

6. Residue Handling and Transport

The mining and process flow diagram is illustrated in Figure 16.

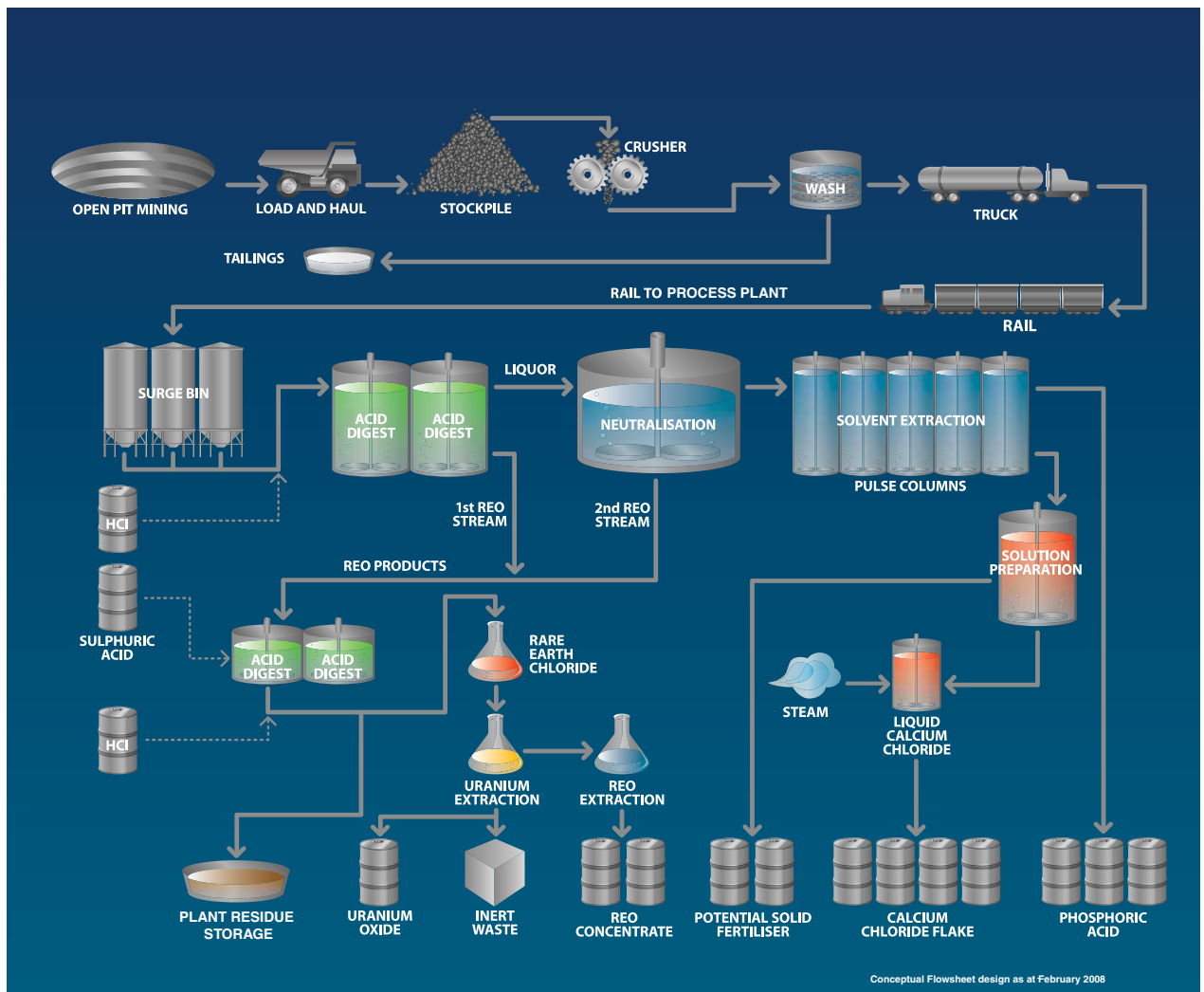


Figure 16. Process Flow Chart

6.1 Ore Processing Products and Wastes

Various products, wastes and recyclable materials will result from ore processing. The amounts and phases of these products will be largely determined by the processing methods implemented. Table 6 below summarises expected processed material production.

The process plant supports a four-stage process of acid digestion, neutralisation, caustic digestion and solvent extraction.



