Government of Western Australia
Department of Environment Regulation

Decision Document

Environmental Protection Act 1986, Part V

Licensee: Matilda Operations Pty Ltd

Licence: L5206/1987/10

Registered office:	Level 2 38 Richardson Street WEST PERTH WA 6000
ACN:	166 954 525
Premises address:	Wiluna Operation WILUNA WA 6646 Being Mining tenements M53/30, M53/32, M53/468, L53/62, L53/20 and part tenements M53/40, M53/44, M53/50, M53/26, M53/6, M53/95, M53/96, M53/200 and M53/69 as depicted in Schedule 1
Issue date:	21 November 2013
Commencement date:	22 November 2013
Expiry date:	21 November 2018

Decision

Based on the assessment detailed in this document the Department of Environment Regulation (DER), has decided to issue an amended licence. DER considers that in reaching this decision, it has taken into account all relevant considerations and legal requirements and that the Licence and its conditions will ensure that an appropriate level of environmental protection is provided.

Decision Document prepared by:	Louise Lavery Senior Licensing Officer
Decision Document authorised by:	Tim Gentle Delegated Officer

Contents

1 Purpose of this Document

This decision document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986.* Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

2 Administrative summary

<table>
<tr><th colspan="4">Administrative details</th></tr>
<tr><td>Application type</td><td colspan="3">Works Approval ☐
New Licence ☐
Licence amendment ☒
Works Approval amendment ☐</td></tr>
<tr><td rowspan="4">Activities that cause the premises to become prescribed premises</td><td colspan="2">Category number(s)</td><td>Assessed design capacity</td></tr>
<tr><td colspan="2">5</td><td>1 800 000 tonnes per annum</td></tr>
<tr><td colspan="2">6</td><td>2 365 000 kL per annual period</td></tr>
<tr><td colspan="2">85</td><td>52 m^3 per day</td></tr>
<tr><td>Application verified
Application fee paid</td><td colspan="3">Date: N/A
Date: N/A</td></tr>
<tr><td>Works Approval has been complied with
Compliance Certificate received</td><td colspan="3">Yes☐ No☐ N/A☒
Yes☐ No☐ N/A☒</td></tr>
<tr><td>Commercial-in-confidence claim</td><td colspan="3">Yes☐ No☒</td></tr>
<tr><td>Commercial-in-confidence claim outcome</td><td colspan="3"></td></tr>
<tr><td>Is the proposal a Major Resource Project?</td><td colspan="3">Yes☐ No☐</td></tr>
<tr><td>Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986*?</td><td>Yes☐ No☒</td><td colspan="2">Referral decision No:
Managed under Part V ☐</td></tr>
</table>

		Assessed under Part IV ☐
Is the proposal subject to Ministerial Conditions?	Yes☐ No☒	Ministerial statement No: EPA Report No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the *Environmental Protection Act 1986*)?	Yes☐ No☒ Department of Water consulted Yes ☐ No ☐	
Is the Premises within an Environmental Protection Policy (EPP) Area Yes☐ No☒ If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes☐ No☒ If Yes, include details here, eg Site is subject to SO_2 requirements of Kwinana EPP.		

3 Executive summary of proposal and assessment

The Wiluna Gold Mine operation is owned by Matilda Operations Pty Ltd (Matilda Operations), a wholly owned entity of Blackham Resources Ltd (BLK) which acquired the Premises from Apex Gold Pty Ltd (Apex) a wholly owned subsidiary of Apex Minerals NL (AXM) on 21 March 2014.

The operation is located approximately 1,000km north east of Perth, 5km south east of the town of Wiluna and comprises mining leases and miscellaneous licences covering approximately 50 square kilometres (km²) (schedule 1). Modern operations of the Wiluna Gold Mine commenced in 1984, however prior to its sale to Matilda Operations it had been in care and maintenance (commenced 25 June 2013). The Wiluna Gold Mine is currently licensed for Categories 5, 6 & 85.

Matilda Operations holds registration R2015/2008/1 for the operation of the site landfill facility. Under Schedule 1, Part 2, category 89 of the *Environmental Protection (Rural Landfill) Regulations 1987* the landfill is classified as a Class II (Putrescible) landfill.

Matilda Operations holds a licence, issued under the *Rights in Water Irrigation Act (1914)* to dewater for mining purposes (GWL 159247(3)). There are three sources of mine water discharged to Lake Way. These sources are Bulletin underground operations, East pit underground operations and Happy Jack pit. Mine water is pumped to Wiluna Operations evaporation and settlement pond and subsequently discharged to the lake. Bulletin mine water is first staged in Lone Hand pit to further assist in settlement of suspended solids. The mine water collected in the evaporation pond is discharged via an established 10 kilometre pipeline feeding into one of the major tributaries to Lake Way, West Creek. This water enters the lake via an energy dispersion channel lined with imported competent rock to reduce the effects of erosion.

