ÖkoRess III

Pilot Screening of Environmental Hazard Potentials of Mine Sites

Factsheet:

Marillana

Brockman Mining Limited , Australia

ID: 32

German Environment Agency

Umwelt Bundesamt

Note

The qualitative assessment of Environmental Hazard Potentials (EHPs) in this factsheet was conducted according to the method developed in the precursor project ÖkoRess I "Discussion of the environmental limits of primary raw material extraction and development of a method for assessing the environmental availability of raw materials to further develop the criticality concept"[1] (Dehoust et al. 2017a). The measurement instructions applied here are described in Dehoust et al. 2017b. The method is tested and further developed within this project (ÖkoRess III).

The information in this factsheet refers exclusively to publicly available, designated sources that have been classified as serious by the authors. It is specifically pointed out that no statement is made about the implementation and quality of agreements or standards that are applied. The implementation of agreements through memberships, certifications, etc. is the responsibility of the companies.

The surface extension of each mine area has been estimated based on publically accessible satellite images as official land-use plans from the public authorities or mine operators are not consistently available. It therefore only corresponds to the apparent area where mining, processing facilities, heaps, etc. and related infrastructure are clearly identifiable.

The fact sheets make no claim to completeness of all relevant voluntary standards. Mentioning a membership in one of the listed voluntary standards does not imply an assessment of the suitability of the standard in itself, nor does it make any statement about the member's success in implementation.

[1]TEXTE 87/2017 https://www.umweltbundesamt.de/publikationen/discussion-of-the-environmental-limits-of-primary

Marillana

Iron ore

General information

Indicator or criteria	Description and values
Name of mine	Marillana
Description of mining area	The Project area covers 82 km^2 and is bordering the Hamersley Range. The mine is currently being constructed and the production start is scheduled for Q3 2019 with transport by road-haulage. From Q3 2020 the product will be transported by rail (Brockman Mining 2018a).
Surface extension	37km^2 37.00 km^2 (No area data can be derived from satellite images. Area assumption, based on internal statistics)
In operation since	2019 Production start is scheduled for Q3 2019
Operator	Brockman Mining Limited
Owner	Brockman Mining Limited
Closest town	Approx. 100 km north-west of Newman
Province	Western Australia
Country	Australia
Longitude	119.243633°
Latitude	-22.575184°
Altitude	430 m a.s.l. 430 m a.s.l. (Google Earth)
Main product and by-products	Main product: iron ore; By-products: none

On-site processing stages	No detailed information could be obtained. The ore will be mined in open pit and a processing route will be used that concentrates the ore to at least 60 % Fe (Golder Associates 2018)
Annual production	20 – 30 Mt/a iron ore Production start scheduled for Q3 2019 with transport by road-haulage and from Q3 2020 by rail (Brockman Mining 2018b).
Proven Reserves	No information available
Probable Reserves	1013 Mt (Brockman Mining 2018c)

Geology

Indicator or criteria	Description and values	Explanation	Assessment result	Data quality
Preconditions for acid mine drainage (AMD)	According to the Environmental Protection Authority (EPA), There could be a potential to produce AMD from mine waste including overburden, fine rejects and coarse rejects. Brockman indicates that no relevant volumes of sulphide minerals are present (EPA 2010). Other studies indicate a very low risk for acid mine drainage (Golder Associates 2018).	There are indications for a potential for AMD, also iron is a siderophile element, and therefore AMD poses a medium EHP.	Medium	B1 = medium, can be estimated on the basis of available information
Paragenesis with heavy metals	The EPA indicates that levels for arsenic is above global background levels (EPA 2010).	The mining of metals generally poses a risk for contamination with heavy metals. In this case also the presence of arsenic has been underlined by the EPA. Therefore, the EHP for heavy metals is high.	High	B1 = medium, can be estimated on the basis of available information

Paragenesis with radioactive components	No indication of paragenesis with thorium and uranium.	In accordance with the measuring instructions, iron ore deposits are evaluated with a medium EHP, if no other information is available. This class division is based on average thorium and uranium activity levels in Chinese iron ore deposits (Dehoust et al. 2017b)	Medium	B2 = medium, classified according to measurement instructions
Deposit size	Marillana Mineral Resource estimate of 1.51 billion tonnes of hematite Detrital and Channel Iron (CID) mineralisation. At a grade of ca. 42 % a total of 630 Mt of iron could be contained in the deposit (Brockman Mining 2018c).	The deposit size is medium according to Petrow. Larger deposits potentially have a greater expected total impact on the natural environment. Considering the estimated resources, Marillana's EHP resulting from the deposit size is medium.	Medium	A = high, can be derived directly from available data
Ore grade	The majority of the mined ore will be hematite Detrital with average grades of 42.2 %. Channel Iron deposits representing ca. 7 % of the resources show Fe grades of ca. 55.6 % (Brockman Mining 2018c).	Priester et al. (2019) categorize iron ore with grades between 30 and 60 % as medium grade deposits. Accordingly, the environmental hazard potential caused by the ore grade at Marillana is medium.	Medium	B1 = medium, can be estimated on the basis of available information

