



Environmental and Social Review Summary

Jordan Bromine Company

This Environmental and Social Review Summary (ESRS) is prepared by MIGA staff and disclosed prior to the date on which MIGA's Board of Directors considers the proposed issuance of a Contract of Guarantee. Its purpose is to enhance the transparency of MIGA's activities. This document should not be construed as presuming the outcome of the decision by MIGA's Board of Directors. Board dates are estimates only.

Any documentation that is attached to this ESRS has been prepared by the project sponsor, and authorization has been given for public release. MIGA has reviewed the attached documentation as provided by the applicant, and considers it of adequate quality to be released to the public, but does not endorse the content.

Country:	Jordan
Sector:	Manufacturing
Project Enterprise:	Jordan Bromine Company Limited
Environmental Category:	B
Date ESRS Disclosed:	May 10, 2012
Status:	Due Diligence

A. Project Description

The project is the expansion and operation of the existing Jordan Bromine Company (“JBC”) bromine and bromine derivatives manufacturing plant. JBC is a joint venture between Albemarle Holdings Company Limited, a wholly owned subsidiary of Albemarle Corporation (“Albemarle”) and the Arab Potash Company (“APC”). Construction of the existing JBC facility started in 2001, with production beginning in 2003 under the control and management of Albemarle.

JBC's existing operations primarily consist of the manufacturing of bromine, tetrabromobisphenol-A (“TBBPA”), calcium bromide, sodium bromide, and potassium hydroxide from bromine rich brine from the Dead Sea and other raw materials. Hydrogen bromide and hydrochloric acid are also produced as intermediaries. The 26 ha JBC production facility is located in the south end of the Dead Sea in the Ghour Al-Safi area, 26.6 km northwest of the city of Karak and 6 km north of the APC plant. JBC also have a 2 ha storage facility in Aqaba, to store bulk liquid products prior to export through the Aqaba Port.

JBC is planning to make an additional equity investment of US\$160 million to double bromine production capacity and increase the capacity of bromine derivatives through installing new parallel production units for bromine, TBBPA, hydrogen bromide, calcium bromide, sodium bromide, and chlorine, as well as necessary infrastructure and related storage and handling facilities. The proposed chlor-alkali plant will use sodium chloride as an input instead of potassium chloride, producing sodium hydroxide as a byproduct instead of potassium hydroxide. The proposed expansion is divided into four phases.

- Phase I: includes the bromine plant, hydrogen bromide unit, calcium bromide/sodium bromide plants and short-term employee housing. Construction activities have already begun and are expected to be complete in July 2012.
- Phase II: includes the power transmission line, boiler, water treatment system, cooling water tower, and compressed air and nitrogen gas system. Construction is planned to commence in January 2012, with mechanical completion expected in October 2012.
- Phase III: includes the TBBPA plant and TBBPA vent scrubber unit. Construction is planned to commence in October 2012, with mechanical completion expected in July 2013.
- Phase IV: includes the chlor-alkali plant. JBC has not yet decided whether the expansion will include Phase IV.

Phase I, II and III works are being managed and overseen by Albemarle, while Phase IV, should it proceed, is expected to be constructed and commissioned via a turnkey EPC.

B. Environmental and Social Categorization

The project is Category B project under MIGA's Policy on Social and Environmental Sustainability. Key environmental and social risks and impacts include air emissions, wastewater, hazardous materials management, hazardous waste disposal, noise, and community and worker health and safety. These risks and impacts are expected to be few in number, generally site-specific, largely reversible and readily addressed through mitigation measures.

C. Applicable Standards

While all Performance Standards are applicable to this investment, based on our current information indicates that the investment will have impacts which must be managed in a manner consistent with the following Performance Standards:

- PS1: Social and Environmental Assessment and Management Systems
- PS2: Labor and Working Conditions
- PS3: Pollution Prevention and Abatement
- PS4: Community Health, Safety & Security

The project facilities are located within the premises of the existing operational JBC facilities, therefore physical and economic displacement (PS5), impacts on indigenous people (PS7) or cultural property (PS8) are not expected. The project site is highly modified and does not present risks to the loss of critical habitat, natural habitat or legally protected areas, therefore impacts to biodiversity are not expected (PS6).

