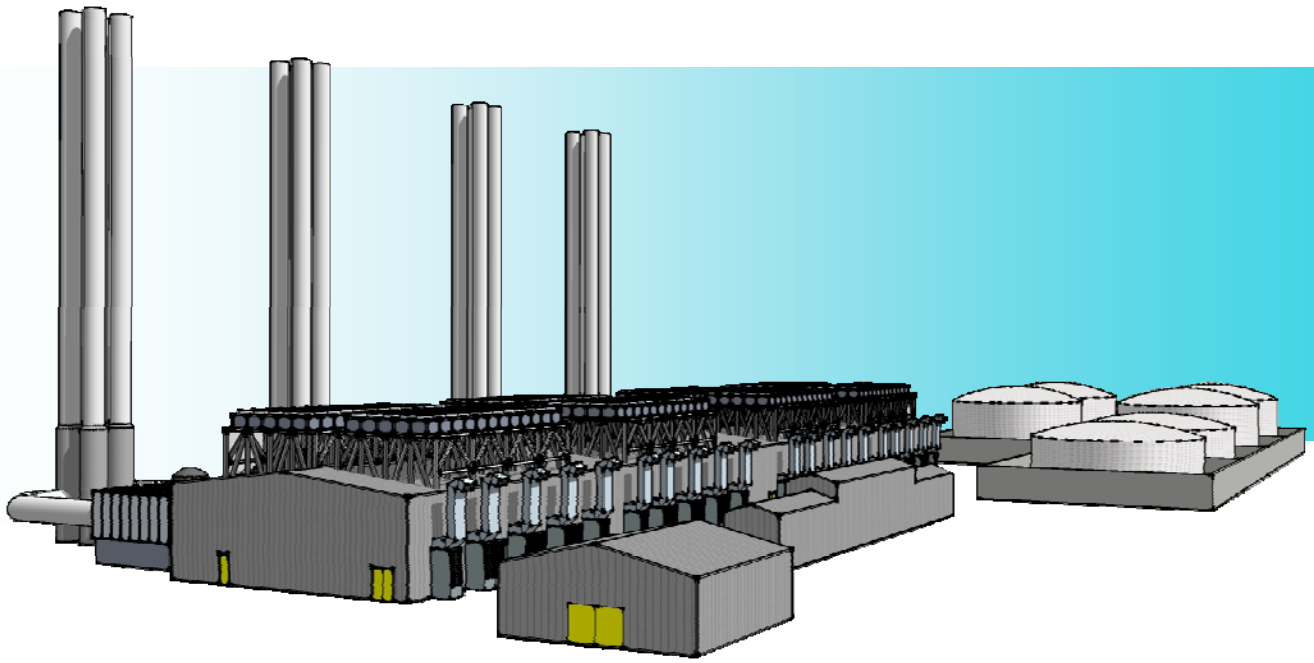
AES Baltic Holdings B.V.

Mitsui & Company Limited

AES Levant Holding BV Jordan PSC

IPP4 Al-Manakher Power Project



ENVIRONMENTAL MITIGATION AND MONITORING PROGRAMME

Prepared by

PARSONS BRINCKERHOFF

May 2012

In association with

الجمعية العلمية الملكية

Royal Scientific Society

IPP4 Al-Manakher Power Project - Environmental Mitigation and Monitoring Programme

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EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

This Environmental Mitigation and Monitoring Programme (EMMP) has been prepared by Parsons Brinckerhoff Ltd. (PB) on behalf of AES Levant Holding BV Jordan PSC, a project company incorporated in Amman, Jordan which proposes to construct a Power Project on the behalf of the Consortium AES Baltic Holdings B.V and Mitsui & Company Ltd near the village of Al-Manakher, approximately 14 km to the east of Amman on a site leased from the Ministry of Finance / Department of Lands and Survey. The Power Project will involve the construction of 16 x 18V50DF tri-fuel compression ignition engine power plant (able to fire on heavy fuel oil (HFO), distillate fuel oil (DFO),and natural gas when this becomes available). The Power Project will have a nominal output of up to 250 MWe at specified site rated conditions.

The EMMP provides information on the mitigation measures and monitoring that will be employed to minimize the environmental and social impact of the project in the construction, operational and decommissioning phases.

Adherence to this EMMP will reduce the risk of the potentially adverse impacts of the Power Project on sensitive environmental receptors and minimise social impacts.

The EMMP forms part of the overall project management for this Power Project and as such, activities will be integrated with other quality, sustainability and health and safety management procedures.
In preparing the EMMP consideration has been given as appropriate to the World Bank / International Finance Cooperation (IFC) Performance Standards on Social and Environmental Sustainability. Consideration has also been given to the relevant Jordanian Standards, Laws and Regulations as necessary.

Specifically, the following issues have been addressed when developing this EMMP:

- Air emissions;
- Noise emissions;
- Impacts to surface water and groundwater;
- Impacts to ecology (flora and fauna); and
- Socio-economic impacts.

Detailed mitigation and monitoring procedures have been developed for each of the above potential impacts of the Power Project. In developing these mitigation measures it has been assured that no impacts will be caused to the surrounding receiving environment.

Key mitigation and monitoring objectives of the EMMP include:

- Selective Catalytic Reduction (SCR) system to ensure oxides of nitrogen (NO_x) levels to be in accordance with World Bank / IFC and Jordanian requirements;
- Low sulphur fuel to limit emissions when firing on HFO and DFO;
- Use of a stack of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion;
- The bunding of all storage tanks and containers with 110 per cent impermeable bunds to ensure that in the event that a tank were to leak all material is contained and could be safely removed and the tank was repaired;
- The use of dust suppression measures such as the use of water bowsers to minimize the potential for dust creation during the construction period;

- The encouraging of the use of public transport, car sharing or use of minibuses to minimize the impact of the projects construction and operational activities on the local traffic infrastructure;
- The installation of a continuous emissions monitoring system (CEMS) in the stack of the power station during operation to ensure that all emissions limits are adhered to; and
- The installation of fire protection measures to ensure that any fire can be combated effectively.
- Regular monitoring and reporting of all emission to air, land and water.

To ensure that the monitoring and mitigation measures outlined in the EMMP are successfully implemented a environmental and safety manager will be appointed during the construction and operational phases to oversee the process.

It is considered that so long as the plant implements the mitigation and monitoring measures outlined in the EMMP the project will comply fully with all relevant Jordanian Standards, Laws and Regulations as well as the requirements of the World Bank / IFC.

SECTION 1

INTRODUCTION

1 INTRODUCTION

1.1 Background

1.1.1 This EMMP has been prepared for the IPP4 Al-Manakher Power Project on behalf of the Consortium AES Baltic Holdings B.V and Mitsui & Company Ltd. The Power Project will be located near the village of Al-Manakher, approximately 14 km to the east of Amman on a site leased from the Ministry of Finance / Department of Lands and Survey. The Power Project will involve the construction of 16 x 18V50DF tri-fuel compression ignition engine power plant that will be able to fire on heavy fuel oil (HFO), distillate fuel oil (DFO),and natural gas (when this becomes available). The Power Project will have a nominal output of up to 250 MWe at specified site rated conditions.

1.1.2 This document provides the management framework needed for planning and implementing the mitigation measures that are discussed in detail in the Environmental Statement (ES) to prevent any adverse environmental impacts arising from the project during construction, operation and decommissioning. It also identifies any monitoring that will be necessary in order to ensure that these measures are successfully implemented.

1.1.3 In preparing the EMMP consideration has been given as appropriate to the World Bank / IFC's Performance Standards on Social and Environmental Sustainability. Consideration has also been given to the relevant Jordanian Laws, Standards and Regulations as necessary including:

- Instruction for Hazardous Waste Management and Handling (2003);
- Civil Defence Law (No.35, 1999);
- Public Health Law (No. 47, 2008);
- Instruction for Management and Handling of Consumed Oil (2003); and
- Management, Transport and Handling of Harmful and Hazardous Substances Regulations (No. 24, 2005).

1.1.4 Adherence to this EMMP will reduce the risk of adverse impact of construction on sensitive environmental receptors and minimise social impacts. Specifically, the following issues have been addressed when developing this EMMP:

- Air emissions;
- Noise emissions;
- Impacts to surface water and groundwater;
- Impacts to ecology (flora and fauna); and
- Socio-economic impacts.

1.1.5 The EMMP forms part of the overall project management for this Power Project and as such, activities will be integrated with other quality, sustainability and health and safety management procedures.

1.2 Roles and Responsibilities

1.2.1 Members of the project team will be assigned specific roles for environmental, health and safety and community liaison, as shown in Figures 1.1 and 1.2:

FIGURE 1.1 - CONSTRUCTION PHASE:

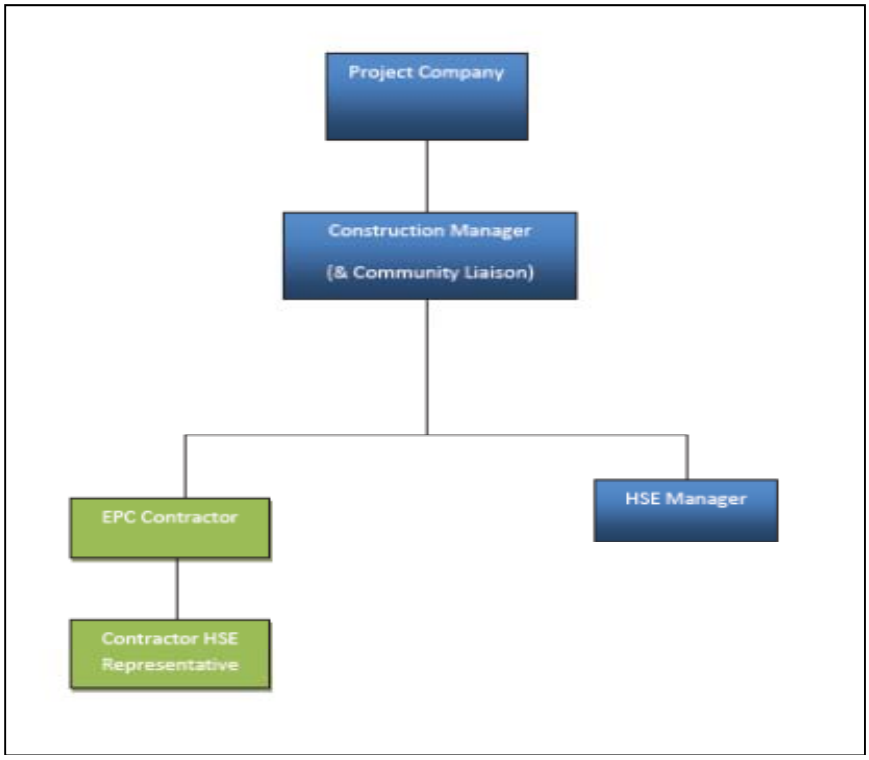
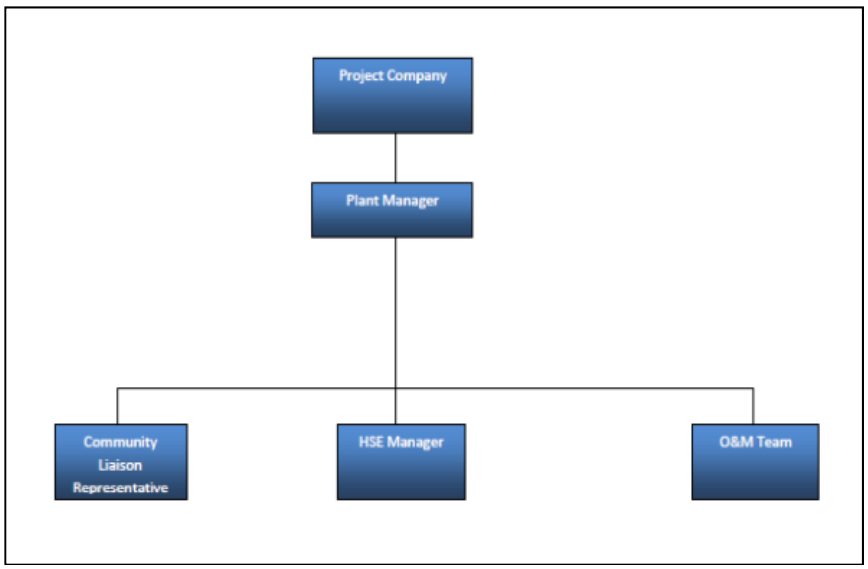


