

ALCOA'S BAUXITE MINE REHABILITATION
PROGRAM

**COMPLETION CRITERIA AND OVERVIEW OF AREA
CERTIFICATION PROCESS**

2015 REVISION

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- ii. Post 1988 Criteria, June 2002 Onwards Rehabilitation
- iii. Post 1988 Criteria, March 2007 Onwards Rehabilitation

1. Purpose

This document contains revised Completion Criteria developed in consultation with the Mining Management Program Liaison Group (MMPLG)¹ that define requirements for relinquishment of management responsibility for areas of Alcoa of Australia's bauxite mine rehabilitation. The revised Completion Criteria are to be applied to rehabilitation established from 2016 onwards until replaced by future revisions of the Criteria.

It is acknowledged that standards will change with time to reflect current technology and community expectations and that there is a requirement and commitment for continuous review and improvement. The site based completion criteria assessment process will include elements of monitoring, audit and self certification by Alcoa and inspection, verification and sign off by Government. See Appendix W: Completion Criteria for 2016 onwards - Current Era Rehabilitation.

2. Background

2.1. Alcoa's bauxite mine rehabilitation

Alcoa presently operates the Huntly and Willowdale bauxite mines in the Northern Jarrah Forest in Western Australia. A third mine at Jarrahdale ceased operations in 1998, with final rehabilitation completed in 2001. On average approximately 600 hectares of forest are currently cleared, mined and rehabilitated each year.

Rehabilitation prescriptions have changed over time in response to improvements in knowledge, technologies and community expectations (Gardner and Bell, 2007; Grant and Koch, 2007). Prior to 1971, rehabilitation consisted of plantations of either *Pinus* or *Eucalyptus* species native to the eastern states of Australia, chosen for their resistance to the soil-borne pathogen *Phytophthora cinnamomi*. Subsequent efforts up to 1977 introduced ground preparation treatments, including landscaping, to facilitate future access, and deep ripping to relieve compaction.

Rehabilitation established in the period 1978-1987 continued to contain few *Eucalyptus* species native to the northern jarrah forest but a broader range of native understorey species were sown, with the objective of establishing a functioning and self-sustaining eucalypt forest. Since 1988, rehabilitation has been undertaken by direct seeding of only indigenous species, with jarrah and marri as the dominant tree species. The objective of rehabilitation for this era has been to restore a self-sustaining jarrah forest ecosystem planned to enhance or maintain water, timber, recreation, conservation and/or other nominated forest values.

2.2. Environmental research and monitoring program

Since the early 1980's, Alcoa has had an extensive research program relating to the establishment, sustainability and management of ecosystems developing on rehabilitated bauxite mines (see Bell and Hobbs, 2007). Alcoa's Environmental Research Group, in collaboration with universities, the CSIRO, Government departments and individual experts, is continuing to develop and support a comprehensive portfolio of research examining many facets of ecosystem establishment and recovery in rehabilitated areas.

¹ MMPLG - The liaison group comprising relevant WA Government agencies chaired by the Department of State Development – Web Site - <http://www.dsd.wa.gov.au/> Alumina Refinery (Pinjarra) Agreement Act 1969

These include studies to understand and improve vegetation establishment, sustained growth, resilience and succession, vertebrate and invertebrate faunal recolonisation and hydrological processes and management. In addition, a range of environmental monitoring is conducted to support specific reporting requirements and to underpin many long-term research programs.

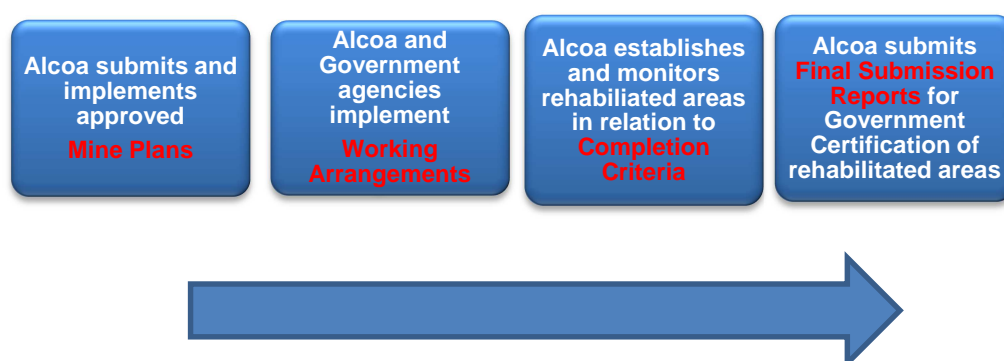
The Completion Criteria are supported and refined in many instances by these research and monitoring programs. In addition, research and monitoring programs support the development of guidelines to assist the Department of Parks and Wildlife (Parks and Wildlife) with future longer-term management of previously mined areas such as fire management or prescriptions for special uses.

