Decision Report

Application for Works Approval

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	W6249/2019/1
Works Approval Holder	Adaman Resources Pty Ltd
ACN	620 314 007
File Number	DER2018/001589
Premises	Kirkalocka Gold Mine Mining tenement M59/234 DAGGAR HILLS WA 6638
Date of Report	30 August 2019
Status of Report	Final

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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
Applicant	Adaman Resources Pty Ltd
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CS Act	*Contaminated Sites Act 2003* (WA)
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
HDPE	means high-density polyethylene
kL	kilolitres
m^3	cubic metres
mg/L	milligrams per litre
Minister	the Minister responsible for the EP Act and associated regulations
mtpa	million tonnes per annum
Noise Regulations	*Environmental Protection (Noise) Regulations 1997* (WA)
Occupier	has the same meaning given to that term under the EP Act.
Prescribed Premises	has the same meaning given to that term under the EP Act.

Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report
Risk Event	As described in *Guidance Statement: Risk Assessment*
TDS	Total Dissolved Solids
tpa	Tonnes per annum

2. Purpose and scope of assessment

Adaman Resources Pty Ltd (the Applicant) has recently acquired the Kirkalocka Gold Mine (Kirkalocka) located 60km south of Mount Magnet. The site has been in care and maintenance since 2008 with no activities occurring onsite. The Applicant has been issued a Licence (L9195/2019/1) on 10 May 2019 to operate a wastewater treatment plant prescribed as category 85 under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations). The Applicant has also been issued Works Approval W6190/2018/1 for the construction of an ore processing facility prescribed as category 5 in the EP Regulations, and Works Approval W6191/2018/1 for the construction of a landfill prescribed as category 89 in the EP Regulations.

The Applicant has now applied for the construction and installation of dewatering infrastructure for the dewatering of a mined pit void, known as the Curara Well mine void (Curara), with the water to be discharged to land at a future waste rock landform (known as WRL2) and an onsite drainage channel (creek).

The Application relates to the:

- dewatering of the water contained within Curara;
- discharge of the dewatered effluent to the environment; and
- construction of dewatering infrastructure.

2.1 Application details

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Date received
Application form: Works Approval	18 February 2019
Kirkalocka Gold Project, Works Approval Application - Supporting Documentation, dated 15 February 2019	18 February 2019
Kirkalocka Gold Project, Water Management Strategy, dated 15 February 2019	18 February 2019
Kirkalocka Pit Water Quality Sampling Technical Report 2018, dated 25 January 2019	18 February 2019
Mining Proposal for the Kirkalocka Gold Project Mine Expansion (Version 2), dated 7 March 2013	18 February 2019
Applicant Notification – Application for a Works Approval – Request for further information – Response provided by Applicant	17 April 2019

3. Background

The Kirkalocka Gold Mine commenced operations in 2002. Equigold NL operated the mine between 2002 and 2008 which was then placed into care and maintenance. Mount Magnet South NL assumed ownership of the mine in 2008 which was then transferred to Minjar Gold Pty Ltd in 2015. The Applicant assumed ownership of the mine assets in 2017.

Mount Magnet South NL held a licence (L7814/2002/6) for the mine under Part V of the *Environmental Protection Act 1986* (EP Act) for categories 5, 54 and 89. The Licence ceased in

October 2015 due to non-payment of fees.

Table 3 lists the prescribed premises categories that have been applied for.

Table 3: Prescribed Premises Categories

Classification of Premises	Description	*Approved Premises production or design capacity or throughput*
Category 6	Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore	3,900,000 tonnes per annum

4. Overview of Premises

4.1 Operational aspects

The Applicant plans to recommence mining operations at Kirkalocka which requires dewatering approximately 6.7 gigalitres (GL) of water over an 18 month period (a maximum of 3.9 GL per annum). The total volume to be dewatered is made up of 5.2 GL of water (pit lake) contained within Curara, and an expected 1.5 GL of inflows during the dewatering operations (1.0 GL/pa). The removal of the water is required to facilitate safe mining conditions.

The first 18 months of dewatering the pit lake will exceed demands at Kirkalocka (i.e. dust suppression, construction and processing) and therefore dewatered water will require discharge to the environment. Following the completion of dewatering the pit lake, all ongoing dewatering (approximately 1.0 GL per annum) will then be used onsite for dust suppression and processing with no further discharge to the environment required.

The Applicant considered various options for the temporary disposal of dewatering effluent to the environment, with the preferred methods provided below:

- Discharge via spray irrigation to a vegetated area within the footprint of a future waste rock landform (WRL2). Volume to be discharged is 1,900,000 tpa; and
- Direct discharge at a minimum of three separate locations to a nearby drainage channel (ephemeral creek) located on the Premises. Volume to be discharged is 2,000,000 tpa.

Excluding onsite use, the total volume of dewatering water expected to be discharged to the environment will be approximately 3,900,000 tpa. The quality of the water contained within the Curara pit is presented in Table 4 below.

Dewatering pumps which are already in place at Kirkalocka, will be used to transport the dewatered water to the discharge locations. 200 mm diameter HDPE water pipelines will be installed to connect the dewatering pumps at Curara to each of the proposed discharge locations. The dewatering pipelines will be anchored to prevent movement and will be fitted with isolation valves switches and flow metres to direct water to each of the discharge locations.

Table 4: Curara pit water sampling results

Constituent	Unit	KS	K50	K100	K140	D
Aluminium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Alkalinity	mg/L	156	152	152	151	151
Arsenic	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	1.3	1.3	1.3	1.3	1.3
Barium	mg/L	0.047	0.046	0.046	0.046	0.046
Beryllium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Cyanide WAD	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Cyanide total	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
CO3	mg/L	17	8	5	3	2
Calcium	mg/L	58.4	58.1	59	60.1	59.7
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chloride	mg/L	962	926	929	927	916
Cobalt	mg/L	0.0008	0.0016	0.0014	0.0016	0.0016
Chromium	mg/L	0.001	0.001	0.001	0.001	0.001
Copper	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Digest		1	1	1	1	1
Electrical Conductivity	mS/m	356	346	345	344	344
Fluoride	mg/L	1	1	1	1	1
Iron	mg/L	0.01	<0.01	0.02	<0.01	<0.01
HCO3	mg/L	155	169	175	179	180
Hardness	mg/L	430	420	420	430	430
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Potassium	mg/L	34.1	33.7	33.5	34.1	34.2
Magnesium	mg/L	68.7	70.6	66.9	67.8	66.9
Manganese	mg/L	0.0015	0.0007	0.0006	<0.0005	<0.0005
Molybdenum	mg/L	0.046	0.045	0.045	0.045	0.045
Nitrogen NOx (nitrate/nitrite)	mg/L	3.8	4.3	4.5	4.6	4.6
Sodium	mg/L	527	538	518	516	519
Nickel	mg/L	<0.001	<0.001	<0.001	<0.001	0.002
Lead	mg/L	0.0006	<0.0005	<0.0005	<0.0005	<0.0005
SO4	mg/L	220	210	210	210	210
Selenium	mg/L	0.008	0.008	0.008	0.008	0.008
TDS	mg/L	2000	2000	2000	2000	2000
Uranium	mg/L	0.0077	0.0078	0.0079	0.0079	0.0078
Vanadium	mg/L	0.014	0.014	0.014	0.014	0.013
Zinc	mg/L	0.005	<0.005	<0.005	<0.005	0.03
pH		8.7	8.5	8.4	8.3	8.3

Drainage channel discharge infrastructure

The Applicant also proposes to discharge excess water, which cannot be discharged to the WRL2 sprinkler area, to a drainage channel on the Premises at three separate locations (see figure 2 below).