FIGURE 1.2 - OPERATIONAL PHASE:



1.2.2 The Consortium's environmental, health and safety responsibilities during construction and operation phases will be managed by appointed environmental, health and safety representatives. These responsibilities include:

- Contractor to develop, and review the EMMP and any specialist procedures and method statements;
- Delivery of environmental training to project personnel;
- Review of method statements and provide any suggested improvements prior to work starting;
- Construction activities and performance monitoring to ensure appropriate control measures are being implemented and are effective and ensure compliance with the EMMP;
- Contractors interaction with the environmental coordinator to ensure mitigation and monitoring of environmental procedures;
- Relevant instruction of all personnel on site;
- Implementation of mitigating measures at the work site in collaboration with the public works contractors; and
- Organisation and implementation of monitoring during the site works and subsequent operation.

1.3 Community Liaison Representatives and Community Engagement

1.3.1 The Consortium Community Liaison Representatives (as shown in Figure 1.1) shall during the construction and operations phases be responsible for:

- Conducting scoping and disclosure meetings to engage with the general public and government authorities during the ESIA / EMMP process;
- Develop an ongoing consultative program including a program of regular meetings with the general public and authorities to oversee, grievances, and general questions; these shall comprise of formal and informal events during the construction and operations phases;
- Training of Consortium personnel in public relations, holding meetings and addressing grievances; and
- Develop an auditable reporting progress which can be reviewed periodically by all parties.
- Ensuring the general public are regularly informed of site activities, including any events with possible negative social impacts.

SECTION 2

MITIGATION DURING THE CONSTRUCTION PHASE

2 MITIGATION DURING THE CONSTRUCTION PHASE

2.1 Introduction

2.1.1 Potential environmental impacts due to construction activities are described in more detail in the sections below.

2.1.2 All monitoring and mitigation measures during the construction phase will be the responsibility of the EPC contractor. The cost of this mitigation is considered to be negligible during this phase and is in any case part of best working practices

2.2 Site Development

2.2.1 All plant and equipment during the construction period will be contained within the Power Project boundary and appropriate laydown areas.

2.2.2 The IFC EHS General Guidelines, under Section 4 (construction and decommissioning) state that soil erosion may be caused by exposure of soil surfaces to rain and wind during site clearing, earth moving and excavation activities. The mobilisation and transport of soil particles may in turn result in sedimentation of drainage networks which may result in impacts to the quality of natural water systems and ultimately the biological systems that use them. Therefore, the following mitigation measures have been designed to prevent sedimentation and runoff:

- Additional care and attention will be given to risk assessment for excavation during heavy rainfall;
- The length and steepness of the slopes on the side of stockpiles would be limited to help prevent erosion;
- Silt traps would be used where there is the potential for any sediment laden runoff to enter watercourses;
- The gradient of access roads would be limited to reduce runoff-induced erosion and provide adequate road drainage based on road width, surface material, compaction and maintenance;
- Excavation faces, when not being worked, should be sheeted;
- The number of handling operations should be minimised, ensuring that dusty material is not moved or handled unnecessarily. Fine material should be delivered to site in bags or enclosed containers, otherwise they will be delivered in lorries and be offloaded and stored appropriately at site. Drop height must be kept to a minimum;
- Stockpiles should be located as far away as practicable from potential sensitive receptors, with slopes at angles less than the natural angle of repose of the material. Stockpiles should be sheeted, contained within wind barriers or potentially damped down. If long term stockpiles are required, consideration should be given to the use of chemical bonding agents.

2.3 Air Quality

2.3.1 It is considered that the main potential air quality issues resulting from the construction phase of the development would be from dust generating activities and from exhaust emissions from vehicles.

2.3.2 The potential for dust to cause impacts is likely to be limited to a short distance from construction works that have dust generation potential. However, construction traffic and plant also have the potential to impact on human health and ecosystems via exhaust gas emissions. In addition, if particularly dry and windy conditions prevail, the potential for dust migration over longer distances cannot be discounted.

2.3.3 The potential for dust generation and its transport to sensitive receptors is highest during dry, windy conditions. In general, construction activities associated with the greatest potential for dust generation are:

- Earthworks including excavation of topsoil, handling on site and deposition;
- Handling and storage of materials (including loading and unloading);
- Haulage roads and unsealed site surfaces (including vehicles travelling along them);
- Wind blow across disturbed site surfaces and materials; and
- Mechanical operations such as crushing, drilling, concrete mixing and cutting.

2.3.4 To ensure that atmospheric dust, contaminants or dust deposits generated by the construction work do not exceed levels which could constitute a nuisance to local residents or damage to ecosystems, or site equipment, it is proposed that visual inspections of dust, odours and exhaust emissions be undertaken along approach roads and along the boundary of the construction works. Additionally, the following mitigation measures will be applied to the construction phase of the works:

- The prolonged storage of debris on site, in temporary stockpiles will be avoided;
- Vehicles removing demolition or site clearance materials must have their loads effectively sheeted on all sides;
- Crushing of material for reuse, transportation or disposal should be undertaken as far away as possible from sensitive receptors;
- Burning of waste material should be avoided if possible;
- Excavation faces, when not being worked, should be sheeted;
- The number of handling operations should be minimised, ensuring that dusty material is not moved or handled unnecessarily;
- Fine material should be delivered to site in bags or enclosed lorries with appropriate storage methods on arrival at site;
- Drop height must be kept to a minimum;
- Hard-standing areas for vehicles entering, parking and leaving the site should be provided, with wheel washing facilities at access points;
- Site roads should be cleaned regularly, and damped down if necessary to prevent nuisance dust;
- Site vehicle movements should be kept to a minimum and, where possible, restricted to paved haulage routes;
- Vehicle speeds should be limited to 20 km/h or less on surfaced roads, and 10 km/h on unpaved surfaces. The idling of vehicles should be kept to a minimum;

- To prevent excess exhaust fumes, equipment and plant should be in a good state of repair and serviced regularly.

2.4 Water Quality

2.4.1 Water will be used during construction for mixing, sanitary purposes, washing equipment and to spray stockpiles on site to reduce dust. Measures will be employed to conserve water usage. The following mitigation measures will also be employed to limit impacts to the receiving environment:

- Potentially polluted water will be treated in the oily water treatment unit before being discharged into the natural environment;
- Sanitary water will be treated in septic tanks before being sent to a treatment unit;
- Surface water will be discharged to the natural environment, but will pass through silt traps;
- Any refuelling will be undertaken over areas of hard standing;
- Vehicles and site equipment will be checked regularly to ensure they are in good working order and do not have any leaks;
- Monitoring of wastewater streams shall comply with Section 1.3 of the IFC general EHS guidelines, which require that the discharge characteristics of the process water are monitored over time. This monitoring will most likely comprise taking occasion grab samples during construction and subjecting them to assessment for a range of pollutants and suspended solids. Storm water samples would only be required during times of rainfall; and
- Monitoring of watercourses in the vicinity of the site will also be undertaken during the construction phase to ensure that no off-site pollution is being caused by construction activities.

2.5 Noise and Vibration

2.5.1 The magnitude and significance of the effect of construction noise depends upon a number of variables, including:

- The noise generated by plant or equipment used on site, generally expressed as sound power levels;
- The periods of time site plant is operational, generally expressed as on time and measured as a percentage;
- The distance between the noise source and the receptor; and
- The level of attenuation likely due to ground absorption, air absorption and barrier effects.

2.5.2 Some construction activities can also be a source of ground-borne vibration, which can be a cause for concern at the nearest receptors.

2.5.3 The main mitigation measure to limit impacts of nuisance noise on human receptors is to agree appropriate noise levels with the relevant authorities and to undertake noise monitoring during construction to make sure these agreed thresholds are not breeched. All reasonable effort will be made to ensure that noise will be kept to a minimum during construction.

2.5.4 All contractors and sub-contractors working on-site have a general duty to take all possible measures to minimise nuisance from noise and vibration that has potential to impact on the local community or environment. To achieve this, Best Practical Means (BPM), shall be employed and the following mitigation measures complied with:

- Noisy plant or equipment should be sited as far away as is practical from noise sensitive receptors;
- All machines in intermittent use shall be shut down in the intervening periods between work or throttled down to a minimum;
- All items of plant shall be maintained in good working condition;
- All vehicles and mechanical plant used for the purposed of the work must be fitted with effective exhaust silencers;
- All compressors should be “sound reduced” models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use. All pneumatic percussive tools shall be fitted with silencers or mufflers;
- Where necessary and practical, equipment that breaks concrete by bending rather than by percussion must be used; and
- Where practical, rotary drills and bursters actuated by hydraulic or electrical power should be used for excavating hard material.

2.6 Public Relations

2.6.1 A grievance mechanism, tied in with a public information process, is essential for the success of this project. The grievance mechanism will provide a transparent and credible process to all parties, resulting in outcomes that are seen as fair, effective and lasting. It should also build trust with local communities.

2.6.2 The grievance mechanism will also serve as an early warning system for wider problems, yield insight from individual grievances that highlight changes which may be required and indicates potential recurring issues.

2.6.3 The key features of a grievance programme are:

- A central point for coordination;
- Mechanism for reporting back to the community;
- Grievance log to monitor cases and improve;
- The grievance programme will be managed by a Community Liaison Officer who will be made known to local communities; and
- The grievance plan will apply to both the construction and operational phases of the project.