This licence also covers the following prescribed activities on the premises:

- crushing plant;
- Tailings Storage Facilities (TSFs):
    - Tailings B (formerly Calcine Dam 507mRL – decommissioned 1985, used periodically as a pond for storage and evaporation of excess process water; now redundant as a result of June 2016 amendment for TSF Cell J);
    - Tailings C (decommissioned);

- Western Cell to RL 521m (decommissioned);
- BIOX Dam:
  - Tailings E and Tailings F (have been joined to create one dam and recommissioned in 2011, now redundant as a result of June 2016 amendment for TSF Cell J);
  - Tailings G (decommissioned - now redundant as a result of June 2016 amendment for TSF Cell J);
  - Tailings H 516m Australian Height Datum (AHD) – two 2.5m lift approved to 521m AHD;
- In-pit tailings:
  - Golden Age pit (receives decant water for evaporation at capacity for tailings solids, ~ 50,000m^3 water storage capacity);
  - Republic Pit South (full – no longer in use);
  - Republic North (active landfill, very small pit, will no longer be used for the disposal of tailings);
  - Lawless pit (full – now redundant as a result of June 2016 amendment for TSF J);
  - Moonlight pit (receives decant water for evaporation; at capacity for tailings solids, ~ 50,000m^3 water storage capacity; active);
  - Squib pit (receives decant water for evaporation; at capacity for tailings solids, ~ 50,000m^3 water storage capacity; active);
  - Essex pit (has a seepage issue – currently is not in use);
  - Adelaide pit (currently not authorised for ~~in~~ use);
  - Gunbarrel North pit (currently in use: original capacity 125 000m^3; 25 000 m^3 remaining);
  - Gunbarrel South pit (currently in use: original capacity 175 000m^3; 100 000m^3 remaining).

- Lake Way pipeline;
- evaporation pond;
- heap leach operation;
- bacterial leaching plant;
- Carbon in Pulp (CIP)/Carbon in Leach (CIL) Gold Extraction Plant; and
- Lake Way discharge.

The Licence covers the discharge of water from the Wiluna Gold Mine dewatering program via a settling pond, abandoned pits and a 'turkey's nest' to Lake Way via the Lake Way pipeline and West Creek.

This Licence is the successor to Licence number L5206/1987/9 and is a REFIRE licence. The conditions of the Licence were reviewed in 2013, at the time of REFIRE conversion, to better reflect the operations at the site.

August 2014 Amendment

This Licence was the result of an amendment sought by the Licensee to transfer the occupier from Apex Gold Pty Ltd (Apex) to Matilda Operations Pty Ltd, to update the Improvement Program and to reflect the most current REFIRE licence format.

June 2016 Amendment

This amendment is to authorise the construction of TSF Cell J over the footprint of the existing TSFs Tailings B/Calcine Tailings, Tailings E, Tailings F and Tailings G. TSF Cell J will abut the existing Tailings H and East Pit Waste Rock Dump. New groundwater monitoring bores will be added to the ambient groundwater monitoring program (TD12J – TD 16J).

The amendment also authorises an increase to the production capacity under category 5 to 1,800,000 tonnes per annum. As part of the increase the following plant will be installed:

- Crusher primary screen (replacement);
- Fine ore bin;
- New gravity circuit;
- New crusher MCC (replacement);
- Upgrade of oxygen delivery systems;
- New carbon regeneration kiln (replacement);
- Minor upgrade of process control and instrumentation systems; and
- New leach tank and associated equipment.

As part of the amendment DER has removed conditions it considers 'redundant' due to their incompatibility with the DER (2015) Guidance Statement: Licensing and Works Approvals.

Three improvement requirements have been added to the improvement program to:

- submit and implement a dust management plan for the Premises;
- complete a monitoring plan for assessing ecological impacts associated with the mine dewater discharge to Lake Way; and
- check for sampling ports on the offgas stacks within the gold processing plant.

4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987* and DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE			
Works Approval / Licence section	**Condition number** **W = Works Approval** **L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
General conditions	Previous conditions L1.2.1 – L1.2.5	In accordance with DER's *Guidance Statement: Setting Conditions* October 2015, these standard conditions have been removed from the Licence as they are deemed to either be not enforceable, not valid (as per the meaning in the Guidance Statement) or risk-based.	DER *Guidance Statement: Setting Conditions,* October 2015
Premises operation	L1.2.1 L1.2.2 L1.2.3 L1.2.4	Containment infrastructure information has been added to Table 1.2.2 and a detailed containment infrastructure map has been added during this amendment. Adelaide Pit has been removed from the list of pits authorised to accept tailings, given the elevated arsenic concentrations in groundwater at this site, likely related to high arsenic tailings deposited at this pit in 2011- 2012. A minimum freeboard for all containment infrastructure of 300mm or capacity sufficient to contain a 1 in 100 year rainfall event over 72 hours has been provided. Conditions relating to management of wastewater treatment ponds were removed from the containment infrastructure table and added as a stand-alone condition L1.2.4 but the requirements for management of these ponds remain unchanged.	
	L1.2.5 L1.2.6	**Emergency Operation – Tailings pipelines** *Emission*: Release of alkaline tailings slurry (pH 9 -10) or tailings decant (pH approximately 7.7) containing elevated metals and cyanide to ground and potentially to surface water from a pipeline failure. Weak acid dissociable cyanide concentration in	Knight Piesold (2016b) Memorandum PE16-00323 to Blackham

