Prepared for ACE Power

Waste Management Plan

Forbes Solar Farm

Forbes Shire Local Government Area, Forbes, NSW

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Acronyms and abbreviations

BESS	Battery Energy Storage System
CoA	Conditions of Approval
DPE	(Former) Department of Planning and Environment (NSW) (now DCCEEW and DPHI)
DPHI	Department of Planning, Housing and Infrastructure (NSW) (formerly DPE)
EIS	Environmental impact statement
EPA	Environment Protection Authority (NSW)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
ESCP	Erosion Sediment Control Plan
FSC	Forbes Shire Council
Kl	Kilolitres
km	kilometres
L	Litres
m	metres
MW	Megawatt
MWh	Megawatt hours
MNES	Matters of national environmental significance
NSW	New South Wales
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PV	photovoltaic
SEA	Site Environmental Advisor
SEARs	Secretary's Environmental Assessment Requirements

SSD	State Significant Development
t	tonnes
the Applicant	ACE Power
the Project	Forbes Solar Farm
VENM	Virgin Excavated Natural Material
WARR Act	*Waste Avoidance and Resource Recovery Act 2001*
WMP	Waste Management Plan

1. Introduction

1.1. Background

The Applicant is planning the development of the Forbes Solar Farm (the Project). The Project is located at lots 94 and 95 DP750173 and lot 29 DP750173, 207 Hooper Road Forbes 11.6km from the township of Forbes. The Project Site is approximately 270 hectares (ha) in the Forbes Shire Council and is zoned as Primary Production (RU1) as per the Forbes Local Environmental Plan 2013.

The Project would involve the construction, operation and decommissioning of a photovoltaic (PV) solar facility with a capacity of approximately 141MW_{DC} (Point of Connection 120MW_{AC}) that would supply electricity to the national electricity market (NEM), and a BESS with an approximate capacity of 120MW and up to four hours of storage (480MWh) to provide system strength and grid stability.

The Project is currently in the Prepare Environmental Impact Statement (EIS) stage (SSD-71855714) and is being prepared in accordance with Part 4 of the New South Wales (NSW) *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 2 of the Environmental Planning and Assessment Regulation 2000 (EP&A Regulation). It is considered to be State Significant Development (SSD).

This Draft Waste Management Plan (WMP) outlines the appropriate management measures to be implemented during construction, operation and decommissioning phases of the Project to avoid or reduce potential waste impacts. At this early stage, the WMP has been prepared using a conservative approach, with the estimated waste streams detailed at a high level. The WMP will be updated during the Project's detailed design stage and in consultation with Council, to accurately capture the expected waste streams for the Project and reflect local disposal capacity.

1.2. The Project

The Project would involve the construction, operation and decommissioning of a photovoltaic (PV) solar facility with a capacity of approximately 166MWDC (discharge/connection capacity of 120MWAC) that would supply electricity to the national electricity grid, and a BESS with an approximate capacity of 120MW and up to eight hours of storage (960MWh).

The Involved land is approximately 354ha in total. The Project Site covers approximately 270ha with the area of solar PV modules, BESS and associated infrastructure anticipated to occupy approximately 251ha (Development Footprint). This would include onsite substations, one for the project and one for Transgrid to facilitate the cut in to the existing line.

The Project is likely to include the specific following infrastructure components:

- Approximately 197,000 single axis tracking bifacial PV modules supported by approximately 2,600 tracker units. The modules can reach a peak height of between 2.6m and 3m above ground level when fully rotated.
- Approximately 30 solar inverters
- Approximately 40 BESS inverters
- Medium voltage (MV) transformers
- BESS with a storage duration of up to 4 hours

- Substations, control room, maintenance facility (some minor components [i.e. lightning rods and transmission poles] of the substation site would be about 8m high)
- Internal access track and underground/overhead cabling
- Watercourse crossings for internal access tracks as required
- Intersection and road upgrades as required
- Landscape plantings.

During the construction phase, temporary facilities would include a laydown area with a secure compound, construction site offices and amenities and car and bus parking areas for construction staff. After decommissioning, most above ground infrastructure would be removed and the site returned to its existing land capability for continued agricultural or alternative appropriate uses

The indicative Project Site plan is provided in Figure 1-1.

