Appendix F

Environmental risk assessment

A-1 Sandy Ridge Facility – 2016 environmental risk assessment (see Appendix A(A-2))

A-2 Sandy Ridge Facility – 2021 environmental risk assessment

Assessment of key environmental risks and potential impacts associated with the alignment of Sandy Ridge waste tonnage

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
Terrestrial Environment Quality Objective: To maintain the quality of land and soils so that environmental values are protected.	Soil removal	Almost certain	Minor	High	Adverse	Medium term	MCP WFDCP OEMP	MCP WFDCP OEMP	Moderate	Almost certain	Minor	High	Adverse	Medium term	Risk L/C same
	Degradation of stockpiled soils	Likely	Minor	Medium	Adverse	Medium term	MCP WFDCP OEMP	MCP WFDCP OEMP	Moderate	Possible	Minor	Medium	Adverse	Medium term	Risk L/C reduced
	Soil contamination from leaks/spills	Possible	Minor	Medium	Adverse	Temporary	ERP OEMP SRP TMP TMPF TMPAR	ERP OEMP SRP TMP TMPF TMPAR	Moderate	Unlikely	Minor	Low	Adverse	Temporary	Risk L/C reduced
	Potential subsidence and instability of a waste cell allowing infiltration of water and generation of leachate.	Possible	Minor	Medium	Adverse	Permanent	LMMP MCP WFDCP Design specifications	LMMP MCP WFDCP Design specifications	Moderate	Unlikely	Minor	Low	Adverse	Short term	Risk L/C reduced
	Sterilisation of minerals beneath the cells	Unlikely	Minor	Low	Adverse	Permanent	SMP Design specifications	SMP Design specifications	Moderate	Unlikely	Minor	Low	Adverse	Permanent	Risk L/C same
	Change in landform from erosion	Possible	Minor	Medium	Adverse	Permanent	MCP WFDCP Design specifications	MCP WFDCP Design specifications	Moderate	Unlikely	Minor	Low	Adverse	Permanent	Risk L/C reduced
	Radiological exposure during operation	Possible	Moderate	Medium	Adverse	Temporary	RWAP RMP WZG	RWAP RMP WZG	Moderate	Remote	Moderate	Low	Adverse	Temporary	Risk L/C reduced
	Non-compliance with waste acceptance criteria	Possible	Major	High	Adverse	Temporary	CWAP RWAP WZG	CWAP RWAP WZG	Moderate	Remote	Major	Medium	Adverse	Temporary	Risk L/C reduced

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
	Inconsistency with the National Waste Policy and WA Waste Strategy	Possible	Moderate	Medium	Adverse	Temporary	CWAP RWAP	CWAP RWAP	Moderate	Unlikely	Moderate	Medium	Adverse	Temporary	Risk L/C reduced
	Waste disposal cumulative impacts	Possible	Moderate	Medium	Adverse	Permanent	CWAP RWAP RMP WZG Design specifications	CWAP RWAP RMP WZG Design specifications	Moderate	Unlikely	Moderate	Medium	Adverse	Permanent	Risk L/C reduced
Flora and Vegetation To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	Removal of vegetation	Almost certain	Minor	High	Adverse	Long term	FVMP MCP WFDCP OEMP	FVMP MCP WFDCP OEMP	Moderate	Almost certain	Minor	High	Adverse	Long term	Risk L/C same
	Removal of vegetation of conservation significance	Possible	Moderate	Medium	Adverse	Long term	FVMP MCP WFDCP OEMP	FVMP MCP WFDCP OEMP	Moderate	Remote	Moderate	Low	Adverse	Long term	Risk L/C reduced
	Removal of flora species of conservation significance	Possible	Moderate	Medium	Adverse	Long term	FVMP MCP WFDCP OEMP	FVMP MCP WFDCP OEMP	Moderate	Unlikely	Moderate	Medium	Adverse	Long term	Risk L/C reduced
	Impacts on lands managed by DBCA	Possible	Moderate	Medium	Adverse	Long term	FVMP MCP WFDCP OEMP	FVMP MCP WFDCP OEMP	Moderate	Unlikely	Moderate	Medium	Adverse	Long term	Risk L/C reduced
	Alteration of the natural fire regime	Possible	Major	High	Adverse	Long term	BFMP ERP	BFMP ERP	Moderate	Unlikely	Major	Medium	Adverse	Long term	Risk L/C reduced
	Altered hydrology	Likely	Minor	Medium	Adverse	Long term	OEMP SWCP	OEMP SWCP	Moderate	Likely	Minor	Medium	Adverse	Long term	Risk L/C same
	Dust emissions	Almost certain	Minor	High	Adverse	Temporary	OEMP	OEMP	Moderate	Likely	Minor	Medium	Adverse	Temporary	Risk L/C reduced