2.3. Working Arrangements

In 1979 a document containing a set of prescriptions for how operations, including rehabilitation, should be conducted in State forest, was agreed with the State Government Forests Department (now Parks and Wildlife). This document, presently known as the Alcoa/DEC Working Arrangements, captured the best practice operations of the time and, in the case of rehabilitation, prescribed performance criteria for the establishment phase. Working Arrangements are also in place between Alcoa and the Department of Water and the Water Corporation to ensure appropriate water resource management and protection.

The intent of the Working Arrangements is to maintain a coordinated approach to the management of mining operations and the protection of biodiversity and water resources. The document provides clear information about relationships and communications between Alcoa and State Government agencies and the agreed procedures and guiding principles that are to be followed in communications. The Working Arrangements document is now regarded as a key adjunct document to the Completion Criteria and from 2016 onwards will be reviewed immediately following the Completion Criteria review, so that operational management can be updated to reflect any changes in the Criteria and any improvements in knowledge from research, technology and operational understanding. Figure 1 illustrates the sequence of application of Alcoa's Mine Plans, Working Arrangements, Completion Criteria and the rehabilitation area certification process involving government review of Final Submissions Reports.

Figure 1. Application of key documents during mining, rehabilitation and certification



3. Completion Criteria

It has been recognised by the mining industry, government authorities and the public that criteria are needed to determine when mine rehabilitation is agreed as complete. For industry, completion criteria facilitate the determination of when liability for mined and rehabilitated areas ceases. Government seeks successful rehabilitation to ensure the State does not inherit liability requiring input of extraordinary resources. The wider community also desires rehabilitation that will be successful and that restores a sustainable land use.

The Completion Criteria for rehabilitated bauxite mining areas provide the Government and Alcoa with clear direction for management of mine rehabilitation on a regional basis. They also give a description of the desired state of rehabilitation that is measurable and applicable to the surrounding lands influenced by Alcoa's operations, before the State will agree that obligation for ongoing financial input or legal responsibilities by Alcoa effectively cease. In particular, the criteria are designed to ensure areas will display self-sustaining characteristics of a forest ecosystem and demonstrate to Parks and Wildlife, as the manager of the jarrah forest, that areas agreed as meeting the completion criteria can be managed within normal forest management procedures without input of extraordinary resources.

3.1. Requirements and principles

Procedures associated with the environmental approval of Alcoa's Wagerup refinery expansion define the requirements for development of completion criteria for rehabilitation. The procedures assign responsibility for carriage of the rehabilitation completion criteria program to the MMPLG. The procedures also require:

- Public consultation prior to finalisation of the Completion Criteria, and public access to the final Completion Criteria.
- Regular review and revision of the Completion Criteria via the MMPLG, involving public consultation and access to the final document.
- Application of best practice environmental management principles.
- Where areas have met all appropriate criteria, a certificate of acceptance will be supplied to Alcoa by the Department of Parks and Wildlife on behalf of the State.

Completion Criteria and associated standards were developed based on a set of principles that were considered appropriate for mine rehabilitation in the northern jarrah forest. The agreed principles were that rehabilitated areas:

- Meet landuse objectives.
- Are integrated into the surrounding landscape.
- Support vegetation that exhibits sustained growth and development.
- Support vegetation that is as resilient as jarrah forest.
- Can be integrated with the surrounding forest management.

3.2. Application

Since rehabilitation practices and procedures have evolved over time (Section 2.1) and Completion Criteria are subject to periodic review (Section 3.1), Alcoa's rehabilitation areas are assessed against differing criteria and expectations depending on the year of establishment (Table 1). Rehabilitated areas established up to 1987 reflect the agreed practice at that time of establishing a non-jarrah forest ecosystem with restricted objectives and values, and are collectively termed Early Era rehabilitation. From 1988, with the objective of restoring a self-sustaining jarrah forest ecosystem, criteria were increasingly influenced by ecological considerations. This document represents the second revision to the Completion Criteria applicable to jarrah-dominant post-1988 rehabilitation.

Table 1. Periods of rehabilitation establishment and associated Completion Criteria that are applicable for each period.