2.7 Waste

2.7.1 During construction all wastes will be recovered and treated in conformity with World Bank / IFC and Jordanian regulations.

2.7.2 Additionally, where possible, The Consortium will re-use and recycle wastes where possible. Burning of waste on site will not be allowed and only inert waste (e.g. excavated soils) will be stored on site.

2.7.3 It is not anticipated that on site incineration of waste lubricating oil or fuel oil sludge shall be necessary.

2.8 Ecology and Biodiversity

2.8.1 The construction of the Power Project will result in the loss of the existing vegetation on the site. However, the Power Project site does not contain any plant species that are notable or rare.

2.8.2 Indirect impacts which could result from aqueous effluent and runoff from site activities during construction will be carefully monitored and kept to an absolute minimum. This will ensure that there is no contamination of habitats and ecosystems outside the Power Project boundary. Additionally, the following mitigation measures will also be applied during the construction phase of works:

- The Construction Contractor will not allow workers to hunt or kill animals. Any accidents resulting in the death of wild life will be reported to the Ministry of Environment and the Royal Society for Conservation of Nature;
- The destruction of bird nests will be prohibited. Any ground nests found inside the site boundary will be moved to an appropriate area in coordination with Ministry of Environment and the Royal Society for Conservation of Nature;
- Construction activity which is particularly noisy will be kept to a minimum during night-time to decrease disturbance on wildlife in the area;
- The planting of exotic or invasive plants for landscaping inside and around the Power Project site boundary will be prohibited; and
- A preference will be given to the planting of native species where landscaping is deemed necessary.

2.9 Transport and Infrastructure

2.9.1 During construction regular servicing and maintenance of vehicles will be employed to help minimise emissions to air. All vehicles will be well maintained and remain with the applicable Jordanian standards and guidelines for noise and exhaust emissions.

2.9.2 Wheel washing may be employed to help prevent mud and earth being carried from the site on to local roads. In dry periods onsite roads may be dampened to reduce the potential for dust creation. Signs will be put in place as necessary to warn of the presence of construction traffic entering and leaving the site.

2.9.3 Car sharing and the use of minibuses and public transport will be encouraged by all staff. In addition the contractors appointed would be encouraged to provide a minibus service for construction staff.

2.9.4 A traffic management plan will be prepared to help minimise the volume of additional traffic requiring use of the local traffic network. The plan will include provisions for the movement of any heavy plant or machinery which could include timing of the transport to outside of the hours of peak demand. The assistance from authorities may be sought, as necessary.

2.9.5 Duties will be designated to all parties involved in the transportation of oils/fuels up to and including the receipt of the deliveries at the site. These duties may include:

- Correct labelling and classification of the substance;
- Ensuring that all consignments are fully documented;
- The use of suitable transport vehicles including the provision of all necessary safety equipment, such as fire extinguishers, spill kits and warning signs; and
- All drivers must hold a valid and appropriate licence for driving the particular delivery vehicles.

2.9.6 A designated safety representative will monitor all of the above (including the compliance of suppliers). Safety training will be provided to vehicle drivers and all drivers will be instructed to comply with all relevant speed limits and other relevant laws.

2.9.7 Construction traffic movements will be reviewed to avoid sensitive receptors such as schools and residential areas to reduce the potential for impact on local traffic safety. Signs will be provided to warn of heavy vehicles using roads in the area of the site.

2.10 Cultural Heritage / Archaeology

2.10.1 The Construction Contractor shall contact the Department of Antiquities (DOA) if any potentially significant archaeological antiquities / sites are encountered during the construction period.

2.10.2 Following initial consultation, the Construction Contractor will also secure the written approval of the DOA before the removal of any building / foundation / structure / fence / obstruction over 50 years old.

2.10.3 Designated salvageable material shall be removed, without causing unnecessary damage, in parts or pieces which may be readily transported. Any salvageable material removed shall be stored by the Construction Contractor at approved locations, for later use or possession by the DOA.

SECTION 3

MITIGATION MEASURES DURING POWER PLANT OPERATION

3 AIR QUALITY

3.1 Air Quality

3.1.1 The Power Project will involve the construction of a 16 x 18V50DF tri-fuel compression ignition engine power plant (able to fire on HFO, DFO and natural gas when this becomes available) with a nominal output of up to 250 MWe at specified site rated conditions.

3.1.2 The combustion of these oils will result in the emission of NO_x, SO_2, carbon monoxide (CO), Particulate Matter (PM_{10}/PM_{25},) Total Suspended Particulates (TSP), Hydrogen Sulphide (H_2S) and hydrocarbons.

3.1.3 The anticipated operating regime of the proposed Power Project will be to provide short-term support to the National Transmission System (NTS).

3.1.4 Accordingly, the potential impacts on local air quality will be limited to short-term averaging periods.

3.1.5 During operation, the combustion of fuel oil will comply with limits provided by the World Bank / IFC.

3.1.6 In particular, The World Bank / IFC EHS Guidelines for Thermal Power Plants state:

3.1.7 "[the environmental assessment] *may justify more stringent or less stringent* [emissions] *limits due to ambient environment, technical and economic considerations provided there is compliance with applicable ambient air quality standards and incremental impacts are minimized*"

3.1.8 The results of the atmospheric dispersion modelling have been compared to the air quality objectives presented in the World Bank / IFC Guidelines. Key findings from the analysis of normal operation of the proposed Power Project, in isolation, are:

- The predicted maximum process contribution to short term NO_2 concentration is 159.3 µg/m^3 and is within the short term limit of 200 µg/m^3.
- The predicted maximum increase to short-term PM_{10} concentration is 7.8 µg/m^3 and is well within the prescribed limit for a 24-hour averaging period.
- The predicted maximum increases to short-term SO_2 concentrations is 90.9 µg/m^3 and within the prescribed limit for a 24-hour averaging period.
- The predicted maximum concentrations of CO, TSPs, H_2S and hydrocarbons are negligible.

3.1.9 The location of maximum increments is indicative of the prevailing meteorological conditions (i.e. predominately north-westerly winds). The predicted maximum short term concentrations of NO_2, SO_2, CO and PM_{10}/$PM_{2.5}$ are below the applicable air quality objectives in all locations.

3.1.10 The air dispersion modelling described above has assumed that particulate matter will be emitted at a maximum of 50 mg/Nm^3, in accordance with the World Bank / IFC Guidelines.

3.1.11 The following mitigating measures have been 'built-into' the design of the Power Project:

- The potential use of Selective Catalytic Reduction (SCR), which will control NO_x emissions levels;
- The use of stacks of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion; and,
- The reservation of a development area for the installation of Flue Gas Desulphurisation (FGD) equipment should this be considered necessary.

3.1.12 The Consortium will require a manufacturer's guarantee regarding the performance of the NO_x abatement system. If NO_x values are outside the permitted levels, the operation and calibration of the instrument will be checked. If proved to be accurate, corrective action shall be taken immediately to identify cause and to reduce emissions level to within the permitted levels.

3.1.13 Emissions will be controlled during operation in accordance with the manufacturer's recommendations, taking account of the Technical Guidance and Local Legislation and Guidance applicable. Efficient and regular operation and maintenance of the engine units will ensure that the emissions of CO are controlled.

3.1.14 Whilst the design of the Power Project allows for the future installation of FGD equipment if necessary it is considered that the primary method for the control of SO_2 emissions (from any thermal power plant) is to reduce the sulphur content of the fuel.

3.1.15 Similarly, the emission of PM should be limited by the ash content of the fuel. However, complete conversion of any fuel is not possible in any combustion system, and some small amount of un-burned hydrocarbons will be emitted from the engines that can form soot and add to the emissions of PM. It is considered that the engines will be able to comply with the emissions standards described earlier.

3.1.16 The stack will be fitted with continuous emissions monitors. The measured values will be recorded and displayed both remotely and in the control room. Routine calibration checks will be carried out as recommended by the manufacturer and as agreed with the Relevant Authorities. Any other ad-hoc calibration checks required by such Authorities will be carried out. An oxygen monitor will also be supplied and results from this will be used to correct the measured values to the required reporting formats.

3.1.17 Sampling points and safe access adjacent to the continuous monitoring points will be installed during construction.

3.1.18 Regular observation of chimney emissions will also be made.

3.1.19 In combination, these measures will ensure that the impact of operation of the Power Project, both in isolation and in conjunction with IPP1, will have an insignificant impact on local air quality.

3.1.20 Over the last 100 years, the average temperatures at the earth's surface have increased, a phenomenon generally attributed to increases in anthropogenic emissions of greenhouse gases. Although several greenhouse gases contribute to rising surface temperatures, the main gas is CO_2.

3.1.21 The CO_2 emissions from the plant will be calculated on an annual basis and reported; based on the type of fuel used.

3.2 Protection of Water Resources

3.2.1 All water required by the Power Project will be provided by the Water Authority of Jordan (WAJ) and Miyahuna through a connection point on the IPP1 site. The water pipeline will likely be made of steel and will be buried such that it is an appropriate depth below ground level. The agreement with WAJ will allow the plant to use of the order of 240 m^3 of water per day though the plant may ultimately use less that this during operation.

3.2.2 It is not proposed that water will be removed from on-site bore holes or local wells and the plant will therefore not impact on the water resource or water quality of the local community. The quantities of water to be taken from the Jordanian water pipeline network will be easily accommodated by WAJ and will not impact on the availability of water to other users.

3.2.3 On a day to day basis, the primary requirements for water will be as make-up water for the exhaust gas boiler and SCR system. The make-up water must be of high purity and will be treated in a new on-site water treatment plant.

3.2.4 Process effluents from the proposed plant are summarised below as are the quantities that represent a worst case that may not ultimately reflect the plants normal day to day operation.

Boiler blowdown	0.3 kg/sec
Water treatment plant effluent	1.3 kg/sec
SCR effluent	1.4 kg/sec

3.2.5 The boiler blowdown will essentially be pure water with some trace anti-corrosion chemicals used to prevent fouling in the energy recovery systems.

3.2.6 The effluent from the water treatment plant will contain salts removed from the raw water, which will provide the make-up to the water treatment plant, and also some additional sodium sulphate produced by neutralisation of the spent regenerants. This effluent will discharge to the on-site collection pond.

3.2.7 During commissioning and at infrequent intervals during the life of the plant it will be necessary to chemically clean the water side of the boiler tubes. All effluents will be tankered off-site by a licensed contractor for treatment and disposal at an appropriately licensed disposal facility.

3.2.8 During maintenance it may be necessary to drain down the boiler, the closed circuit cooling water system or parts of these systems. All such wastes will be discharged to the collection pond after treatment. The cooling water will be identical to boiler blowdown and will be high purity water containing only small amounts of corrosion inhibitor.