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
	Uptake of saline water used for dust suppression	Possible	Minor	Medium	Adverse	Temporary	FVMP OEMP	FVMP OEMP	Moderate	Remote	Minor	Low	Adverse	Temporary	Risk L/C reduced
	Uptake of saline water from potential water pipeline leaks within the former Jaurdi Pastoral Lease	Possible	Minor	Medium	Adverse	Temporary	FVMP OEMP	FVMP OEMP	Moderate	Unlikely	Minor	Low	Adverse	Temporary	Risk L/C reduced
	Introduction and spread of weeds	Likely	Minor	Medium	Adverse	Temporary	FVMP OEMP	FVMP OEMP	Moderate	Possible	Minor	Medium	Adverse	Temporary	Risk L/C reduced
	Radiation exposure during operation	Possible	Moderate	Medium	Adverse	Temporary	RWAP RMP WZG	RWAP RMP WZG	Moderate	Remote	Moderate	Low	Adverse	Temporary	Risk L/C reduced
	Transpiration of leachate from waste cell	Possible	Minor	Medium	Adverse	Permanent	FVMP WZG	FVMP WZG	Moderate	Remote	Minor	Low	Adverse	Permanent	Risk L/C reduced
	Vegetation association cumulative impacts	Possible	Minor	Medium	Adverse	Long term	FVMP MCP WFDCP OEMP	FVMP MCP WFDCP OEMP	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C reduced
Terrestrial Fauna To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	Loss of regional habitat	Possible	Minor	Medium	Adverse	Long term	FVMP MCP WFDCP OEMP CEMP	FVMP MCP WFDCP OEMP CEMP	Moderate	Remote	Minor	Low	Adverse	Long term	Risk L/C reduced
	Loss of local habitat	Likely	Minor	Medium	Adverse	Long term	FVMP MCP WFDCP OEMP CEMP	FVMP MCP WFDCP OEMP CEMP	Moderate	Likely	Minor	Medium	Adverse	Long term	Risk L/C same
	Impacts on fauna species of conservation significance	Possible	Moderate	Medium	Adverse	Short term	OEMP CEMP	OEMP CEMP	Moderate	Remote	Moderate	Low	Adverse	Short term	Risk L/C reduced

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
	Increased light, noise and vibration	Likely	Minor	Medium	Adverse	Long term	OEMP CEMP	OEMP CEMP	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C reduced
	Fauna displacement	Likely	Minor	Medium	Adverse	Long term	OEMP CEMP	OEMP CEMP	Moderate	Likely	Minor	Medium	Adverse	Long term	Risk L/C same
	Increased predation and competition for resources	Possible	Minor	Medium	Adverse	Long term	OEMP CEMP	OEMP CEMP	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C reduced
	Increased feral fauna attracted to water and food resources	Possible	Minor	Medium	Adverse	Long term	OEMP CEMP	OEMP CEMP	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C reduced
	Alteration of the natural fire regime	Possible	Major	High	Adverse	Long term	BFMP ERP	BFMP ERP	Moderate	Unlikely	Major	Medium	Adverse	Long term	Risk L/C reduced
	Injury and death from fauna ingress into active cell	Possible	Minor	Medium	Adverse	Long term	OEMP CEMP Design specifications	OEMP CEMP Design specifications	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C reduced
	Injury and death from fauna collision	Almost certain	Minor	High	Adverse	Long term	OEMP TMP TMPF TMPAR CEMP	OEMP TMP TMPF TMPAR CEMP	Moderate	Likely	Minor	Medium	Adverse	Long term	Risk L/C reduced
	Radiation exposure during operation	Possible	Moderate	Medium	Adverse	Temporary	RWAP RMP WZG CEMP	RWAP RMP WZG CEMP	Moderate	Remote	Moderate	Low	Adverse	Temporary	Risk L/C reduced
	Generation of void space and subsequent collapse/instability of the waste cell	Possible	Minor	Medium	Adverse	Temporary	MCP WFDCP Design specifications	MCP WFDCP Design specifications	Moderate	Unlikely	Minor	Low	Adverse	Temporary	Risk L/C reduced
	Terrestrial fauna cumulative impacts	Possible	Minor	Medium	Adverse	Short term	OEMP CEMP	OEMP CEMP	Moderate	Unlikely	Minor	Low	Adverse	Short term	Risk L/C reduced