The World Bank Group General Environmental, Health and Safety ("EHS") Guidelines, Industry Sector EHS Guidelines for Large Volume Inorganic Compounds Manufacturing and Coal Tar

Distillation, and Industry Sector EHS Guidelines for Large Volume Petroleum-based Organic Chemicals Manufacturing are also applicable.

D. Key Documents and Scope of MIGA Review

As part of due diligence, a MIGA Environmental Specialist visited the project in March 2012. The following documents were reviewed by MIGA:

- *Environmental Impact Assessment Study: Jordan Bromine Company Plants Expansion Project, Special Free Zone, Ghor Numeira, Jordan.* Al-Rawabi Environment and Energy Consultancies. January 2012.
- *Preliminary Environmental Evaluation: Jordan Bromine Company Plant Expansion Project, New Tanks in Aqaba Terminal.* Al-Rawabi Environment and Energy Consultancies. November 2011.
- *Environmental Auditing: Jordan Bromine Co. Ltd.* Royal Scientific Society (Jordan). November 21, 2011.
- *Environmental Impact Assessment – Final Report: Jordan Bromine Company.* Royal Scientific Society (Jordan). June 2001.

E. Key Issues and Mitigation

PS1: Social and Environmental Assessment and Management Systems

An environmental and social impact assessment (“ESIA”) was first prepared for JBC in June 2001. This EIA assessed risks and impacts related to construction and operation of JBC’s existing production and storage facilities, particularly related to the marine environment, water resources, biodiversity, air quality, socio-economic conditions, public health, archaeology, noise and occupational health and safety. A subsequent ESIA was conducted of the proposed expansion at the Ghour Al-Safi production facility in January 2012, as well as a preliminary environmental assessment for the Aqaba bulk storage facility (collectively “2012 ESIA”). The 2012 ESIA collected baseline data assessed risks and impacts related to public health, water resources, biodiversity, socio-economic conditions, occupational health and safety and archaeology during construction, operation and decommissioning phases. Accident risks to workers and communities, solid wastes, wastewater, air quality, noise, hazardous materials and chemical risks were assessed as significant adverse impacts requiring mitigation measures, which were proposed in the 2012 ESIA.

An environmental audit of JBC’s operations was commissioned by the Jordan Ministry of Environment (“MoEnv”) and conducted by the independent Al-Rawabi Environmental & Energy Consultancies under delegation from MoEnv in November 2011. The audit reviewed and assessed all of the existing facilities operations, identified areas of improvement and provided recommendations to meet Jordanian environmental laws and regulations. JBC has implemented or is in the process of implementing all obligations identified in the audit.

JBC's environmental and social management system ("ESMS") has been ISO 14001 certified since 2007 and is operated based on Albemarle's corporate standards. The facility's TBBPA plant is also independently certified under the Voluntary Emission Control Action Program ("VECAP") since June 2011. VECAP is a voluntary initiative of the European Flame Retardant Association and Bromine Science and Environmental Forum to establish a code of best practice for handling and use of brominated flame retardants. JBC is also ISO 9001 certified for quality management systems. JBC reports on EHS performance to Albemarle on a regular basis. Albemarle provides technical support, conducts periodic internal inspections and oversees EHS training. A comprehensive Safety Manual has been developed and is regularly updated, including plans and policies to ensure the safe operation of the facility. JBC has developed a Waste Disposal Procedure and also has an Emergency Plan with designated staff trained as first responders and an emergency response vehicle equipped with necessary PPE and spill response equipment. JBC has also provided local Civil Defense units with first responder equipment and training as part of emergency management at the production facility. An incident reporting system has also been established for workers to proactively identify and report unsafe or hazardous acts and conditions. The incident reports include the root cause of the incident and recommended corrective actions. Corrective actions are tracked and reviewed monthly, all serious incidents are reviewed with Albemarle corporate management.

PS2: Labor and Working Conditions

JBC currently has approx. 280 direct hire workers, which is expected to increase by 100 when expansion is complete. JBC employs 2 expatriate workers, with the remainder local hires. The production facility operates on four shifts for 12 hours per each shift for four days. JBC's operators and engineers are unionized and JBC meets with union representatives regularly. JBC has a human resources ("HR") policy and is required to submit the HR policy to the Jordan Ministry of Labor for certification to ensure it is compliant with national labor law. Workers accommodation is provided at JBC operated housing 200 m north of the production facility, with four workers allocated per room. The workers accommodation, which is also being expanded, has a capacity of 200 and currently houses 120 workers.