Rehabilitation establishment year	Applicable Completion Criteria	Reference
1966-1987	Early Era (pre-1988) Rehabilitation. Formally accepted by the MMPLG 5 June 2002.	DoIR (2002, 2007)
1988-2004	Current Era (post-1988) Rehabilitation Formally accepted by MMPLG, 14 October 1998.	DoIR (2002)
2005-2015	Completion Criteria for 2005 onwards - Current Era Rehabilitation. Review completed and approved by MMPLG 15 March 2007.	DoIR (2007)
2016 onwards	This document	

Specific completion criteria and standards have been identified for individual aspects of rehabilitation that demonstrate the principles identified in Section 3.1. The assessment of rehabilitation, except for areas established prior to 1988, against the Completion Criteria is applied throughout the various stages of the rehabilitation operations and during the early and later years of ecosystem development. Early assessment ensures that corrective actions can be carried out effectively and cost-efficiently by Alcoa. Completion Criteria for rehabilitation established prior to 1988 were developed retrospectively, so are based on assessment at later stages of development only. However, the principles are the same as those used for current era rehabilitation.

Reviews of the Completion Criteria are initially undertaken by the Alcoa/Parks and Wildlife Working Group, with input from other MMPLG members as necessary. The Working Group recommends changes to the Completion Criteria to the MMPLG for its approval. The MMPLG then reviews and approves the availability of the Completion Criteria for public review. The public review process includes advertising the Completion Criteria in the West Australian newspaper and making the relevant documents accessible on the Department of State Development's web site. All comments from the public are reviewed by the Working Group.

There is provision within the Completion Criteria for individual assessment of particular sites used for bauxite mining (or related infrastructure) that may have elevated historical recreational, or other value. Assessments of these sites is to confirm that they are acceptable for handback even though some of the final closure outcomes for these areas differ from the forest rehabilitation standards outlined in the Completion Criteria. For each of these areas, Alcoa develops a specific area management plan that defines required actions for closure and relinquishment and any ongoing responsibilities of nominated parties for future

management. The specific area management plan must be approved by the MMPLG to ensure that the final closure outcomes for the affected area are appropriate and consistent with the default land use objectives for State forest in the area.

In addition to special provision for sites with elevated historical or recreational value, it is recognised that variation from the standard rehabilitation completion criteria may be considered for particular forest areas within identified catchments or subcatchments on a case by case basis, subject to review and consideration by Parks and Wildlife, and assessment and approval by the MMPLG. Such cases include the application of special rehabilitation prescriptions, in particular to areas prescribed within Catchment Management Plans that are prepared and approved pursuant to the Forest Management Plan 2014-2023. This provides opportunities to apply and test new understandings and rehabilitation approaches for that could benefit biodiversity and other values of forest areas such as native aquatic fauna, under appropriate circumstances.

3.3 Assessment

The assessment of rehabilitation against the Completion Criteria is applied throughout the various stages of the rehabilitation operations and during the early years of ecosystem development (See Appendix A- Completion Criteria). This ensures that corrective actions can be carried out while operations are still nearby.

An Environment/Rehabilitation checklist has been developed to record the status of rehabilitation in the field. Historic rehabilitation records and aerial photographs are also used to assist with the assessment. The checklists were developed and modified after testing them over a range of rehabilitation quality and age and the requirements for the assessment sheets are set out in the Working Arrangements.

Assessment results and photographs taken at each site are stored in Alcoa's Geographical Information System to ultimately assist Parks and Wildlife with future management of the rehabilitation. The assessments indicate whether the site is exhibiting sustained growth and development. If a site is recorded as not meeting one of the criteria, it is reviewed with Parks and Wildlife to determine the need for corrective action and the extent of rework to improve the site. Re-work prescriptions aim to favour the re-establishment of jarrah forest species and suppress the re-establishment of non-indigenous species.

Areas that do not meet the standards due to the presence of significant infrastructure, such as pit faces, are automatically reviewed with Parks and Wildlife regardless of growth on the site. Some additional works like the installation of access tracks and waterholes for fire management are carried out to facilitate the integration of management of the rehabilitated areas with the surrounding forest. The sites are reviewed in a local and regional context.

Applications for certificates of acceptance, which signal successful completion of requirements, will be made by Alcoa on a mining region or sub-region basis, rather than at the individual pit scale. Therefore, it is likely that more than one set of criteria applicable to rehabilitation of different ages will be applicable, and applied accordingly in the assessment of overall rehabilitation success.