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
Human Health To protect human health from significant harm.	Exposure to leaks and spills	Possible	Moderate	Medium	Adverse	Temporary	ERP HHMP HSMP OEMP SRP TMP TMPF TMPAR	ERP HHMP HSMP OEMP SRP TMP TMPF TMPAR	Moderate	Unlikely	Moderate	Medium	Adverse	Temporary	Risk L/C reduced
	Radiological exposure during operation	Possible	Moderate	Medium	Adverse	Temporary	RWAP RMP HHMP HSMP OPVM WZG	RWAP RMP HHMP HSMP OPVM WZG	Moderate	Remote	Moderate	Low	Adverse	Temporary	Risk L/C reduced
	Radiological exposure during post closure	Possible	Moderate	Medium	Adverse	Permanent	RWAP RMP HHMP HSMP MCP WFDCP WZG	RWAP RMP HHMP HSMP MCP WFDCP WZG	Moderate	Remote	Moderate	Low	Adverse	Permanent	Risk L/C reduced
	Generation of void space and subsequent collapse/instability of the waste cell	Possible	Minor	Medium	Adverse	Temporary	MCP WFDCP Design specifications	MCP WFDCP Design specifications	Moderate	Unlikely	Minor	Low	Adverse	Temporary	Risk L/C reduced
	Exposure to dust emissions from kaolin	Almost certain	Minor	High	Adverse	Temporary	HHMP HSMP OPVM	HHMP HSMP OPVM	Moderate	Possible	Minor	Medium	Adverse	Temporary	Risk L/C reduced
	Dust emissions from waste handling	Possible	Moderate	Medium	Adverse	Temporary	HHMP HSMP OPVM	HHMP HSMP OPVM	Moderate	Remote	Moderate	Low	Adverse	Temporary	Risk L/C reduced

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
	Potential for fire	Possible	Major	High	Adverse	Long term	BFMP ERP	BFMP ERP	Moderate	Unlikely	Major	Medium	Adverse	Long term	Risk L/C reduced
	Insufficient safety of the final landform	Possible	Minor	Medium	Adverse	Permanent	MCP WFDCP Design specifications	MCP WFDCP Design specifications	Moderate	Remote	Minor	Low	Adverse	Permanent	Risk L/C reduced
	Bush tucker consumption	Possible	Minor	Medium	Adverse	Permanent	EPCH FVMP CEMP	EPCH FVMP CEMP	Moderate	Remote	Minor	Low	Adverse	Permanent	Risk L/C reduced
	Risks to workers at the accommodation village	Possible	Minor	Medium	Adverse	Long term	HHMP HSMP OPVM PWMP	HHMP HSMP OPVM PWMP	Moderate	Remote	Minor	Low	Adverse	Long term	Risk L/C reduced
Inland Waters To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected.	Surface water ingress into mined waste cells	Likely	Moderate	High	Adverse	Temporary	OEMP SWCP	OEMP SWCP	Moderate	Remote	Moderate	Low	Adverse	Temporary	Risk L/C reduced
	Leak/spill contamination of surface water	Possible	Moderate	Medium	Adverse	Temporary	ERP OEMP SRP SWCP Design specifications	ERP OEMP SRP SWCP Design specifications	Moderate	Unlikely	Moderate	Medium	Adverse	Temporary	Risk L/C reduced
	Leak/spill generation of leachate to contaminate groundwater	Possible	Moderate	Medium	Adverse	Permanent	DGMMP ERP LMMP OEMP SRP WZG Design specifications	DGMMP ERP LMMP OEMP SRP WZG Design specifications	Moderate	Remote	Moderate	Low	Adverse	Permanent	Risk L/C reduced

