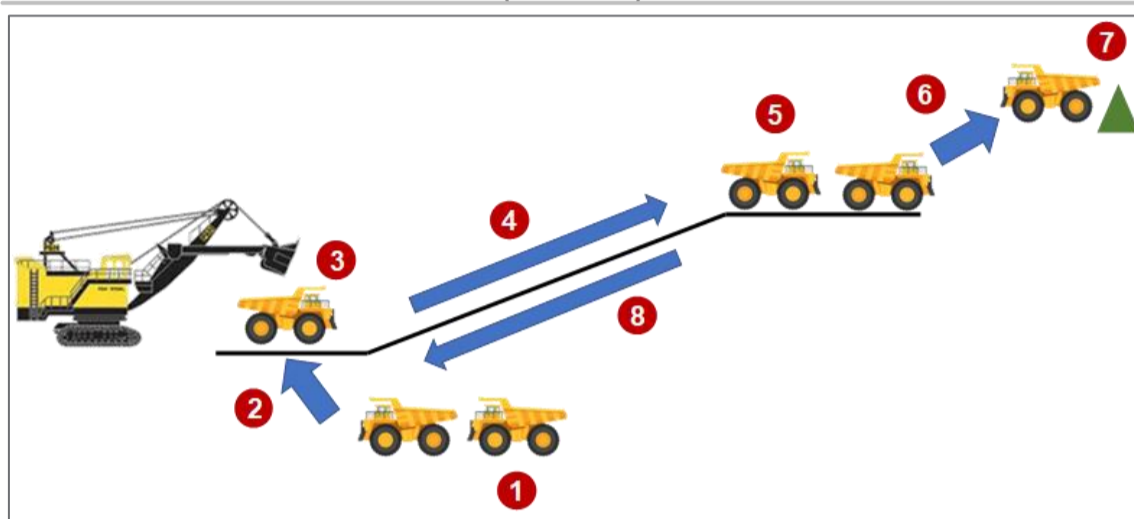






FIG 1: Hauling Cycle Simulated

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SHOVEL LOADING OPTIMISATION

## CLIENT NEED

The Client requested VBKOM to conduct a technical study of its truck- and shovel fleet at an open pit coal operation, in order to determine the optimal fleet size and identify any potential improvement areas and trade-offs, such as shovel loading technologies, autonomous hauling, in-pit crushing (IPC), and the impact of congestion in the pit.

VBKOM had completed a similar project in 2019 for this operation, however this time various changes had to be considered, i.e., an updated Life of Mine Plan (LOMP), pit design, equipment parameters and assumptions (cycle time, payload, etc.), and constraints related to haul routes.

## APPROACH

- › The mining and backfill production schedules were used to create annual **centroids** for each mining bench and backfill dumping location.
- › **Spatial data**, such as topography, pit design, and bench coordinates was used, together with rolling resistance and speed limits to create **annual haul networks**.
- › Truck travel times were **simulated** using truck performance data and the annual haul networks.
- › Identify and incorporate **improvement opportunities** in the haul networks.
- › Calculate the **required truck fleet size** for the Base case (LOM Plan) and alternative scenarios.

Importantly the haul networks were designed per year to represent the differences in annual volumes and pit design.

## SCENARIOS

To ensure alignment with interfacing projects at the mine, VBKOM tested the following scenarios after reviewing the current haul networks, and conducting a truck fleet size calculation:

- › **Base Case** fleet size per annum of the LOM schedule.
- › Coal- and Overburden In Pit Crushers (**IPC's**) scenarios reducing haul distance and resulting in truck savings.
- › Shovel loading optimization scenario with **Surge Loaders**
- › **Autonomous truck** scenario hauling to an IPC location.
- › **Congestion** impacts at specific areas on the haul route, i.e. loading, dumping, and intersections.
- › Loader fleet requirement calculations and haul network update.

## VALUE DELIVERED AND RESULTS

VBKOM delivered the following value to the client:

- › A truck fleet size calculation for each scenario, including the **number of trucks** that will be required for every period of the production schedule (LOMP).
- › **Calibration** of the model with the LOMP, equipment factors, cycle time assumptions, and haul network definition.
- › Tradeoffs and scenarios relating to **improvement opportunities** in the shovel loading methodology, hauling automation, IPC destinations, and congestion impacts.
- › An independent **technical report** was delivered to the client for board approval.