Each of the water discharge points located in the drainage channel will have a discharge 'basket' at the outlet to slow the velocity of the water exiting the pipeline and to spread the water as it enters the drainage channel.

The Applicant proposes to discharge the water out of each outlet for one day out of three. This will allow the discharged water to infiltrate and evaporate to reduce saturation (waterlogging) of the soils. The Applicant will also consider additional discharge locations downstream of the northern most discharge point (Discharge Point 3) if required. This would be determined through ongoing monitoring at each of the discharge locations. The rate of discharge will be up to 100 L/s.

The Applicant has proposed vegetation monitoring, soil moisture monitoring and water sampling during the dewatering discharge program. Further details of the monitoring program are provided in the section Risk Event 1 below.

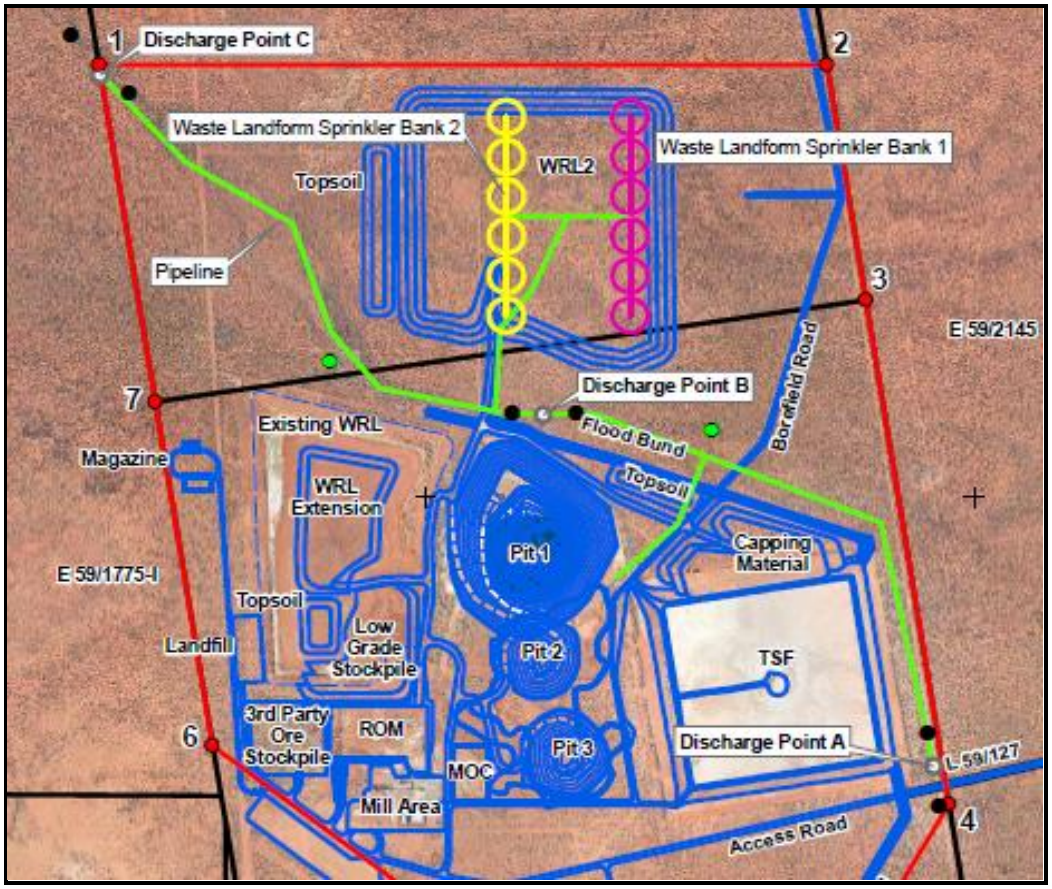

Figure 2: Drainage channel discharge points A, B and C

Irrigation to the WRL2

A 70-80 hectare (Ha) area north of the Curara pit is an approved area for the purpose of a future waste rock landform (Mining Proposal, Kirkalocka Gold Project Mine Expansion, Version 2). This area is currently uncleared and the Applicant proposes to use this area for the temporary disposal of excess mine dewatering water. It's unlikely that the full area will be used for disposal, with the Applicant expecting approximately 50 Ha will be utilised.

Irrigation to the WRL2 will occur via the use of an agricultural size sprinkler system to facilitate evaporation and water dispersion. Figure 1 below provides an overview of the sprinkler layout.

The irrigation system is designed with two separate banks of sprinklers which allows the discharge to be alternated between the banks to avoid water logging. Each sprinkler bank will consist of six DuCar Green 150 sprinklers with a 28 mm bore. The sprinklers are connected by a 160 mm HDPE pipeline. The discharge rate will range from 20 L/s to 60 L/s.

The Applicant calculates the maximum potential water disposal loss via evaporation at the WRL2 area would be about 2.7 GL/year. This calculation does not take into consideration seepage which would allow even greater volumes to be discharged at the WRL2. The Applicant expects to discharge up to a maximum of 1.9 GL into this area in the first year of discharge.

The Applicant has proposed vegetation monitoring, soil moisture monitoring and water sampling during the dewatering discharge program. Further details of the monitoring program are provided in the section Risk Event 2 below.