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		tailings feed is approximately 80 – 100 mg/L, 10mg/L in the decant. *Impact*: The active mining area is very disturbed with gold mining at the site dating back 100 years. The assessed risk of discharge is if the spilled material migrates to Lake Violet and/or Lake Way due to a release during a storm event or if the spill is not attended to for a long period of time. Lake Way and Lake Violet have prior contamination of sediments due to historical tailings discharge at Lake Violet (which was remediated in the 1980s but may still present contamination) and mine dewater discharge to Lake Way. The arsenic concentration in the tailings supernatant exceeds the ANZECC guideline value for livestock drinking water. *Controls*: The tailings delivery and decant return pipelines will be contained within a bunded trench between the process plant and the TSF and equipped with an automatic pressure drop cut-out. The section of the tailings pipeline traversing TSF J will be located on the upstream crest of the embankment which will have a minimum crossfall to the tailings beaches of 2%; any leakage should flow towards the TSF. <u>Risk Assessment</u> *Consequence*: Minor *Likelihood*: Unlikely *Risk Rating*: Moderate <u>Regulatory Controls</u> Condition L1.2.5 has been placed on the Licence to require that all pipelines carrying alkaline water, saline water, cyanide, process liquors, and/or tailings must be bunded and/or contain automatic cut-outs to stop the flow in the event of pipeline failure. Condition L1.2.6 requires daily inspections of the pipelines to be completed to assess integrity <u>Risk Assessment</u> *Consequence*: Minor *Likelihood*: Unlikely	Resources Ltd *Re: Additional Information TSF J Application*, 12 April 2016

DECISION TABLE			
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
		Risk Rating: Moderate	
	L1.2.7 L5.2.3 L5.2.4	DER's assessment and decision making in relation to authorising the construction and commissioning of TSF J are detailed in Appendix A. Reporting requirements associated with submission of compliance documentation for construction are detailed in conditions L5.2.3 and L5.2.4. Submission of these documents and successful completion of construction according to the documents in Table 1.2.4 is required prior to authorising operation of TSF J.	Refer Appendix A
	L1.2.8	Monthly water balances of the active TSFs will be required to be completed to assess the seepage rates for each facility. It provides a method of assessing the performance of the underdrainage system in TSF J and whether this deteriorates over time. Refer also to Appendix A for further detail of DER's assessment and decision making.	Refer Appendix A
Emissions general	L2.1.1	Descriptive limits will be set through conditions 2.3.2 and 3.4.1 of the licence and therefore condition regarding recording and investigation of exceedances of limits has been included.	N/A
Point source emissions to air including monitoring	L2.2.1 IR3 of L4.1.1	Two emission points to air, from the carbon regeneration kiln and the gold smelter, are authorised under the Licence. Improvement requirement IR 3 of L4.1.1 has been added to the Licence to determine if suitable sampling ports are installed for use on these stacks. If so, a further amendment will require an investigatory monitoring program to be completed to determine the significance of any emissions to air from these stacks.	General provisions of the *Environmental Protection Act 1986.*
Point source emissions to surface water including monitoring	L2.3.1 L2.3.2 L3.2.1 L3.4.3 L4.1.1, IR2	Due to a lack of current monitoring information on the nature and impact of the dewatering discharge to Lake Way, in part as the site has been on care and maintenance for the past 3 years these conditions have not been reassessed as part of this amendment. However the requirements for the dewatering discharge monitoring program have been reviewed and updated for consistency with the Williamson Mine applications.	General provisions of the *Environmental Protection Act 1986.*

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Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
		Consequently L3.2.1 requires quarterly monitoring of metals and metalloids in the dewater discharge and IR2 for improvement condition 4.1.1 has been added to require the Licensee to submit a monitoring plan for an annual assessment of potential biological impacts from the dewater discharge. Condition 3.4.3 will require the annual assessment of the impacts on Lake Way from the dewatering to be reported. This report is to be submitted in conjunction with the Annual Environmental Report.	
Point source emissions to groundwater including monitoring	L – no conditions	No conditions relating to point source emissions to groundwater are included in this Licence in this section. Ambient monitoring of groundwater quality in the vicinity of open pits used for tailings deposition or decant water storage is conducted in accord with condition L3.4.1.	N/A
Emissions to land including monitoring	L – no conditions	No conditions relating to emissions to land are included in this Licence.	N/A
Fugitive emissions	L4.1.1, IR1	Former Licence conditions 2.6.1 and 2.6.2 that covered fugitive dust emissions have been removed as DER considers that these conditions are not clearly enforceable. Improvement requirement IR1 has been added to condition L4.1.1 to require a dust management plan to be submitted and implemented, given the proximity of the premises to the town of Wiluna (less than 5 km away).	DER (2015) *Guidance Statement: Setting Conditions* General provisions of the *Environmental Protection Act 1986.*
Odour	L – no conditions	No odour impacts are anticipated from the premises. No conditions relating to odour are included in the Licence.	General provisions of the *Environmental Protection Act*