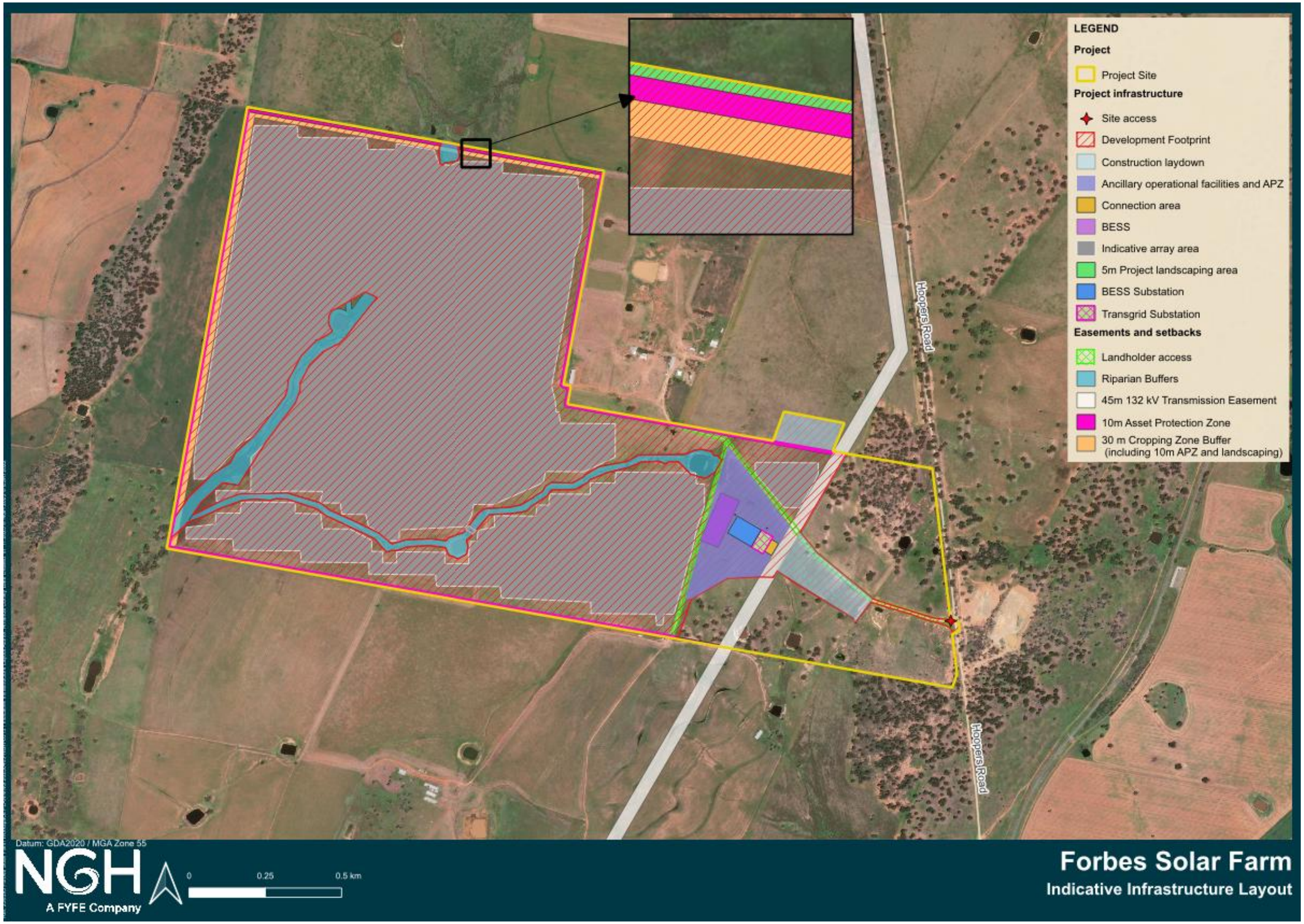

Figure 1-1 Indicative Project Site plan

1.3. Purpose and objectives

The purpose of this Plan is to describe how the Contractor and ACE Power proposes to manage waste and resources during construction, operation and decommissioning of the Project.

The key objective of the Plan is to ensure all Conditions of Approval (CoA), and mitigation measures relevant to waste management are describes, scheduled, and assigned responsibility as outlined in the Project EIS (NGH, 2024).

In addition, objectives of this WMP are to:

- Maximise the efficient use of resources for the Project. This will include minimising resource use and maximising the recovery and recycling of resources
- Increase subcontractors' awareness of their obligations about waste management and recycling opportunities
- Prevent pollution associated with the management and disposal of waste materials for the Project

1.4. Planning Secretary's Environmental Assessment Requirements

This WMP has been prepared concurrently with the Project EIS, in accordance with the Planning Secretary's Environmental Assessment Requirements (SEARs), in relation to waste, which states the EIS will:

- Identify, quantify and classify the likely waste stream to be generated during construction, operation, and decommissioning, and describe the measures to be implemented to manage, reuse, recycle and safely dispose of this waste (in consultation with waste facilities, including Council); and
- Provide a waste management prepared in accordance with the Solar Guideline.

While the SEARs do not state consultation as a requirement, it is recommended that this Waste Management Plan be finalised reflecting Forbes Shire Council comments.

Appendix A serves as a place holder for Council comments.

2. Planning

2.1. Relevant legislation and guidelines

2.1.1. Legislation

Legislation relevant to the development and implementation of the WMP includes:

- *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act)
- Environmental Planning and Assessment Regulation 2021
- *Protection of the Environment Operations Act 1997* (NSW) (POEO Act)
- Protection of the Environment Operations (General) Regulation 2009
- Protection of the Environment Operations (Waste) Regulation 2005
- *Waste Avoidance and Resource Recovery Act 2001* (WARR Act)
- *Biosecurity Act 2015*

- *Environmental Legislation Amendment (Hazardous Chemicals) Act 2024*
- *Dangerous Good (Road and Rail Transport) Act 2008*

2.1.2. Guidelines and standards

Guidelines and standards relevant to the development and implementation of the WMP include:

- NSW Waste and Resource Recovery Strategy 2014-21 (NSW EPA, 2014)
- NSW Government Resource Efficiency Policy (GREP)
- Waste Classification Guidelines (NSW EPA, 2014)
- Stockpile Site Management Guideline (RMS, 2011)
- NSW Large-Scale Solar Energy Guideline (NSW DPE, 2022)

2.2. Conditions of Approval

The Waste Management Plan will be updated to incorporate the CoA and management measures that will form management guides that clearly identify the necessary environmental management actions for reference by ACE Power's personnel and contractors.

3. Consultation

Consultation was not included as a requirement with the issued SEARs for this Project and has not been undertaken as part of the draft WMP. It is recommended, however, that this WMP be finalised reflecting GMC comments. Appendix A retains a place holder for Council comments.

4. Environmental aspects and impacts

4.1. Waste streams and resource use

Project activities will generate solid and liquid wastes, which can be broadly classified as:

- Regulated waste: wastes that require specific controls or actions as defined by legislation. Listed, hazardous, regulated, controlled or trackable wastes typically have unique handling and disposal requirements in order to manage specific hazards associated with them
- General waste: wastes not defined as regulated waste under legislation. General wastes comprise putrescible wastes (easily decomposed, recyclable by composting) and non-putrescible wastes (not easily decomposed, may be recyclable)
- Recyclable waste: waste types that are able to be reconditioned, reprocessed, or reused.