Table 6 Ore Processing Products and Wastes

CLASSIFICATION	COMPOUND	PHASE	QUANTITY (tpa)	STAGE
PRODUCT	Beneficiated Ore	Solid < 6mm	550,000	Mine
	Uranium Oxide U_3O_8	Solid	177	Process Plant
	Phosphate Bearing Residue	Solid	119,000	Process Plant
	Rare Earths	Solid	26,350	Process Plant
	Phosphoric Acid H_3PO_4	Liquid	150,000	Process Plant
	Calcium Chloride $CaCl_2$	Solid (flake)	400,000	Process Plant
WASTE	Inert Tailings	Solid (wet cake)	100,000	Process Plant
	Process plant waste (Th bearing)	Solid (wet cake)	25,500	Process Plant
	Heavy Media Tailings	Solid	300,000	Mine

Filter cake from the phosphate pre-treatment circuit, the calcium chloride pre-treatment circuit and the rare earths treatment circuit are waste and will be returned to the mine site. Solids from the hydrochloric acid process (used to dissolve the rare earths in the re-leach tanks) are a waste product and will be sent to the mine site.

How the materials will be handled, transported and stored will be determined by the potential market value or alternative use for each.

6.2 Process Plant Residues

The most common thorium isotope and radioactive material encountered at Nolans Bore is ^{232}Th . It accounts for approximately 72% of the total radioactivity of the Nolans ore. The majority of the remaining radioactivity is due to the ^{238}U chain. It is estimated that 25,500 tpa of plant residues will be produced. Handled as a slurry residue with a pulp density of around 40%, this would equate to a total of 63,750 tpa of residue waste.



Total Specific Activity of the Nolans ore is approximately 400 Bq/g. The expected activity of the waste residues following processing is 4,000 Bq/g. This equates to similar radiation level as thorium contained in monazite residues from most heavy media beach sand mineral processing operations.

6.2.1 Process Plant Residue Storage Facility Options

Options for the storage of process plants residues will be investigated as part of the ongoing studies as part of project approval process. Options to date are as follows;

6.2.2.1 Facility Option

A facility is likely to incorporate a:

- ▶ Site area of 450m x 220m to allow road trains to enter, unload, and drive out;
- ▶ Perimeter security fenced with one access controlled gate;
- ▶ Building finished floor level (FFL) 2.0m below natural ground level (NGL) with bunded 30m ramp in and out giving 1:15 grade;
- ▶ 4m wide spray and double sealed access road with lay-by for road train. The area around shed will be cleared and graded away from building with cracker dust for dust suppression and prevention of plant growth;
- ▶ 4m grated drain at each entry with a sump and connection to 300mm RCP to take water away with end wall and rip rap at each end;
- ▶ Shed, industrial quality, 5.5m to springing point 100 x 50 with 200mm pre-cast walls to 3m above floor level (AFL), metal clad over on girts. Pre-cast walls will have an aggregate lining and waterproofing behind to stop moisture;
- ▶ 30m access/egress drive front and rear, with 200mm pre-cast retaining wall standing 300mm above NGL with an aggregate lining and waterproofing behind. 200mm concrete floor over 150mm basecourse and 50mm sand bed;
- ▶ Shed containing an office 8m x 5m, staff area 4m x 5m and male and female toilet/shower combined 3m x 5m. All air conditioned and ventilated;
- ▶ 4m wide x 5m high roller door front and rear, and ridge vent full length to shed. There is no other opening in roof or walls;
- ▶ Power supplies, including high bay lights in the warehouse area and general power outlets (GPO's) to warehouse;
- ▶ Suitably fitted out office and ablutions;
- ▶ Water connection and sewer facilities or septic connection;
- ▶ Water connection suitable for fire fighting, as allowed all areas to be sprinkled and equipped with thermal detectors; and
- ▶ Two safety showers, eye baths and a security system.



6.2.2.2 Primary Storage Dam Option

A primary storage dam (200m x 200m x 3m) would be sufficient for this purpose. An overflow dam, (50m x 50m x 2m) would be used in case of flooding conditions. An emergency pump will be required.

Process plant residues could be stored in a lined dam under a suitable volume of water to prevent exposure of the material to the effects of evaporation and wind. The major benefit from covering the material with water would be to reduce risks associated with wind contamination of the site and surrounding areas.

The dam structure should ensure that no discharge is allowed, either as waste or dust. Control measures such as a water seal or cover may be required to ensure dust is suppressed. This will be determined by further studies. Experience gained in other areas indicates that in tailings dams with an acid leach material which has been processed using salt water, has a tendency for the surface to dry or crack but not develop a dust problem. It is recognised that dust problems may occur in tailings dams where an alkali leach process is used. Studies will be completed to determine the most appropriate liner that is suitable for these dams once the tailings properties are fully understood. These studies will include fully understanding the chemical properties of the plant residues (i.e. pH and corrosive properties, reactivity etc) and site geotechnical investigations

6.2.2.3 Sub-surface Pit Option

Another alternative may be to store the plant residues in a lined sub-surface pit. It is assumed this material would need to be covered by water or a synthetic liner to prevent aerial contamination to the surroundings. If a market for the thorium component of the residue was not found by the end of life of the operation, the material could be encapsulated under earth. The thorium could be readily recovered from such a facility. Additional refining processes would be required prior to sale.