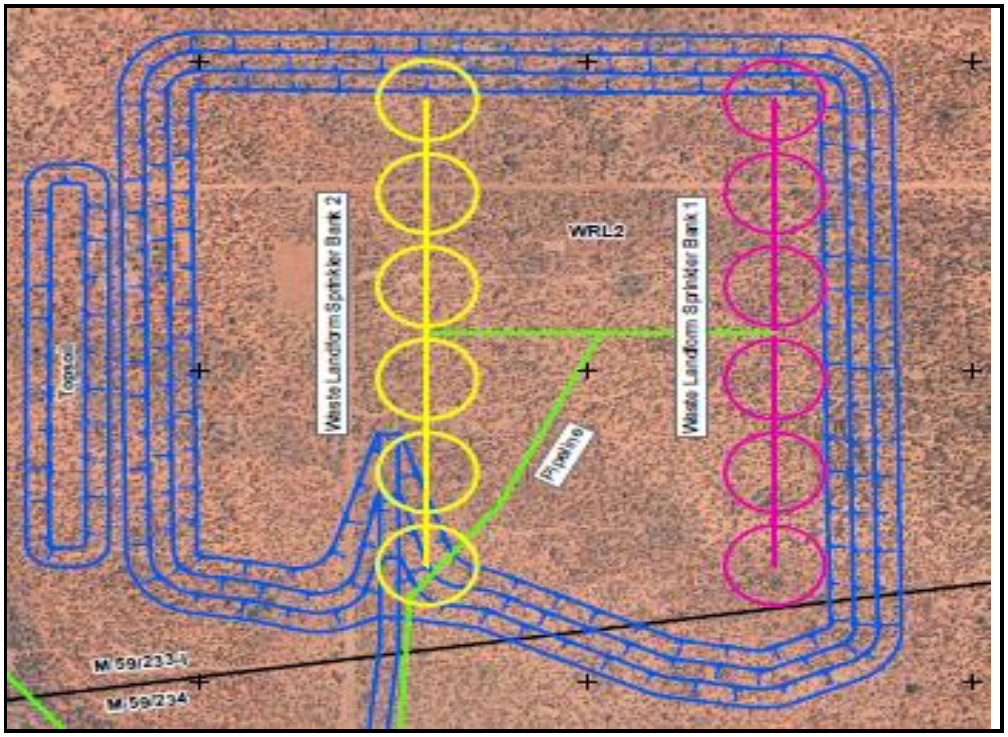

Figure 1: WRL2 sprinkler layout

4.2 Infrastructure

The Kirkalocka infrastructure, as it relates to Category 6 activities, is detailed in Table 5 and with reference to the Site Plan (attached in the Issued Works Approval).

Table 5 lists infrastructure associated with each prescribed premises category.

Table 5: Kirkalocka Category 6 infrastructure

	Infrastructure	Site Plan Reference
	Prescribed Activity Category 6 (Existing infrastructure)	
The following infrastructure already exists on the premises from previous mining operations and will be re-commissioned.		
1	Dewatering pumps	-
	Infrastructure	**Site Plan Reference**
	Prescribed Activity Category 6 (New infrastructure)	
Dewatering infrastructure to dewater water contained within the Curara pit with discharge to the environment		
1	200 mm diameter HDPE dewatering pipelines	Schedule 1: Maps - Site Layout Map attached to the Works Approval
2	Sprinkler banks 1 and 2 at the WRL2. Each bank will consist of six DuCar Green 150 sprinklers with a 28 mm bore. The sprinklers are connected by a 160 mm HDPE pipeline in each bank.	
3	Discharge outlet Points A, B and C into drainage channel	

4.3 Exclusions to the Premises

The following activity will be occurring at the Premises which is not included in the scope of this assessment:

- Ongoing mine dewatering of the Curara pit following the completion of dewatering the Curara pit lake. This activity will not be regulated by DWER as the mine dewater will not be discharged to the environment, instead it will be directed to the Raw Water Pond (lined containment pond) and reused for ore processing and dust suppression.

5. Legislative context

Table 6 summarises approvals relevant to the assessment.

Table 6: Relevant approvals and tenure

Legislation	Number	Subsidiary	Approval
Rights in Water and Irrigation Act 1914	GWL 202380(1)	Adaman Resources Pty Ltd	Allowance for the abstraction of 3.5GL of groundwater per annum. February 2019
Mining Act 1978	Tenement number M59/234	Kirkalocka Gold SPV Pty Ltd	Kirkalocka Gold SPV Pty Ltd is the registered holder of M59/234 which is a wholly owned subsidiary of Adaman Resources Pty Ltd. A mining proposal for the mine including TSF lifts, was approved in 2013. The mining proposal does not currently include the new SAG Mill.

5.1 Part IV of the EP Act

5.1.1 Background

The Application has not been referred under Part IV of the EP Act and as such there are no Ministerial Statements relevant to this Premises.

5.2 Contaminated sites

The site is not currently listed as a contaminated site under the *Contaminated Site Act 2003.*

5.3 Other relevant approvals

5.3.1 Planning approvals

The site is located within mining tenement M59/234 and is therefore not subject to planning approval. The area is currently zoned for rural/mining purposes.

5.3.2 Department of Mines, Industry Regulation and Safety (DMIRS)

The existing Mining Proposal permits the dewatering of the Curara pit.

5.4 Part V of the EP Act

5.4.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are:

- *Guidance Statement: Regulatory Principles (July 2015)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessments (February 2017)*
- *Guidance Statement: Environmental Siting (November 2016)*

5.4.2 Works approval and licence history

Table 7 summarises the works approval and licence history for the premises.

Table 7: Works approval and licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
W3574/2002/1	Expired 24/3/2015	New Works Approval Application for Category 5 activities
W3633/2002/1	Expired 21/5/2005	New Works Approval Application for Category 5 activities
W5155/2012/1	Expired 20/6/2015	Works Approval submitted by previous operator (Mount Magnet South NL) under Category 5 for the construction of 6 TSF lifts. Infrastructure approved under this works approval was not constructed and the Works Approval has since expired.
W5401/2013/1	Expired	Works Approval submitted by previous operator (Mount Magnet South NL) under Category 5 for the construction of a tertiary crushing circuit and

	29/6/2015	Intense Cyanidation Circuit (ICC). Infrastructure approved under this works approval was not constructed and the Works Approval has since expired.
L7814/2002/6	Ceased	Licence Category 5 activities ceased due to non-payment fees
W6191/2018/1	20/3/2019	New Application for a Category 89 Putrescible Landfill Site
W6190/2018/1	3/4/2019	New application for Category 5 Processing or beneficiation of metallic or non-metallic ore
L9195/2019/1	10/5/2019	Licence to operate a Category 85 Sewage facility

5.4.3 Compliance inspections and compliance history

Previous inspections identified non-compliance with conditions of the former licence L7814/2002/6 relating to dust list off from the TSF (ICMS# 32657). The Licence Holder at the time (Mount Magnet South NL) implemented management action, including a rehabilitation and stabilisation plan, to improve dust emissions from the site while in care and maintenance.

Advice received from DMIRS indicated that dust management measures have not been successful with evidence of tailings situated outside of the TSF. This issue is being managed by DMIRS who have directed the Applicant to remediate the affected areas and return tailings to the TSF.