4.1.1. Construction and decommissioning

Waste produced during construction activities could adversely impact the environment through inappropriate storage and / or disposal. Inappropriate management can also result in legislative non-compliance. Waste can be described as general solid waste and recycling or as Regulated wastes. The following waste streams have been identified as likely to occur as a result of the Project works:

- Excavation of topsoils and vegetation clearing (expected to be minimal)
- Packaging materials associated with items delivered to site such as pallets, crates, cartons, plastics and wrapping materials
- Wastes produced from the maintenance of various heavy construction equipment including liquid hazardous wastes from cleaning, repairing and maintenance
- Non-hazardous wastes generated through the use of worker's facilities such as toilets
- General wastes including office wastes, scrap materials and biodegradable wastes
- Chemicals and oils
- Waste water from wash-down and bunded areas
- Redundant erosion and sediment controls
- Liquid bio wastes from onsite septic systems
- Excess building materials
- Scrap metal and cabling materials
- Plastic and masonry products, including concrete wash.

4.1.2. Operation

During operation resources would be associated with maintenance activities and use of machinery and vehicles.

4.2. Potential impacts

The Large-Scale Solar Energy Guideline states that volumes of solar panel waste from large scale solar farms is not significant (DPHI, 2022). However, the waste stream is expected to grow as installed panels start to be decommissioned in the coming decades. By 2025, solar energy systems in NSW are anticipated to generate approximately 3,000–10,000 tonnes (t) of waste and this is expected to grow to 34,000–63,000t per year by 2035.

To combat this growing waste stream the NSW Government has created a $10 million Circular Solar Fund, managed by the NSW Environmental Protection Authority (EPA). Several companies have received grants to become a part of the PV and battery circular economy to divert large scale solar and battery waste away from landfill and into reuse and recycling. These companies include (refer to Circular solar grants program | EPA):

- Blue Tribe Co. Pty Ltd
- PV Industries Pty Ltd
- Scipher Technologies Pty Ltd
- TES-AMM Australia Pty Ltd
- University of New South Wales
- KGM Services trading as The Solar Professionals
- Resource use and availability

While increasing scarcity of resources and environmental impacts are emerging from the use of non-renewable resources, the supply of the materials required for the Project's construction are not currently limited or restricted. In the volumes required, the Project is unlikely to place significant pressure on the availability of local or regional resources. The use of the required resources including their initial outlay for greenhouse gases in production is considered reasonable given the benefits of offsetting fossil fuel electricity generation.

In operation, electricity production using photovoltaics emits no pollution, produces no greenhouse gases, and uses no finite fossil-fuel resources. Only limited amounts of fuels would be required for maintaining and operating vehicles during operation of the solar farm.

It is likely that some electrical components, such as inverters, transformers, and electrical cabling, would need replacement over the proposed life of the solar farm. This would require further use of metal and plastic based products. However, these activities are expected to occur infrequently.

Below a brief lifecycle analysis for the key solar farm components (PV panels and batteries) is presented. Lifecycle analysis is a method to assess the energy and material flows associated with a given process to identify the resource impacts of that process and potential for resource recovery. Lifecycle analysis estimates energy and emissions based on the total lifecycle of materials used for a project, being the total amount of energy consumed in procuring, processing, working up, transporting and disposing of the respective materials (Schleisner, 2000).

PV panels

A lifecycle inventory of multi-crystalline PV panels was undertaken by European and United States photovoltaic module manufacturing companies in 2005-2006. Over the 30-year lifetime of the panels, it is expected that 28g of Green House Gas (GHG) emissions would be produced per kWh of energy generated (Fthenakis, et al., 2011). The 'energy payback time' for multi-crystalline PV panels is dependent on the geographical location, however, on average it is estimated to be 1.5 years. A solar installation in Southern Europe would be even less than 1.5 years (Fraunhofer ISE 2015), which is considered comparable to the solar radiance expected at the Forbes Solar Farm.

The purification of the silicon, which is extracted from quartz, accounts for 30% of the primary energy to produce the panel. This stage also produces the largest amount of pollutants with the use of electricity and natural gas for heating (Fthenakis, et al., 2011). The waste produced during production of the panels which can be recycled include graphite crucibles, steel wire and waste slurry (silicon and polyethylene glycol). However, silicon crystals cannot be recycled during this stage (Fthenakis, et al., 2011). The production of the frames and other system components, including cabling, would also produce emissions and waste but less than the production of panels.

The energy yield ratio of a product is a ratio of the energy produced by, in this case, a solar PV system over its lifetime, to the energy required to make it is referred to as the system's. PV system energy yield ratio in Northern Europe was estimated to be more than ten, indicating the system would produce more than ten times the amount of energy required to make it (Fraunhofer Institute for Solar Energy Systems (ISE), 2015). This positive energy yield ratio also means that GHG emissions generated from the production of solar energy systems are more than offset over the systems' lifecycle (GA and ABARE, 2010).

Li-ion Batteries

Li-ion batteries are classified as hazardous waste under the Commonwealth *Hazardous Waste Act 1989*, and Dangerous Goods under the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). The code has a special provisions and packaging instructions for Li-ion batteries transported for disposal or recycling. The average life of the Li-ion PV solar batteries is assumed to be 10 years (Randell Environmental Consultancy, 2016) and therefore batteries may require replacement 1-2 times during the life of the solar farm.

Presently, there is one B-Cycle accredited, EPA permitted and licensed recycler of mixed batteries including Li-ion batteries in Australia that are collecting, sorting and processing entirely onshore. The number of recycling plants with these accreditations will grow with demand. B-Cycle is a government backed scheme which is run by the Battery Stewardship Council and authorised by the Australian Competition and Consumer Commission (ACCC) to promote the safe use and disposal of batteries including Lithium-Ion Batteries.

Any spent batteries would be recycled at a B-Cycle accredited, EPA permitted and licensed recycler of Lithium-Ion Batteries. Batteries would be handled, stored, and transported according to manufacturer's guidelines and the ADG Code.

