Sunrise 50MW Photovoltaic Power Plant

Mafraq, Jordan

Environmental and Social Impact Assessment

Volume 1 – Non-Technical Summary

Prepared for:

ACWA Power

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Document Information

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1 PROJECT DESCRIPTON

1.1 Key Project Information

ACWA Power intends to develop a 50MW Photovoltaic (PV) Power Plant known as the 'Sunrise' project, within King Hussein Development area (KHBTDA) in Mafraq, Jordan. The Project will generate 50MW of renewable energy to be connected to the national electrical grid.

5 Capitals Environmental & Management Consulting has been appointed by ACWA Power to undertake an Environmental & Social Impact Assessment (ESIA) in order to gain project approval locally from the Jordanian Ministry of Environment (MoE), as well as ensuring that the project can demonstrate compliance with the necessary requirements for project finance lending for the prospective lenders, specifically the European Bank for Reconstruction and Development (EBRD).

The ESIA comprises 4 Volumes. This is Volume 1 which provides a non-technical summary of the ESIA. Volume 2 includes the main ESIA text, baseline data interpretation, assessment and mitigation measures. Volume 3 provides an outline Environmental and Social Management and Monitoring Plan (ESMMP), whilst Volume 4 presents the supporting appendices.

1.2 Description of the Project

The proposed Project is to be located within the King Hussein Bin Talal Development Area (KHBTDA) in the Mafraq Governorate in the northwest of Jordan, (approximately 70km north east of Amman). The KHBDA is intended as a world class industrial and logistics hub with a substantial area set aside for solar power generation.

The KHBTDA has 3 individual plots assigned for solar power projects:

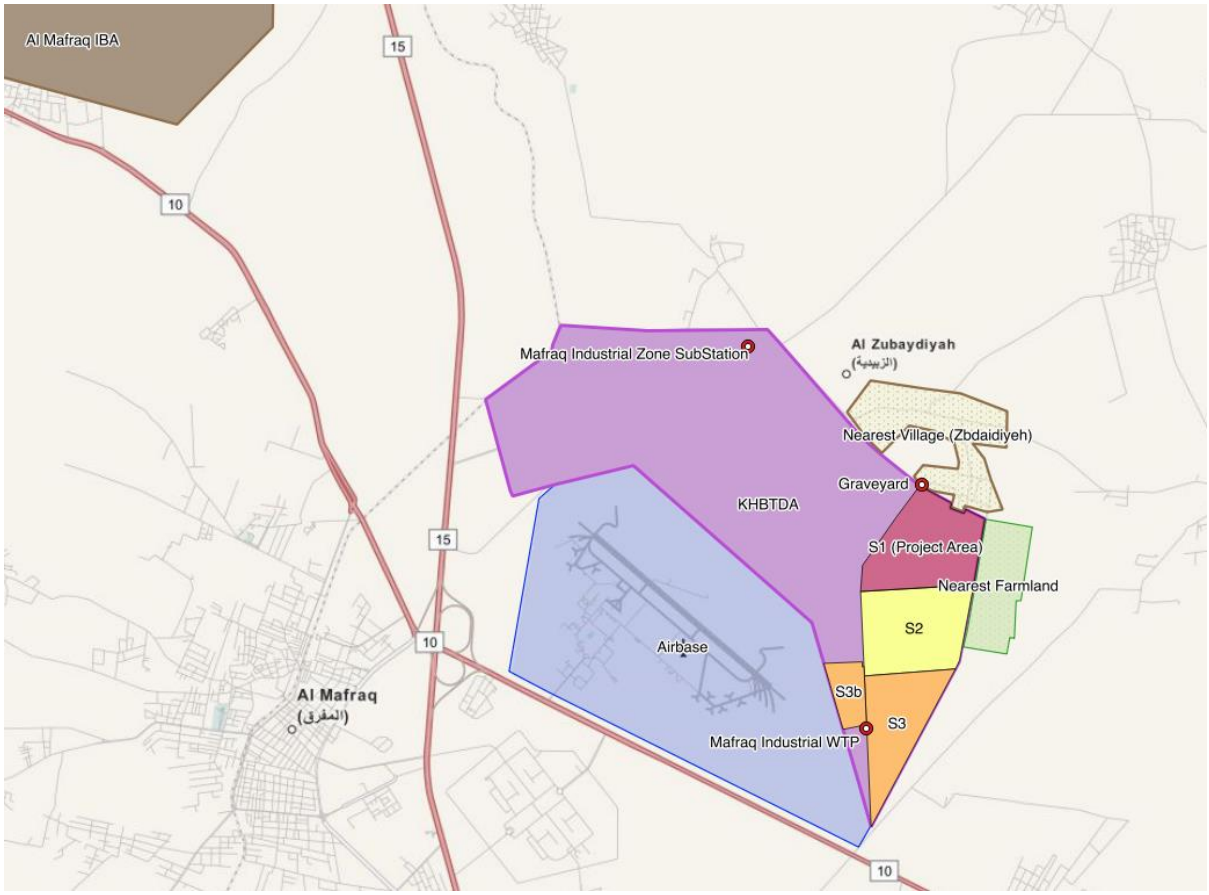
- ·Plot S1, the Sunrise Project, being developed by ACWA Power.
- ·Plot S2, being developed by Fotowatio Renewable Ventures.
- ·Plot S3 (a and b parts), being developed by Fotowatio Renewable Ventures.