The method used to store the plant residues will depend on the:

- ▶ Viability of options as determined by risk assessments / regulatory approval;
- ▶ Radiation Management Plan assessment;
- ▶ Cost of refining the material upon extraction from the storage dam;
- ▶ Chemical analysis of the plant residues;
- ▶ Geotechnical site investigation and recommendations;
- ▶ Bunding requirements of the dams; and the
- ▶ Availability of water to cover ponds/pits.

6.3 Inert Tailing/Landfill Operation

About 100,000 tpa of inert tailings will be transported to a disposal site. Optimally the material could be transported in the containers used to transport the ore from the mine site to the process plant.

It is possible that the dense, wet tailing matter will be difficult to discard directly from the containers. If so, once the material is at the storage site, the materials' clay-like properties will make it difficult to drive equipment over the storage, making the disposal/deposition operation difficult. An alternative to this method would be to install an aerial conveyor system, such as Rope Con by Doppelmayr, to deposit waste into the storage facility (Figure 17). These systems can be tailored and adjusted to suit the



changing requirements and layout of a facility. This method has obvious benefits to safety and ease of operation.

The RopeCon has the following attributes:

- Single maximum conveyor lengths of up to 20,000m;
- Capacity up to 20,000 tonnes/hour;
- Easy traversing of obstacles such as ridges, rivers and environmentally sensitive areas;
- Tower spacing up to 2,000m;
- Resistant to earthquakes and cyclonic wind conditions;
- Virtually no product degradation along the conveyor length;
- Extremely low noise levels during operation along the conveyor length;
- Extremely low operating costs and maintenance requirements;
- Long Design Life; and
- Safe transport of material over roads and infrastructure due to zero spillage.



Figure 17. Ropecon

(Courtesy Doppelmayr AG)

6.4 Combined Waste Product Dump Facility

One solution to the disposal of the process waste is a combined landfill facility such as a suitably lined pit or pond facility. The feasibility of this solution will depend largely on environmental approval and the compatibility or reactivity of the compounds when combined. From initial observations of the anticipated waste products, a combined waste material would be a wet-cake or slurry compound. The disposal of such materials will require a specific materials handling approach. Waste materials from the processing plant will be returned to the mine site for ongoing management. The containers could be emptied into a primary holding facility and then washed. The water used for the washing could be run into this primary facility.

Ultimately the materials in this facility would be pumped into a lined storage dam or pit.



6.5 Container Wash and Dry Facility

A container wash and dry facility will be needed if containers be used for both ore and waste materials transport. Some residue “hang-up” is likely to occur when the waste materials are discarded from the bulk containers. This material may have radioactive or other undesirable chemical properties (i.e. calcium chloride which can rust containers). A container wash and dry facility at the disposal site would be beneficial for the following reasons:

- ▶ It will improve the lifetime of containers; and
- ▶ It will reduce radiation contamination and risk by having clean containers.

Such a facility is conceptual at this stage but should be noted for future consideration.

7. Legislative and Licencing Requirements

Early investigations indicate the ore from the Nolans site has a measurable radioactivity of 400 Becquerel's per gram (Bq/g). This qualifies the ore as a prescribed substance and must be handled through all aspects of the operation according to the following acts, regulations and codes:

- Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste and Mineral Processing (2005) (Commonwealth).
- Code of Practice for the Safe Transport of Radioactive Material (2001) (Commonwealth).
- *Radiation Protection Act (N.T.)*
- *Radiation (Safety Control) Act (N.T.)*
- *Radioactive Ores and Concentrates (Packaging and Transport) Act (N.T.)*.
- Radioactive Ores and Concentrates (Packaging and Transport) Regulations (N.T.).

7.1 Commonwealth Environmental Legislation Context

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Environment and Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* contains an assessment and approvals system for, among other things, actions that will have or are likely to have a significant impact on matters of national environmental significance (NES).

The Act identifies the following six matters of NES:

- World Heritage areas;
- Wetlands protected by international treaty (the Ramsar Convention);
- Nationally listed threatened species and ecological communities;
- Nationally listed migratory species;
- All nuclear actions; and
- The environment of Commonwealth marine areas.

The proposal would not affect a World Heritage area, Ramsar wetland or Commonwealth marine area. The proposal does involve a nuclear action (as defined in Section 22 of the EPBC Act). Some threatened and/or migratory species are recorded in the region (as referred to in Section 9.1.1). The EPBC Act requires an assessment and approval system for actions carried out by the Commonwealth Government or that are likely to have a significant impact on the environment of Commonwealth land. As the actions proposed may have a significant effect on the environment (although is not on Commonwealth land), and includes a nuclear action, this Act is relevant. An EPBC Referral will be required.