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			1986.
Noise	L – no conditions	Noise has not been reassessed as part of this amendment. As the previous licence did not impose controls on noise, no specified conditions have been included in this section. The *Environmental Protection (Noise) Regulations 1997* apply.	
Monitoring general	L3.1.1 – L3.1.4	General monitoring conditions have not been reassessed as part of this amendment. General monitoring conditions are included in the licence to ensure ambient environmental monitoring specified in condition 3.4.1 of the licence is carried out in accordance with the relevant standards and at appropriate intervals.	AS/NZS 5667.1 AS/NZS 5667.10 AS/NZS 5667.4 AS/NZS 5667.6 AS/NZS 5667.9 AS/NZS 5667.11 AS/NZS 5667.12
Monitoring of inputs and outputs	L – no conditions	No conditions relating to monitoring of inputs and outputs are included in this Licence.	N/A
Process monitoring	L3.3.1	The requirement to monitor flushed leachates from the leach facility decommissioned pad and the PM4a monitoring point have been removed as it is no longer relevant to site activities. PM4J has been added in anticipation for when TSF J is operational, noting only active TSFs require monitoring during the life of the Licence. An exemption from NATA laboratory analysis has been granted for pH measurements due to the geographical remoteness of the site and the short holding time of the parameter.	October 2014 DER site inspection report (zA80694).
Ambient quality monitoring	L3.4.1	Thallium has been added to the list of parameters for analysis in Table 3.4.1. Information provided by Smith (2007) suggests that thallium could be a contaminant of concern in leachate from ore processing and in groundwater due to the potential for this element to be mobile in groundwater under a wide range of geochemical conditions. Thallium is also potentially more toxic to humans and many environmental receptors than mercury, cadmium and lead and is commonly found in elevated concentrations in drainage from mine sites (Peter and Viraraghavan, 2005). Limit of 2 mbgl (metres below ground level) for standing water level within tailings and water storage pits in Table 3.4.3 has been changed to 700 mm as this limit had	Smith, K.S., 2007. Strategies to predict metal mobility in surficial mining environments. *Geological Society of America Reviews in Engineering*

DECISION TABLE			
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
		effectively imposed a 2000 mm freeboard on the in-pit facilities and therefore required correction. Additionally, the 2009 Works approval for the use of these in-pit TSFs was completed on the assessment of a 0.7 m freeboard. An exemption from NATA laboratory analysis has been granted for pH and TDS measurements due to the geographical remoteness of the site and the short holding time of the parameter. An allowance for bore maintenance has been added to the monitoring requirements of Table 3.4.3 ensuring that a minimum of 90% of all bores listed are sampled during the sampling period to allow for maintenance and operational constraints (e.g. dry bores). Bores IPT01 and IPT01A are within the footprint of the new TSF J and will be de-commissioned as part of the construction of TSF J. Consequently they have been removed from this condition. Bores TD10a and TD11a will be replaced as part of the TSF J. New bores TD12 J – TD16 J have been added to the Licence to monitor seepage impacts from new TSF J. Essex Pit bores have also been removed as they have collapsed and are unable to be used for monitoring. Also refer to the assessment and decision making in Appendix A.	*Geology,* **Vol XVII**, 25-45 Peter, A.L. and Viraraghavan, T., 2005. Thallium: a review of public health and environmental concerns. *Environment International*, **31**, 493-501
	L3.4.2	This condition replaces previous condition L3.9 and has not been reassessed as part of this amendment, with the exception of removing bores made redundant by TSF J and those relating to Adelaide Pit which is no longer authorised for decant water or tailings deposition due to elevated arsenic concentrations in groundwater at this site.	N/A
	L3.4.3 L4.1.1, IR2	Previous condition L5.2.2(c) has moved to L3.4.3 and reworded to clearly state the requirements for the dewatering discharge monitoring program and associated report. Improvement requirement IR2 of L4.1.1 has been added to the licence to develop a biological monitoring plan as part of the monitoring requirements to assess the impact of the dewater discharge on Lake Way. Future amendments will add this requirement	General provisions of the *Environmental Protection Act 1986.*

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		to the monitoring required under the ambient quality monitoring section.	
Meteorological monitoring		No conditions relating to meteorological monitoring are included in the Licence.	N/A
Improvements	L4.1.1	Previous improvement condition 4.1.1 IR1 was removed from the licence as the Licensee had met this condition to supply containment infrastructure information. New IR 1, IR 2 and IR3 added to require the Licensee to: • develop and implement a dust management plan for the site, given the proximity of the premises to the town of Wiluna (less than 5 km away). • Develop a plan to assess and monitor potential ecological impacts from the dewatering discharge; and • provide information to the CEO whether sampling ports are installed on the gold smelter stack and the carbon regeneration kiln stack and if so, whether these are compliant with AS 4323.1.	Outback Ecology (2006) *Dewatering Discharge License Report Jan 2005 – Dec 2005* DER Licence L5206/1987/8
Information	L5.1.1- L5.1.4 L5.2.1 L5.2.2 L5.3.1	Standard reporting conditions have been retained on the Licence.	General provisions of the *Environmental Protection Act 1986.*
	L5.2.3 L5.2.4	Conditions relating to submission of the compliance documentation related to the construction works authorised by condition 1.2.7 are listed in conditions 5.2.3 and 5.2.4.	General provisions of the *Environmental Protection Act 1986.*
Licence Duration		No changes have been made to the Licence expiry date of 21 November 2018.	