Significant adverse occupational health and safety risks during construction and operations are related to accident risks, noise, and hazardous materials. Albemarle has standardized JBC's worker health and safety programs to comply with United States Occupational Health and Safety Administration ("OSHA") laws and regulations. Accident risks will be mitigated during construction through installing signage to facilitate traffic safety and during operation through JBC's Safety Manual, which includes: Safety Committee, General Safety Rules, Eye Protection, Head Protection, Hearing Protection, Hand Protection, Foot Protection, Personal Protective Equipment ("PPE"), PPE Selection Guide, Plant Safety Matrices, Laborers and Contracts Safety Plan, Work Permit Procedures, Lock-Out Tag Procedures, Confined Space Entry Permit, Line Breaking Procedure, Management of Change, Driving Rules, and Hazard Communication Policy. JBC has not had a reported occupational injury in 585 days as of May 7, 2012. Noise impacts will be mitigated during construction and operation through warning signs and required PPE for hearing protection where levels are measured or expected exceed national law, OSHA regulations and/or the World Bank Group EHS Guidelines. Routine equipment inspection and maintenance will be conducted during operation to reduce potential sources of vibration, noise monitoring is conducted annually in work areas and at the facility fence line and audiometric testing of workers is conducted annually. Hazardous material risks to worker health and safety are expected to be

mitigated through use of appropriate PPE (i.e. footwear, clothing, eye protection, respirator) as identified in the Plant Safety Matrices, secondary containment for storage tanks, the Waste Disposal Procedure, Emergency Plan and following instructions in the Materials Safety Data Sheets, which are maintained on-site electronically. Emergency eye wash and shower stations are located in areas of the facility where potential chemical exposure risks to workers have been identified. Medical monitoring is conducted for employees subject to high risk of chemical exposure.

PS3: Pollution Prevention and Abatement

Significant adverse risks and impacts from *construction* of the project are related to solid waste, air emissions, sanitary wastewater and water consumption. Inert construction waste material from site preparation and construction will be used as fill material where appropriate, with the remaining construction waste, along with domestic solid waste resulting from workers to be segregated, stored in designated bins for collection and transport by the government to the nearest licensed and approved municipal solid waste landfill. Air emissions from fugitive dust generated during construction will be mitigated through use of water spray, when necessary. Sanitary wastewater will be generated by construction workers producing moderate adverse impacts that will be mitigated through on-site treatment and collection for offsite disposal. Water demand for activities such as fugitive dust mitigation will be continually evaluated during construction and abstraction will be minimized as much as possible. Runoff during construction is considered likely, but expected to only have negligible impacts as the impact is only expected to be of a short duration and limited to construction works outside production facility fence line. The production facility itself is designed to collect surface runoff from storm events for reuse.

Significant adverse risks and impacts from *operations* of the project are related to air emissions, hazardous materials management, solid domestic and hazardous waste disposal, and liquid wastes.

Air emissions: The production facility emits sulfur dioxide, nitrogen oxides, particulate matter, bromine gas, hydrogen bromide gas, chlorine gas, hydrogen chloride gas and volatile organic compounds (particularly ethanol) to the air. Baseline studies found that ambient air quality at the project site occasionally exceeded the World Bank Group EHS Guidelines for particulate matter as a result of the arid environmental conditions. Modeling of potential cumulative impacts in the 2012 ESIA to ambient air quality from the expansion project found that the proposed investment is not expected to significantly impact ambient air quality for sulfur dioxide, nitrogen oxides, particulate matter, bromine gas, hydrogen bromide gas, chlorine gas, hydrogen chloride gas. Ambient air quality was found to conform to national standards for sulfur dioxide and nitrogen oxides. While there is no national standard for the production gases, the assessment found that the project is expected to meet national workplace air quality standards for bromine gas, hydrogen bromide gas, chlorine gas, hydrogen chloride gas, as well as national stationary source emissions standards for chlorine gas and hydrogen chloride gas and European Commission sector benchmark target values for bromine gas and hydrogen bromide gas. Air emissions are monitored from stacks and other emission points according to a schedule. To mitigate the risk of fugitive hazardous air emissions from production equipment, JBC is implementing a mechanical integrity program for undertaking regular inspections and preventative maintenance and conducting real time monitoring to detect bromine and chlorine leaks through sensors on the production equipment and at the facility fence line.