No statutory notices have been issued.

6. Consultation

The Application was open for public consultation from 27 May 2019 to 17 June 2019. No submissions were received. The following stakeholders were contacted directly:

- Mr Jared Ridley of Kirkalocka Station.

7. Location and siting

7.1 Siting context

The Kirkalocka Gold Mine is an existing mine located 70 km south of the Town of Mount Magnet on mining tenement M59/234. The main landuse in the area consists primarily of pastoral landuse and the Premises is located within the boundaries of Kirkalocka Station and Nalbarra Station. The site also crosses the boundaries of two local government authorities; Shire of Mount Magnet and Shire of Yalgoo. North West Coastal Highway, a major state road, is located approximately 2km east of the Premises.

7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 8.

Table 8: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Residential Premises (Kirkalocka Station Homestead)	Approximately 13km north of the boundary of M59/234
Residential Premises (Nalbarra Station Homestead)	Approximately 14km west north west of the boundary of M59/234

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 9. Table 9 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

The table has also been modified to align with the *Guidance Statement: Environmental Siting.*

Table 9: Environmental values

Specified ecosystems	Distance from the Premises
Threatened/Priority Fauna	Shield-backed Trapdoor Spider (*Idiosoma nigrum*) listed as "Endangered" under the *Wildlife Conservation Act 1950* and "Vulnerable" under the *Environmental Protection and Biodiversity Conservation Act 1999* recorded to occur on the premises.
Threatened Ecological Communities (TEC)	The nearest TEC is located approximately 40km away.

7.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 10.

Table 10: Groundwater and water sources

Groundwater and water sources	Distance from Premises	Environmental value
Watercourses/ waterbodies	Kirkalocka Creek is located approx. 6km north west of the premises boundary. A poorly defined drainage channel is located just north of the pit and TSF that drains north west towards Kirkalocka Creek and is proposed as a dewatering discharge location in this Application. In general these types are dryland water courses are dry for a majority of the time and only experience short period flows during extreme rainfall events normally associated with cyclonic events.	The area is used for pastoral purposes and water within creeks may be utilised by stock.
Groundwater	Baseline groundwater studies were undertaken in 2002 prior to mining commenced at Kirkalocka. The results from those studies indicate the aquifer thickness at the location of the WRL2 was between 6 to 47 mbgl. The groundwater quality was found to be saline (3,780 mg/L). Recent drilling undertaken at the WRL2 area now shows groundwater was encountered at approximately 11 – 14 metres below ground level (mbgl). Groundwater sampling undertaken at nearby monitoring bores in 2012 show salinity levels from 2,400 to 6,300 mg/L. Groundwater sampling conducted at the nearby Kirkalocka TSF monitoring bores in 2015 indicates the groundwater quality is considered fresh to saline (TDS range of 840 to 3,500 mg/L). The lower salinity levels were observed in groundwater monitoring bores upstream of the TSF. Downstream groundwater sampling results (closest to the WRL2 area) show TDS levels as high as 3,500 mg/L. There are 2 privately owned bores nearby the Premises (based on available GIS dataset –WIN Groundwater Sites): • Curara Well (1.3km south of the TSF); and • Callaloo Well (4.2km north of the TSF).	Water is used onsite for industrial and domestic purposes. Groundwater in the regional area may be used for stock watering. There are no Public Drinking Source Water Areas within 50km of the premises.

7.5 Soil type

The soil types found at the WRL2 mainly consists of iron rich red/brown sandy type soils.

Soil samples taken from the proposed discharge points A, B and C show the soil types to range from a red clay/loam to a red/brown clay. No exposed rock was observed in each of these locations.

7.6 Meteorology

Rainfall in the area can vary considerably, however on average it is approximately 260 mm per year with the majority falling between January and August (Bureau of Meteorology). This pattern reflects the influence of summer cyclones emerging from northern monsoonal weather patterns as well as winter fronts associated with low-pressure systems, which affect the southwest land division. Average annual Class A pan evaporation at Mount Magnet is approximately 2,500 mm.

8. Risk assessment

8.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 11 and Table 12.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 11 and 12 below.

Table 11. Identification of emissions, pathway and receptors during construction

Risk Events					Consequence rating*	Likelihood rating*	Risk*	Reasoning
Sources/Activities	**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**				
Category 6 **Dewatering the Curara pit** Construction and installation of new dewatering pipelines and irrigation discharge infrastructure	Noise	No residences or other sensitive receptors in proximity.	Air / wind dispersion	None	N/A	N/A	N/A	No receptor present
	Dust	Surrounding native vegetation along the pipeline corridor and vehicle access roads		Decline in health of vegetation due to smoothing	Slight	Rare	Low	Minor fugitive dust is likely to be generated from light vehicle movements during installation of dewatering pipelines. Fugitive dust emissions generated during construction activities including traffic movements can impact on the health of vegetation. However, this risk is considered low due to the vegetation in this area being highly degraded as a result of mining and historical grazing activities,

Risk Events					Consequence rating*	Likelihood rating*	Risk*	Reasoning
Sources/Activities	**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**				
								short construction period, and the use of a water cart when required. No additional regulatory controls are required to mitigate this risk. Any potential dust emissions can be regulated by section 49 of the EP Act.

Table 12: Identification of emissions, pathway and receptors during operation

Risk Event					Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities	**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**				
Category 6 **Dewatering the Curara pit** Dewatering discharge to onsite drainage channel (poorly defined ephemeral creek)	Mine dewatering discharge to surface waters	Vegetation	Direct discharge	Decline in health of vegetation due to water logging	Moderate	Unlikely	**Medium**	1. Refer to detailed risk assessment (Risk Event 1) below.
		Surface waters		Impacts to surface water quality	Slight	Rare	Low	There are no permanent water bodies or pools associated with this drainage channel. The only time water is present is during extreme rainfalls normally associated with infrequent cyclonic events. During those events, the water is only present for short periods of time, and also carries large volumes of suspended materials typically associated with sheet flows across landscapes. Therefore, impacts to surface water from discharging mine dewatering water is expected to be insignificant as a result of high background suspended solids and large volumes of water being present during flows.
		Soils		Scouring of creek beds Increased salinity in soils	Slight	Possible	Low	The Applicant will apply the following controls: • Energy diffusing devices will be installed at each discharge