5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
08/06/2016	Proponent sent a copy of draft instrument	No comments received.	N/A
10/06/2016	Final review of document	-	Minor edits made to correct for amendment date; cross referencing errors corrected.

6 Risk Assessment

Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management

Table 1: Emissions Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High

Appendix A

Premises Construction, Commissioning and Operation – TSF J

Normal – Commissioning and Operations

Emission Description

Emission: Seepage from TSF J contaminating local groundwater.

Impact: Tailings deposited to TSF J will contain elevated levels of arsenic, antimony, and selenium in solution. Weak acid dissociable cyanide of up to 10mg/L will also be present in supernatant liquor. Groundwater in the local area is hypersaline ranging from 36 800mg/L to 200 000 mg/L TDS.The long period of mining at the site has resulted in a significant change to the phreatic groundwater levels due to mine dewatering with standing water levels between 9.8 mbgl (Republic South, bore ITP02) to 36.1 mbgl (Happy Jack ITP08) to more than 100 mbgl in East Pit (KH Morgan and Associates, 2009). Originally the levels ranged from between 10 and 2 mbgl. There is also a history of contamination of the groundwater within the active mining area due to tailings deposition in the open pits, operation of TSF H, a significant diesel spill from an underground line within the processing plant and operation of an arsenic smelter at the site in the 1940s. The current ambient groundwater monitoring program has detected total cyanide in groundwater surrounding TSF H at levels up to 1 mg/L. Groundwater in the vicinity of Adelaide Pit exceeded the arsenic limit of 0.4 mg/L for the period from 2013 to 2015, due to deposition of high concentrations of arsenic in tailings in 2011/12 from a period of poor process control within the processing plant.

Underground and open pit mining and dewatering has also resulted in an alteration in the natural groundwater flow back towards the east and north pits, a reversal of the generally southward natural regional flow of the groundwater system. The exception to this flow regime is an increase in flow rate southward induced by groundwater mounding under the tailings impoundment H and C and the dewatering evaporation ponds which lie to the south of the mining area and close to Lake Way (KH Morgan and Associates, 2009). It can be expected that while most of the mounding from TSF J will travel towards the East Pit, some of the mounding under TSF J will also migrate south.

The Wiluna mining area is naturally highly anomalous in toxic metals including arsenic which, in its natural state, was partially contained from surface spreading by adsorption into laterite layers. The impact of these metals in the groundwater system has been highly enhanced through early mining activity particularly through the poorly environmentally controlled early mining system. This early activity has resulted in a highly arsenic contaminated groundwater system (KH Morgan and Associates, 2009).

The design life of TSF J is forecast to be 4 years and 9 months for a total storage requirement of 6.04 Mt. Seepage rates have been estimated at between 2.8 – 3.3 kL/ha/day; over an approximate 40 ha TSF the rate would be approximately 112 – 132 kL/day. This is a conservative estimate assuming the central underdrainage was not operational, the decant pond exceeded the volume for a 1 in 100 year event and only the toe drain was operational (Knight Piesold, 2016b).

Controls: No liner system has been employed for TSF J. The Cell is being constructed over the base of existing TSFs Calcine Dam, Biox Dam E, Biox Dam F and Biox Dam G. It will also cover the existing Lawless In-pit TSF and be located adjacent to TSF H and Waste Rock Dump of the East Pit. The permeability at the base is estimated to be 1 x 10^{-6} m/s (Knight Piesold, 2016a).

Instead the following seepage controls have been employed as part of the design:

- cut off trench;

- basin underdrainage collection system comprising branch and finger drains of 100mm and 63mm diameter draincoil pipe placed within a 300mm sand layer wrapped in geotextile (refer to Figure 6 for further detail);
- underdrainage collection sumps with submersible pumps to pump seepage to the decant tower; and an
- embankment upstream toe drain.

As part of operating in accord with a Tailings Operating and Surveillance Manual the Licensee will aim to minimise the size of the supernatant pond in order to reduce the head on the tailings and therefore rate of seepage.