Given the rapid rise of Li-ion battery use in Australia, including in renewable energy Projects and electric cars, cost-effective local recycling may be available at the time of battery replacement or decommissioning. The Australian Energy Market Operator (AEMO) predict strong growth in the consumption of Li-ion batteries for both electric vehicles and PV solar over the next 20 years. This growth would begin to significantly affect the waste stream from 2025 (Randell Environmental Consultancy, 2016), onwards, and we are seeing a

reaction in the market through recycling grants such as $10 million Circular Solar Fund managed by the NSW EPA.

Solar farms in general

When compared to the major electricity generating methods employed in Australia, solar farms are favourable for the following reasons:

- CO2 emissions generated per kilowatt hour of energy produced.
- Short energy payback time in comparison to the life span of the project.
- Potential to reuse and recycle component parts.

As the industry becomes established in NSW, further opportunities for waste reuse are identified.

4.3. Environmental risk assessment

An environmental risk assessment (refer to Table 4-1) has been completed using the construction activities and impacts listed above. The residual risk level identified below represents the risk remaining **after** management and mitigation measures are implemented, refer to Table 6-1. The risk matrix used for this assessment is provided in Appendix D.

Table 4-1 Environmental risk assessment - waste

Activity / risk	Potential environmental impact	Residual risk level			
		Consequence	Likelihood	Risk	Residual risk[1]
General	• Breach of legislation or development approval conditions.	4	3	High	Low
Disposal of wastes (vehicular use)	• Dust emissions degrading air quality.	4	3	High	Low
	• Contamination / sedimentation of local watercourses.	3	4	High	Low
	• Waste materials entering local environment.	3	3	Moderate	Low
	• Increased tracking of mud within and outside of the Project site.	3	3	Moderate	Low
Onsite storage of waste oil / lubricants and scrap metal, prior to disposal	• Contamination of local watercourses.	3	3	High	Low
	• Decreased stormwater quality.	3	4	High	Low

[1] Residual risk represents the risk rating after the implementation of management and mitigation measures.

Activity / risk	Potential environmental impact	Residual risk level			
		Consequence	Likelihood	Risk	Residual risk[1]
	• Offsite contamination.	3	3	Moderate	Low
Misclassification of wastes	• Improper disposal of wastes.	3	3	Moderate	Low
	• Contamination of local waterways.	3	4	High	Low
	• Improper reuse / recycling of resources.	3	3	Moderate	Low

5. Waste management

5.1. Waste management hierarchy

The waste and resource management hierarchy, as described in *the NSW Waste Avoidance and Resource Recovery Strategy 2014 – 21*, is a tool used to quantify and prioritise methods of waste management, ensuring that resource management options are considered against a hierarchy of:

- Avoidance of unnecessary resource consumption
- Resource recovery (including reuse, recycling, reprocessing and energy recovery)
- Disposal.

A summary of the waste hierarchy is presented in Figure 5-1 below.

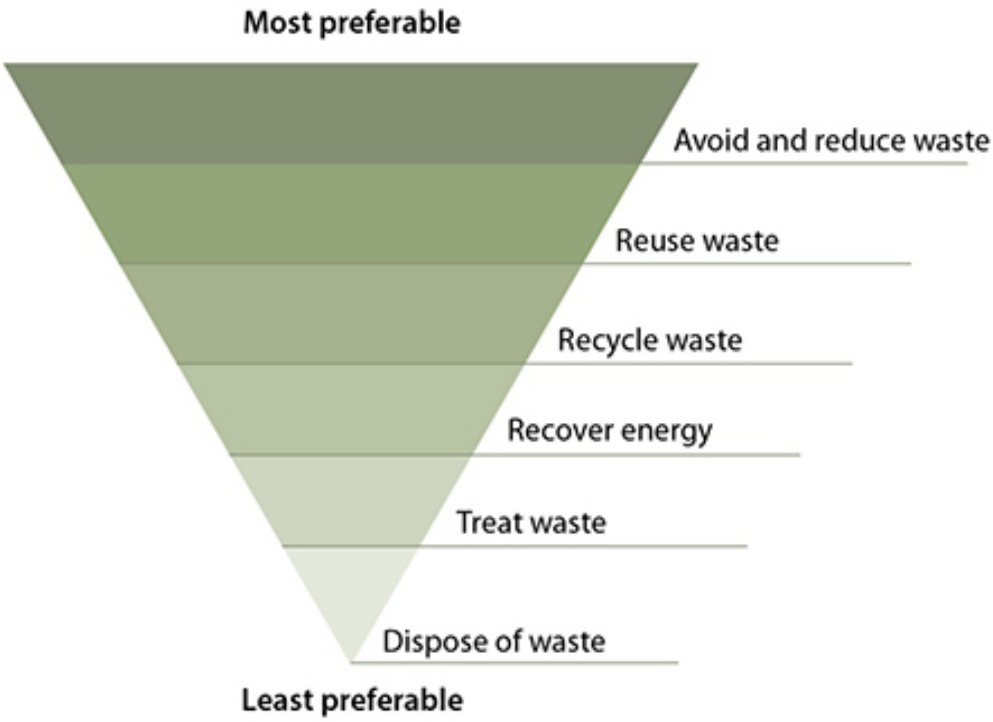

Figure 5-1 Waste management hierarchy - extract from *NSW Waste Avoidance and Resource Recovery Strategy 2014 - 21*, (NSW EPA, 2014)

5.1.1. Avoid and reduce waste

Reducing or avoiding the generation of waste is of primary importance to the Project. The following approach will be adopted:

- Unnecessary resource consumption will be avoided (e.g. fuel-efficient practices will be employed in connection with the proposed development).