3.2.9 During maintenance it may be necessary to drain down the engine cooling water system or parts of these systems. All such wastes will be discharged to the maintenance tank and returned after maintenance has been completed.

3.2.10 All oil and chemical storage tanks and areas where drums are stored will be surrounded by an impermeable bund. Single tanks will be within bunds sized to contain 110 per cent of capacity and multiple tanks or drums will be within bunds sized to contain 110 per cent of the capacity of the largest tank. Permanently fixed taps, filler pipes, pumping equipment, vents and sight glasses will also be located

within the bunded area. Taps and valves will be designed to discharge downwards and will be shut and locked in that position. Manually started electrically operated pumps will remove surface water collected within the bund and its composition will be verified prior to disposal. Daily visual inspection of bunded areas will be made to ensure the effectiveness of these systems.

3.2.11 Adequate facilities for the inspection and maintenance of the interceptors will be provided and the interceptors will be regularly emptied to ensure efficient operation. A suitably qualified contractor will dispose of all sludges off-site.

3.2.12 Any waste oils will be removed by a licence contractor to and disposed of at an appropriate disposal site in the event that the oil cannot be recovered/reused/recycled.

3.2.13 All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.

3.2.14 Designated waste areas will be used to store the minimal amounts of solid waste (generally office/domestic waste) generated by the plant.

3.2.15 The plant will be designed taking into consideration the danger of flash floods. This may include such measures as construction of a diversion channel or berm surrounding the plant facilities.

3.2.16 Emergency response plans will be developed and include for the leaking of any hazardous substances stored/used on-site.

3.3 Noise and Vibration

3.3.1 The predicted operational noise level at the school NSR is compliant with the current background. Predicted operational noise levels at the two nearest residential NSR locations are in the order of 0.2 dB(A) to 1 dB(A) above the current background. The noise modelling has been undertaken in accordance with ISO9613-2, which has a stated accuracy between 100 m and 1000 m of +/- 3 dB. The current background level is already exceeding the required noise regulation limits and the increase is negligible as noise changes of less than 1 dB are not perceptible by humans, there is no demonstrable environmental impact associated with a noise increase of 1 dB. World Bank / IFC guidelines permit an increase of upto 3 dB(A) above the existing background noise, the predicted noise levels are well within these guidelines.

3.3.2 The following measures would also serve to continually monitor and minimise the impact of noise from the proposed power plant:

- A computer model of the proposed plant items should be produced at the detailed design stage, to calculate the predicted noise levels at the Noise Sensitive Receptors (NSRs) locations, and ensure that planning limits are adhered to. Detailed design will ensure that site noise is mitigated as far as possible, through site layout and orientation of noisy plant items.
- Since tonal or impulsive noises are considered more annoying than continuous noise sources, plant items should be silenced or otherwise controlled through regular maintenance to ensure no such emissions are audible at NSR locations.
- Inherently quiet plant items should be selected wherever practicable. High performance silencers should be fitted to achieve maximum noise attenuation

on plant and ductwork. Acoustic lagging and low noise trims will be fitted to all pipe-work and noise generating steam valves.

- High performance acoustic enclosures should be considered for all plant items where practicable, not overlooking smaller plant items such as compressors and pumps.
- Internal surfaces within the Engine enclosures should be treated to control internal reverberant noise levels. An appropriate treatment would consist of dense mineral wool panel behind perforated sheet steel, or a spray on cellulose fibre treatment.
- Plant items that are used for periods of shorter duration such as at the start-up and shut down should be afforded the same level of noise control as all other plant.
- All noisy plant can be positioned such that it faces towards the existing plant or towards new plant such that all sensitive receptors benefit from screening and/or directivity corrections.

3.3.3 These measures will help to ensure that noise at nearest sensitive receptors is kept to a minimum.

3.4 Relations with Local Community

3.4.1 The Consortium will ensure that the project regularly communicates with the local community and allays all fears that may be had regarding increase in noise levels or pollutant levels due to the operation of the plant.

3.4.2 The Consortium will respond to any complaints raised within the minimal possible timescale.

3.5 Training

3.5.1 All workers will receive training as necessary, including:

- Fire fighting;
- Spill prevention and clean up methods;
- Health and safety;
- First Aid;
- Training regarding chemical hazards;
- Manual Handling; and
- Public relations.

3.6 Ecology and Biodiversity

3.6.1 Operation of the Power Project site may lead to the disturbance of created habitats through noise, movement and lighting. This may limit the value of these habitats to some species (e.g. small mammals and birds). However these effects will be minimized by directional lighting and buffer planting.

3.6.2 Workers will be prevented from hunting or killing local wildlife. Any accidents resulting in the death of wild life will be reported to the Ministry of Environment and the Royal Society for Conservation of Nature.

3.6.3 Disposal of domestic / industrial wastes will be to appropriate disposal sites. The disposal of wastes on-site, and in the in the surrounding area especially at the near shallow wadies, will not be allowed.

3.6.4 All parking for the Power Project will be within the site boundary. Parking on areas outside the site boundary will not be allowed unless strictly necessary.

3.7 Transport and Infrastructure

3.7.1 The anticipated additional traffic generated by operation of Power Project is minimal compared to the capacities of the local road network.

3.7.2 The delivery of HFO and DFO and oils to the site would be timed to avoid the peak traffic congestion rush hours at 6:30 am and 4.30 pm, as far as is practical, to minimise the impact to the local traffic network.

3.7.3 As per the construction phase, similar duties will be designated to all parties involved in the transportation of oils/fuels and a Safety Advisor will monitor the compliance of all staff and suppliers/contractors throughout the operating lifetime of the Power Project.

SECTION 4

DECOMMISSIONING

4 DECOMMISSIONING

4.1.1 The development is planned to have a 30 year lifespan. At this time, detailed decommissioning procedures have not been developed, as they will follow best practice at the time. However, as an indication, the following measures will be applied:

- All wastes will be eliminated from the site;
- Dismantling of all production units and associated technical installations under conditions ensuring the prevention of pollution; and
- Cleaning of zones where necessary, emptying and rendering inert tanks.

4.1.2 All works completed with the aim of minimising noise disturbance, dust emissions and waste.

SECTION 5

MITIGATION TABLES

5 MITIGATION TABLES

5.1 Overview

5.1.1 The mitigation measures above have been tabulated below to give an easy reference guide for the implementation of the EMMP.

CONSTRUCTION IMPACT MITIGATION, MONITORING, AND MANAGEMENT MEASURES

Concern	Significance	Mitigation Measure	Monitoring
Air Quality			
Dust creation from soil movements, emissions from vehicles etc	Moderate Significance	A water bowser will be used if required (following tests to determine the moisture content of material)	To ensure that atmospheric dust, contaminants or dust deposits generated by the construction do not exceed levels which could constitute a health hazard or nuisance to those persons working on the site or living nearby a dust monitoring programme will be carried out throughout the construction period.
		Excavation faces not being worked will, if required, be either sheeted or treated with a chemical dust suppressant	
		All operatives working in areas of potential dust emission will be provided with paper facemasks.	
		All stockpiles will be located away from sensitive receptors wherever possible.	
		Materials deposited on stockpiles on-site will be closely monitored for any possible emission of dust and if required they will be damped down, covered or treated with a dust suppressant.	
		All vehicles carrying bulk materials into and out of the site will be sheeted so as to contain any material that may be dispersed during transit. Minimum drop heights will be used during material transfer	Daily visual inspections will be made to ensure that good practice is employed at all times. Inspections will include monitoring of exit points and the immediate area outside the site entrance.
		If finely ground materials are delivered, these will be in bag form, enclosed lorries or stockpiled in specified locations where the material can be suitably covered.	
		Engines will be switched off when not in use.	
		All vehicles will be properly maintained to reduce air emissions	

Concern	Significance	Mitigation Measure	Monitoring
Water Quality and Soils			
Protection of ground waters	Moderate Significance	Water inflows to excavated areas to be minimized by the use of lining materials, good housekeeping techniques and by the control of drainage and construction materials in order to prevent the contamination of ground water. Site personnel to be made aware of the potential impact on ground and surface water associated with certain aspects of the construction works to further reduce the incidence of accidental impacts.	
Potential leakage of storage tanks	Moderate Significance	Refuelling of construction vehicles and equipment to be restricted to a designated area with properly designed fuel tanks and bunds and proper operating procedures.	Daily visual inspection of bunded areas will be made to ensure the effectiveness of these systems.
Protection of ground and surface waters	Moderate Significance	Spill kits will be kept on-site to clean up any spills of fuels or oils. Spills would be reported and responded to as quickly as possible.	
		Maintenance of construction machinery will not be allowed on-site unless absolutely necessary to help to prevent the accidental leakage of lubricating and hydraulic fluids.	
		Pass all site drainage and runoff through oil and silt traps	
		Conserve water use where possible	
		Construction Contractor to dispose of any construction effluents in a responsible manner.	
		Locate stockpiles away from watercourses	
		Storage of construction materials will be in assigned areas and follow standard best working practices.	
		Disposal of excavated materials will either be off-site at an appropriate landfill site or in areas of the site that will not give rise to surface run off during wet periods.	
		Portable toilets will be provided during the construction period with any waste tankered of site and disposed of in an appropriate manner.	

Concern	Significance	Mitigation Measure	Monitoring
		Water inflows to excavated areas to be minimized by the use of lining materials, good housekeeping techniques and by the control of drainage and construction materials in order to prevent the contamination of ground water.	
		Reuse excavated material within the site boundary where practicable which would reduce the volume of excavated material going off-site to landfill.	
		No materials will be disposed of in the wadi to the north-west of the site.	
		Segregation of contaminated excavated material (should this be encountered), from non-contaminated excavated material would be made with the contaminated soils removed to an appropriate disposal site.	
Noise and Vibration			
Construction noise	Moderate significance	All vehicles and mechanical plant used for construction would be fitted with effective exhaust silencers, and regularly maintained.	Daily auditory inspection/walk round to ensure best practicable means are being employed
		Inherently quiet plant would be used where appropriate	Noise monitoring undertaken at selected locations around construction site if required.
		All major compressors would be sound-reduced models fitted with properly lined and sealed acoustic covers which would be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers.	
		All machines in intermittent use shall be shut down in the intervening periods between work or throttled down to a minimum.	
		All ancillary plant such as generators, compressors and pumps would be positioned so as to cause minimum noise disturbance. If necessary, temporary acoustic barriers or enclosures would be provided.	