Australian Heritage Council Act 2003

As cited in the act, the *Australian Heritage Council Act* 'identifies, conserves and protects places of national heritage significance, provides for the identification and management of Commonwealth heritage



places, and establishes an independent expert body to advise the Minister on the listing and protection of heritage places'. Some items of heritage significance are listed in the vicinity of the project (see Section 9.8).

Atomic Energy Act (1953)

This Act states uranium is a "prescribed substance" requiring a person who discovers uranium to report its discovery to the Commonwealth within one month of making the discovery. This includes uranium and thorium or any other substance declared by the regulations to be capable of being used for the production of atomic energy or for research into matters connected with atomic energy (an atomic number greater than 90).

Australian Radiation Protection and Nuclear Safety Act (1998)

The aim of this Act is to protect the health and safety of people and the environment, from the harmful effects of radiation.

Customs (prohibited Exports) Regulations 1958

An export licence must be obtained for exporting uranium. This is to ensure that any export complies with the Commonwealth Government's nuclear safeguard, environmental and heritage legislation and regulations. This regulation is relevant if Arafura Resources Ltd exports any uranium as product.

Nuclear Non-Proliferation (Safeguards) Act 1987

A person seeking to mine uranium must obtain a permit from the Australian Safeguards and Non-Proliferation Office under the Act.

Customs (Prohibited Exports) Regulations 1958 under the Customs Act 1901

Schedule 7 of these Regulations includes goods the exportation of which is prohibited without the permission of the Minister for Industry, Tourism and Resources, or an authorised person. These include:

- ▶ Uranium containing the mixture of isotopes occurring in nature;
- ▶ Uranium depleted in the isotope 235;
- ▶ Thorium;
- ▶ And special fissionable materials (including those listed in Schedule 7a of the Regulations). This is relevant to some of the minerals present as Rare Earths at the Nolans deposit such as Gadolinium.

Hazardous waste (Regulations of Exports and Imports) Act 1989

The object of this Act is to regulate the export, import and transit of hazardous waste to ensure that exported, imported or transited waste is managed in an environmentally sound manner so that human beings and the environment, both within and outside Australia, are protected from the harmful effects of the waste.



Nuclear Safeguards (Producers of Uranium Ore Concentrates) Charge Act 1993

This Act is pertinent to those who hold a permit to possess an unlimited quantity of uranium ore concentrates granted under paragraph 13(1)(a) of the *Nuclear Non-Proliferation (Safeguards) Act 1987* if:

- ▶ During the previous financial year the person produced more than 1,000 kilograms of uranium ore concentrates at a processing facility; and
- ▶ At any time (whether during the previous financial year or earlier) the person, or another person, exported uranium ore concentrates produced at that processing facility.

Commonwealth Radioactive Waste Management Act 2005.

this Act makes provision in relation to the selection of a site for, and the establishment and operation of, a radioactive waste management facility, and for related purposes.

Native Title Act 1993

The *Native Title Act 1993* was established by the Commonwealth following the High Court's decision in *Mabo v Queensland No 2*, which found that Australian common law can recognise the rights and interests over land and water possessed by Indigenous people in Australia under their traditional laws and customs. The Act was amended in 1998 to allow native title rights and interests to exist over land that is or has been subject to a pastoral lease, and possibly some other forms of leasehold tenure. The act also established the National Native Title Tribunal, which governs how native title is dealt with across Australia. Certain developments on land where government considers native title may be affected are required to be notified to the public and any registered native title parties by way of a section 29 notice.

A search of the Native Title Tribunal database has indicated that a Registered Native Title Claim exists to the east of the mining lease application area.

Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The Act aims to preserve and protect places, areas and objects of significance to Aboriginal and Torres Strait Islander People. The provisions of the *Aboriginal and Torres Strait Island Heritage Protection Act* apply in this instance because items of Aboriginal heritage significance are listed in the study area.

National Environmental Protection Council (Northern Territory) Act 1994

The National Environment Protection Council (NEPC) was established to set national environmental goals and standards for Australia through the development of National Environment Protection Measures (NEPM). The Act has been established to ensure people enjoy the benefit of equivalent protection from air, water or soil pollution and from noise, wherever they live in Australia and so that decisions of the business community are not distorted, and markets are not fragmented, by variations between participating jurisdictions in relation to the adoption or implementation of major environment protection measures.



7.2 Northern Territory Environmental Legislation Context

Environmental Assessment Act 1982

Proposed new projects that may cause significant land disturbance and potential impacts on the surrounding community and social environment must be assessed under the Northern Territory *Environmental Assessment Act 1982* and its *Environmental Assessment Administrative Procedures 1984* before they can proceed. This legislation forms the basis for the environmental impact assessment process in the Northern Territory. The Department of Natural Resources, Environment and the Arts (NRETA) are responsible for administering this legislation.