Risk Assessment
Consequence: Moderate
Likelihood: Possible (possible in that the contaminated groundwater may migrate south to Lake Way and add to contamination in this area; underdrainage may become blocked over time and with no liner the tailings will be expected to add to contamination of the groundwater locally to TSF J) .
Risk Rating: Moderate

Regulatory Controls
Condition 1.2.7 has been added to the Licence to ensure that the construction is completed in accord with the design documentation submitted. Compliance documentation must be submitted following construction in accord with conditions 5.2.3 and 5.2.4 prior to authorising operation of TSF J under condition 1.2.2. A minimum operational freeboard is set by condition 1.2.3 and will apply once SF J is authorised for use. Regular inspections of infrastructure will be required by condition 1.2.6 and monthly water balances required to be completed as per condition 1.2.8, to track the performance of the underdrainage system. In the event that the underdrainage system does not perform as expected, these conditions will be revised. Condition 3.4.1 requires monitoring of the ambient groundwater quality in the vicinity of TSF J. Monitoring is required to commence from the date of the amendment (as soon as the bores are constructed) so as to enable background monitoring to be completed in advance of the tailings deposition to TSF J. It is acknowledged that the background groundwater is already significantly impacted from historical mining operations, however the goal is to limit the contribution of additional contamination due to seepage from TSF J.

Residual Risk
Consequence: Moderate
Likelihood: Possible
Risk Rating: Moderate

Emergency - Commissioning and Operations

Emission Description

Emission: Overtopping of the TSF J releasing tailings supernatant or tailings slurry to surrounding land and surface water either during a storm event or due to operator error.

Impact: Tailings will contain elevated levels of arsenic, antimony, and selenium in solution. Weak acid dissociable cyanide of up to 10mg/L will also be present in supernatant and values of between 80 - 100mg/L in the tailings slurry. A release of tailings would likely flow into Lake Violet and potentially travel to Lake Way.

Controls: The TSF is designed to contain a 1 in 1000 (Annual Exceedance Probability) storm event and the embankments have a factor of safety greater than 1.1 under post seismic conditions. The TSF will be operated in accord with a Tailings Operating and Surveillance Manual which will prescribe

periodic checks of the integrity of the TSF's embankments and also check the operating freeboard of the cell. The TSF is intended to operate with a water deficit and the decant ponds should remain at a minimum size under average conditions. The TSF storage capacity is sufficient under design conditions to contain the run-off from a 1 in 100 year, 72 hr storm event without the ponds encroaching onto the external embankments.

Risk Assessment
Consequence: Major
Likelihood: Rare
Risk Rating: Moderate

Regulatory Controls
Condition 1.2.7 prescribes that the construction of TSF J and its ancillary infrastructure shall be constructed in accord with the design documentation in Table 1.2.4. This design includes the provision for capacity for a 1 in 1000 AEP storm event. Current Licence conditions 1.2.3 (minimum freeboard provision) and 1.2.6 (inspection of infrastructure frequency and requirements) shall be extended to TSF J following successful completion of the construction phase and submission of compliance documentation in accord with conditions 5.2.3 and 5.2.4.

Residual Risk
Consequence: Major
Likelihood: Unlikely
Risk Rating: Moderate

References

KH Morgan and Associates (2009) *Hydrogeological Assessment Impact for Positioning of New Inpit Taiilngs Facility Monitoring Bores*, unpublished report for Apex Gold Pty Ltd, 9 June 2009.

Knight Piesold (2016a) *Blackham Resources Limited Matilda Gold Project Tailings Management Feasibility Study*, prepared for Blackham Resources Limited, February 2016.

Knight Piesold (2016b) Memorandum PE16-00323 to Blackham Resources Ltd *Re: Additional Information TSF J Application*, 12 April 2016