4. Process¹ for certification

There is an ongoing process prior to proposed hand back of rehabilitated areas for Alcoa to internally monitor and confirm achievement of completion criteria prior to submission of applications for certificates of acceptance. This takes place at the various stages of completion, supported by monitoring data and self-audit checklists. DPaW reviews Alcoa's rehabilitation checklists, and monitoring data are provided to DPaW annually to allow field audits of the rehabilitation and timely feedback to Alcoa where appropriate.

The formal acceptance of rehabilitated areas by the State is achieved through the issue of a Certificate of Acceptance to Alcoa by the Department of Parks and Wildlife (DPaW) on behalf of the State. The indicative steps required to receive a Certificate of Acceptance are outlined below. Note that timeframes provided are intended to be the maximum required, and endeavours will be made to limit the time taken to the minimum necessary at each phase.

STEP	TIMING
1. Alcoa initiates discussion with the MMPLG ² signalling intent to submit an application for a Certificate of Acceptance (Final Submission Report - Section 3.5), including confirmation of the scope and content of the Final Submission Report (based on Appendix B) for the area involved.	Alcoa to initiate.
2. Alcoa provides a draft Final Submission Report to the MMPLG for review and confirmation of content.	Alcoa to initiate.
3. MMPLG reviews the draft Final Submission Report and provides feedback on report content and presentation within 6 weeks.	6 weeks
4. Within 6 weeks Alcoa applies for a Certificate of Acceptance, including a Final Submission Report (Letter and report addressed to DSD attention MMPLG) which is distributed to MMPLG members.	6 weeks or TBA
5. Within 10 weeks of receiving the Final Submission Report, the MMPLG provides an Assessment Report to Alcoa,	8 weeks
6. Within 12 weeks of receiving the MMPLG Assessment Report, Alcoa submits a draft Action Plan to address any issues identified within the Assessment Report.	12 weeks or TBA
7. Within 4 weeks of receiving the draft Action Plan, MMPLG provides feedback to Alcoa identifying any further actions to be included in the Action Plan.	4 weeks
8. Within 12 weeks or as otherwise advised, Alcoa completes activities within the final Action Plan or identifies areas and proposed arrangements to address any 'further requirements' and submits evidence in the form of a Completion Report to the MMPLG.	12 weeks or TBA
9. Within 4 weeks of receipt, MMPLG completes review of the Completion Report and provides advice to Alcoa on the outcome. Then within 2 weeks, the Department of State Development (DSD) places an advertisement in the West Australian and on its website indicating that the MMPLG report on this application and associated documentation is publically available, with any comments accepted during a 4 week period (comments are to be acknowledged by DSD and forwarded to MMPLG members as they are received).	6 weeks
10. Within 6 weeks of the closing date for public comments, DSD and DPaW develop a response to public submissions in consultation with MMPLG members and Alcoa and provides a recommendation to MMPLG regarding the issue of a certificate of acceptance.	6 weeks
11. Within 2 weeks of a recommendation MMPLG meets and confirms a decision on whether to advise DPaW to issue a Certificate of Acceptance.	2 weeks
12. DPaW issues Alcoa with a Certificate of Acceptance within 8 weeks of supporting advice from MMPLG.	8 weeks
Maximum indicative timeframe from submission of draft Final Submission Report to issuing of Certificate of Acceptance	70 weeks
	Government
	Alcoa

1. The process is intended to apply to applications covering all years of rehabilitation and is not exclusive to rehabilitation established from 2016 onwards.
2. Alcoa to provide documents prior to MMPLG meeting and scope confirmed at the meeting

4.1 Content of Final Submission Report

The required content of Final Submission Reports is provided as Appendix B – Final Submission Report Content. In reviewing final submission reports, recognition is given to the fact that additional monitoring information agreed to in the current revision will not necessarily be available for rehabilitation established prior to 2016.

4.2 Periodic review

Completion Criteria are subject to review and revision on an approximately 5-yearly basis, in light of improved knowledge, practices and changes in standards.

More information about Alcoa World Alumina (Australia) is available at <http://www.alcoa.com.au>.

5. References

Bell, D.T. and Hobbs, R.J. (2007). Jarrah forest ecosystem restoration: a foreward. *Restoration Ecology* 15 (Supplement), pp. S1–S2.

Department of Industry and Resources (2002). Alcoa World Alumina Australia Darling Range Bauxite Mine Rehabilitation Completion Criteria.