A Notice of Intent will need to be prepared to meet the requirements of the Environmental Assessment Act 1982. This NOI will provide the Minister with details of the proposed works to assist in determining whether significant environmental impacts may result and if so whether a Public Environment Report (PER) or an Environmental Impact Statement (EIS) is required.

Radiation (Safety Control) Act 1978

This Act relates to the control, regulation, possession, use and transport of radioactive substances and irradiating apparatus. Nothing in this Act applies to the mining, production, possession, treatment, handling, sale, use or disposal of uranium ores or uranium oxide (U₃O₈).

Radioactive Ores and Concentrates (Packaging and Transport) Act 1980

This Act provides for the packaging, storage and transport of radioactive ores and concentrates in the Northern Territory. Radioactive ores will have temporary storage at the mine site and may be transported from the site to the processing plant. This Act applies.

Waste Management and Pollution Control Act 1998

The *Waste Management and Pollution Control Act 1998*, is designed to protect the environment from pollution, establish a hierarchy of avoidance, reuse, recycling and reprocessing and disposal, encourage ecologically sustainable development and facilitate the implementation of national environment protection measures made under the *National Environment Protection Council (Northern Territory) Act*.

The Act contains requirements in relation to disposal and transport of waste. The proponents would be required to comply with the requirements of the Act in relation to waste management during construction and operation of the project.

Mining Act 1980

This Act establishes the process for gaining access to and approval of mining leases. It establishes the process for exploration, licences and approvals required from the Minister for Mines and Energy. Developments ancillary to mining activities are authorised under this Act (ie clearing vegetation, roads, plant etc).



Mining Management Act 2001

This Act establishes management plans for mining sites, including occupational health and safety and the environment. It requires the Minister to authorise mining activities and stipulates the type of information required in a mining management plan, which includes:

- Describing the mining activities;
- Management systems addressing safety and health issues;
- Management systems addressing environmental issues;
- Plans and costing of closure activities;
- Particulars of the organizational structure; and
- Plans for current and proposed mine working and infrastructure

Weeds Management Act 2001

The *Weeds Management Act* is to prevent the spread of weeds to ensure that the management of weeds is an integral component of land management. This is to be conducted in accordance with the Northern Territory Weeds Management Strategy 1996-2005 or any other strategy adopted to control weeds in the Territory.

Construction, operation and further exploration on the Project site will need to be undertaken in accordance with this Act, minimising all potential impacts to the environment.

Territory Parks and Wildlife Conservation Act 1993

The *Territory Parks and Wildlife Conservation (TPWC) Act* (1993) was designed to manage and maintain parks or reserves in the Territory, to protect wildlife, and to serve visitor and community needs for education and enjoyment. The TPWC Act has provisions for protected wildlife. The TPWC Act defines wildlife as that being in a park, reserve, sanctuary, wilderness zone or area of essential habitat; is a vertebrate that is indigenous to Australia, or is specifically defined as being protected. The TPWC Act prohibits the intentional killing of any terrestrial or marine vertebrate (with the exception of fish).

Construction at the project site will need to be undertaken in accordance with this Act, minimising all potential impacts to the terrestrial and marine flora, fauna and ecosystems.

Northern Territory Aboriginal Sacred Sites Act 1989

This Act provides for the location, recognition, description and protection of sites sacred under Aboriginal tradition. The Act provides a procedure for the protection and registration of sacred sites, providing for entry onto sacred sites and the conditions to which such entry is subject, establishing a procedure for the avoidance of sacred sites in the development and use of land and establishing an Authority for the purposes of the Act and a procedure for the review of decisions of the Authority by the relevant Minister. Compliance with this Act is achieved by contacting the Aboriginal Areas Protection Authority (AAPA) prior to any works being undertaken to ensure that there are no sacred sites in the development area.



Bushfires Act 1980

The *Northern Territory Bushfires Act 2004* establishes the legal framework and responsibilities for bushfire management. The Act puts the responsibility for bushfire management with the landholder. Section 47 of the Act establishes the Bushfires NT annual Firebreak Enforcement Program. This program is to ensure that a minimum standard of fire protection exists within rural areas. This section requires landowners to establish a firebreak around the property and to reduce grassy fuel loads on the property. Landholders who do not comply with section 47 could face fines of up to \$25,000. The Bushfires Council should be contacted and the appropriate permit obtained for any burning on the site.

Water Act 1992

The *Water Act 1992* covers allocation, use, control, protection and management of NT water resources.