Technology

Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Mine type	The mine is planned to be mined in an open pit mining process (EPA 2010).	Open-pit mines are usually limited to an area that is only slightly larger than the projection of the deposit body to the	Medium	A = high, can be derived directly

		surface. Accordingly, the EHP resulting from the mining method is medium.		from available data
Use of auxiliary substances	Crushing, screening and returning the reject to a tailings storage facility (Brockman Mining 2018d; Richards 2011).	No indication on the use of auxiliary substances could be found. Accordingly, the EHP resulting from the extraction and processing is evaluated as medium.	Medium	C = low, no concrete information, no general specifications in the measuring instructions, (expert) estimate
Mining waste	Above ground overburden and fine rejects (tailings) storage: Waste Rock disposal: Up to 587 ha above ground plus in-pit storage after year two of operation. Fines rejects Storage: Up to 247 ha above ground plus in-pit storage of tailings after year seven of operations (EPA 2010).	Once the mine starts production, a tailings storage facility will be filled with residues covering an area of 2.47 km^2. No further information concerning the size and height of the impoundment could be obtained. However, it is assumed that more than 3 million m^3 of material could be stored within the impoundment and the dam height is likely to be higher than 5 m qualifying the facility as a large dam. Accordingly, the EHP resulting from waste management is high (ICOLD 2011).	High	C = low, no concrete information, no general specifications in the measuring instructions, (expert) estimate
Remediation measures	The rehabilitation and closure requirements will address any potential residual impact to species of national significance as a result of habitat removal. It is anticipated that all but 60 ha (area of the final pit void) of the 3,785 ha disturbance footprint will be considered in the rehabilitation programme of the Closure Plan.	Since progressive remediation measures during operation are foreseen, the Environmental Hazard Potential for the indicator is low.	Low	A = high, can be derived directly from available data

	The rehabilitation will be progressive (ecologia Environment 2011).			

Framework conditions natural environment

Indicator or criteria	Description and values	Explanation	Evaluation result	Data quality
Accident hazard due to floods, earthquake, storms, landslides	The rating system for the 4 sub-indicators uses georeferenced data from publicly available risk maps (see measurement instructions). Metrics are directly taken from the given risk assessment. The indicator total is determined by the highest hazard level of the sub-indicators.	The Marillana project is probably located in an earthquake and tropical storm region and with medium EHP The EHP for the other sub-indicators is low.	Medium	Underlying risk maps: A = high, can be derived directly from available data Surface extension of site: C1 = low, no concrete information, based on statistical mean of iron ore mines.
Water Stress Index (WSI) und desert areas	The WSI by Pfister et al. (2009) provides characterization factors on the relative water availability at watershed level. Absolute water shortages in dry areas is supplemented by desert areas. The highest hazard level of the sub-indicators determines the total result.	The water stress for the mining area is low and but it is located in a desert area, which results in a high EHP.	High	Underlying risk maps: A = high, can be derived directly from available data Surface

				extension of site: C1 = low, no concrete information, based on statistical mean of iron ore mines.
Protected areas and AZE sites	Georeferenced data for designated protected areas are used to assess hazards posed by mining extraction. The metric to evaluate EHPs corresponds to the method first described in the draft standard of the Initiative for Responsible Mining Assurance (IRMA 2014).	The mine site is not situated in designated protected areas and AZE sites, which results in a low EHP.	Low	Underlying risk maps: A = high, can be derived directly from available data Surface extension of site: C1 = low, no concrete information, based on statistical mean of iron ore mines.

State Governance

Indicators

WGI 1 -Voice and Accountability	94.58 °°°

WGI 2 -Political Stability and Absence of Violence/ Terrorism	77.62 °°°
WGI 3 - Government Effectiveness	92.31 °°°
WGI 4 -Regulatory Quality	98.08 °°°
WGI 5 - Rule of Law	93.27 °°°
WGI 6 -Control of Corruption	92.79 °°°
EPI (Environmental Performance Index)	74.12
EITI membership	Other (has announced its commitment to join the EITI)
International Agreements	
ILO 176	Not ratified
Others	Not applicable
Legal framework	