Hazardous materials: JBC stores, uses and produces significant quantities of hazardous materials in its operations with potential adverse environmental impacts resulting from unplanned and unmitigated releases to air, soils, surface and ground water. The 2012 ESIA included excerpts of a Process Hazard Analysis (“PHA”) exercise conducted at the production facility, which is a qualitative assessment of operational hazards and risks associated with a given production unit. Specific risk scenarios were developed, associated worst-case consequences identified and subsequently rated and evaluated in a risk ranking matrix to identify priorities for consideration of implementing recommended engineering and administrative controls. Following OSHA regulations, JBC plans to conduct a PHA process every five years. JBC has also prepared an Emergency Plan that establishes procedures, duties and actions of management and staff for responding to and managing unplanned and unmitigated releases of hazardous materials, or accidents resulting in serious injury to people or property.

Solid domestic and hazardous waste disposal: All waste is tracked from generation to final disposal. JBC has developed a Waste Matrix that describes all waste streams generated by the production facility; classifies according to domestic solid wastes, non-hazardous industrial wastes and hazardous wastes; as well as identifying the type of container, labeling, on-site storage location and off-site disposal location. JBC has also prepared a Waste Disposal Procedure that details responsibilities and procedures for waste management, including identification, segregation, storage and disposal. The Waste Disposal Procedure requires the use of approved waste transporters and disposal locations for each category of waste. Domestic solid waste resulting from workers and non-hazardous industrial solid waste generated from production units and maintenance activities are segregated and stored in separately designated bins for collection and transport by the government to the nearest licensed and approved municipal solid waste landfill. Solid hazardous wastes generated from production units and maintenance activities, including phenolic wastes from the TBBPA plant and inorganic solids from the calcium bromide, sodium bromide and chlorine plants are segregated and disposed at the MoEnv managed Swaqa landfill hazardous waste unit, which is currently the only approved hazardous waste facility in Jordan. The quantity and time of storage for hazardous waste is generally restricted and storage areas are inspected and internally audited periodically for compliance with procedures.

Liquid wastes: Significant adverse risks and impacts to surface and ground water were assessed related to liquid wastes, including hazardous liquid wastes, generated in production units. Swaqa was not designed to appropriately manage highly toxic and/or liquid hazardous wastes. JBC’s Waste Disposal Procedure prohibits the disposal of all liquid wastes in landfill. Non-hazardous process liquid wastes generated through condensate steam lines, wash down water, boiler and cooling tower blowdown water and collected runoff are diverted to the fire fighting water pond. Liquid hazardous wastes generated from process water in the TBBPA, calcium bromide and chlor-alkali plants are diverted to a lined evaporation pond where the evaporated sludge solids will eventually be removed and transported for disposal at Swaqa when the pond is full. The tail brine discharge consists of acidified brine from the bromine plant, discharge from the caustic scrubber and hydrogen bromide process water that contains small quantities of dissolved organic compounds. The tail brine is neutralized using sodium hydroxide prior to being discharged back to the Dead Sea via the Peace Canal along the Jordan-Israel border, where it joins effluent from APC and an Israeli chemical manufacturer. Ethyl bromide generated at the bromine plant however cannot be similarly disposed due to its low boiling point (38.4°C) which would potentially cause uncontrolled release of ethyl bromide gas during typical weather conditions at the production facility site. Because Jordan presently lacks capacity to effectively manage liquid hazardous wastes, JBC stores ethyl bromide on site in enclosed containers until sufficient

quantities are achieved to transport for final disposal in Germany through incineration. Water monitoring is conducted regularly on the potable water system, recycle water pond (fire water pond), ground water, and brine discharge to the Dead Sea.