Each project is to generate 50MW and has a similar delivery schedule. This ESIA has been developed specifically for the Sunrise project to be developed at plot S1.

The project site and its context in relation to the KHBTDA and neighbouring PV projects is shown overleaf.

Figure 1-1 Project Area

Figure 1-2 Sunrise Project in Context with the KHBTDA



The Project will alleviate some of Jordan's high dependence on imported fossil fuels, and support energy diversification and sustainable development in Jordan providing power directly to the national grid.

The proposed 50MW PV plant will consist of numerous PV cells within modules arranged in arrays upon tracked mounting structures across the proposed site to ensure the most efficient alignment to capture solar radiation. Besides the solar arrays, the projects ancillary facilities will include:

- a security fence;
- secured gatehouse;
- inverter stations including transformer and switchgear;
- interconnection facilities including interconnection switchgears, SCADA equipment and control room;
- internal access roads and short connection to the KHBTDA internal road network.

Associated Facilities

- The project will include a connection to the local water network already established within KHBTDA.
- Power generated from the project will be transmitted via an underground 34 kV cable to the existing NEPCO substation within the north west of the KHBTDA.

The project is anticipated to take 6 months to complete construction with an additional 2 months for commissioning.

The location of the KHBTDA provides strategic value being located at the nexus of a modern highway network that links Jordan, Syria, Iraq and Saudi Arabia. The project site also receives some of the highest levels of solar radiation in the region, maximising the efficiency of any solar energy capture projects.

The location of the plant, land provision and the requirement for the generation of 50MW through solar PV were established by KHBTDA according to the prepared in 2008 masterplan. Given that the project was awarded through a competitive bidding process, there has been no opportunity for the consideration of an alternative project site or alternative means of power generation. However, the project has undergone a vigorous design process and comparison of the technological alternatives in order to identify the most efficient arrangement and positioning of solar panels to enable the generation of 50MW from a relatively small parcel of land.

1.3 Description of the local environment and baseline conditions

The project site is predominantly open, flat unused land with a slight slope from north to south. A high voltage power line runs through the northern most section of the site. Historically, parcels of land have been used for grazing of small livestock and crops harvesting; there is evidence of plough marks and occasional herds presence on the land. Please note, there is no water source for livestock within the project footprint or immediate project area.

The site soils are fine, consolidated sandy loam, giving a distinctive orange/brown colour. Vegetation is limited to sparse patches of shrub species common to the area and sporadic patches of poorly developed barley from past agricultural use.

In general, vegetation is limited at the site and typically consists of common and native arid species, with few patches of natural re-growth following the cease of agricultural activities. Equally, little natural vegetation is present throughout the wider KHBTDA.

The village of Zbaidiyeh abuts the northern boundary of the site, a small graveyard associated with this village lies adjacent to the northern boundary of the projects area. There is a substation to the north of the KHBTDA, and there is a wastewater treatment plant (WWTP) in the south of the KHBTDA landholding. An air base operated by the Royal Jordanian Airforce is situated to the south of the KHBTDA approximately 2km form the project site, with current operations limited to military aircraft.

There are no known protected or environmentally valuable designated areas affiliated with the project site (the closest being Mafraq Plains Important Bird Area (IBA) located approximately 7km to the north west).