Areas of Law: Environment	All stages of mining require environmental authorization. Depending on the kind of operation, varying degrees of public consultation appeal. Projects involving environmental issues require an Environmental Impact Assessment. Projects or waste storage facilities that might have impact of national environmental significance might require approval under the Environmental Protection and Biodiversity Conservation Act (projects affecting, e.g., World Heritage, threatened species etc.). Projects with significant impact on water resources require the Commonwealth minister to get advice from the Independent Experts Scientific Committee before approving any proposal. Some states have specific legislation concerning mining waste; e. g., in Victoria, Western Australia and Queensland guidelines for the design and operation of TSFs have been issued. Holders of mining rights are liable for the rehabilitation of mining areas. Liability is only discharged once all obligations as stated in the mine closure plan have been fulfilled (Woods / Rifici 2018).
Areas of Law: Occupational Health and Safety (OHS)	Following the Work Health and Safety Act (WHS), most jurisdictions in Australia provide a balanced and nationally consistent framework to health and safety of workers at workplaces (Safe Work Australia 2018). New South Wales, Queensland and Western Australia have laws directly addressing the health and safety in the mining sector including penalties for non-compliance. WHS laws impose obligations on ensuring the safety of all persons working on site, this requires officers and directors of corporations to exercise due diligence to ensure compliance with WHS laws (Woods / Rifici 2018).

Corporate Social Responsibility (CSR)

Voluntary Standards	
Aluminium Stewardship Initiative (ASI): Is the mine owning company a member?	Not applicable Not applicable
Aluminium Stewardship Initiative (ASI): Is the mine certified?	Not applicable Not applicable
International Council of Mining & Metals (ICMM): Is the mine owning company a member?	No No (ICMM 2019)
Towards Sustainable Mining (TSM) Is the mine owning company a member of the Mining Association of Canada (MAC)?	No No (MAC 2019)
Towards Sustainable Mining (TSM) outside Canada: Are TSM standards implemented*?	Not applicable Not applicable
Initiative for Responsible Mining Assurance (IRMA): Is the mine owning company a member?	No No (IRMA 2018)
Initiative for Responsible Mining Assurance (IRMA): Is the mine certified?	No No (IRMA 2018)
Responsible Copper (RC): Is the mine owning company a member of RC?	Not applicable Not applicable
Responsible Copper (RC): Is the mine certified?	Not applicable Not applicable
Responsible Mining Index (RMI): Has the mine been rated?	No No (RMI 2018)
Responsible Mining Index Company indicator „Working conditions“	Not applicable Not applicable (RMI 2018)

Responsible Mining Index Company indicator „Environmental sustainability“	Not applicable Not applicable (RMI 2018)
Responsible Steel (RS): Is the mine owner a member of the RS?	No No (Responsible Steel 2019)
Responsible Steel (RS): Is the mine certified?	No No (Responsible Steel 2019)
Australian Steel Stewardship Forum (ASSF): Is the owner a member of the ASSF?	No No (ASSF 2019)
Australian Steel Stewardship Forum: Is the mine certified?	No No (ASSF 2019)
ISO and CSR reporting	
ISO 14001 (ISO 14004): Is the mine ISO 14001 certified?	Not applicable Not applicable (Mine is not in operation yet)
CSR-directive 2014/95/EU: Does the mine owning company have its headquarters in an EU country?	No No (Hong Kong and Australia)
OECD Guidelines: Does the company have its headquarters in a signatory state?	No No (Brockman Mining Limited is located in Hong Kong) Yes (Mineral Resources are located in Australia)
ISO 26000: Does the mine implement ISO 26000?*	Not applicable Not applicable (Mine is not in operation yet)
Banking Standards	
WB Standards / IFC Performance Standards: Is the mine financed to a major extend by the world bank?	No information obtained No information available
Equator Principles (EP): Is the mine financed to a major extend by a bank adherent to the EP?	No information obtained No information available

*by companies own account.