								location to reduce the likelihood of scouring. • The discharge will only occur over an approximately 18 month period. • The Applicant will sample the discharge water on a monthly basis. If a 20% variation in TDS concentration above background (original pit sampling results) is observed, than discharge will cease. These Applicant controls are suitable for regulatory control under the Works Approval, and Licence respectively. The Applicant also proposed visual monitoring for erosion at the discharge points to occur once during start up, then monthly during the entire dewatering discharge period. The Delegated Officer considers monthly inspections of the discharge locations as too infrequent when monitoring for any impacts, therefore the Delegated Officer will apply a weekly monitoring requirement through conditions in the Licence.
		Groundwater	Seepage through soils in the drainage channel	Contamination of groundwater	Slight	Rare	Low	Depth to groundwater in this area is between 11 – 14 mbgl (drilling results, 2019). Discharged dewatering effluent is not expected to have any detrimental effects on the groundwater at this location as the discharge water is considered better quality than the

								groundwater, is suitable for stock watering purposes and the discharge will only occur over an approximately 18 month period. The Applicant will sample the discharge water on a monthly basis. If a 20% variation in TDS concentration above background (original pit sampling results) is observed, than discharge will cease. The Applicant control is suitable for regulatory control under the Works Approval, and Licence respectively.
Category 6 **Dewatering the Curara pit** Dewatering discharge to the footprint of a future waste rock landform	Mine dewatering discharge to land	Vegetation Soils	Sheet flow outside of WRL2 footprint Spray drift outside of WRL2 area	Decline in health of vegetation Contamination of soils	Minor	Unlikely	**Medium**	2. Refer to detailed risk assessment (Risk Event 2) below.
		Groundwater	Seepage through soil	Contamination of local groundwater	Slight	Rare	Low	Depth to groundwater in this area is between 11 – 14 mbgl (drilling results, 2019). Discharged dewatering effluent is not expected to have any detrimental effects on the groundwater at this location as the discharge water is considered better quality than the groundwater, is suitable for stock watering purposes and the discharge will only occur over an approximately 18 month period. The Applicant will sample the discharge water on a monthly basis. If a 20% variation in TDS concentration above background

								(original pit sampling results) is observed, than discharge will cease. The Applicant control is suitable for regulatory control under the Works Approval, and Licence respectively.
Category 6 **Dewatering the Curara pit** Dewatering pipeline rupture	Discharge of mine dewatering effluent to land	Vegetation Soils Groundwater	Direct discharge Seepage through soils to groundwater	Decline in health of surrounding vegetation due to waterlogging Contamination of groundwater Erosion of surrounding soils	Slight	Possible	Low	The Applicant will apply the following controls: The Applicant has committed to conducting 12 hourly inspections of the pipeline, sprinkler systems and outlets into the drainage channels. The pipelines will be anchored to prevent pipe movement which reduces stress at joints and junctions. The pipelines will be fitted with flow meters and isolation valve switches for directing water to the discharge locations. The quality of the dewatering water is considered brackish and is suitable for livestock drinking when compared with ANZECC trigger values due to the relatively low salinity levels (3.5 ms/cm) and no elevated metals. Therefore any temporary discharge due to pipeline failure is not expected to have any effect on surrounding vegetation. These Applicant controls are suitable for regulatory control under the Works Approval, and Licence respectively.

8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 13 below.

Table 13: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 14 below.

Table 14: Risk criteria table

Likelihood		**Consequence**		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		**The following criteria has been used to determine the consequences of a Risk Event occurring:**		
			Environment	**Public health* and amenity (such as air and water quality, noise, and odour)**
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*

"onsite**"** means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 15 below:

Table 15: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – Dewatering discharge to a drainage channel (poorly defined ephemeral creek) causing water logging

8.4.1 Description of Risk Event 1

The discharge of approximately 2,000,000 tonnes per year of dewatering effluent to a drainage channel at three separate locations causing waterlogging. The drainage channel is poorly defined and contains vegetation in very good to excellent condition.

8.4.2 Identification and general characterisation of emission

Five water samples were collected from the Curara pit in December 2018 at four separate depths (surface, 50 m, 100 m and 140 m) and a duplicate sample for quality control. The results from the water quality analysis is provided in Table 4 above.

The results indicate the water is considered brackish (TDS 2,000 mg/L), slightly alkaline (pH 8.1 to 8.4) with no elevated metals. Results from biannual sampling of groundwater at monitoring bores located 1.0 to 3.5 km away (upstream) from Kirkalocka when the mine was previously operating (2012), the Curara pit water was found to be consistent with the groundwater quality in this area with the exception of TDS, which was found to be less saline than the groundwater at the discharge locations. TDS of groundwater in this area is shown to be greater than 2,400 mg/L with concentrations as high as 6,300 mg/L downstream of Kirkalocka.

The discharge will only occur for a period of approximately 18 months.

8.4.3 Description of potential adverse impact from the emission

Discharging dewatering effluent to the drainage channel could result in water logging of the soils resulting in a decline in the health of vegetation. Mulga (*Acacia aneura),* which is a dominate vegetation species in this area, is susceptible to water logging due to shallow root systems and therefore maybe impacted from water logged soils.

8.4.4 Criteria for assessment

The discharge of dewatering water to a poorly defined drainage channel, which has no permanent water pools and only has sheet flows occurring during extreme rainfall events, is best described as a discharge to land for this Application. There are no guidelines specifically for the discharge of water to terrestrial environments.

Soil moisture studies in relation to Acacia aneura and associates at Leinster Downs (Fox, J.E.D. & Kaljuste, D.J. 1980).

Native Vegetation Condition Assessment and Monitoring Manual for Western Australia (N. Casson, S. Downes, and A. Harris. 2009).

8.4.5 Applicant controls

This assessment has considered the controls set out in Table 16 below.

Table 16: Applicant's proposed controls for dewatering discharge to a drainage channel (creek)

Control	Description
Design	• Two discharge baskets at each of the three dewatering discharge locations to increase water dispersion and reduce velocity. • Each basket consists of a metal basket frame with dimensions approximately 1.5 m high, by 1.5 m wide and 1.0 m long and are filled with 100 – 800 mm diameter sized rocks. A 200 mm HDPE dewatering pipeline feeds into the basket centre. • Re-establish vegetation health monitoring quadrants MMS08, MMS20 and MMS29 downstream of the discharge locations, and control plots MMS11 and MMS14 upstream of the discharge locations. See Figure 3 below for monitoring quadrants. Each quadrant consists of a 20 m x 20 m survey area. • Each re-stablished vegetation health monitoring quadrant will also be paired with a 10 m x 10 m survey area for Mulga health. • Establish trigger values for soil moisture levels at the discharge locations. • Establish trigger values for vegetation health at select locations.
Operational	• Dewatering discharge will be alternated between the 3 separate discharge locations identified in Figure 2 above thereby minimising potential waterlogging impacts downstream of each discharge location. • Dewatering water will be discharged for one out of three days at each location. This management action allows for discharged water to infiltrate and evaporate so soil conditions can return to an unsaturated state. • Undertake vegetation health monitoring at each of the designated monitoring quadrants prior to discharge commencing, and then weekly for a minimum of two months, then monthly if no changes are observed. A photograph from a designated point will be taken upon each monitoring event that can be compared to subsequent and/or previous photographs, to assess and record any visible changes in vegetation health. The monitoring system will be based upon Casson, Downes, and Harris (2009) utilising the 'tree and stem condition rating'. • Soil water moisture content monitoring will occur daily for three days after discharge at each vegetation health monitoring location and will be compared to baseline (dry) conditions.