The Mafraq region has a mid-latitude desert/ arid cool climate. Annual mean temperatures are 17.5 °C with a mean high of 25°C in the summer and a mean low of 7°C in the winter. Total annual precipitation averages 150 mm. On average there are 3435 hours of sunshine per year.

1.4 Extent of ESIA Work Undertaken

This ESIA has been prepared in accordance with the requirements of the Jordanian "Environmental Protection Law No. 52 of 2006", the "Environmental Impact Assessment Regulation No. (37) of 2005" and the EBRD Performance Requirements (2014).

A Terms of Reference/Environmental Scoping Report was prepared and submitted to the Jordanian MoE and EBRD in March 2016. The MoE approved the ToR without comments, whilst some comments were received from EBRD by email. Such comments have been

suitably addressed in the ESIA. Further comments from EBRD and their advisors were received via a conference call in regard to the project, as well as during the site visit in April 2016.

Site surveys and/or assessment have been undertaken for air quality, water quality and drainage, noise and vibration, soil geology and groundwater, waste management, ecology, social and economic issues, community health safety and security, worker conditions and occupational health and safety, traffic and transportation, archaeology and cultural heritage, landscape and visual impacts; as reported in this ESIA.

A consultation exercise was undertaken in April 2016 and included the following key stakeholders:

- Jordanian Ministry of Environment.
- Jordanian Ministry of Tourism and Antiquities, Department of Antiquities.
- Royal Society for the Conservation of Nature.
- Local Community Representatives (including government departments, local residents and members of a local tribe)
- 'Mafraq Development Corporation' for King Hussein Bin Talal Development Area.
- Royal Jordanian Air Force (RJAF).
- Jordanian Military Headquarters
- Department of Antiquities

Consultation was undertaken through bilateral meetings and included 11 community representatives (undertaken at associated local government offices) and 4 members of the Al Mazawdeh tribe (undertaken at the site).

During consultation, the general attitude towards the project was positive. There are expectations from the local community that the project will provide opportunities for employment and social development.

2 SUMMARY OF MAIN ENVIRONMENTAL IMPACTS OF THE PROJECT

Air quality

There are no existing contributions to air pollution within the proposed project site. Baseline monitoring has confirmed that concentrations of key pollutants (Nitrogen Dioxide, Sulphur Dioxide, Carbon Monoxide, Particulates) are low and are easily compliant with national standards and lender requirements (EC Directive 2008/50/EC) for ambient air quality.

Temporary construction impacts are likely to be associated with plant/vehicle emissions and increased dust generation, particularly upon the community to the north of the site. Such impacts are common to construction activities and can be appropriately managed through

the implementation of best practices via a robust Construction Environmental & Social Management Plan (CESMP).

The plant will not have any direct operational emissions. Few and infrequent vehicle movements for maintenance activities will be the only emissions source.

Projected carbon emission savings from utilising solar to generate 50MW as opposed to traditional fossil fuel power generation is in the order of 79,100 tons per year (when compared with the Jordanian national average carbon emissions for power generation from fossil fuels).

Water Quality and Drainage

There are no water bodies within or adjacent to the project area. Potential temporary construction impacts associated with management of storm water and wastewater management are common to any construction site and can be appropriately managed through mitigation measures to be detailed in the CESMP.

During operation the cleaning of solar panels is anticipated to use 1350m^3 of water per year. Cleaning of solar panels shall be restricted to the use of clean waters that do not pose risk to the environment. Water will be supplied by a connection from the KHBTDA potable water network. Water residues from cleaning activities will be minimal and left to evaporate.

Noise and Vibration

There are no major contributions to noise and vibration within the site of proposed works and immediate site area during the operations, and the levels will be in compliance with Jordanian norms.

Temporary impacts are likely to be associated with equipment and vehicle requirements during construction. Given the proximity of the residential area to the north of the project, there is potential for construction noise to exceed national and international standards for residents at this location. Such impacts are temporary and common to construction sites. These impacts will be appropriately managed by best practices for noise mitigation, to include restrictions on working hours for noisy activities, appropriate plant/equipment selection and notification to local residents of certain activities. In addition, noise monitoring will be required to check compliance with the applicable standards. Where exceedances are identified, additional mitigation for the construction phase shall be considered.

Operational noise will be minimal and will primarily be attributable to operation of transformers, inverters, air conditioning unit and infrequent vehicle use for maintenance. No discernable impacts for local residents are anticipated.

