Glencore
Mangoola Coal

Developing Natural Landform in
Mine Overburden Rehabilitation

Background

This presentation aims to discuss the process of implementing a natural landform in mine rehabilitation at Mangoola Coal

- **Open Cut Coal Mine operating since 2010, rehabilitation commenced in October 2011.**
- **Greenfield site surrounded by undulating terrain**
- **Mangoola acknowledged that the typical overburden rehabilitation, including contour drains and drop structures, would not fit in to this surrounding landscape and that an undulating landform with naturally occurring vegetation communities was more likely to fit into the surrounding landform.**
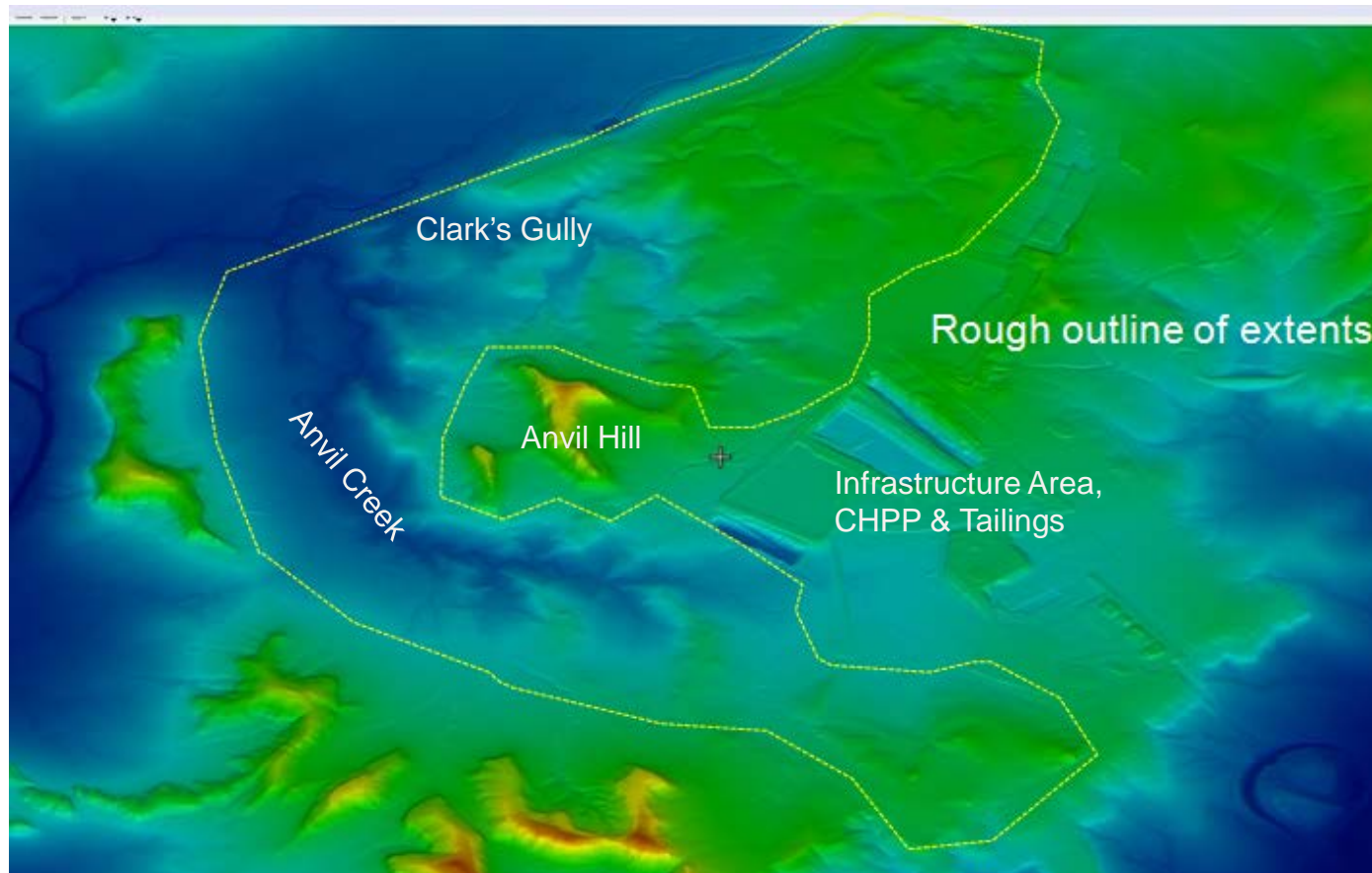
Initial works