- Adequate procurement practices to ensure materials are managed with minimal wastage will be implemented.
- Disposal will only occur as a last resort in accordance with the WARR Act.
- Establishing agreements with suppliers for 'take back' arrangements for packaging/pallets/drums.
- Ensuring appropriate types and quantities of materials are ordered to avoid excess waste and minimise excess of unused materials.
- Ensuring plant and machinery operators employ fuel-efficient practices and that maintenance for plant and equipment uses the least amount of consumables required.
- Ensure that stored supplies are properly protected from the weather.

5.1.2. Reuse and recycling waste

Waste separation and segregation will be promoted onsite to facilitate reuse and recycling as a priority of the waste management procedure as follows:

- Waste segregation onsite – waste materials will be separated onsite into dedicated bins / areas for either reuse onsite or collection by an appropriate recycling contractor and transported to a licenced off-site facility.
- Where material cannot be reused onsite, the project will utilise resource recovery facilities (reprocessing, recycling, and energy recovery).

5.1.3. Waste handling and storage

Waste that is handled and stored onsite prior to onsite reuse or off-site recycling / disposal will have applied the following measures:

- Spoil, topsoil and mulch are to be stockpiled onsite. Mitigation measures for dust control and surface water management will be implemented in accordance with a site Erosion Sediment Control Plan (ESCP), as required.
- Liquid wastes are to be stored in appropriate containers in covered and bunded areas until transported off-site. Bunded areas will have the capacity to hold 110% of the liquid waste volume for bulk storage or 120% of the volume of the largest container for smaller packaged storage.
- Hazardous waste such as used battery modules will be managed by appropriately qualified and licensed contractors, in accordance with the requirements of the POEO Act and NSW Environment Protection Authority (EPA) waste disposal guidelines.
- All other recyclable or non-recyclable wastes are to be stored in appropriately covered receptacles (e.g., bins or skips) in appropriate locations onsite and contractors commissioned to regularly service the bins and dispose of contents at approved disposal or recycling facilities.

5.1.4. Waste disposal

Waste disposal is to be in accordance with the POEO Act and WARR Act. Wastes that are unable to be reused or recycled will be disposed of off-site to an EPA approved waste management facility, certified to receive the type of waste in question and following waste classification assessment. Waste that requires disposal will be removed off-site by a licenced transporter to a licensed facility. An example of a waste contact list with locations of waste management / disposal facilities is included in Appendix B. Details of waste types, volumes and destinations are to be recorded in the Waste Management Register in Appendix C.

Where possible, wastes will be removed off-site by a licenced transporter to a recycling facility or will be disposed of at a licensed waste facility. This will be determined by the EPC Contractor, prior to the commencement of works.

The closest facility is the Forbes Waste Management Facility (WMF), located approximately 8.3km southwest of the Project. The Forbes WMF is licensed to receive all Solid Waste Transfer stations are also located at 341 Daroobalgie Rd, Forbes, NSW 2871.

5.2. Management of waste streams

The construction activities, types of wastes and indicative volumes which may be generated during construction are outlined within classifications in Table 5-1. These indicative volumes will likely be refined and updated at the detailed design stage.

Table 5-1 Indicative waste streams, volumes and management

Activity / material	Waste Type	Waste Classification	Approx. annual quantity	Storage and treatment onsite	Sampling and testing requirements	Proposed reuse/recycling/disposal methods	Reuse / Recycle Target
Office / staff operations	Paper, cardboard, recyclable plastic, soft plastic	General solid waste (non-putrescible)	1.6 Kilolitres (Kl)	Separate Bins emptied into secured comingled Bulk Bins	Visual	Resource recovery off-site - reprocessing at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence (where relevant) and the *Waste Classification Guidelines*.	100%
	Glass and aluminium	General solid waste (non-putrescible)	400L	Separate Bins emptied into secured comingled Bulk Bins	Visual	Resource recovery off-site - reprocessing at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence (where relevant) and the *Waste Classification Guidelines*.	100%
	Food waste	General solid waste (non-putrescible)	1.2Kl	Separate Bins emptied into secured comingled Bulk Bins	Visual	Disposal off-site at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence and the Waste Classification Guidelines.	0%
	Ink cartridges	General solid waste (non-putrescible)	<0.1 tonnes (t)	Stored in Office server room	NA	Resource recovery off-site - reprocessing at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence (where relevant) and the *Waste Classification Guidelines*.	100%
	Effluent	Liquid	600L	Holding tank	NA	Off-site disposal, picked up with bulk effluent tanker	0%

Activity / material	Waste Type	Waste Classification	Approx. annual quantity	Storage and treatment onsite	Sampling and testing requirements	Proposed reuse/recycling/disposal methods	Reuse / Recycle Target
Site establishment	Removal of existing fences/ boundary features (including timber / steel posts and fencing wire)	General solid waste (non-putrescible)	<0.5t	Stockpile	NA	Off-site recycling. Loaded into tipper or flatbed truck	100%
Earthworks	Excavated material Virgin Excavated Natural Material (VENM) is material: That has been excavated or quarried from areas that are not contaminated with manufactured chemicals or process residues, as a result of industrial, commercial, mining, or agricultural activities. That does not contain sulfidic ores or soils. Excavated Natural Material (ENM) is naturally occurring rock and soil (including materials such as sandstone, shale, clay and soil) that has: Been excavated from the	Classification based on soil tests carried out during construction and in accordance with *Protection of the Environment Operations Act 1997* (POEO Act) and *Waste Classification Guidelines: Part 1 and 2* (NSW EPA, 2014) VENM is a waste that has been pre-classified as general solid waste (non-putrescible). For more information see the EPA's VENM website.	<100m^3	Stockpile	Yes – ENM must be sampled, tested and contain contaminant levels less than the criteria listed in EPA's Excavated natural material order 2014 (ENM order) before the material is transported to the receiving site. Sample collection and testing methodology is detailed in the ENM order. VENM is to be sampled to confirm that the material is contaminate free.	Reused on-site. Topsoil to be segregated for reuse in rehabilitation. Excavated material may be used as aggregate for fill, footings, construction pads or road base. Where required, disposal off-site at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence and the *Waste Classification Guidelines*.	100%