Soil Geology and Groundwater

Site visits to date have not identified any areas of the site that may be subject to historical soil contamination. Soil analysis did identify one spot location with low levels of Total Petroleum Hydrocarbons, an isolated instance, with no other such observations. Geology within the project area is typical for the region comprising limestone deposits, chert and marl. Groundwater is anticipated to be several hundred meters below ground level (well below any excavation requirements associated with the project).

Temporary potential impacts on soil associated with construction are likely to be a result of leaks, spills and/or poor site management. Such impacts are common to any construction site and can be appropriately managed through a robust CESMP.

During operation, risks associated with stores of fuels, oils and sanitary wastewater (in septic tanks prior to connection to the KHBTDA sewerage network) will be appropriately managed through a robust Operational ESMP.

Waste Management

Waste streams associated with the construction phase are anticipated to be restricted to those commonly associated with construction activities and civils works, primarily topsoil, inert and non-hazardous wastes. The fraction of hazardous waste will be minimal and may include small quantities of solvents, oils, resins, paints, and other common construction wastes. Waste management during construction will be managed through a Waste Management Plan consistent with the CESMP, which shall include an auditable process for the transport and disposal of all waste streams.

The project will not generate notable quantities of any wastes during operation. Waste management will be required for wastes associated regular maintenance, and domestic wastes from maintenance workers. Installed solar panels are expected to have a lifespan in excess of 25 years. All wastes shall be disposed of at an appropriate licensed waste facility. As no more than 8 employees are anticipated during operation, waste quantities will be minimal, but nonetheless controlled through the best practices via the OESMP.

Biodiversity

Ecology at the project site is consistent with that of the local area in Mafraq and the Irano-Turanian Biogeographic region. The site has little evidence of wildlife activity and biodiversity is minimal. A total of 4 sparse common floral species were identified (*Anabasis sp., Centaurea pseudosinacia*, *Onopordon ambigum*, Hordum sp*)*. No tracks, foraging remains, faeces have been identified, however a rodent (*Dipodillus dasyurus*) common to the Irano-

Turanian region was seen onsite. An abandoned burrow was found towards the northern extent of the site likely to be associated with Red Fox, (common to the region).

Consultation with the Royal Society for the Conservation of Nature (RSCN) did not identify any sites or species of conservation concern that could be influenced by the project.

Risks associated with the killing and injury of native fauna during construction will be managed through a robust CESMP.

Increased water availability during operation (from panel cleaning) could result in marginal increases in pioneer vegetation and possible increase in numbers of small mammals, no associated discernable impacts are anticipated. Annual ecological monitoring shall be included as part of the OESMP.

Social and Economic Issues

The project is anticipated to provide national social and economic benefits attributable to the increased availability of a renewable energy source. The construction phase will introduce local opportunities for employment including roles for site operatives, semi-skilled positions and engagement with local contractors. The construction phase will also provide opportunity for dissemination of skills, education and increased sales for local retail and service industries.

Opportunities for employment during the operational phase will be limited as only 8 full time positions are required.

Negative impacts could arise from population influx during construction placing increased demands on local services. A total of 300 employees are anticipated for the construction phase, a sizable increase in number for a sparsely populated area. Options for worker accommodation are still being explored and discussions ongoing with Mafraq Development Corporation (MDC). Worker accommodation shall be established in accordance with International Labour Organisation (ILO) standards and guidance published by EBRD and IFC.

The locals from Al-Zbadiyeh Village periodically use lands throughout the area for growing fodder and grazing. This includes small parcels of land within the project area which will no longer be accessible as a result of the project. It is noted that the locals do not own this land nor is it communal land, the land in question is under ownership of MDC who allow the locals access at present. Consultation with the local community has raised no specific concerns over this issue and there have been no requests or concerns over making other lands available. There is alternative land of similar quality to the North and East of the KHBTDA (adjacent to Al-Zbadiyeh Village) that is to remain undeveloped. Despite consultation during

the ESIA not identifying any concerns over MDC land not being available for growing fodder and grazing, should grievances be raised in the future, further assessment will be undertaken.

Consultation with the Royal Jordanian Airforce and KHBTDA has not raised any significant concerns. Consultation with local community representatives identified general support for the project with the expectation that the development may include job opportunities, capacity building and training programs. The CESMP and OESMP for the project shall identify opportunity for employment and engagement with the local community in-line with EBRD performance requirements.