- **The first stages of natural landform was developed by Mangoola mining engineers over 9 ha (not Geofluv).**

- **Natural landform was not a consent condition, this was internally recognised and management committed to any additional costs and time associated with the trial.**

- **100ha rehabilitation has been established as natural landform to date.**
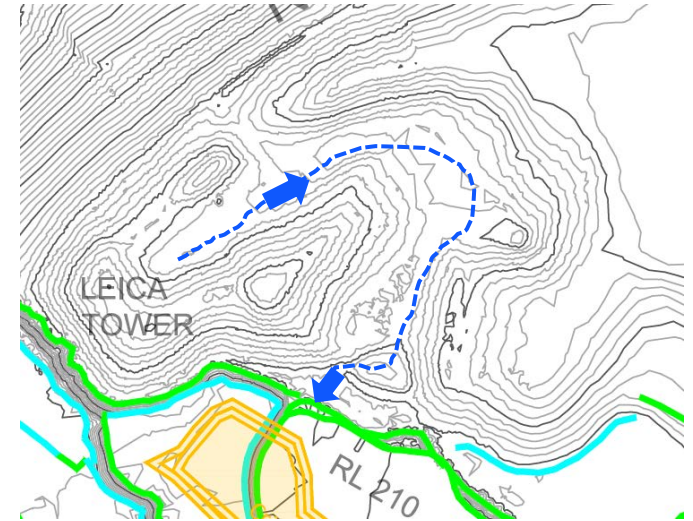
Natural Landform Model

- **1300ha project area, work undertaken externally (Umwelt Australia)**
- **The modelling program selected for this project was Natural Regrade (Carlson Software) - Geofluv.**

Clark's Gully

Rough outline of extents

Anvil Creek

Anvil Hill

Infrastructure Area, CHPP & Tailings

Process

The process of developing the natural landform design includes:

1. Testing of material to understand erosion and infiltration rates;

2. Evaluate characteristics of existing drainage lines;

3. Hydrological modelling of existing drainage lines;

4. Blend ridges and creek alignments in with the surrounding natural landscape;

5. Assess constraints to the proposed ridge lines and creek alignments such as preferred haul access routes;

6. Develop boundary conditions for the sub-catchments;

7. Determine preferred creek stream bed layouts based on natural creeks;

8. Develop natural landform using the Natural Regrade software;

9. Post processing of the generated landform

10. Generation of suitable dxf file for use with mine design software.
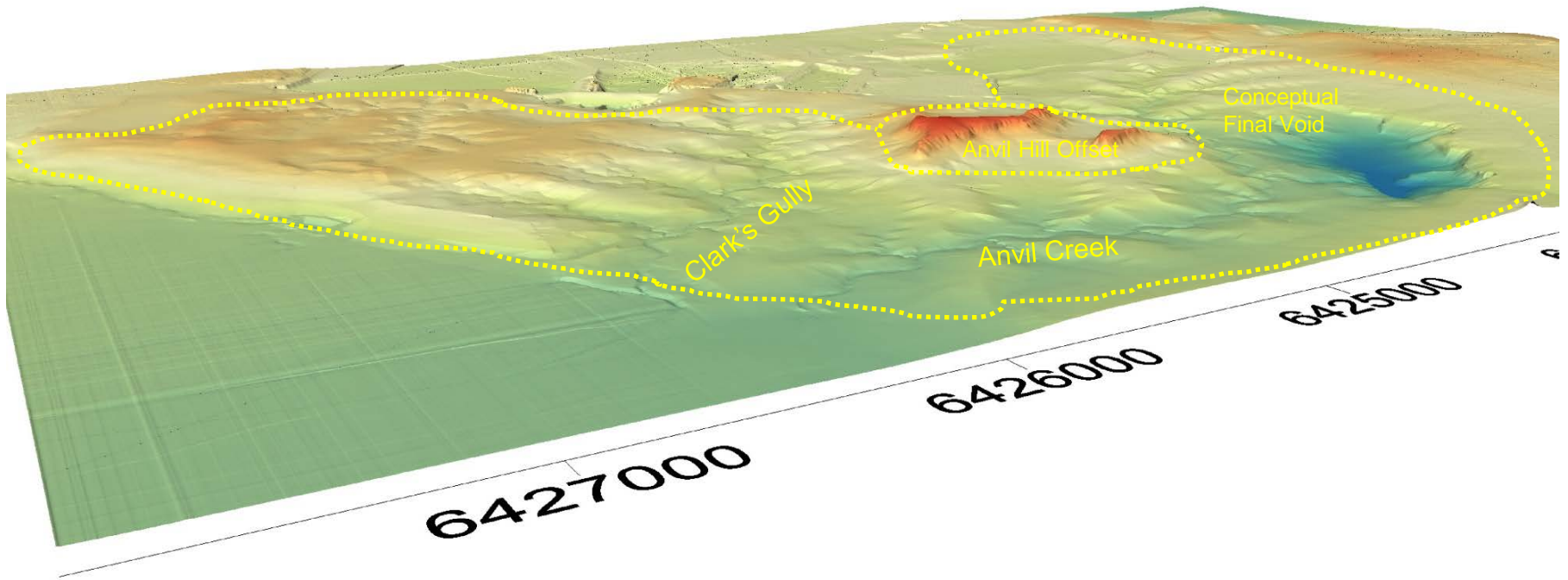
Original Landform

Approximate mining Boundary

Anvil Hill Offset

Anvil Creek

Clark's Gully
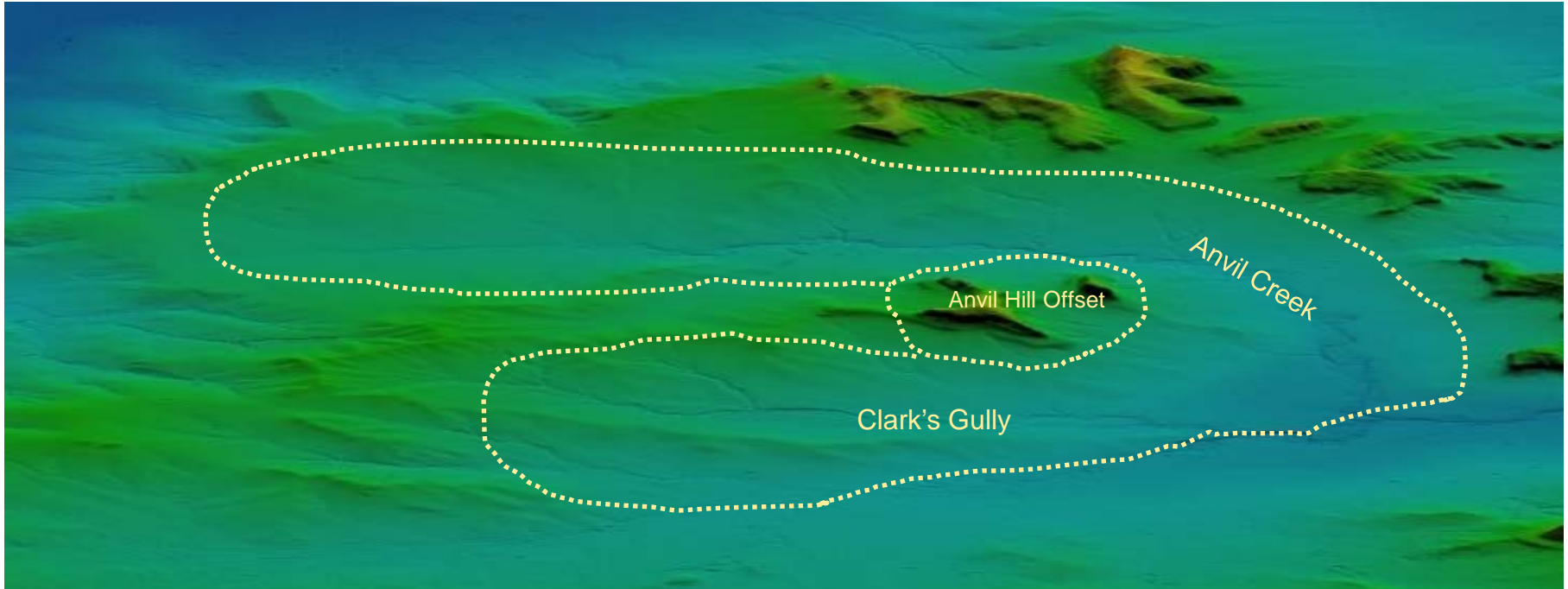
Pre-mining landscape, facing south