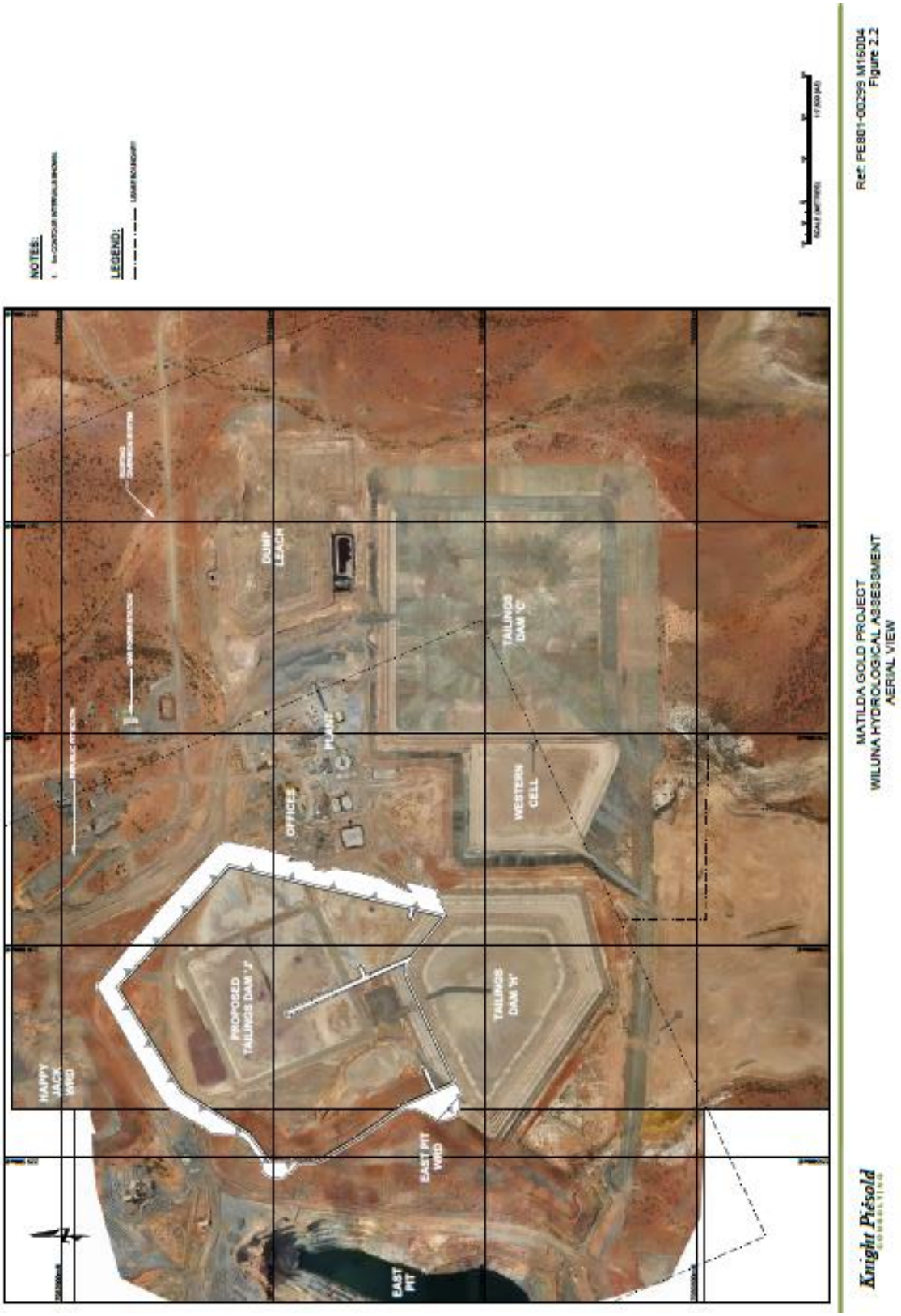

Figure 5: Location of TSF J relative to existing infrastructure

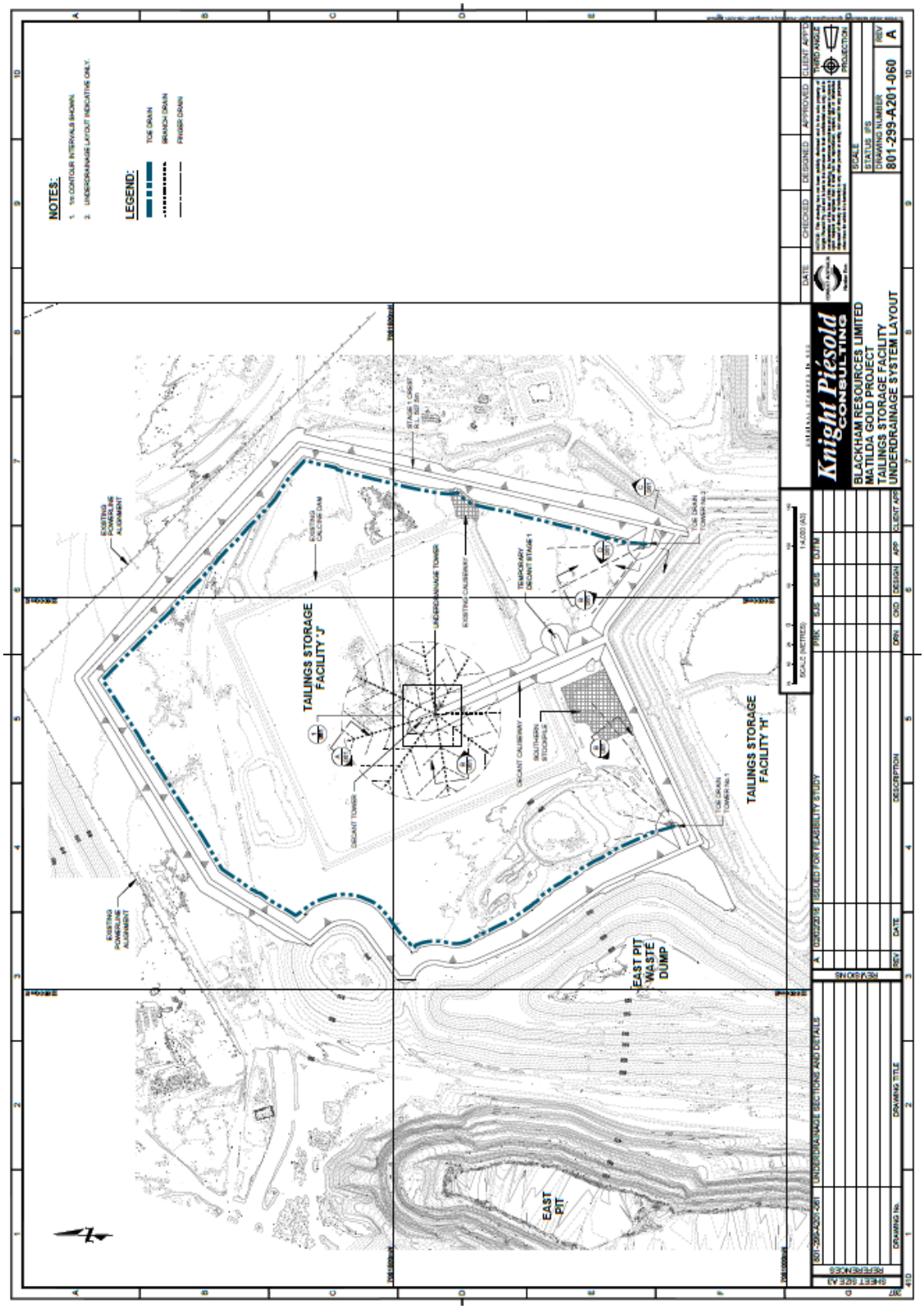