Activity / material	Waste Type	Waste Classification	Approx. annual quantity	Storage and treatment onsite	Sampling and testing requirements	Proposed reuse/recycling/disposal methods	Reuse / Recycle Target
	ground Contains at least 98 per cent (by weight) natural material; and Does not meet the definition of VENM.						
	Vegetation clearing and grubbing	General solid waste (non-putrescible)	<8t	Stockpile	On-site reuse (where possible)	Resource recovery - Green waste will be shredded and reused as an embankment cover.	100%
	Weed material	General solid waste (non-putrescible)	<2t	Chemical or physical removal	NA	Weeds removed during work will be managed in accordance with the NSW Department of Primary Industries (DPI) requirements that relate to its classification status.	0%
Construction	Timber	General solid waste (non-putrescible)	Approx 0.5t	Skip bin	No	Resource recovery – Depending on treatment, Timber would be reused at local high schools or TAFE. If untreated and free of nails, could be shredded and reused on site.	100%
	Concrete waste	General solid waste (non-putrescible)	<200m^3	Stockpile	No	Resource recovery - Concrete waste is crushed and used for haul road construction.	80%
	Packaging materials (including plastic, cardboard, timber, steel,	General solid waste (non-putrescible)	<14t	Skip bin	No	Resource recovery off-site - Reuse, recycling, reprocessing or energy recovery at an appropriately licensed waste facility in accordance with the	100%

Activity / material	Waste Type	Waste Classification	Approx. annual quantity	Storage and treatment onsite	Sampling and testing requirements	Proposed reuse/recycling/disposal methods	Reuse / Recycle Target
	paper and polystyrene)					premises' Environment Protection Licence and the *Waste Classification Guidelines*.	
Plant and equipment maintenance	Liquid wastes - waste oil, coolants, lubricants.	Liquid waste – waste oil, coolants, lubricants	Dependent on contamination levels of vehicles and containers to be washed	Containerised in covered bunded storage	No	Disposal off-site at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence and the Waste Classification Guidelines.	100%
	Tyres	Special waste	<400L	Stockpile	No	Resource recovery off-site - Reuse, recycling, reprocessing or energy recovery at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence and the *Waste Classification Guidelines*.	80%
	Batteries	Hazardous waste	<0.5t	Covered Bunded storage	No	Resource recovery off-site - Reuse, recycling, at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence and the *Waste Classification Guidelines*.	100%
	Spill kit waste	General solid waste (non-putrescible)	<400L	Covered Bunded storage	No	Disposal off-site at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence and the Waste Classification Guidelines.	0%
Decommissioning	PV panels	General Solid Waste (non-	1800t	Covered Bunded storage	No	Recycled off-site at an appropriately licensed in accordance with the	90%

Activity / material	Waste Type	Waste Classification	Approx. annual quantity	Storage and treatment onsite	Sampling and testing requirements	Proposed reuse/recycling/disposal methods	Reuse / Recycle Target
		putrescible)				premises' Environment Protection Licence and the Waste Classification Guidelines.	
	Electrical cables	General Solid Waste (non-putrescible)	1.0t	Covered Bunded storage	No	Disposal off-site at an appropriately licensed waste recycling facility in accordance with the premises' Environment Protection Licence and the Waste Classification Guidelines.	90%
	Concrete waste	General Solid Waste (non-putrescible)	<1000m^3	Covered Bunded storage	No	Disposal off-site at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence and the Waste Classification Guidelines.	90%
	Fencing	General Solid Waste (non-putrescible)	<10t	Covered Bunded storage	No	Disposal off-site at an appropriately licensed waste facility in accordance with the premises' Environment Protection Licence and the Waste Classification Guidelines.	90%
	BESS – Lithium-Ion Batteries	Hazardous waste	<2t	Covered Bunded storage	No	Recycled off-site at an appropriately licensed B-cycle facility in accordance with the premises' Environment Protection Licence and the Waste Classification Guidelines.	100%

5.3. Resource conservation

The Applicant is dedicated to implementing resource conservation best practice and adopting energy efficient work practices. The Project will minimise consumption of:

- Fuel, oil and other consumables associated with the operation of plant and motor vehicles
- On-site electricity.

The energy efficiency and related carbon emissions will be considered in the selection of vehicle and plant equipment.

6. Environmental mitigation and management measures

A range of environmental requirements and control measures are identified in the EIS. Specific actions and processes which will be implemented to comply and address the requirements and measures are outlined in Table 6-1. This table will be updated to incorporate the relevant CoA for the Project prior to construction.

Table 6-1 Environmental mitigation and management measures for waste and resource use

ID	Measure	Resources required	Timing	Responsibility	Reference
General					
WM1	All staff and sub-contractors will undergo a site induction and ongoing toolbox talks that will detail waste minimisation and reuse management measures, including the requirements of the waste management hierarchy. Waste minimisation training will include energy consumption awareness that promotes energy conservation methods including minimising energy use by switching off equipment when not in use.	Induction materials Toolbox materials	Construction	Project Manager Site Environmental Advisor (SEA)	Best Practice
WM2	Resource management hierarchy principles are to be followed: • Avoid unnecessary resource consumption as a priority. • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery). • Disposal is undertaken as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001*).		Construction Decommissioning	Site supervisor	Section 5
WM3	Minimise the waste generated by the development by implementing measures in this WMP.		Construction	Site supervisor	This Plan

