

TAILINGS MANAGEMENT TARGETED ASSESSMENT PROGRAM

Guidance note

MAY 2020

Purpose of this guidance note

An important part of the NSW Resources Regulator's compliance and enforcement strategy involves implementing a scheduled and targeted assessment program for mines. The Regulator has developed targeted assessment programs (TAPs) around the identified critical controls. The TAPs comprise inspections across the mine sites in NSW to ensure measures have been identified and implemented to facilitate sustainable rehabilitation outcomes.

The Regulator takes into account several factors when assessing how mine operators identify, refine and implement critical controls in relation to tailings storage facility management for closure. This guidance note may help mine operators understand the range of issues that are assessed by the Regulator as part of an assessment program.

Important: Information provided here is intended as guidance only and is not intended to be relied upon as a comprehensive list of all controls that may apply to risks associated with facility closure. Mine operators must undertake risk assessments and implement controls relevant to the risk profile of their particular tailings storage facility.

Assessment considerations

The Regulator has developed a targeted assessment program (TAP) to determine how mine operators define and implement risk controls for tailings storage facility closure (see our [Consideration of risks webpage](#)). The TAP focuses on the critical controls implemented during three main life cycle process including construction, operation and closure. Objectives of these critical controls and assessment considerations of the Regulator when undertaking TAPs are described below.

Construction phase

The objective critical controls implemented during construction is to control or limit the release of contaminants from tailings containment. This incorporates controls for facility construction (principally environmental considerations) and, if required the installation of a liner (geomembrane or modified soil clay layer). Assessment of the success of the implementation of these control requires consideration through the full tailings storage facility life cycle.

A checklist of the range of controls (where applicable) that are evaluated by the Regulator are included below.

Construction materials are characterised:

- Construction material for tailings containment structures are identified and geochemistry characterised.
- Material management practices to ensure undesirable material [such as potential acid forming (PAF) material] is managed correctly (i.e not inadvertently incorporated into construction material).
- Verification testing of construction material has and is being conducted during placement.

Drainage system operation understood:

- Drainage requirements and performance criteria identified.
- Collection and treatment (if required) system for the drainage specified.
- If applicable, information on how drainage system can be modified as the tailings facility is extended (i.e. additional lifts) during the life of a mining operation.
- A monitoring program in place to determine drainage system effectiveness, including a trigger action response plan (TARP) to rapidly address matters identified as part of the monitoring.

Tailings are characterised:

- Tailings geochemistry is routinely characterised (contaminants of concern, PAF).
- Physical properties of tailings are routinely determined (particle size distribution).
- The frequency of the characterisation of tailings material has been implemented in consideration of the potential for tailings composition to change over time (i.e. process different ore bodies, seams etc).
- Tailings decant water is routinely monitored and characterised.

- Testing regime specified to determine any release the environment based on tailings properties (contaminants of concern) such as groundwater quality monitoring network.

Liner requirements and performance are understood:

- Where a liner has been required to be implemented, liner performance and design criteria have been specified (type, lifespan, thickness, area of placement) to minimise environmental impacts.
- Information on how liner performance is maintained if tailings facility is extended (i.e. additional lifts).

Liner installation and monitoring are understood:

- Construction quality assurance program is in place and provides information on the following.
 - For geomembrane: How quality control testing is to be conducted in accordance with the manufacturer's standard procedures.
 - For modified soil (clay): Type of geotechnical testing and supervision that is required during material placement to verify liner meets performance requirements.
- Response plan such as a TARP is in place to document response if monitoring determines liner has been compromised.

Operational phase

The objective of critical controls implemented during the operational phase is to ensure tailings consolidation/settlement is maximised during placement to reduce impacts from settlement post closure.

A checklist of the range of controls (where applicable) that are evaluated by the Regulator are included below:

Tailings deposition strategy to maximise consolidation understood

- An evaluation has been undertaken to determine the optimum strategy to promote consolidation/settlement of tailings, including testing/modelling and options analysis
- A deposition strategy has been defined in consideration of the following to maximise consolidation/settlement:
 - Treatment methods such as flocculent etc.