	Monitoring will be adapted as required. • Inspections of all associated dewatering pipelines will be undertaken on a daily basis and recorded in a log book.

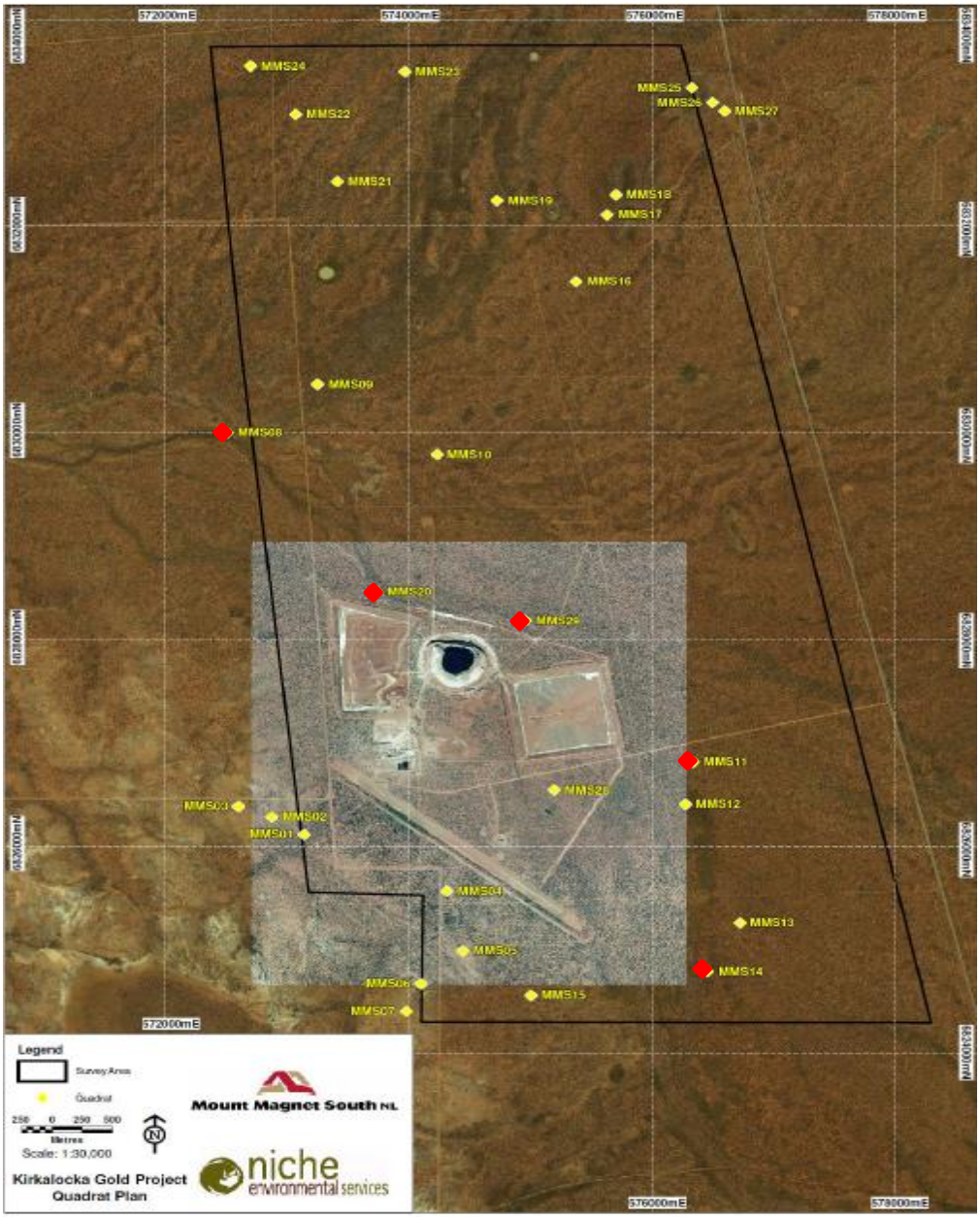

Figure 3: Vegetation monitoring points

8.4.6 Consequence

Any excess dewatering water that is not discharged to the WRL2 area will be discharged to a poorly defined drainage channel at three separate locations on the Premises. This discharge could cause waterlogging resulting in impacts to vegetation The vegetation has been mapped in this area (Niche Environmental Services, 2011) and the area is dominated by low Mulga (Acacia aneura) woodland which is susceptible to waterlogging. There are no nearby sensitive receptors with the nearest Threatened Ecological Communities (TEC) located 40 km away. The dewatering discharge is temporary, with the dewatering of the Curara pit lake only expected to take approximately 18 months. The dewatering water is considered reasonable quality with low level salts (TDS 2,000 mg/L) and no elevated metals.

Therefore, the Delegated Officer has determined that the impacts of water logging causing harm to vegetation from the discharging of dewatering effluent to a drainage channel at the Premises will be mid-level onsite impacts, low level offsite impacts on a local scale and no detectable impacts on a wider scale. Therefore, the Delegated Officer considers the consequences of discharging 2,000,000 tpa of dewatering effluent to a drainage channel at three separate locations to be **Moderate.**

8.4.7 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of water logging from the discharging of dewatering effluent to a drainage channel resulting in a decline in the health of vegetation occurring, will probably not occur in most circumstances due to the discharge being alternated between three separate locations, and the discharge only occurring for a period of approximately 18 months. Therefore, the Delegated Officer considers the likelihood of Risk Event 1 to be **Unlikely**.

8.4.8 Overall rating of Dewatering discharge to a drainage channel (poorly defined ephemeral creek) causing water logging

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 13) and determined that the overall rating for the risk of Dewatering discharge to a drainage channel (poorly defined ephemeral creek) causing water logging is **Medium**. Therefore the Delegated Officer has determined the risk is acceptable subject to applicant controls conditioned.

8.5 Risk Assessment – Dewatering discharge to the WRL2 area (land)

8.5.1 Description of Risk Event 2

The discharge of approximately 1,900,000 tonnes per year of dewatering effluent to land via an irrigation system located at a future waste rock landform area (WRL2). The discharge is expected to occur for a period of 18 months.

8.5.2 Identification and general characterisation of emission

Five water samples were collected from the Curara pit at four separate depths (surface, 50 m, 100 m and 140 m) and a duplicate sample for quality control. The results from the water quality analysis is provided in Table 4 above.