ID	Measure	Resources required	Timing	Responsibility	Reference
WM4	All waste generated on site is to be transported off site and disposed of at landfill site approved to accept waste. When transporting or depositing the waste the contractor is to comply with Section 143 of the POEO Act.	Waste register (Appendix C)	Construction	Site supervisor SEA	Section 5.1.4
WM5	No waste is to be received onsite		Construction	Site supervisor SEA	Best Practice
WM6	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.		Construction	Site supervisor	Best practice
Reduce or avoid					
WM7	Minimise the use of geotextiles for temporary cover and sediment fence for sediment control – utilise soil polymer instead.		Construction	SEA	Best practice
WM8	No supply of disposable cups, plates, bowls or cutlery in crib huts or site offices.		Construction	Project Manager	Best practice
WM9	Calculate precise estimates prior to placing orders, particularly when estimating required volumes of concrete.		Construction	Site engineers	Best practice
WM10	Implement, where possible, agreements with suppliers to return excess construction materials or packaging for future reuse.		Construction	Site engineers	Best practice
Resource recovery (reuse, recycle)					

ID	Measure	Resources required	Timing	Responsibility	Reference
WM11	Excavated material will be reused on-site for fill where practicable.		Construction	Site supervisor	Best practice
WM12	Glass, aluminium and plastic drink containers to be recycled. Recycling bins for drink containers to be provided in site offices and in/at door of the main crib hut. Containers to be deposited at the closest Return and Earn facility.	Recycling bins	Construction	SEA	Best practice
WM13	Paper and cardboard to be recycled. Paper and cardboard recycling bins to be provided in site offices, which will be emptied into the paper and recycling skip bin to be collected by the Project's licenced waste contractor for offsite recycling.	Recycling bins	Construction	SEA	Best practice
WM14	Site surface water collected in sumps and other locations on site should be pumped into water carts for reuse as dust suppression.	The Project ESCP (if required)	Construction	SEA	Best practice
WM15	Construction metal, steel and scrap aluminium to be collected and recycled through a licensed scrap metal recycler.	Skip Bins	Construction	SEA	Best practice
Waste receptacles/storage					
WM16	Waste receptacles and site amenities will be inspected as part of the weekly environmental inspection to ensure waste is appropriately being disposed of, there is adequate capacity in bins onsite and no litter is present around the site.	Weekly environmental Inspection form	Construction	SEA	Best practice
WM17	Garbage receptacles will be provided. Rubbish will be transported to an appropriate waste disposal facility as soon as practical.	Rubbish bins	Construction	Foreman	Section 5.1.3

ID	Measure	Resources required	Timing	Responsibility	Reference
WM18	Ensure waste is contained in bins or waste areas in high winds or rain events.		Construction	Foreman	Best practice
WM19	Provide separate bins in your site compounds and all your site offices to promote recycling of materials such as paper, cardboard, glass, plastics and metals.	Labelled rubbish bins	Construction	Foreman	Best practice
WM20	Provide appropriate size and type of containers in a locked storage area to store waste oils, liquids, fuels and chemicals.		Construction	Foreman	Section 5.1.3
WM21	Portable toilets will be provided for construction workers and will be managed by the service provider to ensure the appropriate disposal of sewage.		Construction	SEA	Table 5-1
WM22	Septic system is to be installed and operated according to the Forbes Shire Council regulations		Construction, Operation, Decommissioning	SEA	Table 5-1
WM23	If concrete washout is required onsite, a dedicated concrete washout facility will be provided during construction so that run-off from the washing of concrete machinery and equipment can be collected and disposed of at an appropriate waste facility.		Construction	SEA	Best practice
Disposal					
WM24	All waste is to be classified in accordance with the EPA's Waste Classification Guidelines 2014	EPA's Waste Classification Guidelines 2014	Construction	Site Supervisor SEA	Section 5

ID	Measure	Resources required	Timing	Responsibility	Reference
WM25	All waste removed from site will be recorded in the Waste Register.	Waste register (Appendix C)	Construction	Site Supervisor SEA	Best practice
WM26	Waste leaving site is to be covered.		Construction	Site Supervisor SEA	Best Practice
WM27	Once the works have been completed, all waste material is to be removed from site, recycled or disposed of at a licenced facility. Waste is not to be buried on site.		Construction	Site Supervisor SEA	Section 5.1.4 Best practice
Weed removal					
WM28	Priority weeds removed during work will be managed in accordance with the DPI requirements that relate to its classification status and disposed of at a licensed landfill facility.	Weed and Pest Management Plan	Construction	Site Supervisor SEA	Best practice
Record keeping					
WM29	Obtain copies of licences or licence numbers (under the *Waste Avoidance and Resource Recovery Act 2001*) for transporters of industrial/hazardous waste, industrial/hazardous waste treatment facilities and waste disposal facilities and provide these to X-Elio, prior to disposal of these wastes.		Construction	Site Supervisor SEA	Best practice

7. Compliance management

7.1. Roles and responsibilities

The EIS describes the roles and responsibilities of ACE Power's Project team and its Contractors, in relation to environmental management. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of this Plan.

7.2. Training

All employees, contractors and utility staff working on site will undergo site induction training relating to waste and resource management. The induction training will address elements related to waste and resource management including:

- Existence and requirements of this Waste Management Plan
- Relevant legislation
- Implementation of the waste hierarchy
- Waste handling requirements and details of the waste streams that are intended for offsite and on-site reuse
- Type and location of waste receptacles
- Other specific responsibilities for waste and reuse management.

Further details regarding staff induction and training will be outlined in post-approval management plans.

7.3. Monitoring and inspections

Requirements and responsibilities in relation to monitoring and inspections will be detailed in the post approval documents. This will include weekly inspection and fortnightly inspection with Project owner to monitor compliance with this management plan. Any corrective actions identified during these inspections will be implemented.

Regular monitoring and inspections will be undertaken during construction; frequencies and responsibilities are outlined in Table 4-1 below.

Table 7-1 Waste monitoring requirements for the Project

Monitoring requirement	Frequency	Responsibility	Record
Waste tracking for all (waste) materials that leave the site.	When waste taken offsite. Waste Register to be updated regularly.	SEA	Waste Register
	When waste taken offsite to a waste facility.	SEA	Waste dockets
	When EPA 'Trackable' waste taken offsite.	SEA	Transportation dockets

Monitoring requirement	Frequency	Responsibility	Record
Inspections for litter, materials management, unauthorised disposal of construction waste streams and adequacy of capacity of waste receptacles	Weekly	SEA	Environmental Inspection Form

7.4. Auditing

This Waste Management Plan will be updated to incorporate any relevant Conditions of Consent.