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
	Contamination of groundwater from waste in disposal cells after capping	Possible	Moderate	Medium	Adverse	Permanent	CWAP RWAP DGMMP LMMP MCP WFDCP OEMP SWCP WZG Design specifications	CWAP RWAP DGMMP LMMP MCP WFDCP OEMP SWCP WZG Design specifications	Moderate	Remote	Moderate	Low	Adverse	Permanent	Risk L/C reduced
	Impacts on salt lakes	Unlikely	Minor	Low	Adverse	Permanent	OEMP SWCP	OEMP SWCP	Moderate	Remote	Minor	Low	Adverse	Permanent	Risk L/C reduced
Social Surroundings To protect social surroundings from significant harm.	Noise emissions from Facility affecting landusers	Unlikely	Minor	Low	Adverse	Long term	SMP TMP TMPF TMPAR	SMP TMP TMPF TMPAR	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C same
	Dust generation from Facility affecting landusers	Unlikely	Minor	Low	Adverse	Long term	SMP TMP TMPF TMPAR	SMP TMP TMPF TMPAR	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C same
	Visual amenity from Facility	Unlikely	Minor	Low	Adverse	Long term	SMP TMP	SMP TMP	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C same
	Traffic safety and amenity	Likely	Moderate	High	Adverse	Long term	SMP ERP HSMP TMP TMPF TMPAR	SMP ERP HSMP TMP TMPF TMPAR	Moderate	Possible	Moderate	High	Adverse	Long term	Risk L/C reduced
	Impacts to Aboriginal heritage and culture	Unlikely	Moderate	Medium	Adverse	Permanent	EPCH SMP	EPCH SMP	Moderate	Remote	Moderate	Low	Adverse	Permanent	Risk L/C reduced

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
	Impacts to National and historical heritage	Remote	Minor	Low	Adverse	Permanent	EPCH SMP	EPCH SMP	Moderate	Remote	Minor	Low	Adverse	Permanent	Risk L/C same
Closure and Rehabilitation	The subsidence of a waste cell allowing infiltration of water and the generation of leachate	Possible	Minor	Medium	Adverse	Long term	DGMMP HSMP MCP WFDCP OEMP WZG Design specifications	DGMMP HSMP MCP WFDCP OEMP WZG Design specifications	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C reduced
	Topsoil degradation	Likely	Minor	Medium	Adverse	Long term	MCP WFDCP OEMP	MCP WFDCP OEMP	Moderate	Possible	Minor	Medium	Adverse	Long term	Risk L/C reduced
	Erosion/gullies/deep rooted vegetation creating cracks in the clay capping	Possible	Minor	Medium	Adverse	Long term	MCP WFDCP OEMP Design specifications	MCP WFDCP OEMP Design specifications	Moderate	Unlikely	Minor	Low	Adverse	Long term	Risk L/C reduced
	Revegetation not growing	Likely	Minor	Medium	Adverse	Medium term	FVMP MCP WFDCP OEMP	FVMP MCP WFDCP OEMP	Moderate	Possible	Minor	Medium	Adverse	Medium term	Risk L/C reduced
	Fauna not returning	Likely	Minor	Medium	Adverse	Medium term	MCP WFDCP OEMP CEMP	MCP WFDCP OEMP CEMP	Moderate	Possible	Minor	Medium	Adverse	Medium term	Risk L/C reduced

Environmental factor	Hazard identified by the proponent	Pre-mitigated risks					Mitigation			Post-mitigated risks					Risk L/C outcome**
		Likelihood	Consequence	Risk ranking	Nature	Duration	Mitigation to reduce likelihood*	Mitigation to reduce consequence*	Confidence	Likelihood	Consequence	Risk ranking	Nature	Duration	
	A functioning ecosystem is not achieved	Likely	Minor	Medium	Adverse	Long term	FAD FVMP MCP WFDCP OEMP CEMP	FAD FVMP MCP WFDCP OEMP CEMP	Moderate	Possible	Minor	Medium	Adverse	Long term	Risk L/C reduced

***Abbreviations:**

Bushfire Management Plan (BFMP)
Chemical Waste Acceptance Procedure (CWAP)
Environmental Protection and Cultural Heritage Procedure (EPCH)
Construction (Fauna) Environmental Management Plan (CECEMP)
Deep Groundwater Monitoring and Management Plan (DGMMP)
Emergency Response Plan (ERP)
Flora and Vegetation Management Plan (FVMP)
Health Hygiene Management Plan (HHMP)
Health and Safety Plan (HSMP)
Leachate Monitoring and Management Plan (LMMP)
Mine Closure Plan (MCP)
Operational Environmental Management Plan (OEMP)
Operational Plan Ventilation Management (OPVM)
Financial Assurance Deed (FAD)
Potable Water Management Plan (PWMP)
Radiation Management Plan (RMP)
Radiological Waste Acceptance Procedure (RWAP)
Spill response procedure (SRP)
Surface Water Control Procedure (SWCP)
Traffic Management Plan - Facility (TMPF)
Traffic Management Plan Access Roads (TMPAR)
Transport Management Plan (TMP)
Waste Facility Decommissioning Closure Plan (WFDCP)

****Risk outcome in relation to potentially reduced likelihood or consequence**