Pollution under the Act includes directly or indirectly altering the physical, thermal, chemical, biological or radioactive properties of the water so as to render it less fit for a prescribed beneficial use for which it is or may reasonably be used, or to cause a condition which is hazardous or potentially hazardous to:

- Public health, safety or welfare;
- Animals, birds, fish or aquatic life or other organisms; or
- Plants.

The Act will apply as groundwater will be extracted for operations (discharging waste from and into the environment). Water will be discharged from reclamation ponds during the construction phase. The location, quantity and quality of water discharge are not determined at this stage of the project and will require further consideration.

Pastoral Land Act 1992

The objectives of this Act are to:

- Provide a form of tenure for Crown land that facilitates the sustainable use of land for pastoral purposes and the economic viability of the pastoral industry;
- Provide for the monitoring of pastoral land so as to detect and assess any change in its condition;
- Prevention or minimisation of degradation of or other damage to the land and its indigenous plant and animal life and rehabilitate the land;
- Recognise the right of Aboriginals to follow traditional pursuits on pastoral land;
- Provide reasonable access for the public across pastoral land to waters and places of public interest; and
- Provide a procedure to establish Aboriginal community living areas on pastoral land.

Transport routes from the mine will pass through pastoral land. This Act is relevant.

Environmental Offences and Penalties Act 1996

The *Northern Territory Environmental Offences and Penalties Act 1996* is an act to establish penalties for certain offences relating to the protection of the environment, and for related purposes. An individual or a



body corporate found guilty of an environmental offence is liable to a penalty prescribed under this Act. Construction on the Project site will need to be undertaken in accordance with this Act.

Soil Conservation and Land Utilisation Act 1978

The *Soil Conservation and Land Utilisation Act* provides for the prevention of soil erosion and for the conservation and reclamation of soil. Construction on the Project site will need to be undertaken in accordance with this Act, minimising all potential impacts to the soil environment.

Dangerous Goods Act 2006.

The *Dangerous Goods Act* provides guidance on safe handling, storage, transfer and sale of dangerous goods. A licence may be required to store and handle dangerous goods.

The *Dangerous Goods Act* creates a general duty that states that a person involved in the handling of dangerous goods must ensure, as far as practicable, that the goods are handled safely.

Dangerous Goods (roads and rail transport) Act 2004

This Act makes provision for safety in the transport of dangerous goods by road as part of the system of nationally consistent road transport laws and makes provision for safety in the transport of dangerous goods by rail. As stated in the Act:

- ▶ Involvement in the transport of dangerous goods by road or rail" includes:
 - Importing, or arranging for the importation of, dangerous goods into Australia;
 - Marking packages and unit loads containing dangerous goods for transport by road or rail, and placarding containers and vehicles in which dangerous goods are transported by road or rail;
 - Consigning dangerous goods for transport by road or rail;
 - Loading dangerous goods onto a vehicle, or into a container that is to be put on a vehicle, for transport by road or rail or unloading dangerous goods that have been transported by road or rail;
 - Undertaking, or being responsible for, otherwise than as an employee or sub-contractor, the transport of dangerous goods by road or rail;
 - Driving a vehicle carrying dangerous goods by road or rail;
 - Being the consignee of dangerous goods transported by road or rail; and
 - Being involved as a director, secretary or manager of a body corporate, or other person who takes part in the management of a body corporate, that takes part in an activity covered by this definition.

Public Health Act 1952

This Act prescribes matters (which have relevance to this project) for or in relation to:

- ▶ The prevention of disease;
- ▶ The maintenance of health;
- ▶ Sanitation;



- ▶ The care and treatment of sick persons;
- ▶ The designation of diseases and measures for the control of diseases;
- ▶ The control and inspection of –
 - Animals, birds and poultry used for food or for the production of food;
 - Eating houses and food shops;
 - Boarding houses and hostels;
 - Laundries, cleaning establishments and dye works;
- ▶ Garbage, refuse, trade waste and night soil and the making of charges for and in relation to the collection and disposal of garbage, refuse, trade waste and night soil;
- ▶ The prevention and abatement of nuisances;
- ▶ Measures for the control or destruction of noxious vermin and insects;
- ▶ The disposal of dead animals;
- ▶ The testing, examination, isolation and destruction of animals and the payment of compensation for the destruction of animals which are found to be diseased; and
- ▶ Approval of the construction of wells by the Controller of Water Resources appointed under the *Water Act*.

Work Health Act 1986

The *Work Health Act* is to promote occupational health and safety in the Territory to prevent workplace injuries and diseases, to protect the health and safety of the public in relation to work activities, to promote the rehabilitation and maximum recovery from incapacity of injured workers, to provide financial compensation to workers incapacitated from workplace injuries or diseases and to the dependants of workers who die as the results of such injuries or diseases, to establish certain bodies and a fund for the proper administration of the Act, and for related purposes.