7.5. Reporting

Reporting requirements and responsibilities will be detailed in the post-approval management plans.

A Waste Management Register (example in Appendix C) will be maintained until the Actual Completion Date to record the type, amount and location of waste reused, recycled, stockpiled and disposed of.

Details on incident reporting will be included in the post-approval documents. The Contractor will promptly advise the asset owner on events that are non-conforming with any relevant Conditions of Consent and mitigation measures. The Asset owner will advise the Department of Planning, Housing and Infrastructure (DPHI) accordingly for any notifiable non-conformances

8. Review and improvement

8.1. Continuous improvement

Continuous improvement of this WMP will be achieved through ongoing evaluations of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

The requirements outlined in the Conditions of Consent may result in the need to update or revise this Plan. This will occur as needed.

Only the Site Environmental Advisor, or delegate, has the authority to change any of the environmental management documentation.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure.

9. References

ANZG. (2018). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

GREP. (n.d.). *NSW Government Resource Efficiency Policy.*

NSW DPE. (2022, August). *Large-Scale Energy Solar Guideline*. Retrieved from NSW Planning Portal: https://shared-drupal-s3fs.s3.ap-southeast-2.amazonaws.com/master-test/fapub_pdf/Lisa+Drupal+Documents/16007_DPIE+Large+Scale+Solar+Energy+Guidelines_26-9-22.pdf

NSW EPA. (2014). *NSW Waste and Resource Recovery Strategy 2014-21.* Sydney: NSW Environment Protection Authority.

NSW EPA. (2014). *Waste Classification Guidelines Part 1: Classifying Waste.* Sydney: NSW Environment Protection Authority.

(RMS, 2011). *Stockpile Site Management Guide.*

Appendix A Consultation

Appendix B Proposed waste facilities

Contractor/waste facility	Details (EPL #)	Contact details	Waste accepted	Waste recycled
Waste contractors subject to refinement following contract negotiations				

Appendix C Waste Management Register

Date / time	Waste classification	Description of waste	Amount (tonnes)	Transporter and licence (if applicable)	Receiving facility (EPL#)	Material use (reused, recycled, stockpiled or disposed)	Invoice no. or reference no.

Appendix D Risk Matrix

Consequence and likelihood for the risk assessment (refer to Section 4.3) were determined using the descriptions provided in Table D-1 and Table D-2, respectively. The risk matrix is provided in Table D-3.

Table D-1 Consequence description

Consequence	Description
1 - Minor	• No detrimental effect on the environment or minor environmental impact (impacts are contained on-site and short term in nature) • Minor local habitat modification and / or lifecycle disruption for a listed species. No loss of individuals of listed species • Negligible soil impact. Chemical concentrations are above background but below Ecological Investigation Levels (EILs) • No detectable change to background water quality. No exceedance of background and applicable Water Quality guidelines (ANZG, 2018).
2- Moderate	• Moderate, unplanned localised environmental impact (may be of a temporary nature) or discharge contained on-site or with negligible off-site impact • Moderate local habitat modification and / or lifecycle disruption for a listed species • Moderate local decrease in size of population(s) of listed species • Localised soil impact. Low level <2 times exceedance of EILs • Local short-term moderate exceedance of background and applicable Water Quality guidelines (ANZG, 2018).
3 - Significant	• Substantial, unplanned environmental impact contained on-site or minor impact that is off-site • Substantial local habitat modification and / or lifecycle disruption for a listed species. • Substantial local decrease in size of population(s) of listed species • Localised long term or widespread short-term soil impact. Chemical concentrations 2-5 times EILs • Local long-term or widespread short-term exceedance of background and applicable Water Quality guidelines (ANZG, 2018).
4 - Major	• Major or widespread, unplanned environmental impact on or off-site • Could include substantial pollutant discharges • Significant resources required to respond and rehabilitate • Major regional habitat modification and / or lifecycle disruption for a listed species. Substantial local decrease in size of population(s) of listed species • Widespread and / or long-term impact to soils. Chemical concentrations 5-10 times EILs • Local, permanent or widespread, long-term exceedance of background and applicable Water Quality guidelines (ANZG, 2018).
5 - Critical	• Extensive long-term environmental harm or harm that is very widespread. Could include extensive pollutant discharges

Consequence	Description
	• Impacts permanent or unlikely to be reversible within 10 years • Substantial regional habitat modification and / or lifecycle disruption for a listed species • Moderate or substantial regional decrease in size of population(s) of listed species • Irreversible and / or extensive impact to soils. Chemical concentrations >10 times the ecological investigation levels (EILs) • Widespread, permanent exceedance of background and applicable Water Quality guidelines (ANZG, 2018).

Table D-2 Likelihood description

Likelihood	1 - Rare	2 - Unlikely	3 - Possible	4 - Likely	5 – Almost certain
Description	The event may occur only in exceptional circumstances.	The event could occur very occasionally.	The event may occur.	The event will probably occur.	The event is expected to occur in most circumstances.
Occurrence interval	> 10 years	5 - 10 years	2 - 5 years	1 – 2 years	< 1 year

Table D-3 Risk matrix

		Severity of consequence				
		Minor (1)	Moderate (2)	Significant (3)	Major (4)	Critical (5)
Likelihood of consequence	1 – Rare	Very low	Low	Low	Moderate	Moderate
	2 – Unlikely	Very low	Low	Moderate	Moderate	High
	3 – Possible	Low	Moderate	Moderate	High	Extreme
	4 – Likely	Moderate	Moderate	High	High	Extreme
	5 – Almost certain	Moderate	High	High	Extreme	Extreme

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