

BARROSO LITHIUM PROJECT

INTEGRATED WASTE LANDFORM ('IWL') HIGH LEVEL DESCRIPTION

The following description provides the key high-level points to provide a general understanding of the construction and operation of the proposed IWL to be constructed at the company's Barroso Lithium Project in Portugal. A full description can be found in the company's EIA application.

The EIA is being considered as a pre-phase document with the detailed design phase of the project to be completed in the RECAPE phase and current works presented are to a conceptual level which is entirely consistent with APA requirements.

Design Objectives

The design objectives for the Waste Storages are summarised as follows:

- Provide a long-term stable landform storing all run of mine waste and tailings produced.
- Reduce visual, noise and dust impacts as far as practical.
- Maintain storage structures within the current lease boundary.
- Continuous rehabilitation of areas at final construction limits.
- Control runoff and reduce sediment generation.
- Reduce poor water quality seepage from the facility.
- Reduce dust generation; and
- Manage impacts on neighbouring landowners.

Design Basis

The key basis of the design will include:

- Prior to any waste placement the topsoil will be excavated from the proposed storage area and transported to stockpiles.
- The topsoil removal will be undertaken in stages as the storage area footprint expands to provide a stable foundation area for the future waste storage. The removed topsoil will be stockpiled to be used in the rehabilitation work when the final slopes of the waste storages are established.
- It is planned that the bulk of Run of Mine ('RoM') waste generated by mining and all tailings from the processing plant will be co-disposed in an Integrated Waste Landform ('IWL'), located to the south of the project area.
- Mine waste rock will be directly transported from the pit to the waste storage area using the mining haul truck fleet.
- After extraction of the product from the mineralisation in the processing plant, the remaining tailings product will be filtered to remove water, hauled and truck-stacked in the integrated waste landform area.
- All waste storages will be designed to not exceed the current maximal topographical elevations and be profiled to blend into the current landscape. Rehabilitation work after mining will ensure the storages are stable in the long term and blend into the natural landscape.

Design criteria

As the tailings are to be filtered and stored along with coarse, durable waste rock, the properties of which will form the basis of design, the design criteria adopted for the structure have been based on the tailings geotechnical properties (more conservative) and typical Waste Rock Dump design criteria.

Factors of Safety, long term stability, seepage and long-term erosion performance requirements are based on the guidelines presented in Directive 2006/21/EC.

Design Parameters

Waste Rock

An assessment of waste rock design parameters has been based on an interpretation of the geological and geotechnical logging database and photographic record of exploration and geotechnical cored boreholes across the pit areas. Key waste rock factors considered for the IWL design include the degree of weathering, alteration, density tests, uniaxial compressive strength testing and triaxial shear testing.

Tailings

Classification testing of a representative tailings sample was undertaken to determine the following characteristics to aid the IWL design including particle size distribution, Atterberg Limits and Density. Based on the testing completed, the tailings sample would be classified as a low plasticity clayey SILT with sand.

Design Hazard Assessment

One of the key aspects of the waste storage facility design is to undertake a design hazard assessment.

The main intent of the adopted development sequence and overall dump geometry is to provide long term stable structures. As such, the RoM waste and tailings storage facilities (IWL) have been designed using current best available practices as adopted by mining operations in similar topography and climatic settings. In addition, 'Guidelines for Mine Waste Dump and Stockpile Design' (Hawley and Cuning / CSIRO 2017) were utilised to formalise the dump hazard assessment.

The guidelines provide a formal process to develop a hazard rating for the waste dumps which is subsequently used to inform investigation, design, construction and operational requirements.

Determination of the hazard the waste storage poses to the downstream environment and land users considers the following aspects:

- Regional setting: Seismicity, precipitation, foundation conditions (slope, material, stratigraphy, liquefaction potential, groundwater).
- Material quality: Gradation, strength.
- Dump geometry: Height, slope, volume and mass.
- Static stability / dynamic stability.
- Construction: method, loading rate.
- Stability performance: Long term stability and resistance to deformation, localised instability and erosion.
- Based on the assessment of the Project's waste dumps, a 'Low' hazard rating was determined.

Failure Modelling

A great deal of care was taken to design the IWL structure with one of the key features being that the material grading / inclusion of coarse rockfill and the limited ability to store large volumes of water within the structure (designed as a water shedding, relatively high permeability, free draining structure) significantly enhancing the stability of the structure.

- Current industry best practises have been applied to the design, operating, construction and monitoring strategies adopted for the Integrated Waste Landform.