Environment Protection (National Pollutant Inventory) Objective Act 2004

This Act covers:

- ▶ Emissions of substances to the environment whether in pure form or contained in other matter and whether in solid, liquid or gaseous form; and
- ▶ Emission of a substance to the environment from –
 - Premises for disposing of waste by burial (but does not include the deposit, licensed under section 34 of the Act or authorised under the *Mining Management Act*, of a substance at the premises);
 - A sewage treatment plant (but does not include the discharge of a substance to a sewer); and
 - A tailings dam (but does not include the discharge, authorised under the *Mining Management Act*, of a substance to a tailings dam), but does not include the removal of a substance from premises for the purpose of destruction, treatment, recycling, reprocessing, recovery or purification.



Planning Act 1989

This Act exempts 'mining' from the definition of development. Therefore, the *Mining Act* and *Mining Management Act* control mining activities in the Northern Territory. Any development proposed that is included or authorized under either of these acts does not require a development permit unless it is required under the Northern Territory Planning Scheme.

Generally, land which is not zoned (and this applies to the mining area) no development permits are required. However, other approvals may be required under Northern Territory environmental and waste pollution legislation. Additionally, clearing of native vegetation on unzoned land off the mining lease will require a development permit, obtained from the Minister for Natural Resources, Environment and the Arts.

There may be some circumstances where a development permit must be obtained on unzoned land. The planning scheme requires a development permit for works within 500 metres of the Stuart Highway, unless certain circumstances exist which are:

- ▶ The land is not within a local or community government area; or
- ▶ The land is within a town defined under the *Crown Lands Act*.

7.2.1 Northern Territory Management Plans

Cycad Management Plan 2003 – 2008

The Cycad Management Plan has been put in place to ensure the protection of all species, subspecies and hybrids of the genus *Cycas* found in the wild in the Northern Territory. As Protected Plants, a permit (noncommercial) or license (commercial) is required to take *Cycas* plants or plant material, except for noncommercial use by landholders. Permits for noncommercial use may be issued for a period up to fifteen months. Sections 50 and 52 of the TPWC Act address the granting of permits or licences to take and willful destruction by a landholder.

A search of the EPBC Search Engine lists *Macrozamia macdonnellii* (the MacDonnell Ranges Cycad) as potentially occurring within the Project Area. This species is restricted to the MacDonnell Ranges, and as such is unlikely to occur in the Project Area. A search of the NRETA database for the area around the Project site has been undertaken. This species is not listed as being present in the Project area.



8. Project Timing and Activities

8.1 Construction

Typical construction activities are listed below in Table 7.

8.1.1 Construction Timing

The construction schedule proposes that commencement of construction is expected to occur in 2010, with ongoing construction and commissioning in 2011. Full production is expected during 2013. A detailed construction schedule can be provided once the pre-feasibility phase is complete.



Table 7 Construction Activities

Section	Activity	Comments
Mine	Security fence (if required)	Construction of a perimeter fence
	Haul roads and hardstand areas	Clear and grub; road earthworks and drainage; compaction, roadbase and running surface
	Site preparation	Survey; clear and grub; earthworks (incl. building pads, drainage etc.)
	Surface water control	Installation of creek bunds or diversions as necessary; installation of water handling facilities such as evaporation ponds or re-injection bores. Dependent on ongoing investigations
	Mine dewatering facilities	Pit pumps and/or dewatering bores installed, piping to sedimentation facilities and water storage. Dependent on ongoing investigations
	Grade control drilling	Drilling a close-spaced pattern of drill holes ahead of mining to accurately assess ore grades and waste boundaries (if required)
	Waste rock dump	Clear and grub; earthworks and drainage
	Mine area pre-strip	Drill and blast of ore and waste rock; stockpiling of any ore encountered, waste rock to dump
	Mine operations	Drill and blast; ore mining, waste removal; grade control functions
Mine Industrial Area	Site preparation	Survey; clear and grub; earthworks (incl. building pads, drainage etc.)
	Security fence	Construction of a perimeter fence
	Haul roads and hardstand areas including ROM pad	Clear and grub; road earthworks and drainage; roadbase and running surface



Section	Activity	Comments
	Foundations	Clear and grub; road earthworks and drainage; compaction, roadbase and running surface
	Ore handling and processing equipment	Suitable concrete or other foundations will be established for all major buildings and facilities, including: layout; trenching; installation. Installation of ore stockpile reclaimer, crushers and screens as required; HM Plant as required
	Water	Installation or upgrade of water reticulation including potable, grey and sewerage
	Power	Installation or upgrade of generators and fuel tanks, powerlines and transformers/switching as required.
	Buildings and facilities	Includes offices, ablutions, workshops etc. Installation of site built or prefabricated buildings as per the MIA plan
	Roads and carparks	Clear and grub; road earthworks and drainage; compaction, road-base and running surface
Mine Access	Site preparation	Survey; clear and grub; earthworks (incl. drainage etc.)
	Security fence	Construction of a perimeter fence
	Haul roads and hardstand area	Clear and grub; road earthworks and drainage; compaction, road-base and running surface
Haulage Facility Includes container set-down areas and road-train mustering areas etc.	Site preparation	Survey; clear and grub; earthworks (incl. building pads, drainage etc.)
	Security fence	Construction of a perimeter fence