Department of Industry and Resources (2007). Alcoa World Alumina Australia Darling Range Bauxite Mine Rehabilitation Completion Criteria. Available from URL: www.doir.wa.gov.au/investment/Bauxite_Mine_Rehabilitation.pdf Perth, WA.

Gardner, J.H. and Bell, D.T. (2007). Bauxite mining restoration by Alcoa World Alumina Australia in Western Australia: social, political, historical, and environmental contexts. *Restoration Ecology* 15 (Supplement), pp. S3–S10.

Grant, C. and Koch, J. (2007). Decommissioning Western Australia's First Bauxite Mine: Co-evolving vegetation restoration techniques and targets. *Ecological Management and Restoration* 8, 92-105.

Appendix B– Final submission report content

The following information is to be provided in the Final Submission Report to demonstrate and provide evidence that the crusher region is ready to be handed back to the State.

FACTOR	OBJECTIVE	SUPPORTING DOCUMENTATION
1) Accessibility	Demonstrate that the Forest Access Plan for the Crusher Region has been implemented and that the forest road network has been established to required standards	<ul style="list-style-type: none"> • Evidence that the final integrated Forest Access Plan has been progressively (on a forest block basis) signed off by Parks and Wildlife. • Parks and Wildlife and Water Corporation sign off that Forest Access Plan has been implemented to their satisfaction • MMPLG approved Decommissioning Plan. • GIS coverage of agreed long term access plan. • Annual sign off inspection sheets on all roads to be re-instated through rehabilitation. • Erosion identified at 9 month inspections will be field inspected. Implementation report of CA's agreed with Parks and Wildlife. • Surface rock issues identified at Annual pit inspection and Implementation report of agreed CA's.
2) Mine infrastructure	Demonstrate that the Crusher Region has removed all infrastructure as outlined in the Decommissioning Plan	<ul style="list-style-type: none"> • Evidence that the Decommissioning Plan has been progressively signed off by MMPLG • MMPLG approval of Decommissioning Plan • Evidence of the final decommissioning plan implementation. Signed off by MMPLG. • GIS coverage of all identified mine infrastructure Contaminated site report by external consultant. • Contaminated site report by independent consultant.

3)	Mine safety	Demonstrate that the Crusher Region complies with all Department of Mines and Petroleum safety criteria	<ul style="list-style-type: none"> • Evidence that a mine safety report has been signed off – inspection required by DMP to provide this report. • A formal letter from Department of Mines and Petroleum to the MMPLG indicating that Alcoa have met their safety obligations with the decommissioning of the crusher region.
4)	Integrated fire management	Demonstrate that the fire management plans for the Crusher Region have been agreed to and or implemented, and that integration with Parks and Wildlife’s fire management practices has been achieved, OR that rehabilitation has had one controlled burn or is capable of being burnt in a mosaic pattern with surrounding forest.	<ul style="list-style-type: none"> • Controlled burn and fire history map for Crusher Region • Research results showing evidence of stand recovery and resilience to fire. These results to include photos. • Aerial photographs and satellite imagery of region • GIS map identifying all areas previously burnt, either controlled or uncontrolled. • Documentation of unburnt rehabilitated areas for which financial liability is retained.
5)	Dieback forest rehabilitation (DFR)	Demonstrate that the DFR program has been completed to the standard prescribed within the Crusher Region.	<ul style="list-style-type: none"> • Summary of DFR records and treatment outcomes • Map showing areas of treatment • Letter from Parks and Wildlife indicating that Alcoa’s DFR responsibilities have been met • DFR sign off sheets (signed by both Parks and Wildlife and Alcoa) • Monitoring reports • Summary of history of meeting minutes of all DFR within the area for submission
6)	Weeds	Demonstrate that mining activities in the region have not led to the introduction or spread of weeds* in either rehabilitation or unmined forest areas.	<ul style="list-style-type: none"> • GIS map showing weed areas identified at 9-month monitoring and treated. • Findings and actions resulting from the aerial photography weed inspection • Sign off Annual inspections and Corrective actions with Parks and Wildlife. • Letter from Parks and Wildlife indicating that Alcoa’s weed management responsibilities have been met • Report on trials and monitoring.
		*A naturalised non-indigenous plant species, that adversely affects the health, survival or regeneration of local provenance-indigenous plant species in Alcoa’s rehabilitation and unmined forest	