Figure 6: Drawing of TSF J, showing underdrainage detail.

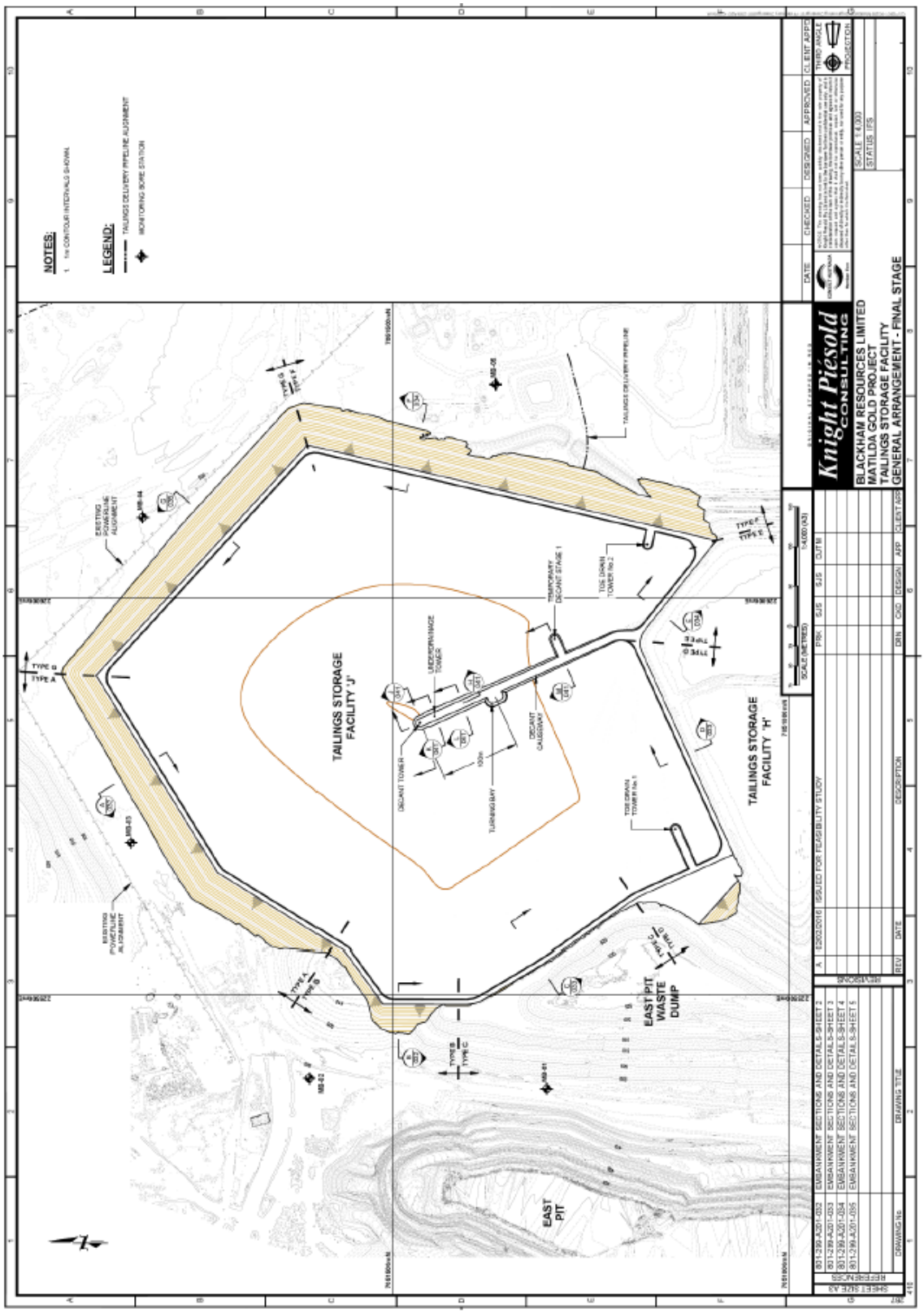

Figure 7: General arrangement drawing of TSF J at final height.