Concern	Significance	Mitigation Measure	Monitoring
Ecology and Biodiversity			
Aqueous effluent and runoff	Moderate Significance	Potential aqueous effluent and runoff from site activities will be kept to an absolute minimum so as to ensure that there is no contamination of habitats and ecosystems outside the project boundary.	Visual inspection to ensure that construction impacts do not spread onto other land.
Removal of existing natural vegetation	Low Significance	Unnecessary removal of existing natural vegetation will be avoided.	
		Workers will be required not to cut down plants in the surrounding area for fires etc.	
Destruction of bird nests	Low Significance	The destruction of bird nests will be prohibited. Any ground nests found inside the site will be moved in coordination with MoE and the Royal Society for Conservation of Nature (RSCN) to an appropriate area.	
Disturbance to wildlife	Low Significance	Construction activity will be kept to a minimum during night-time to decrease disturbance on wildlife in the area.	
Planting of exotic or invasive plants	Low Significance	The planting of exotic or invasive plants for landscaping inside and around the plant will be prohibited	
Hunting or killing of animals	Low Significance	The contractor will not allow workers to hunt or kill animals. Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.	Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.
Transport and Infrastructure			
Construction traffic	Moderate Significance	Car sharing and the use of minibuses and public transport will be encouraged	
		The contractors appointed would be encouraged to provide a minibus service for construction staff	
		Car sharing and the use of minibuses and public transport will be encouraged by all staff	
Vehicle emissions	Moderate Significance	Regular servicing and maintenance of vehicles will be employed to help minimize emissions to air	

Concern	Significance	Mitigation Measure	Monitoring
Dust and dirt generation	Moderate Significance	Wheel washing may be employed to help prevent mud and earth being carried from the site on to local roads	Visual checks will be made to ensure that dust creation and mud carry are not encountered to any significant degree.
		In dry periods on-site roads may be dampened to reduce the potential for dust creation	
Road Safety	Moderate Significance	Adequate signage will be put in place as necessary.	The plant operator will check that all signage is in place as necessary.
		Drivers accessing the site will be obliged to comply with all Jordanian road safety laws	Where locals report cases of law breaking by staff with regard to speed limits etc this will be internally investigated as necessary.
Construction traffic management	Moderate Significance	A Traffic Management plan will be prepare to help minimize the impact to the local traffic network.	
Cultural Heritage / Archaeology			
Archaeological site finds	Moderate Significance	Construction staff will report any finds that may have cultural or archaeological significance.	Construction staff will be requested to report any archaeological finds to an appropriate manager.
		If any site is found during construction and will be damaged by construction activities, the DOA will be invited to assess the discovered remains and may carry out an emergency salvage excavation salvage excavation which entails that archaeological excavation is conducted during construction phase. The contractor would be obliged to wait for a period of 10 days before commencing construction activities in the vicinity of an archaeological find to allow the DOA to respond to the sites identification.	
		The Contractor shall seek the written approval of the DOA before the removal of any chance find building, foundation, structure, fence and other obstruction over 50 years old, any portion of which is in the quarrel.	
Socio-economics			
Worker rights	NA	Labour law (No. 8, 1996) will be applied and complied with throughout the duration of the project as necessary.	

Concern	Significance	Mitigation Measure	Monitoring
On-site Health and Safety			
Safety	N / A	Equipment, tools and substances will be suitable for their use and selected to minimize dangers to safety or health when used correctly.	
		Work places will where possible receive natural light and be supplemented with sufficient artificial illumination, and signage will appropriately mark hazards, exits, materials etc.	
		Ventilation design factors will consider physical activity, substances in use and process related emissions. Temperatures will be maintained at levels appropriate for the purpose of the facility.	
		Fire prevention and protection will be adequate for the dimensions and use of the premises, equipment installed, physical and chemical properties of substances present, and the maximum number of people present. Fire detection and protection systems will be provided throughout the plant and site area. These will include fixed foam protection systems, fire alarms, portable appliances, etc.	
		The plant will also store firewater sufficient to meet the requirements of the Jordan Fire Department and the local fire code requirements.	
		Places of work, traffic routes and passageways shall be kept free from waste and spillage, regularly cleaned, and maintained. First aid facilities will be provided and will be easily accessible throughout the place of work. Welfare facilities will include locker rooms, an adequate number of toilets with washbasins, and a room dedicated for eating. An ample supply of drinking water will be provided at all places of work.	

Concern	Significance	Mitigation Measure	Monitoring
		Buildings and structures will be designed according to local and internationally recognized standards. They will be structurally safe, provide appropriate protection against the climate and have acceptable light and noise conditions.	
		Personal protection equipment (PPE) will be identified and provided, that will offer adequate protection to the worker, co-workers and occasional visitors without incurring unnecessary inconvenience. The use of PPE will be actively enforced if alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure. The employer shall ensure that PPE is cleaned when dirty, properly maintained and replaced when damaged or worn out. Proper use of PPE shall be part of the recurrent training programs for employees.	Daily visual inspection of use of PPE equipment would be made.
		Exposure to vibration from equipment will be controlled through selection of equipment and limitation of time of exposure. The limits for vibration and action values will conform to those provided by the IFC guidelines for Occupational Health and Safety.	
		Indoor temperatures will be maintained such that they are reasonable and appropriate for the work at site. Risks of heat related stress will be adequately addressed and feasible control measures implemented for work.	
		First aid facility adequately and appropriately stocked	A register of accidents on-site would be maintained with prevention training sessions held.
		A health and safety plan would be prepared with the aim of preventing accidents and injuries for both and construction and operation stages of the project.	Review site specific health and safety plan would be made on an appropriately regular basis.
		Sufficient training will be provided to all workers to ensure health and safety in the work place	A training register for Employees would be maintained and kept up to date with evaluation of training sessions made.

Concern	Significance	Mitigation Measure	Monitoring
Community Health and Safety			
		The plant will be located within a security fence ensuring to prevent trespass or accidental entry of the site by local peoples. The plant will also be fitted with security cameras	
		Construction materials will be managed safely with any stockpiles etc placed in areas to prevent any risk to local communities such as the materials becoming airborne through exposure to the wind.	
		Transport during all phases of the project will be managed so as to minimize impact to the local community.	Accidents and incidents involving the public will be documented and reported to management.
		The transport of raw materials and the transport and disposal of waste will be undertaken in an appropriate manner.	
		Project vehicles and equipment will be well maintained with project-related traffic will be requested to travel no faster than the speed limit.	
		The contractor will allow for a means of complaints regarding on-site activities to be made by members of the local community.	A complaints register will be maintained as necessary.

CONSTRUCTION MONITORING PROGRAMME

Monitoring Issue	Monitoring Method	Monitoring Frequency
Air Quality		
Dust creation from soil movements, emissions from vehicles etc	Dust monitoring programme will be carried out	Upon receipt of complaint from local peoples/MoE etc
Inspections will include monitoring of exit points	Visual inspections	Daily during construction contract
Inspection of bunded areas	Visual inspections	Daily during construction contract
Noise and Vibration		
Construction noise	Auditory inspection/walk round to ensure best practicable means are being employed	Daily during construction contract
Water Quality		
Aqueous effluent and runoff	Visual inspection to ensure that construction impacts do not spread onto other land.	Daily during construction contract
Ecology and Biodiversity		
Hunting or killing of animals	Any accidents resulting in the death of wild life will be reported to the Ministry of Environment and RSCN.	As necessary
Geology, Soils and Waste		
Visual impact of construction	Visual inspections will be made to ensure that plant wastes are not escaping to the surrounding environment.	Daily during construction contract
Dust and dirt generation	Visual checks will be made to ensure that dust creation and mud carry are not encountered to any significant degree.	Daily during construction contract
Traffic and Infrastructure		
Road Safety	The plant operator will check that all signage is in place.	As necessary
	Where locals report cases of law breaking by staff with regard to speed limits etc this will be internally investigated.	As necessary

Monitoring Issue	Monitoring Method	Monitoring Frequency
Cultural Heritage / Archaeology		
Archaeological site finds	Construction staff will be requested to report any archaeological finds to an appropriate manager.	As necessary
Health and Safety		
Safety	Visual inspection of use of PPE equipment would be made.	Daily
	A register of accidents on-site would be maintained with prevention training sessions held.	As necessary
	Review site specific health and safety plan would be made on an appropriately regular basis.	Annually
	A training register for employees would be maintained and kept up to date with evaluation of training sessions made.	As necessary
	Accidents and incidents involving the public will be documented and reported to management.	As necessary
	A complaints register will be maintained.	As necessary

OPERATIONAL IMPACT MITIGATION, MONITORING, AND MANAGEMENT MEASURES

Concern	Significance	Mitigation Measure	Monitoring
Air Quality			
Emissions to air from burning DFO, HFO and natural gas.	High significance	The use of Selective Catalytic Reduction (SCR), which ensures NO_x levels to be in accordance with World Bank / IFC requirements	Stack emissions will be monitored continuously for NO_x, O_2 and CO by the proponent. Sampling points and safe access adjacent to the continuous monitoring points will be installed.
		Operation on low sulphur fuel.	
		A stack of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion.	
		The potential use of SCR, which will control NOx emissions levels.	
		The use of stacks of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion.	
		The reservation of a development area for the installation of FGD equipment should this be considered necessary.	
		The Consortium will require a manufacturer's guarantee regarding the performance of the NO_x abatement system. If NO_x values are outside the permitted levels, the operation and calibration of the instrument will be checked. If proved to be accurate, corrective action shall be taken immediately to identify cause and to reduce emissions level to within the permitted levels.	

Concern	Significance	Mitigation Measure	Monitoring
		Emissions will be controlled during operation in accordance with the manufacturer's recommendations, taking account of the applicable Technical Guidance. Efficient operation and maintenance of the engine units will ensure that the emissions of CO, TSPs, H_2S and hydrocarbons are controlled.	
		Whilst the design of the Power Project allows for the reservation of an area for the installation of FGD equipment, it is considered that the primary method for the control of SO_2 emissions (from any thermal power plant) is to reduce the sulphur content of the fuel.	
		Similarly, the emission of PM should be limited by the ash content of the fuel.	
		General good housekeeping to prevent fugitive dust emissions	
Fugitive dust emissions	Low significance	General good housekeeping to prevent fugitive dust emissions	
Water Quality / Geology, Soils and Waste			
Potential leakage of storage tanks	High significance	All oil and chemical storage tanks and areas where drums are stored will be surrounded by an impermeable bund. Single tanks will be within bunds sized to contain 110 per cent of capacity and multiple tanks or drums will be within bunds sized to contain 110 per cent of the capacity of the largest tank. Permanently fixed taps, filler pipes, pumping equipment, vents and sight glasses will also be located within the bunded area.	Daily visual inspection of bunded areas will be made to ensure the effectiveness of these systems. All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.

Concern	Significance	Mitigation Measure	Monitoring
		Taps and valves will be designed to discharge downwards and will be shut and locked in that position. Manually started electrically operated pumps will remove surface water collected within the bund and its composition will be verified prior to disposal (for maintenance of the system)	The inspection of oil interceptors will be undertaken on a regular basis.
		An oily waste water drainage system will drain all areas where oil spillages could occur. The design will incorporate oil interceptors and traps. These will discharge with the other surface water discharge to the storm water discharge system. The discharge from each oil interceptor will contain no visible oil or grease	
		Disposal of the sludge will be undertaken by an appropriate contractor and disposed of off-site at an appropriate disposal site.	
Waste disposal	Low significance	Sludge removed in the oily waste separation will be removed by road tanker and disposed of at an appropriate disposal site.	
		Wastewater containing detergent will be discharged to the oily waste separation pond and oil separators prior to discharge to an on-site chemical wastewater collection pond.	
		All collection ponds will be appropriately bunded to ensure that no water leaches in to the ground.	
		Emergency response plans will be developed for the leaking of any hazardous substances stored/used on-site.	