The results indicate the water is considered brackish (TDS 2,000 mg/L), slightly alkaline (pH 8.1 to 8.4) with no elevated metals. The Curara pit water is consistent with the groundwater quality in this area with the exception of TDS, which is found to be less saline than the groundwater at the discharge location (TDS of groundwater in this area is greater than 2,400 mg/L and was found to be as high as 6,300 mg/L just north of the WRL2 in a NNE direction).

8.5.3 Description of potential adverse impact from the emission

Discharging dewatering effluent to the WRL2 area could result in water logging of the soils outside of the WRL2 footprint due to seepage, spray drift or sheet flow resulting in a decline in the health of vegetation. Mulga (*Acacia aneura),* which is a dominate vegetation species in this area, is susceptible to water logging due to shallow root systems and therefore maybe impacted from water logged soils.

Discharging dewatering effluent, which has a slightly elevated TDS (2,000 mg/L), to the WRL2 area, could result in an increased level of salts in the soils outside of the WRL2 footprint due to seepage, spray drift or sheet flow. Salinity dramatically impedes plant growth as a result of

osmotic stress and ion toxicity. Osmotic stress occurs because saline soils have high osmotic potential, so plants which grow in saline soils have difficulty taking up water. Ion toxicity occurs because saline water moves up the transpiration stream, causing sodium and chlorine ions to accumulate in leaf tissue. Leaves with high sodium and chlorine ion levels display premature senescence and death (Munns and Tester, 2008).

8.5.4 Criteria for assessment

There are no guidelines specifically for the discharge of water to terrestrial environments.

8.5.5 Applicant Controls

This assessment has considered the controls set out in Table 17 below.

Table 17: Applicant's proposed controls for dewatering discharge to the WRL2 area (land)

Control	Description
Design	• Installation of two Sprinkler banks with each bank consisting of six DuCar Green 150 sprinklers with a 28 mm bore. The discharge rate will range from 20 L/s to 60 L/s. • Establishment of Mulga health monitoring quadrants downstream of the WRL2 area.
Operational	• Dewatering discharge will be alternated between sprinkler banks 1 and 2 to reduce the potential of water pooling. • Inspections of all associated dewatering pipelines will be undertaken on a daily basis and recorded in a log book. • Visual monitoring for erosion at the discharge points. Once during start up then monthly during the entire dewatering discharge period. • Sampling of the discharge water will occur on a monthly basis. If a 20% variation in TDS concentration above background (original pit sampling results) is observed, than discharge to the WRL2 will cease. • Monitoring of Mulga health will occur downstream of the WRL2 area. • Monitoring of existing shallow observation bores at selected sites downslope of the WRL2 area.

8.5.6 Consequence

The WRL2 area is an approved area for the future construction of a waste rock landfall facility, and therefore will be subject to clearing of all vegetation and topsoil. There are no nearby sensitive receptors with the nearest Threatened Ecological Communities (TEC) located 40 km away. The dewatering discharge is temporary, with the dewatering of the Curara pit lake only expected to take approximately 18 months. The dewatering water is considered reasonable quality with low level salts (TDS 2,000 mg/L) and no elevated metals. The vegetation surrounding the WRL2 is expected to be cleared during construction of the outer walls of the facility. Only approximately 50 Ha of the 70-80 Ha WRL2 area will be utilised for the discharge of dewatering water. Spray drift from the sprinklers is expected to remain within the footprint of the WRL2 if a suitable buffer is retained between the sprinklers and the outer perimeter of the WRL2.

Therefore, the Delegated Officer has determined that the impacts of water logging, increased salinity in the soils and spray drift from the discharging of dewatering effluent to the WRL2 area (land) will be low level onsite impacts, minimal offsite impacts on a local scale and no detectable impacts on a wider scale. Therefore, the Delegated Officer considers the consequences of discharging 1,900,000 tpa of dewatering effluent to the WRL2 area to be **Minor**.

8.5.7 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of water logging and increased salinity in the soils occurring outside of the WRL2 area, from the discharging of dewatering effluent to the WRL2 area, will probably not occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Event 1 to be **Unlikely**.

8.5.8 Overall rating of water logging and increased salinity in the soils from the discharging of dewatering effluent to the WRL2 area

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 13) and determined that the overall rating for the risk of water logging and increase soil salinity is **Medium**. Therefore the Delegated Officer has determined the risk is acceptable subject to applicant controls conditioned.

9. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 18. The risks are set out in the assessment in section 8 and the controls are detailed in this section. DWER will determine controls having regard to the adequacy of controls proposed by the Applicant. The conditions of the Works Approval will be set to give effect to the determined regulatory controls.

Table 18: Summary of regulatory controls to be applied

		Controls (references are to sections below, setting out details of controls)				
		Infrastructure and equipment	**Emission limits**	**Monitoring**	**Specified actions**	**Reports**
Risk Items (see risk analysis in section 8)	**1. Water logging of soils at the WRL2 area.**	●	●	●	●	●
	2. Increased soil salinity at the WRL2 area.	●	●	●	●	●
	3. Spray drift outside of the WRL2 area.	●	●	●	●	●
	4. Waterlogging of the soils in the drainage channel	●	●	●	●	●
	5. Scouring of creek bed in the drainage channel	●		●	●	
	6. Increase salinity in the drainage channel		●	●	●	●

9.1 Works Approval controls – Discharge dewatering water to drainage channel

9.1.1 Infrastructure and equipment (design and construction)

The Applicant is required to ensure the dewatering discharge infrastructure to the drainage channel is constructed in accordance with the following requirements (as set out in Condition 1):

1. Each discharge point is fitted with an energy diffusion device to minimise scouring and erosion of the drainage channel (creek bed); and
2. Re-establish vegetation health monitoring quadrants MMS08, MMS20 and MMS29 downstream of the discharge locations, and control plots MMS11 and MMS14 upstream of the discharge locations.

Grounds: The risk assessment (section 8.4) identified that there is a medium risk associated with waterlogging occurring within the drainage channel causing detrimental impacts on vegetation (Mulga).The requirements are derived from the controls outlined by the Applicant.

9.2 Works Approval Controls – Dewatering discharge to the WRL2

9.2.1 Infrastructure and equipment (design and construction)

The Applicant is required to ensure the dewatering discharge infrastructure at the WRL2 is constructed in accordance with the following requirements (as set out in Condition 1):

1. The sprinkler banks are installed so a minimum separation distance of 100 m is provided between each sprinkler and the outer perimeter of the future WRL2 footprint.