Sources

ASSF (2019): Membership. In: Australian Steel Stewardship Forum (ASSF). http://steelstewardship.com/membership/. (01.11.2019).
Brockman Mining (2018a): Iron Ore – Marillana Project. http://www.brockmanmining.com/en/business/marillana.php. (02.06.2020).
Brockman Mining (2018b): Brockman and Mineral Resources to form 50/50 Unincorporated Joint Venture to develop Marillana Iron Ore Project. http://www.brockmanmining.com/en/press/p180727.pdf (02.06.2020).
Brockman Mining (2018c): Annual Report 2018. http://doc.irasia.com/listco/hk/brockmanmining/annual/2018/ar2018.pdf (02.06.2020).
Brockman Mining (2018d): Major transaction in relation to transfer of 50% interest in Marillana project. http://www.brockmanmining.com/media//ew_0159cir-20181219.pdf (02.06.2020).
Dehoust, G.; Manhart, A.; Möck, A.; Kießling, L.; Vogt, R.; Kämper, C.; Giegrich, J.; Auberger, A.; Priester, M.; Rechlin, A.; Dolega, P. (2017a): Erörterung ökologischer Grenzen der Primärrohstoffgewinnung und Entwicklung einer Methode zur Bewertung der ökologischen Rohstoffverfügbarkeit zur Weiterentwicklung des Kritikalitätskonzeptes (ökoRess I) - Konzeptband. Umweltbundesamt, Dessau-Roßlau.
Dehoust, G.; Manhart, A.; Möck, A.; Kießling, L.; Vogt, R.; Kämper, C.; Giegrich, J.; Auberger, A.; Priester, M.; Rechlin, A.; Dolega, P. (2017b): Erörterung ökologischer Grenzen der Primärrohstoffgewinnung und Entwicklung einer Methode zur Bewertung der ökologischen Rohstoffverfügbarkeit zur Weiterentwicklung des Kritikalitätskonzeptes (ökoRess I) - Methode für einen standortbezogenen Ansatz. Umweltbundesamt, Dessau-Roßlau.
ecologia Environment (2011): Brockman Resources Marillana iron ore project - Assessment on preliminary documentation. http://www.brockmanmining.com/en/enc/marillana_mine/20111219.brockman.marillana.mine.pd.v4.pdf (02.06.2020).
EITI (2019): EITI Countries. In: Extractive Industries Transparency Initiative. https://eiti.org/countries. (16.04.2019).
EPA (2010): Marillana Iron Ore Project - Brockman Resources Limited. Report and recommendations of the Environmental Protection Authority Perth, Australia. http://www.brockmanmining.com/en/enc/marillana_mine/attachment.g.-.marillana.epa.report.and.recommendations.pdf (02.06.2020).
EPI (2018): EPI Results. In: Environmental Performance Index (EPI). https://epi.envirocenter.yale.edu/epi-topline. (26.11.2018).
Golder Associates (2018): Brockman Mining Australia Pty Ltd. Marillana Iron Ore Project – Mineral Resource and Ore Reserve Statement.

ICMM (2019): Member companies. In: International Council on Mining and Metals (ICMM). https://www.icmm.com/en-gb/members/member-companies. (16.04.2019).
ICOLD (2011): Constitution Status. International commission on large dams (ICOLD). https://www.icold-cigb.org/userfiles/files/CIGB/INSTITUTIONAL_FILES/Constitution2011.pdf (13.05.2020).
IRMA (2014): Standard for Responsible Mining. Draft v1.0. Initiative for Responsible Mining Assurance (IRMA). https://responsiblemining.net/wp-content/uploads/2018/09/IRMA_Standard_Draft_v1.007-14.pdf.
IRMA (2018): Responsible Mining Map. In: Initiative for Responsible Mining Assurance (IRMA). https://map.responsiblemining.net/. (16.04.2019).
MAC (2019): Safety and Health. In: The Mining Association of Canada. https://mining.ca/towards-sustainable-mining/protocols-frameworks/safety-and-health/.
Pfister, S.; Koehler, A.; Hellweg, S. (2009): Assessing the Environmental Impacts of Freshwater Consumption in LCA. In: Environmental science & technology. Vol. 43, No.11, S. 4098–4104.
Priester, M.; Ericsson, M.; Dolega, P.; Löf, O. (2019): Mineral Grades: An important indicator for environmental impact of mineral exploitation. In: Mineral Economics. Raw Materials Report. Springer Nature Vol. 32, No.2, S. 127–256.
Responsible Steel (2019): Members and Associates. https://www.responsiblesteel.org/membership/members-and-associates/. (07.01.2019).
Richards, W. (2011): Brockman Resources - Investor Presentation 2011.
RMI (2018): Companies. In: Responsible Mining Index (RMI). /en/companies/29. (16.04.2019).
Safe Work Australia (2018): Glossary | Safe Work Australia. https://www.safeworkaustralia.gov.au/glossary#model_WHS_Act. (20.08.2019).
WGI (2018): The Worldwide Governance Indicators (WGI). The World Bank. http://info.worldbank.org/governance/WGI/#home. (10.12.2018).
Woods, G.; Rifici, M. (2018): Australia: Mining Law 2019. In: The International Comparative Legal Guide to: Mining Law 2019.

A Glossary

Table 1 Legend

Environmental hazard potential

low

medium

high

Data quality

low

medium

high

- No concrete information, no general specifications of the measurement instructions, expert estimation.
- Assessment not possible due to lack of data at the site, as there is also no evidence for an assessment and there are no generalized assessment rules.

- Assessable on the basis of available information.
- Generalized classification according to measurement instructions.

- Can be derived directly from available data.

B Abbreviations

EHP	Environmental hazard potential
FY	Financial year
kt	Kilo tonnes
m a.s.l.	Meters above sea level
Mt	Million tonnes
OHS	Occupational Health and Safety
t	tonnes
TSF	Tailing Storage Facility
WGI	World Governance Indicators
WHS	Work Health and Safety

C Imprint

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