- ❑ Placement depth and time frames for settlement (rate of rise).
- ❑ Type of distribution system e.g. spigot number and layout.
- ❑ Tailings beach angles.
- ❑ Decant design, location and operation.
- ❑ Additional treatment for breaking up crust.
- ❑ Any requirements to maintain moisture in tailings for dust control and/or reduce PAF reactions.

Tailings deposition monitoring undertaken

- A monitoring program is in place to assess the effectiveness of deposition strategy to maximise consolidation. This should include consideration of the following:
 - ❑ Regular survey of tailings relative level (RL) changes.
 - ❑ Use of survey and deposition volumes to estimate density and compare to optimum values.
 - ❑ Use of survey to inform tailings placement.
 - ❑ Decant location and levels.
 - ❑ Other insitu methods for monitoring consolidation of tailings (such as cone penetration testing, shear vane etc).
- Maintaining required freeboard levels in accordance with facility design.
- Long term consolidation/settlement of tailings modelled.
- A TARP in place to respond to rapidly address matters identified as part of the monitoring.

Closure phase

The objective of critical controls implemented during the closure phase is to provide a final barrier to contain tailings and prevent release to environment and to support. This incorporates controls for erosion control (final landform and water management) and capping. Although these controls are implemented at closure, the planning and consideration of them must be considered through the full tailings storage facility life cycle.

A checklist of the range of controls (where applicable) that are evaluated by the Resources Regulator are included below:

Landform is designed with performance requirements understood

- A final landform design for long term stability of tailings facility post closure has been nominated. This should include consideration of the following:
 - How design has been determined.
 - Has ANCOLDs closure requirements been adequately considered (i.e. 1000 year notional post-closure life all consequence categories).
 - Surface water management considerations in final landform, including consideration of spillway in final landform requirement
 - Long-term settlement of tailings.

Tailings strength properties are understood

- Testing is undertaken to verify tailings has sufficient bearing capacity to allow capping placement. This should involve in-situ geotechnical testing (e.g. cone penetration testing, shear vane tests) to determine strength profile at depth.

Performance requirements of capping understood

- Final land use is adequately defined (including vegetation requirements or exclusion).
- Principle function of capping has been identified i.e. 'rainfall shedding', 'store and release'.
- Performance requirements have been identified for capping of tailings with low strength (bearing capacity) if identified as a consideration. This should include consideration of the following:
 - Use of geotextiles and other engineering materials nominated (if required) and the installation process documented.
 - Thickness of capping specified to reach strength performance nominated.
- Performance requirements for capping to reduce permeability and seepage into tailings – if identified as a consideration. This should include consideration of the following:
 - Post closure water balance when determining likely seepage.
 - Consideration of oxygen flux in capping for geochemically unstable tailings.
- Performance requirements for capping taking into account final land use. This should include consideration of the following:
 - Capping thickness to support final land use (in particular vegetation).

- ❑ Consideration of capping surcharge to offset expected settlement of tailings.
- ❑ Phyto-toxicity associated with tailings. Consideration of vegetation mortality on capping performance (i.e. tree death and fall, material removed with root ball exposing tailings etc.).
- ❑ The nature of materials proposed for use in capping and the potential to impact upon the ability to sustain the approved final land use (e.g. Potential Acid Forming material or other contaminants of concern that may present phytotoxicity risks or be a source for contamination)
- ❑ Capping performance to address any potential combustibility issues (typically associated with coal).

Capping material type, source and quantity is known

- Suitable capping material has been identified.
- The source and quantity of material required has been identified.
- Methods to quarantine adequate quantities of capping material have been specified and implemented.

Final landform (including capping) is constructed in accordance with design specification

- A construction quality assurance program is in place.
- Survey control is in place to verify final landform, capping and water management structures comply with design parameters.
- Testing of capping material to verify it meets performance criteria (e.g. geotechnical testing supervision, contamination testing etc.)
- A groundwater monitoring program has been implemented to verify water balance modelling as well as performance requirements for permeability have been achieved.
- Settlement monitoring following installation has been implemented.
- Response plan such as a TARP in place to document response if capping or water management structure not effective or compromised.

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DOC20/404129