Section	Activity	Comments
	Haul roads and hardstand area	Clear and grub; road earthworks and drainage; compaction, roadbase and running surface
	Rail construction	Laying of rail and ballast



8.2 Operational Activities

It is expected that the mine may be operating 24 hours per day, five days per week. However, the final configuration of the operation won't be determined until testwork currently being done is concluded. Operational considerations will consider the potential exposures of workers in determining the optimum operation configuration. Shutdowns will occur on an annual basis as part of scheduled maintenance procedures.

8.2.1 Staff Requirements

8.2.1.1 Workforce

A workforce of about 60 personnel will be required during the construction of the mine site. An estimated full time workforce of 40-50 personnel will be required during the operational period. This will be determined during the detailed design period.

An Integrated Management System and a Risk Register for the facility will be completed during the detailed design and prior to commissioning of the mine site.

8.2.1.2 Staff Training

All staff will be trained on the safe management and environmental and cultural aspects of working on the mine site.

8.2.2 Power Supply

During shutdowns, the auxiliary power supply will be sourced via the 11 kV powerlines connected to the power station switchyard. A diesel backup generator will be utilised in the event that power is not available via these lines.

8.2.3 Wastes Generated

Sundry waste streams generated during the construction and operation of the facility are as follows.

Construction waste, including:

- ▶ Scrap metal from plant assembly and construction activities;
- ▶ Scrap timber;
- ▶ Packaging materials;
- ▶ Concrete asphalt and solid fill (including excess soil that cannot be reused within the site);
- ▶ Plant material generated during site clearing;
- ▶ Grease, oils and fuels;
- ▶ Stormwater;
- ▶ Paint materials;
- ▶ Green wastes from vegetation removal; and
- ▶ Kitchen and office refuse.

Operational waste, including:



- ▶ Process wastewater;
- ▶ Maintenance waste;
- ▶ Stormwater;
- ▶ Solid wastes from septic tanks;
- ▶ Kitchen and office refuse;
- ▶ Waste oil; and
- ▶ Wastewater from plant washing and septic.

A Waste Management Plan will be written for the construction and operational stages of the Nolans Mine. All waste generated on the site during the construction stages including green waste, food scraps, construction waste, chemicals and effluent are to be disposed of in an appropriate manner. Recycling of waste materials will be completed where appropriate.

A waste tracking system will be established to monitor the quantities of material leaving the site and the facilities receiving each waste for disposal.

Contractors awarded construction of the facility will be required to maintain records to demonstrate that all surplus materials are reused, recycled or disposed of in accordance with statutory requirements. This will ensure that no litter or unwanted waste is disposed of on any land on or around the site.

All refuse and waste materials will be handled in a manner so as to confine the material completely and prevent dust emission.

8.2.4 Waste Management

Most of the unrecovered radioactive elements present in the ore will be left in waste products from the process plant and returned for deposition at Nolans Mine.

8.2.4.1 Waste Rock Management

Some of the barren waste rock from the mine will be used to build a tailings storage dam. The excess barren waste rock will be dumped in a waste rock dump and rehabilitated progressively. The rehabilitation will include profiling, topsoil coverage, seeding, water management and suitable erosion protection if required. All waste will be regularly geochemically checked to verify appropriate management practices are in place.

8.2.4.2 Tailings Management

The solid fraction of the tailings slurry pumped into the storage dam will naturally settle out and consolidate, leaving the water relatively clear. This water will be recovered for re-use in the washing plant.

The water treatment plant will produce an iron based sediment which will contain very little of the radioactive elements, uranium, thorium and radium.

The tailings storage dam will be rehabilitated in a different way to the waste rock dumps. The rehabilitation of these areas will include a cover of selected waste rock, topsoil followed by planting of grasses and shallow rooted species, but no trees. It has been found that tree roots have the ability to puncture the dam liners, which has the potential to cause a leak where the stored tailings could move into the surfaced drainages, creeks and groundwater systems.



8.2.5 Water Management

The mine site is located in an isolated area with very low rainfall. The mine will use many methods to ensure that all water is used effectively, efficiently and recycled wherever possible. Reuse of the water can cause a build up of radioactive elements in the water, so these will be carefully monitored and the water treated before it is reused or disposed.