Note profiles, drainage densities, compound nature of the landform.

Mine Rehabilitation Landform

Final package for Mining Engineers, facing south-east

Mine Rehabilitation Landform

- **The output was more detailed than expected.**
- **Detail included modelling creek bank designs for all creeks and drainage lines.**
- **Recent MOP (REMP) plans were all developed using this natural landform model.**
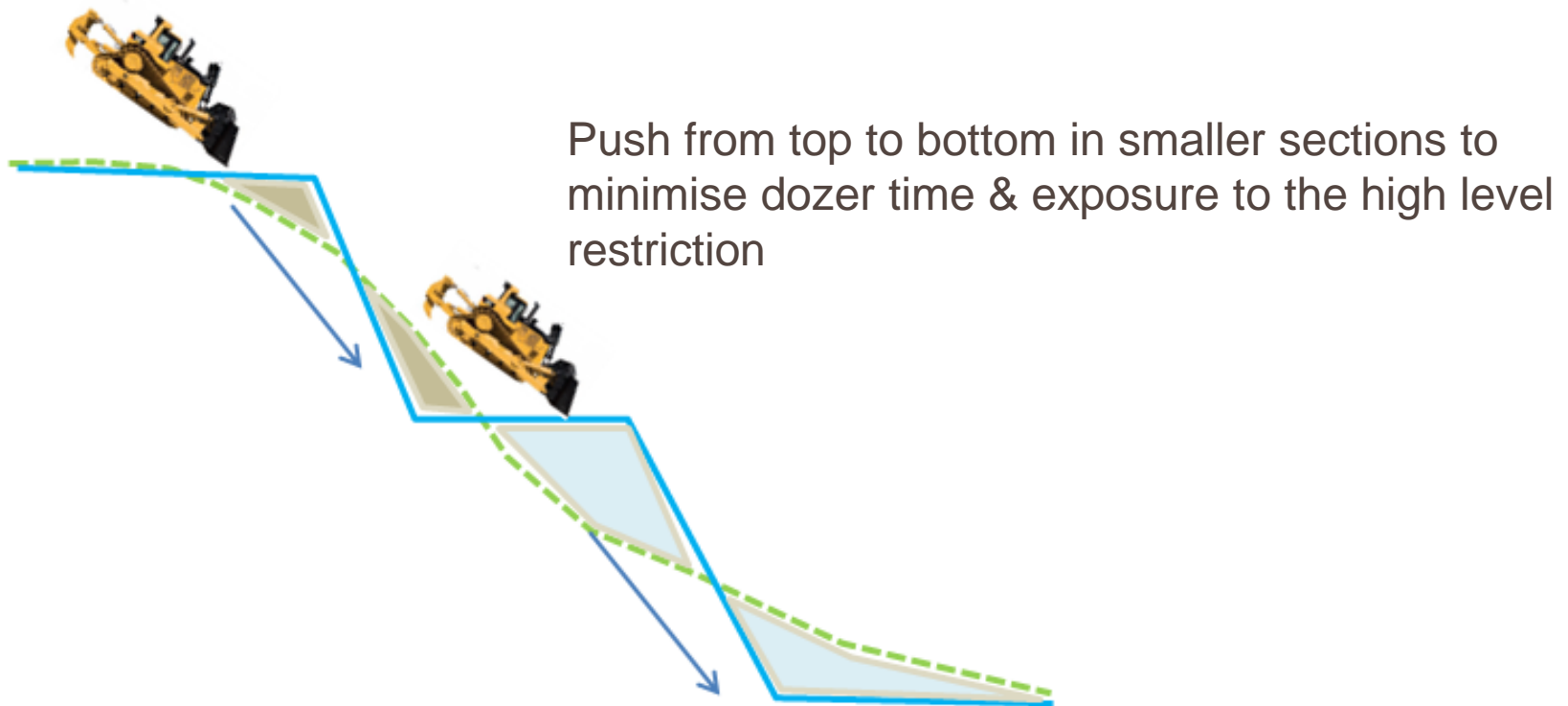- **The output was provided to the Mine Engineers.**
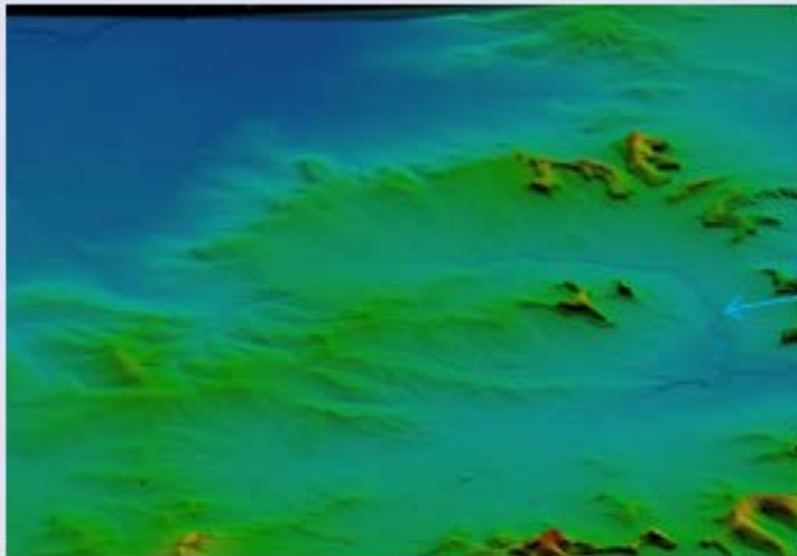
Non linear (sinuous) compound channels with adjacent floodplain
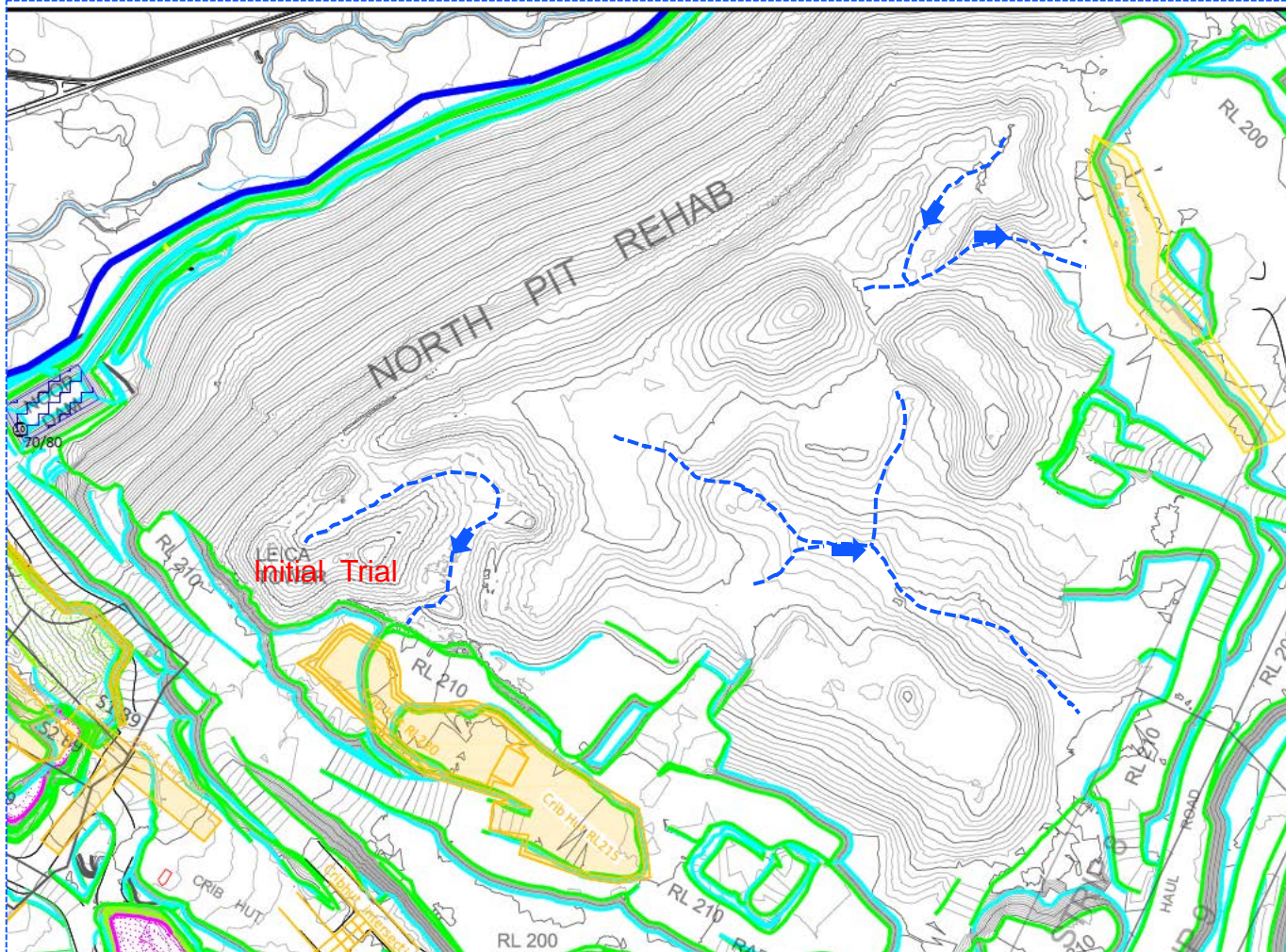
Mine Rehabilitation Landform