- A credible failure mechanism of the materials is a rotational or sliding failure mechanism, which would result in smaller volumes of material being mobilised for a shorter distance, reducing the impacted area from that presented.
- In the unlikely event of a IWL failure during or post closure, modelling of a credible failure mode (localised slope instability) indicates that debris can be contained directly downstream of the IWL (within flood / containment bunding that will be included as part of the final design) reducing the risk of material discharging into the Covas River.

Operation

Development of the IWL will be undertaken on a continuous basis as mine waste and tailings are generated.

Due to the limited areas available within the current mining lease area for waste storage development, a detailed construction and staging plan will be adopted to ensure the earthworks are undertaken in a manner that:

- Provides storage capacity for RoM waste and tailings at all times.
- Reduces sediment generation.
- Controls water runoff.
- Provides a stable structure.
- Reduces any visual impacts of the structures

The RoM waste and tailings will be trucked to the active tip zone within the IWL where depositing, spreading, grading, compaction and sealing will be undertaken with conventional earthmoving equipment (dozers, graders and compactors). The dumping activities will be continually monitored to ensure material placement and sealing is in accordance with the IWL development plan.

Surface water management and sealing of the placed fill will be critical aspects of IWL operation and detailed plans will be provided to ensure the design intent is achieved, seepage through the dump is reduced, and dust generation / sediment runoff is controlled.

During operations, the following measures will be taken to control runoff and sediment generation:

- Continuously rehabilitate disturbed areas to reduce sediment loads and improve overall amenity.
- Capture sediment in permanent sediment control embankments.
- Ensure all excavated soil, tailings and waste rock is placed in a controlled and engineered manner.
- That surface water management structures are continuously upgraded and realigned to suit dump development at that time, reducing the volume of runoff reporting to the dump structure and the extent of sediment generation.

Key Additional Points to Note

- There is no intent to retain water in the structure, in fact the opposite, the design was specifically developed to promote free draining of the material (i.e.: no damming of water upstream) and the structure is not a dam and should not be modelled as such.
- There is no traditional 'upstream' construction, where embankments are constructed on a low strength, saturated, fine grained tailings product.
- Filtering technology and placement method is not considered experimental or unproven. The tailings filtering technology and IWL designs, have been adopted successfully for years at

many operations around the world including Goro Nickel (New Caledonia), Greens Creek (Alaska) and Kokkinolakkass (Greece).

- Strict controls will be implemented at the process plant to ensure the filtered tailings product meets the required moisture content specification prior to being trucked to the Integrated Waste Landform. If the material is above the target moisture content specified, it will be placed in a temporary stockpile, rehandled and conditioned prior to being blended with the RoM waste on the IWL.
- The construction management of the IWL will focus on maintaining a water sheading profile to promote flow towards drainage channels and the sediment control system. Compaction of all placed material will ensure the infiltration is reduced and a low moisture content maintained.
- The material stored within the IWL will neither be contractive nor saturated/near saturation and, when placed in accordance with the controls developed during the design, will not be susceptible to liquefaction.
- Based on the current design, the material will be placed at a density of $\sim 1.5 \text{ t/m}^3$ and at a moisture content (of the filtered tailings) around 15%. The overall moisture content of the IWL will be less due to the blending of low moisture content rockfill. This results in a degree of saturation around $\sim 35\%$, well below the 80% target above which liquefaction could potentially occur.
- The IWL has specifically been designed with potential flooding in mind with the primary control being the location of the IWL at the head of a natural valley so that no significant upstream catchments run through the IWL.
- The toe of the IWL structure will be located above / protected from flooding of the Covas River and additional Flood bunds, if required, and coarse rockfill erosion protection will be used to ensure that the toe of the structure remains stable / free draining under Probable Maximum Flood (PMF) / Probable Maximum Precipitation (PMP) events.
- The Project's tailings are mechanically stacked and compacted at a relatively low moisture content (below saturation value) together with run of mine waste to create a stable long life structure.
- It is not appropriate to conduct the failure modelling for this structure as a 'conventional' hydraulically deposited saturated tailings, generally with a volume of supernatant stored in a pond on the facility as the designs and parameters of materials in the IWL are completely different.
- A credible failure mechanism of the materials is a rotational or sliding failure mechanism, which would result in smaller volumes of material being mobilised for a shorter distance, reducing the impacted area from that presented.
- Current industry best practises will be applied to the design, operating, construction and monitoring strategies adopted for the Integrated Waste Landform.
- In the unlikely event of a IWL failure during or post closure, modelling of a credible failure mode (localised slope instability) indicates that debris can be contained directly downstream of the IWL (within flood / containment bunding that will be included as part of the final design) reducing the risk of material discharging into the Covas River.