Concern	Significance	Mitigation Measure	Monitoring
Hazardous substances	Moderate significance	All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.	
Proper waste water treatment	Moderate significance	Designated waste areas will be used to store the minimal amounts of waste (principally office wastes generated by the plant.	
Noise and Vibration			
Operational noise	Moderate significance	A computer model of the proposed plant items should be produced at the detailed design stage, to calculate the predicted noise levels at the NSR locations, and ensure that planning limits are adhered to. Detailed design will ensure that site noise is mitigated as far as possible, through site layout and orientation of noisy plant items.	Provisions to be put in place for the monitoring of noise at sensitive receptors (on and off site) in the event that there is a complaint or reason for concern. Site walkover surveys and occasional noise monitoring at sensitive receptors will be undertaken as deemed appropriate
		Since tonal or impulsive noises are considered more annoying than continuous noise sources, plant items should be silenced or otherwise controlled through regular maintenance to ensure no such emissions are audible at NSR locations.	
		Inherently quiet plant items should be selected wherever practicable. High performance silencers should be fitted to achieve maximum noise attenuation on plant and ductwork. Lagging and low noise trims will be fitted to all pipe-work and noise generating steam valves.	
		High performance acoustic enclosures should be considered for all plant items where practicable, not overlooking smaller plant items such as compressors and pumps.	
		Internal surfaces within the Engine enclosures should be treated to control internal reverberant noise levels. An appropriate treatment would consist of dense mineral wool panel behind perforated sheet steel, a spray on cellulose fibre treatment, or materials providing the same level of acoustic abatement.	

Concern	Significance	Mitigation Measure	Monitoring
		Plant items that are used for periods of shorter duration such as at the start-up and shut down should be afforded the same level of noise control as all other plant.	
		All noisy plant can be positioned such that it faces towards the existing plant or towards new plant such that all sensitive receptors benefit from screening and/or directivity corrections.	
Ecology and Biodiversity			
Removal of existing natural vegetation	Low Significance	The proponent will avoid any unnecessary removal of existing natural vegetation.	
Hunting or killing of animals	Moderate Significance	The proponent will not allow workers to hunt or kill animals.	Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.
Destruction of bird nests	Low Significance	The destruction of bird nests will be prohibited.	
During night disturbance of wildlife	Low Significance	Not relevant given low level of wildlife	
Planting of exotic or invasive plants	Low Significance	The planting of exotic or invasive plants for landscaping inside and around the plant will be prohibited with a preference given to the planting of native species where landscaping is deemed necessary	
Disposal of domestic or industrial wastes	Low Significance	Disposal of domestic or industrial wastes will be to appropriate disposal sites.	
	Moderate Significance	No materials will be disposed of on-site and in the in the surrounding area especially at the near shallow wadies.	
Light pollution	Moderate Significance	Directional lighting and buffer planting to screen the plant.	

Concern	Significance	Mitigation Measure	Monitoring
Traffic and Infrastructure			
Unauthorized / inappropriate parking	Low Significance	Use of machinery will be restricted to the proposed site as will parking of vehicles unless authorised parking area provided outside proposed site	
	Low Significance	Parking on areas outside the dedicated parking area will not be allowed unless strictly necessary.	
Contamination by vehicle maintenance	Low Significance	Any maintenance of vehicles or machinery will be performed off-site unless strictly necessary.	
Vehicle emissions	Moderate Significance	Regular servicing and maintenance of vehicles will be undertaken to minimize emissions to air, noise, leaks etc.	
Safety	Moderate Significance	Safety training may be provided to vehicle drivers if considered necessary	
	Moderate Significance	Transport of HFO and DFO to the site would endeavour to avoid the peak traffic congestion rush hours at 6:30 am and 4.30 pm to minimize the impact to the local traffic network.	
Traffic management	Moderate Significance	Drivers will be instructed to obey all relevant speed limits and other relevant laws.	
Socio-economics			
Worker rights	NA	Labor law (No 8, 1996) will be applied and complied with throughout the duration of the project as necessary.	

Concern	Significance	Mitigation Measure	Monitoring
On-site Health and Safety			
		Equipment, tools and substances will be suitable for their use and selected to minimize dangers to safety or health when used correctly.	
		Work places will where possible receive natural light and be supplemented with sufficient artificial illumination, and signage will appropriately mark hazards, exits, materials etc.	
		Ventilation design factors will consider physical activity, substances in use and process related emissions. Temperatures will be maintained at levels appropriate for the purpose of the facility.	
		Fire prevention and protection will be adequate for the dimensions and use of the premises, equipment installed, physical and chemical properties of substances present, and the maximum number of people present. Fire detection and protection systems will be provided throughout the plant and site area.	
		These will include fixed foam protection systems, fire alarms, portable appliances, etc. The plant will also store firewater sufficient to meet the requirements of the Jordan Fire Department and the local fire code requirements.	

Concern	Significance	Mitigation Measure	Monitoring
		Places of work, traffic routes and passageways shall be kept free from waste and spillage, regularly cleaned, and maintained. First aid facilities will be provided and will be easily accessible throughout the place of work. Welfare facilities will include locker rooms, an adequate number of toilets with washbasins, and a room dedicated for eating. An ample supply of drinking water will be provided at all places of work.	
		Buildings and structures will be designed according to local and internationally recognized standards. They will be structurally safe, provide appropriate protection against the climate and have acceptable light and noise conditions.	
		Personal protection equipment will be identified and provided, that will offer adequate protection to the worker, co-workers and occasional visitors without incurring unnecessary inconvenience. The use of PPE will be actively enforced if alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure. The employer shall ensure that PPE is cleaned when dirty, properly maintained and replaced when damaged or worn out. Proper use of PPE shall be part of the recurrent training programs for employees.	
		Exposure to vibration from equipment will be controlled through selection of equipment and limitation of time of exposure. The limits for vibration and action values will conform to those provided by the IFC guidelines for OHS.	

Concern	Significance	Mitigation Measure	Monitoring
		Indoor temperatures will be maintained such that they are reasonable and appropriate for the work at site. Risks of heat related stress will be adequately addressed and feasible control measures implemented for work.	
		First aid facility adequately and appropriately stocked	
		A health and safety plan would be prepared with the aim of preventing accidents and injuries for both and construction and operation stages of the project.	
Community Health and Safety			
		The plant will be located within a security fence ensuring to prevent trespass or accidental entry of the site by local peoples. The plant will also be fitted with security cameras	
		Construction materials will be managed safely with any stockpiles etc placed in areas to prevent any risk to local communities such as the materials becoming airborne through exposure to the wind.	
		Transport during all phases of the project will be managed so as to minimize impact to the local community.	Accidents and incidents involving the public will be documented and reported to management.
		The transport of raw materials and the transport and disposal of waste will be undertaken in an appropriate manner.	A complaints register will be maintained as necessary.
		Project vehicles and equipment will be well maintained with project-related traffic will be requested to travel no faster than the speed limit.	

OPERATIONAL MONITORING PROGRAMME

Monitoring Measure	Monitoring Method	Monitoring Frequency
Air Quality		
Emissions to air from burning of HFO,DFO and natural gas	Stack emissions will be monitored for NO_x, O_2 and CO	Continuous
Water Quality		
Potential leakage of storage tanks	Visual inspection of bunded areas will be made to ensure the effectiveness of these systems.	Daily
Poor performance of the water treatment system	All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.	Weekly
Effectiveness of the oil interceptors	The inspection of oil interceptors will be undertaken on a regular basis.	Weekly
Noise and Vibration		
Operational noise	Provisions to be put in place for the monitoring of noise at sensitive receptors (on and off-site) in the event that there is a complaint or reason for concern.	As necessary
	Site walkover surveys and occasional noise monitoring at sensitive receptors will be undertaken as deemed appropriate	Weekly/As necessary
Ecology and Biodiversity		
Hunting or killing of animals	Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.	As necessary
Landscape and Visual		
Visual impact of power station	Visual inspection will be made to check for any degradation of the power stations appearance.	Monthly
	Visual inspections will be made to ensure that plant wastes are not escaping to the surrounding environment.	Weekly

Monitoring Measure	Monitoring Method	Monitoring Frequency
Community Health and Safety		
Community Health and Safety	Accidents and incidents involving the public will be documented and reported to management.	As necessary
	A complaints register will be maintained.	As necessary

DECOMMISSIONING IMPACT MITIGATION, MONITORING AND MANAGEMENT MEASURES

Concern	Significance	Mitigation Measure	Monitoring
Geology, Soils and Waste			
Waste	Minor	Remove all waste from the site, recycle as many materials as possible	
Site conditions	Moderate	Site reinstated to condition prior to development	
Water Quality			
Water	Moderate	As for construction. Best Available Techniques followed at the time to account for relevant guidance.	Post-decommissioning monitoring of water quality
Noise and Vibration			
Noise	Moderate	As for construction. Best Available Techniques followed at the time to account for relevant guidance.	