Including Sunrise, the three solar projects in the KHBTDA shall contribute to the development of a Technical Training Centre intended to benefit the local community. An amount of 60k JOD has been agreed and allocated (20k JOD per project), to establish the centre in collaboration with Mafraq Development Corporation (MDC). In addition, ACWA power will offer resources for lecture and training purpose (ACWA Power has already successfully achieved similar programs in Saudi Arabia and South Africa).

The project is also intended to provide opportunities for employment for locals to the region. During operations and maintenance it is planned that 8 personnel will be employed. This will include at least 90% (7 positions) of employees to be Jordanian, with more than 30% of these being from Mafraq (2 positions). During construction, approximately 30% (90 positions) of the workforce should be semi-skilled and hired locally (the remaining being a mix of skilled from Mafraq, Amman and abroad).

The required workforce during construction is relatively small, particularly when compared to traditional fossil fuel power plants, or other large construction sites of a similar land mass. This is due to the relatively simple construction process associated with solar plants requiring only ground preparation, established foundations, placement of PV panels and installation of associated infrastructure.

Community Health, Safety and Security

Public risks during construction have the potential to result in isolated incidents, if not controlled (e.g. oil spills, dust, fire etc.). The construction phase may present an unwanted opportunity for local communities to access the site, in terms of trespassing, with associated health and safety risks.

The project will carry several low risks that could result in impacts to public safety where such impacts are transferred or received outside of the project site. Such impacts may relate to fire, un-warranted releases of wastewater, exposure to hazardous as well as, environmental impacts (e.g. excessive noise, dust) and security concerns of trespassers.

Risks to public safety will be appropriately addressed and prepared in the construction and operational phase 'Emergency Preparedness and Response Plan' and training. The project will employ its own security staff, who will provide 24*7 security control across the site and dedicated security staff at gatehouses. Security personnel will be employed through the O&M company and will be fully trained to act as responsible security for project, and to appropriately engage with visitors and members of the local community in the event that they are approached at the front gate.

Worker Conditions and Occupational Health & Safety

Common activities undertaken during construction such as the movement of heavy machinery, excavation, handling of chemicals, etc. can all introduce significant risk to the health and safety for the associated work force.

Unless effective systems are properly designed and implemented, worker conditions could be poor, particularly related to site services and accommodation.

The EPC Contractor and O&M Company will implement robust and comprehensive occupational health and safety policies, plans and teams to monitor activities. This will include training of staff and permits to work, as well as provision of necessary personal protective equipment.

Options for worker accommodation are still being explored and discussions ongoing with MDC. Worker accommodation shall be established in accordance with International Labour Organisation (ILO) standards and guidance published by EBRD and IFC.

Human resource policies and procedures will be adapted and will comply to ILO standards to avoid instances of discrimination, inequality, forced labour and child labour as a minimum.

A grievance mechanism will be implemented at both the construction and operational phases to receive and follow up on worker grievances.

Traffic and Transportation

Given the isolated nature of the project site, current traffic conditions and that transportation demands are relatively minimal. Construction activities will likely lead to an increase in vehicle flows locally, which may be noticeable within the KHBTDA.

Construction will require 2 Buses for labour transportation (Diesel) for approximately 100 days, and 5 Heavy vehicles (trucks) for material movements during 100 days. Aqaba port will be used to import equipment and goods, transportation through Route 15 to Mafraq and the project site.

Due to the existing low vehicle flows in KHBTDA, increases in traffic are unlikely to result in congestion. Secondary impacts of additional vehicles may include impacts upon air quality and increased noise and collision risk. The traffic impacts from the operation of the PV plant will be minimal and limited number of vehicle movements required for day-to-day operations. Both the CESMP and the OESMP for the project will include a traffic management plan to alleviate impacts from traffic, and to set out specific routes for construction vehicles the site.

Archaeology and Cultural Heritage

Consultation with the Jordanian DoA has confirmed that the site been surveyed and inspected by the DoA and no archaeological remains on the ground have been recorded. No evidence of cultural/archaeological artefacts, objects or structures have been identified within the Project site during the site visits to date. A small graveyard is located approximately 15m from northern project boundary. The DoA also identified that they have no objection to the development of the Project.

The CESMP shall include a chance finds procedure identifying required action in the instance that any artefacts are uncovered during construction.

Landscape and Visual Impact

The local landscape is characterised by an open and relatively flat topography, with minimal vegetation of a low-lying nature and bright orange/brown soils.