7)	Biodiversity conservation values of Significance	Demonstrate that the species management plans for the Crusher Region have been implemented and that key biodiversity conservation values have been adequately managed.	<ul style="list-style-type: none"> • Summary of key biodiversity conservation values identified from pre-mining surveys (both fauna and flora) including tree islands and granite outcrops. • Alcoa provide evidence of actions taken to protect key biodiversity conservation values as per species management plans • Report on trials and monitoring • GIS map coverage of all trials • Remote sensing imagery of rehabilitation.
8)	Overstorey	Demonstrate that rehabilitation stands of jarrah and marri are capable of producing saw logs.	<ul style="list-style-type: none"> • Evidence from trial results, monitoring and post-fire assessments that stand stocking and bole length meet Completion Criteria standards. • Remote sensing imagery of all rehabilitation areas including identifying areas affected by drought. • Management plans, as agreed with Parks and Wildlife, for areas identified as requiring corrective action. • GIS map coverage of all trials. • Evidence showing proportion of mined area that prior to mining was capable of producing sawlogs (using API information). • Provide GIS shapefiles for the age of rehabilitation, pit size and establishment density. • Establishment or management history. • Monitoring data undertaken prior to handback², provided as GIS coverage, showing current stocking of overstorey, and average or top height of overstorey.
9)	Understorey	Demonstrate that rehabilitation understory is capable of perpetuating a range of legumes and re-sprouting species and has adequate plant species richness.	<ul style="list-style-type: none"> • Evidence provided from plot monitoring data for the understorey density and species richness in the rehabilitation is within prescribed Completion Criteria target ranges at age 9 and 15 months. • Evidence provided from plot monitoring data for the understorey density and species richness in the rehabilitation from post fire assessments demonstrates that rehabilitation is acceptable. • Evidence from trials and monitoring • Reports of 15 month data, included in Annual Completion Reports

² Parks and Wildlife and Alcoa to determine and agree on the standards and format for the supply of overstorey plot data

			<ul style="list-style-type: none"> • GIS map coverage of all trials • Photo history of rehabilitation. Established photo points, 1 per 50ha, recorded on GIS, and revisited on a rotation (approx 4 yearly). Photos to be stored electronically and supplied with final Submission. • Remote sensing imagery of rehabilitation. • Provide random sampling data and reference data.
10)	Forest diseases, insects and drought	Demonstrate that rehabilitation stands have targeted number of marri stems per hectare and that disease, insect infestation or drought expression is no greater than in the unmined forest.	<ul style="list-style-type: none"> • Records depicting dieback areas pre and post mining within the Crusher Region/by pit. • Annual Completion Reports to include dieback status of pits. • GIS map of all rehabilitation, summarising DB/DBF recorded at the time of the rehabilitation. • Field verification, assessment and agreed management plans for areas of rehabilitation affected more than surrounding forest. • Records and maps showing identified insect distress and other forest diseases over the life of the Crusher Region and at the time of hand back. • Remote sensing imagery identifying selective areas affected by drought, insect or disease. • Management plans, as agreed with Parks and Wildlife, if areas identified to be affected. • Ensure consideration is given, and data shown, to identify all other forest diseases (eg Myrtle rust).
11)	Heritage	Demonstrate that significant Indigenous and European heritage values identified in pre-mining surveys within the Crusher Region have been managed appropriately	<ul style="list-style-type: none"> • Summary of assessments from pre mining Indigenous and European heritage sites. (both internal and external consultant reports) • Documentation and GIS maps of all Indigenous and European heritage sites and the management actions taken to protect them
12)	Habitat	Demonstrate that rehabilitation has the targeted number of constructed fauna habitats as defined in the Alcoa/DEC Working Arrangements.	<ul style="list-style-type: none"> • Summary of records from Annual Rehabilitation Inspection and Signoff sheets of constructed habitats. • Provide summary report of fauna monitoring and trials for rehabilitation areas, and adjacent forests.
13)	Visual amenities	Demonstrate that high value view-sheds from within the Crusher	<ul style="list-style-type: none"> • Summary report together with pre and post mining photographic records of landscape values at risk from mining activities and infrastructure.

	Region have been managed and protected.	<ul style="list-style-type: none"> • Management plans for all identified visual issues.
14) Hydrology	Demonstrate that catchment management and rehabilitation design meets Working Arrangements (Parks and Wildlife, DoW and Water Corp.)	<ul style="list-style-type: none"> • Annually identify, and GIS record wet areas within rehabilitation • Aerial photograph and field verify long term wet areas. • Report on research trials and monitoring investigating mining-related changes to hydrology.

Appendix C - Earlier Criteria

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