- **Mining engineers plan to five metre lifts, due to the size of our machines and dump lift heights**
- **This also allows less material pushed and more detail landform shaping.**

Push from top to bottom in smaller sections to minimise dozer time & exposure to the high level restriction

Mine Rehabilitation Landform

- **Ramp and dump strategies were established in the preliminary stages of developing the model and therefore achieving the final landscape did not interfere with the progression of the dump.**

▬▬	RL220
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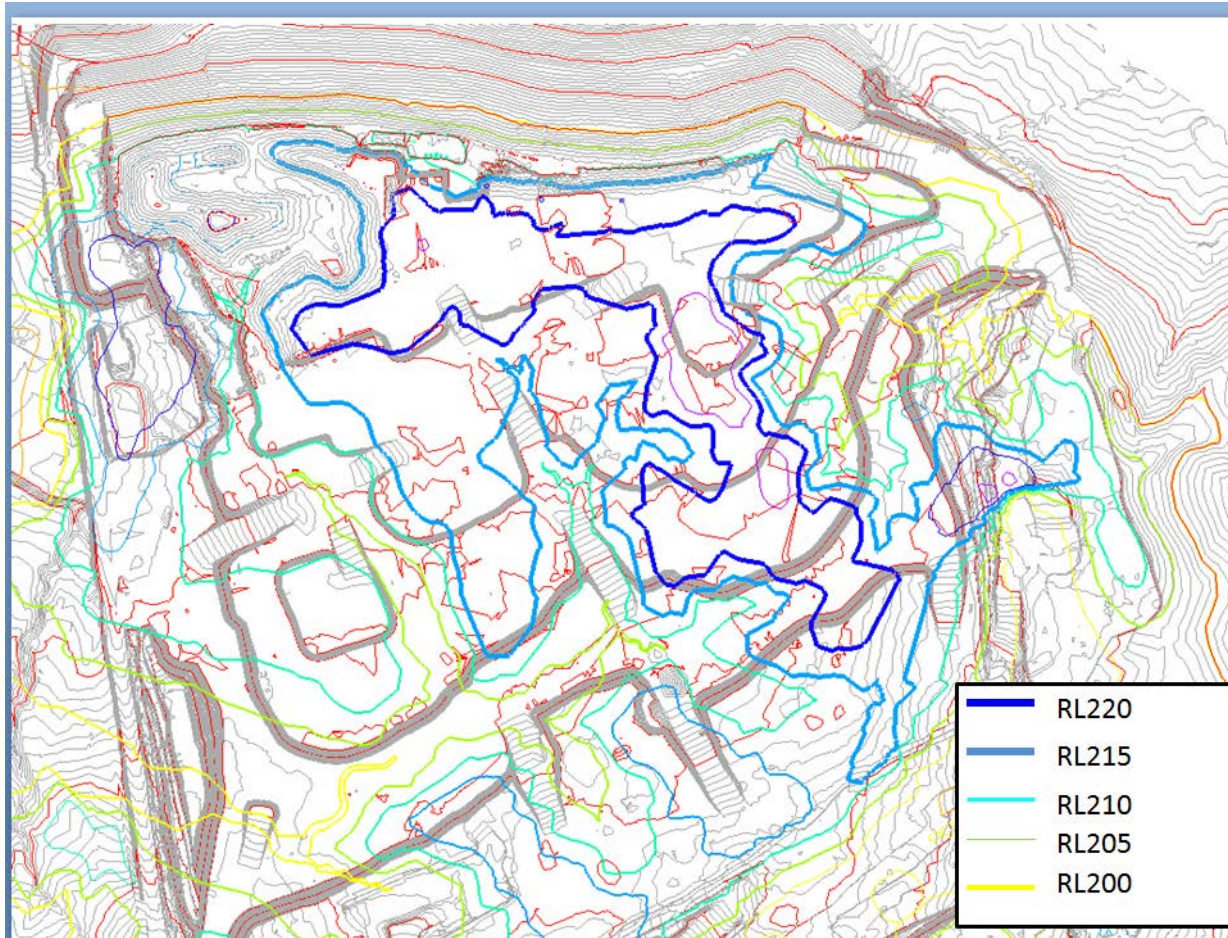
Mine Rehabilitation Landform

2014 Rehabilitation – natural landform design

2011/12 Rehabilitation

Mine Rehabilitation Landform

- **Rehabilitation has been undertaken using this design and to date has been successful in providing a natural looking and stable landform that fits in the surrounding environment, although it is difficult to display in photographs.**

GOPR0_Film3_001.mp4

new rehab 2 GOPR0_Film1_005.mp4

Revegetation and Habitat Structure

- **After the landform is shaped, the areas are strategically targeted for specific vegetation types that occur in the surrounding local area, based on similar topography, slope, aspect and topsoil type. Only species that occur in the local area are used in rehabilitation.**

- **Habitat structures are established including, wood piles, rock piles, standing habitat trees, low areas of inundation and dams. Nest boxes will be installed over time as the vegetation provides appropriate habitat.**

Revegetation and Habitat Structure

Grey Box-Ironbark Woodland

Slaty Box Woodland

ANY QUESTIONS?