CONSTRUCTION IMPLEMENTATION SCHEDULE AND COST ESTIMATES

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
Air Quality					
Dust creation from soil movements, emissions from vehicles etc	Water Bowser	Following tests to determine the moisture content of material	Contractor	$4,500 (period of contract)	N/A
	Materials deposited on stockpiles on-site will be closely monitored for any possible emission of dust and if required they will be damped down, covered or treated with a dust suppressant.	If identified as an issue	Contractor	$3,000 (period of contract)	N/A
	All operatives working in areas of potential dust emission will be provided with paper facemasks.	Automatically applied for on-site staff as appropriate	Contractor	$3,000 (period of contract)	N/A
	All stockpiles will be located away from sensitive receptors wherever possible.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$500 (period of contract)	N/A
	All vehicles carrying bulk materials into and out of the site will be sheeted so as to contain any material that may be dispersed during transit. Minimum drop heights will be used during material transfer	Automatically applied to all applicable vehicles, Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$500 (period of contract)	N/A
	If finely ground materials are delivered, these will be in bag form, enclosed lorries or stockpiled in specified locations where the material can be suitably covered.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$1,000 (period of contract)	N/A
	Engines will be switched off when not in use.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	Part of best working practice Minimal cost	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	All vehicles will be properly maintained to reduce air emissions	As necessary	Contractor	$15,000 (period of contract)	N/A
	To ensure that atmospheric dust, contaminants or dust deposits generated by the construction do not exceed levels which could constitute a health hazard or nuisance to those persons working on the site or living nearby a dust monitoring programme will be carried out throughout the construction period.	Daily visual inspections with implementation of dust suppression measures as necessary.	Contractor	$500 (period of contract)	N/A
	Daily visual inspections will be made to ensure that good practice is employed at all times. Inspections will include monitoring of exit points and the immediate area outside the site entrance.	Daily visual inspections with implementation of wheel washing/dust suppression measures as necessary.	Contractor	Minimal cost (part of Environmental Managers remit).	N/A
	The inspections will be made against the EPC contractors CEMP.				
Water Quality					
Water Quality	DFO storage tanks to be located on an impervious base provided with bund walls to give a containment capacity of at least 110 per cent of the tank volume. All valves and couplings to be contained within the bunded area.	Automatically applied as part of plant design	Contractor	$70,000 (single payment)	N/A
	Portable toilets will be provided during the construction period with any waste tankered of site and disposed of in an appropriate manner.	Sufficient toilets will be provided based on the number of staff with regular tankering of waste.	Contractor	$10,000 (period of contract)	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Any surface water contaminated by hydrocarbons, which are used during the construction phase, to be passed through oil/grit interceptor(s) prior to collection and removal off-site to an appropriate disposal site.	Automatically applied as part of plant design	Contractor	$1,000 (period of contract)	N/A
	Measures to be taken to ensure that no leachate or any surface water that has the potential to be contaminated to be allowed to enter directly or indirectly any water course, underground strata or adjoining land.	Automatically applied as part of plant design	Contractor	$2,000 (period of contract)	N/A
	Provisions to be made so that any existing drainage systems continue to operate.	As necessary, where these are encountered this will be addressed.	Contractor	$10,000 (period of contract)	N/A
	Water inflows to excavated areas to be minimized by the use of lining materials, good housekeeping techniques and by the control of drainage and construction materials in order to prevent the contamination of ground water. Site personnel to be made aware of the potential impact on ground and surface water associated with certain aspects of the construction works to further reduce the incidence of accidental impacts.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$7,500 (period of contract)	N/A
	Refuelling of construction vehicles and equipment to be restricted to a designated area with properly designed fuel tanks and bunds and proper operating procedures.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$500 (period of contract)	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	No materials will be disposed of in the wadi to the north-west of the site.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	Part of best working practice minimal cost	N/A
	Spill kits will be kept on-site to clean up any spills of fuels or oils. Spills would be reported and responded to as quickly as possible.	Staff will be required to report this as and when it occurs	Contractor	$5,000 (period of contract)	N/A
	Maintenance of construction machinery will not be allowed on-site unless absolutely necessary to help to prevent the accidental leakage of lubricating and hydraulic fluids.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented. If it is necessary to carry out maintenance on-site then a designated area with suitable containment shall be provided.	Contractor	$10,000 (period of contract)	N/A
	Construction contractor to dispose of any construction effluents in a responsible manner.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$5,000 (period of contract)	N/A
	Storage of construction materials will be in assigned areas and follow standard best working practices.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$500 (period of contract)	N/A
	Disposal of excavated materials will either be off-site at an appropriate landfill site or in areas of the site that will not give rise to surface run off during wet periods.	As necessary	Contractor	$2,000 (period of contract)	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Water inflows to excavated areas to be minimized by the use of lining materials, good housekeeping techniques and by the control of drainage and construction materials in order to prevent the contamination of ground water.	Automatically applied as part of plant design	Contractor	$1,000 (period of contract)	N/A
	Reuse excavated material within the site boundary where practicable which would reduce the volume of excavated material going off-site to landfill.	Part of best working practice	Contractor	Minimal cost	N/A
	No materials will be disposed of in the wadi to the north-west of the site.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	Part of best working practice minimal cost	N/A
	Segregation of contaminated excavated material (should this be encountered), from non-contaminated excavated material would be made with the contaminated soils removed to an appropriate disposal site.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$500 (period of contract)	N/A
	Daily visual inspection of bunded areas will be made to ensure the effectiveness of these systems.	Daily visual inspection of bunded areas will be made and effectiveness noted.	Contractor	Part of best working practice Minimal cost	N/A
Noise and Vibration					
	All construction activities would be carried out in accordance with the recommendations of BS 5228	Part of EPC contract requirements, any complaints would be investigated.	Contractor	$500 (period of contract)	N/A
	All vehicles and mechanical plant used for construction would be fitted with effective exhaust silencers, and regularly maintained.	Automatically applied as best working practice.	Contractor	Part of best working practice Minimal cost	N/A
	Inherently quiet plant would be used where appropriate	Automatically applied as best working practice.	Contractor	Inherent in design	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	All major compressors would be sound-reduced models fitted with properly lined and sealed acoustic covers which would be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools would be fitted with mufflers or silencers of the type recommended by the manufacturers.	Automatically applied as part of plant design	Contractor	$3,000 (one off payment)	N/A
	All ancillary plant such as generators, compressors and pumps would be positioned so as to cause minimum noise disturbance. If necessary, temporary acoustic barriers or enclosures would be provided.	Automatically applied as part of plant design	Contractor	$5,000 (period of contract)	N/A
	Daily auditory inspection/walk round to ensure best practicable means are being employed	Daily auditory inspection/walk round. Complaints would be investigated.	Contractor	Part of best working practice minimal cost	N/A
Ecology and Biodiversity					
	Potential aqueous effluent and runoff from site activities will be kept to an absolute minimum so as to ensure that there is no contamination of habitats and ecosystems outside the project boundary.	Environmental Manager will ensure that staff are made aware of the requirement as necessary.	Contractor	$800 (period of contract)	N/A
	Unnecessary removal of existing natural vegetation will be avoided.	Environmental Manager will ensure that staff are made aware of the requirement as necessary.	Contractor	Part of best working practice minimal cost	N/A
	Workers will be required not to cut down plants in the surrounding area for fires etc.	Environmental Manager will ensure that staff are made aware of the requirement as necessary.	Contractor	Part of best working practice minimal cost	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	The destruction of bird nests will be prohibited. Any ground nests found inside the site will be moved in coordination with MoE and RSCN to an appropriate area.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	Part of best working practice minimal cost	N/A
	Construction activity generating loud noise will be kept to a minimum during night-time to decrease disturbance on wildlife in the area.	Part of project implementation plan	Contractor	Part of best working practice	N/A
	The planting of exotic or invasive plants for landscaping inside and around the plant will be prohibited	Part of plant design.	Contractor	Part of best working practice	N/A
	The contractor will not allow workers to hunt or kill animals. Any accidents resulting in the death of wild life will be reported to the MoE and RSCN.	Environmental Manager will ensure that staff are made aware of the requirement.	Contractor	Part of best working practice	N/A
	Visual inspection to ensure that construction impacts do not spread onto other land.	Visual inspection	Contractor	Part of best working practice Minimal cost	N/A
Landscape and Visual					
	The contractor will be required to provide areas for the disposal of wastes during the construction period so as to prevent these escaping to the surrounding area and becoming unsightly.	Part of EPC Contract	Contractor	Part of best working practice	N/A
	Land not required for permanent use by the power station will be reinstated to original or better condition.	Part of EPC Contract, will be checked before handover of the plant	Contractor	$1,000 (period of contract)	N/A
	Visual inspections will be made to ensure that plant wastes are not escaping to the surrounding environment.	Visual inspections	Contractor	ca~ $100,000 part of EPC contract (period of contract)	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
Transport and Infrastructure					
	Car sharing and the use of minibuses and public transport will be encouraged	The EPC Contractor will encourage staff to do so	Contractor	Part of best working practice	N/A
	The contractors appointed would be encouraged to provide a minibus service for construction staff	As necessary	Contractor	$30,000 (period of contract)	N/A
	Car sharing and the use of minibuses and public transport will be encouraged by all staff	The EPC Contractor will encourage staff to do so	Contractor	Part of best working practice	N/A
	Regular servicing and maintenance of vehicles will be employed to help minimize emissions to air	As necessary	Contractor	$15,000 (period of contract)	N/A
	Wheel washing may be employed to help prevent mud and earth being carried from the site on to local roads	Visual inspections will be used to confirm or otherwise the need for this.	Contractor	$500 (period of contract)	N/A
	In dry periods on-site roads may be dampened to reduce the potential for dust creation	Visual inspections will be used to confirm or otherwise the need for this.	Contractor	$1000 (period of contract)	N/A
	A Traffic Management plan will be prepared to help minimize the impact to the local traffic network.	Part of EPC Contract	Contractor	$10,000 (one off payment)	N/A
	Visual checks will be made to ensure that dust creation and mud carry are not encountered to any significant degree.	Visual checks	Contractor	Part of best working practice Minimal cost	N/A
	The plant operator will check that all signage is in place as necessary.	Visual checks	Contractor	Part of best working practice Minimal cost	N/A
	Where locals report cases of law breaking by staff with regard to speed limits etc this will be internally investigated as necessary.	As necessary	Contractor	Part of best working practice Minimal cost	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Visual checks will be made to ensure that, emissions and dust creation and mud carry are not encountered to any significant degree.	Visual checks	Contractor	Part of best working practice Minimal cost	N/A
Cultural Heritage / Archaeology					
	If any site is found during construction and will be damaged by construction activities, the DOA will be invited to assess the discovered remains and may carry out an emergency salvage excavation salvage excavation which entails that archaeological excavation is conducted during construction phase. The contractor would be obliged to wait for a period of 10 days before commencing construction activities in the vicinity of an archaeological find to allow the DOA to respond to the sites identification.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$1,500 (period of contract)	N/A
	The Contractor shall seek the written approval of the Department of Antiquities before the removal of any chance find building, foundation, structure, fence and other obstruction over 50 years old, any portion of which is in the quarrel.	As necessary	Contractor	Part of best working practice	N/A
	Construction staff will be requested to report any archaeological finds to an appropriate manager.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	Part of best working practice Minimal cost	N/A
Socio-economics					
	Labor law (No.8, 1996) will be applied and complied with throughout the duration of the project as necessary.	Managers will be made aware of the requirements of the law	Contractor/ proponent	Part of best working practice Minimal cost	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
On-site Health and Safety					
	Equipment, tools and substances will be suitable for their use and selected to minimize dangers to safety or health when used correctly.	Part of EPC Contract. Guidance and training will be provided on equipment use etc as necessary.	Contractor	$40,000 (one off payment)	N/A
	Work places will where possible receive natural light and be supplemented with sufficient artificial illumination, and signage will appropriately mark hazards, exits, materials etc.	Part of plant design and best working practice	Contractor	$10,000 (one off payment)	N/A
	Ventilation design factors will consider physical activity, substances in use and process related emissions. Temperatures will be maintained at levels appropriate for the purpose of the facility.	Part of plant design and best working practice, will be automatically applied	Contractor	Inherent in design	N/A
	Fire prevention and protection will be adequate for the dimensions and use of the premises, equipment installed, physical and chemical properties of substances present, and the maximum number of people present. Fire detection and protection systems will be provided throughout the plant and site area. These will include fixed foam protection systems, fire alarms, portable appliances, etc. The plant will also store firewater sufficient to meet the requirements of the Jordan Fire Department and the local fire code requirements.	Part of plant design and best working practice, will be automatically applied	Contractor/ proponent	$300,000 (one off payment)	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Places of work, traffic routes and passageways shall be kept free from waste and spillage, regularly cleaned, and maintained. First aid facilities will be provided and will be easily accessible throughout the place of work. Welfare facilities will include locker rooms, an adequate number of toilets with washbasins, and a room dedicated for eating. An ample supply of drinking water will be provided at all places of work.	Visual inspections will be made as necessary to ensure that facilities remain adequate	Contractor/ proponent	$10,000 (one off payment then part of best working practice)	N/A
	Buildings and structures will be designed according to local and internationally recognized standards. They will be structurally safe, provide appropriate protection against the climate and have acceptable light and noise conditions.	Part of plant design and requirement of EPC Contract.	Contractor	Inherent in design	N/A
	Personal protection equipment will be identified and provided, that will offer adequate protection to the worker, co-workers and occasional visitors without incurring unnecessary inconvenience. The use of PPE will be actively enforced if alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure. The employer shall ensure that PPE is cleaned when dirty, properly maintained and replaced when damaged or worn out. Proper use of PPE shall be part of the recurrent training programs for employees.	Personal protection equipment will be identified and provided. The use of PPE will be actively enforced by site managers/foremen etc.	Contractor	$15,000 (initially then replaced as necessary)	$1000