Grounds: The risk assessment (section 8.5) identified that there is medium risks associated from waterlogging and increased salinity of the soils occurring outside of the WRL2 area resulting in detrimental impacts to vegetation. Requirement 1 is included to ensure a suitable separation distance is provided between the sprinklers and the outer perimeter of the WRL2 footprint, to ensure the discharge remains within the WRL2 footprint.

9.3 Works Approval controls – Discharge to land (rupture of pipelines)

9.3.1 Infrastructure and equipment (design and construction)

The Applicant is required to ensure that the dewatering pipelines are:

1. Fitted with isolation valve switches and flow metres to direct water to the discharge locations;
2. Anchored to prevent movement;
3. Constructed of HDPE; and
4. Butt welded at each joint.

Grounds: Risks associated with rupture of the dewatering pipelines have been assessed as Low (Table 12). Requirements are derived from the controls outlined by the Applicant.

9.4 Works Approval controls – Discharge to drainage channel and WRL2 during commissioning and time limited operations

9.4.1 Time limited operational requirements

1. Authorised discharge locations will be listed on the Works Approval as the only authorised discharge points for mine dewater.
2. 12 hourly visual inspections are to be carried out of pipelines and discharge systems for integrity.
3. A written log of each inspection is required which must be signed by the responsible person.
4. Routine monitoring for volumes of dewater discharged, pH, TDS and vegetation health are required throughout the commissioning and time-limited operating period.

10. Determination of Works Approval conditions

The conditions in the issued Works Approval in Attachment 1 have been determined in accordance with the *Guidance Statement: Setting Conditions*.

The *Guidance Statement: Licence Duration* has been applied and the issued Works Approval expires in 3 years from date of issue.

Table 19 provides a summary of the conditions to be applied to this Works Approval.

Table 19: Summary of conditions to be applied

Condition Ref	Grounds
Infrastructure and Equipment Conditions 1, 2, 3, and 4	These conditions are valid, risk-based and contain appropriate controls on the design and construction of infrastructure.
Commissioning phase Conditions 5 to 8	These conditions are valid, risk-based and enable flexibility in operations.
Time-limited operational phase Condition 9	These conditions are valid, risk-based and enable flexibility in operations.
Emissions Condition 10	The general and authorised emissions condition is a valid, risk-based condition to ensure appropriate extent of authorised emissions
Discharge of mine dewatering Condition 11	This condition is valid, risk-based and consistent with the EP Act.
Monitoring general Condition 12	This condition is valid, risk-based and consistent with the EP Act.
Process monitoring Condition 13	This condition is valid, risk-based and consistent with the EP Act.
Record-keeping Conditions 14 and 15	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the Works Approval under the EP Act.

11. Determination of Licence conditions

The Applicant was issued EP Act Licence L9195/2019/1 on 10 May 2019 to operate a waste

water treatment plant, prescribed as category 85 under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations), at Kirkalocka.

It is expected that the Applicant will apply for a Licence amendment at or towards the completion of the works described in Schedule 3 of Works Approval W6249/2019/1. The determined controls for a licence will generally be as outlined below:

1. Operation infrastructure and equipment;
2. Emission limits;
3. Monitoring requirements;
   (a) Discharges to the WRL2 area and Drainage channel; and
   (b) Ambient monitoring;
4. Compliance;
5. Specified actions;
6. Annual reporting including submission of an annual water balance; and
7. Notification of limit exceedances.

Final determination of licence controls will consider information submitted by the Applicant in its licence amendment application and in response to works approval requirements.

12. Applicant's comments

The Applicant was provided with the draft Decision Report and draft issued Works Approval on 23 July 2019. The Applicant provided comments on 5 August 2019 which are summarised, along with DWER's response, in Appendix 2. The Applicant was then provided with an updated draft Decision Report and draft issued Works Approval on 20 August 2019. The Applicant provided a response on 29 August 2019 requesting the comment period is waivered and the Works Approval is issued.

13. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Issued Works Approval will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Louise Lavery

Digitally signed by Louise Lavery
Date: 2019.08.30 16:05:31 +08'00'

Louise Lavery
A/Manager, Resource Industries
Delegated Officer
under section 20 of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Adaman Resources, Kirkalocka Gold Project, Works Approval Form, 18 February 2019. Includes attached Works Approval - supporting document.	Application	DWER document reference: A1766024
2.	Adaman Resources, Kirkalocka Gold Project, *Water Management Strategy*, 15 February 2019.		
3.	O2 Marine*, Kirkalocka Pit Water Quality Sampling Technical Report 2018*		
4.	Additional information provided by Adaman Resources, 17 April 2019		DWER document reference: A1782493
5.	Munns and Tester, 2008	Munns and Tester, 2008	Accessed via internet search
6.	Fox, J. E. D. & Kaljuste, D. J. (1980). *Soil moisture studies in relation to Acacia aneura and associates at Leinster Downs.* Mulga Research Centre Report. 3, 35-41. (REF 3-43)	Fox, J. E. D. & Kaljuste, D. J. (1980).	
7.	N. Casson, S. Downes, and A. Harris (2009). *Native Vegetation Condition Assessment and Monitoring Manual for Western Australia.* Prepared for: The Native Vegetation Integrity Project. Funded by the Australian Government and the Government of Western Australia.	N. Casson, S. Downes, and A. Harris (2009).	
8.	DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	-	accessed at www.dwer.wa.gov.au
9.	DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.		

10.	DER, August 2016. *Guidance Statement: Licence duration.* Department of Environment Regulation, Perth.		
11.	DER, February 2017 *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.		
12.	DER, February 2017. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.		

Appendix 2: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder comment	DWER response
Include as a new condition	The commissioning of the sprinkler disposal and creek disposal may not occur simultaneously. Therefore, I would like to request a commissioning period of 3 months to allow each system to be used independently as they are commissioned. Adaman will advise the DWER in writing once commissioning has been completed for each disposal method.	Supported. Works Approval will include conditions for the commissioning and a time limited operational phase for the sprinkler and creek disposal dewatering infrastructure.
Table 2 of Condition 1	We do not believe the Works Approval requires spill protection infrastructure on the pipeline, the discharge is freshwater, its chemistry will have no impact on the environment so incidental spillage does not represent a significant environmental risk.	Supported. A majority of the dewatering pipeline will be located within the drainage channel where dewatering effluent will be discharged, or in the footprint of the future waste rock landform area (see Schedule 1: Maps). The remaining dewatering pipeline is located in highly disturbed areas within the footprint of current and future mining areas.
Table 2 of Condition 1.	The details of the manufacturer, model, bore diameter and pipeline diameter for the sprinklers are unnecessarily restrictive and should be removed from the conditions. Having these details included restricts the flexibility for implementation, in case the specified sprinklers become unavailable, need replacement or aren't fit for purpose.	Supported.

Attachment 1: Issued Works Approval W6249/2019/1