PS4: Community Health, Safety & Security

Significant adverse community health and safety risks and impacts from construction and operation of the project are related to accident risks (see PS2 above), air emissions (see PS3 above), noise (see PS2 above) and hazardous materials (see PS3 above). These risks and impacts are expected to be mitigated through mitigation measures presented in the 2012 ESIA, JBC's Safety Manual, action plans, engineering and administrative controls, as well as monitoring, internal auditing and reporting.

Security Arrangements:

The JBC security department is made up of a mix of direct hire and contract employees hired from an outside security company. All security officers must have previous experience in the Jordan military or police service. The site has established security procedures for control of entry of employees, visitors, and vehicles, as well as patrols of the grounds, dealing with the public, and emergency response procedures. The site perimeter has a chain link fence. All gates are kept secure by locks or guards. The fence and gates are verified by patrols several times per shift. Security officers do not carry firearms. JBC's security procedures must meet the requirements of Albemarle corporate Security procedures and JBC security procedures were audited by Albemarle for compliance in 2011. There was one finding requiring general security training for all JBC employees. This training was completed in March 2012.

F. Environmental Permitting Process and Community Engagement

Jordan's Environmental Impact Assessment ("EIA") Regulation No. 37, 2005 requires a comprehensive EIA to be prepared prior to receiving permission to construct or operate investments in chemicals manufacturing and other high risk sectors, with investments in lower risk sectors required to only submit a Preliminary EIA which MoEnv will assess to determine whether a comprehensive EIA is warranted. A scoping session is required at the beginning of the process for comprehensive EIA's, where legislated government agencies, experts and affected stakeholders are invited at the invitation of MoEnv to provide comments on the draft terms of reference for the EIA. MoEnv then convenes a technical committee to review the EIA and make recommendations. The Jordan EIA regulation has no provision allowing for public disclosure of the EIA other than to the MoEnv technical committee.

The Aqaba Special Economic Zone Authority ("ASEZA"), where JBC's bulk liquid storage facility is located, is a separate legal jurisdiction with its own EIA regulations and process. ASEZA's EIA regulations are provided in the ASEZA Environmental Protection Regulation No. 21, 2001, which is functionally similar to the Jordan EIA regulation. However, ASEZA's EIA regulation doesn't legislatively mandate a technical committee or its members for comprehensive EIA's, only requires a *Preliminary Environmental Evaluation* for chemical storage facilities where the Jordan EIA regulation would require a comprehensive EIA and significantly, it specifically allows for public disclosure of the EIA, upon request.

The EIA for the Ghor Al-Safi JBC production facility expansion was approved in April 2012 by MoEnv. In respect of the Jordan EIA regulation, JBC conducted a scoping session for the expansion EIA in October 2011 in Amman. The scoping session was attended by representatives of government ministries, local elected officials and invited local community representatives. The expansion EIA was completed in January 2012 and submitted to MoEnv for review and approval. MoEnv convened a technical committee to review and EIA submitted comments to JBC for revisions to the EIA prior to approval. JBC made the suggested revisions prior to resubmitting the EIA to MoEnv for approval.

JBC prepared and submitted the required *Preliminary Environmental Evaluation* for expansion of its Aqaba bulk liquid storage facility in November 2011. The *Preliminary Environmental Evaluation* found no significant adverse impacts associated with the expansion and ASEZA issued an environmental clearance in October 2011, which was publicly disclosed. Because only a *Preliminary Environmental Evaluation* was necessary, stakeholder consultation on the terms of reference for the assessment was not required.

G. Availability of Documentation

The listed documentation is available electronically as PDF attachments to this ESRS at www.miga.org.

- [*Environmental Impact Assessment Study: Jordan Bromine Company Plants Expansion Project, Special Free Zone, Ghor Numeira, Jordan.*](#) Al-Rawabi Environment and Energy Consultancies. January 2012.
- [*Preliminary Environmental Evaluation: Jordan Bromine Company Plant Expansion Project, New Tanks in Aqaba Terminal.*](#) Al-Rawabi Environment and Energy Consultancies. November 2011.

The *Preliminary Environmental Evaluation* is locally available upon request at the following location:

- Aqaba Special Economic Zone Authority
P.O. Box 2565
Aqaba 77110, Jordan
Tel: +962 3 203 5757/8 (operator)
Fax: +962 3 203 0912 (central fax)
Email: info@aseza.jo

This ESRS will be translated and made publicly available at the following location:

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