Structures within the landscape are limited to power lines (on-site), road networks and sparse industrial features (at distance).

The project will ultimately introduce a change to the current landscape with the principle view of orange/brown soils, being replaced with of dark coloured flat PV arrays, As PV arrays will not exceed 3-4m in height, views across the wider landscape are unlikely to be significantly impacted.

Properties within the residential cluster to the north that have views to the south are likely to receive a visual impact due to the proximity of the site (the perimeter of the site will be made up of linked fence allowing views into the PV plant). Also, due to the location of the project in close proximity to a military airfield, there is the potential for glare/reflection impacts from the solar arrays upon aircraft which may be accessing the airport. The RJAF has provided a letter to indicate their non-objection of the project.

Outcome of consultation with representatives of the local community did not result in any objections or requests relative to the appearance of the PV plant, nonetheless the OESMP will include consideration of any suitable mitigation measures to minimise visual impacts of the plant during operation.

Panels will incorporate anti-reflective coating therefore the likelihood of any significant impacts from glare/reflection is considered minimal. The CESMP and OESMP will include measures for the cotrol of light pollution that will be used across the plant in the night time.

Cumulative Impacts

Operationally, the project will not result in any emissions, discharges or interference with natural cycles. Therefore, no discernible combined impacts with other projects within the wider KHBTDA are anticipated.

Combined impacts from concurrent construction projects (e.g. other PV plants) within the KHBTDA are possible (traffic congestion, noise, dust impacts etc.) and the opportunity for cumulative impacts has been considered during preparation of the ESIA. Required construction activities for the project are relatively light and manageable through a robust CESMP.

3 MONITORING

Volume 3 of the ESIA (Outline ESMMP) includes a framework for monitoring during the construction and operational phases. This framework recommends specific monitoring activities to be undertaken for the various environmental parameters outlined previously.

The project will be subject to periodic independent monitoring as per the requirements of the lenders. The independent audits will cover on-site activities as well as reviews of ESMMP's and compliance documentation that has been recorded form regular monitoring activities by the EPC Contractor and O&M Company on-site. Key mitigation measures for the projects construction include:

- Dust suppression and control of vehicular emissions.
- Control of site wastewater and disposal via tankers to a licensed waste facility.
- Control of noise and vibration through plant selection and operation times to minimise disturbance to the local community.
- Pollution prevention controls for fuel and chemical storage to include appropriate bunding and materials for emergency spill response.
- Waste management to include containment, segregation and licensed disposal.
- Control of lighting during night operations to prevent light pollution and disturbance.
- Ecological walkover prior to excavation activities.

- Engagement with the local community, including a assignment of community liason officers and a transparent grievance recording system
- Traffic management plan to minimise adverse impacts associated with traffic to and from the site.
- Perimeter fencing and manned security gate.

Impacts relating to the projects operations are considered to be minimal and as such few mitigation measures are deemed necessary, but have been included to the ESIA as appropriate.

4 CONCLUSIONS

Following the implementation of the design based and additional recommended mitigation measures, there are no impacts of a major residual significance.

The key factor that should be noted is the proximity of the residential area to the north of the project site and the potential for adverse impacts that could result from construction activities, specifically dust generation and noise. Mitigation of these impacts will be dependent on the implementation of a robust CESMP as per the outlined mitigation of the ESIA.

Besides the above, all other potential construction and operational impacts are considered to be acceptable to meet the required standards of Jordan standards, and EBRD requirements (i.e. European Union standards).

Full ESIA documentation is available for view at the following web address.

http://acwapower.com/project/sunrise-pv/

Should you wish to raise a comment or grievance associated with the ESIA for the Sunrise 50MW project, a grievance form and appropriate contact details are included within Appendix A.

Appendix A

GRIEVANCE FORM Please note that this form is for recording grievances/comments specifically associated with ESIA.	
Full Name	First Name:
	Last Name:
	☐ I wish to raise my grievance anonymously (You can remain anonymous if you prefer but we will not be able to contact you with a response to your concern)
Contact Information Please mark how you wish to be contacted (mail, telephone, e- mail).	☐ By Post: Please provide mailing address:
	☐ By telephone:
	☐ By email:
Preferred Language of Communication	☐ English
	☐ Arabic
Description of Comment /Grievance associated with the ESIA	
What would you like to see happen to resolve the problem?	
Signature:	Date:

Please send completed forms to the following address:

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