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Exposure to vibration from equipment will be controlled through selection of equipment and limitation of time of exposure. The limits for vibration and action values will conform to those provided by the IFC guidelines for OHS.	Exposure to vibration from equipment will be controlled through selection of equipment and limitation	Contractor	$50,000 (one off payment)	$1000
	Indoor temperatures will be maintained such that they are reasonable and appropriate for the work at site. Risks of heat related stress will be adequately addressed and feasible control measures implemented for work.	Part of plant design.	Contractor	$150,000 (one off payment then minimal additional costs)	$1000
	First aid facility adequately and appropriately stocked	Visual inspections and reordering of supplies as necessary	Contractor	$15,000 (one off payment then minimal additional operational costs)	$500
	A health and safety plan would be prepared with the aim of preventing accidents and injuries for both and construction and operation stages of the project.	A health and safety plan would be prepared	Contractor	$20,000 (one off payment)	N/A
	A training register for Employees would be maintained and kept up to date with evaluation of training sessions made.	A training register for Employees will be maintained	Contractor	Responsibility of Project Manager/ plant manager Zero cost	N/A
	Daily visual inspection of use of PPE equipment would be made.	Daily visual inspection by site managers/foremen etc	Contractor	Responsibility of safety Manager Zero cost	N/A
	A register of accidents on-site would be maintained with prevention training sessions held.	As necessary accidents will be registered.	Contractor	Responsibility of safety Manager (Zero cost)	N/A
	Review site specific health and safety plan would be made on an appropriately regular basis.	Annual review by safety manager/officer	Contractor	$2000	$2000
Off-site Health and Safety					

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	The plant will be located within a security fence ensuring to prevent trespass or accidental entry of the site by local peoples. The plant will also be fitted with security cameras	Part of EPC contract/plant design	Contractor	$120,000 (one off payment then minimal additional operational costs)	$500
	Construction materials will be managed safely with any stockpiles etc placed in areas to prevent any risk to local communities such as the materials becoming airborne through exposure to the wind.	Environmental Manager will ensure that staff are made aware of the requirement as necessary and that the procedure is properly implemented.	Contractor	$2,000 (period of contract)	N/A
	Transport during all phases of the project will be managed so as to minimize impact to the local community.	Preparation of traffic management plan and consideration of any complaints as necessary	Contractor	Part of best working practice Minimal cost	N/A
	The transport of raw materials and the transport and disposal of waste will be undertaken in an appropriate manner.	Best working practices will be applied and any complaints investigated.	Contractor	$7,000 (period of contract)	N/A
	Project vehicles and equipment will be well maintained with project-related traffic will be requested to travel no faster than the speed limit.	Staff will be made aware of the requirement. Preparation of traffic management plan will be made and consideration of any complaints as necessary	Contractor	Part of best working practice Minimal cost	N/A
	Accidents and incidents involving the public will be documented and reported to management.	As necessary	Contractor	Responsibility of Project Manager/ plant manager Zero cost	N/A
	A complaints register will be maintained as necessary.	As necessary	Contractor	Responsibility of Project Manager/ plant manager Zero cost	N/A

OPERATIONAL IMPLEMENTATION SCHEDULE AND COST ESTIMATES

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
Air Quality					
Emissions to air from burning of DFO,HFO and natural gas	Use of SCR	Part of plant design and requirement of EPC Contract	Contractor	Inherent in design	N/A
	Operation on a low sulphur fuel	Sourcing of appropriate fuel	Proponent	Inherent in design	N/A
	A stack of sufficient height and flue gases of sufficient temperature and velocity to ensure good dispersion.	Part of plant design and requirement of EPC Contract	Contractor	Inherent in design	N/A
	Stack emissions will be monitored for NO_x, O_2 and CO	Part of plant design and requirement of EPC Contract. The proponent will ensure that the monitor is properly calibrated on an annual basis.	Proponent	$5000	$5000
Fugitive dust emissions	General good housekeeping to prevent fugitive dust emissions	The Environmental Manager will make staff aware of the requirement.	Proponent	$3,000	$3,000

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
Water Quality					
	All oil and chemical storage tanks and areas where drums are stored will be surrounded by an impermeable bund. Single tanks will be within bunds sized to contain 110 per cent of capacity and multiple tanks or drums will be within bunds sized to contain 110 per cent of the capacity of the largest tank. Permanently fixed taps, filler pipes, pumping equipment, vents and sight glasses will also be located within the bunded area. Taps and valves will be designed to discharge downwards and will be shut and locked in that position. Manually started electrically operated pumps will remove surface water collected within the bund and its composition will be verified prior to disposal. (for maintenance of the system)	Part of plant design and requirement of EPC Contract	Contractor/ proponent	$500 (one off payment)	N/A
	An oily waste water drainage system will drain all areas where oil spillages could occur. The design will incorporate oil interceptors and traps. These will discharge with the other surface water discharge to the storm water discharge system. The discharge from each oil interceptor will contain no visible oil or grease.	Part of plant design and requirement of EPC Contract	Contractor/ proponent	Inherent in design no additional cost	N/A
	Disposal of the sludge from the evaporation ponds will be undertaken by an appropriate contractor and disposed of off-site at an appropriate disposal site.	Disposal to appropriate disposal site as necessary.	Proponent	$2,000	$2,000

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Sludge removed in the oily waste separation pond will be removed by road tanker and disposed of at an appropriate disposal site.	Disposal to appropriate disposal site as necessary.	Proponent	$500	$500
	Waste water containing detergent will be discharged to the oily waste separation pond and oil separators prior to discharge to an on-site chemical waste water storage pond.	Part of plant design and requirement of EPC Contract	Proponent	$1,000	$1,000
	Collection pond will be appropriately bunded to ensure that no water leaches in to the ground.	Part of plant design and requirement of EPC Contract	Contractor	Inherent in design	N/A
	Emergency response plans will be developed for the leaking of any hazardous substances stored/used on-site.	Emergency response plans will be developed	Proponent	$10,000	N/A
	The plant will be designed taking into consideration the danger of flash floods. This may include such measures as construction of a diversion channel or berm surrounding the plant facilities.	Part of plant design and requirement of EPC Contract	Contractor	$70,000	N/A
	All elements of the treatment systems will be regularly monitored to ensure optimum performance and maintenance.	All elements of the treatment systems will be regularly monitored by the plant staff as necessary	Proponent	Part of best working practice	N/A
	Designated waste areas will be used to store the minimal amounts of waste (principally office wastes generated by the plant.	Part of plant design and requirement of EPC Contract	Proponent	$400	N/A
	Visual inspection of bunded areas will be made to ensure the effectiveness of these systems.	Visual inspection of bunded areas will be made.	Proponent	Part of best working practice	N/A
	The inspection of oil interceptors will be undertaken on a regular basis.	Inspection of oil interceptors will be undertaken	Proponent	Part of best working practice	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
Noise and Vibration					
	Since tonal or impulsive noises are considered more annoying than continuous noise sources, plant items will be silenced or otherwise controlled through regular maintenance to ensure such emissions are minimised at NSR locations	Part of plant design and requirement of EPC Contract	Contractor	$2,000	$2,000
	High performance acoustic enclosures will be considered for plant items where practicable, not overlooking smaller plant items such as compressors and pumps	Part of plant design and requirement of EPC Contract if required	Contractor	$2,000,000	N/A
	Internal surfaces within the turbine hall will be treated to control internal reverberant noise levels. An appropriate treatment would consist of dense mineral wool panel behind perforated sheet steel, or a spray on cellulose fibre treatment	Part of plant design and requirement of EPC Contract	Contractor	$30,000	N/A
	Provisions to be put in place for the monitoring of noise at sensitive receptors (on and off-site) in the event that there is a complaint or reason for concern.	Monitoring in the event of complaint as necessary	Proponent	$500 (equipment purchase)	minimal
	Site walkover surveys and occasional noise monitoring at sensitive receptors will be undertaken as deemed appropriate	Site walkover surveys and occasional noise monitoring.	Proponent	(equipment purchase above)	minimal

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
Ecology and Biodiversity					
	The proponent will avoid any unnecessary removal of existing natural vegetation.	Environmental Manager will ensure that staff are made aware of the requirement as necessary.	Proponent	Part of best working practice	N/A
	Use of machinery will be restricted to the proposed site as will parking of vehicles.	Managers will ensure that staff are made aware of the requirement as necessary.	Proponent	Part of best working practice	N/A
	Any maintenance of vehicles or machinery will be performed off-site unless strictly necessary.	Environmental Manager will ensure that staff are made aware of the requirement as necessary.	Proponent	$2,000	$2,000
	The proponent will not allow workers to hunt or kill animals.	Environmental Manager will ensure that staff are made aware of the requirement as necessary.	Proponent	Part of best working practice	N/A
	The destruction of bird nests will be prohibited.	Environmental Manager will ensure that staff are made aware of the requirement as necessary.	Proponent	Part of best working practice	N/A
	The planting of exotic or invasive plants for landscaping inside and around the plant will be prohibited with a preference given to the planting of native species where landscaping is deemed necessary	Environmental Manager will ensure that staff are made aware of the requirement as necessary.	Proponent	Part of best working practice	N/A
	Disposal of domestic or industrial wastes will be to appropriate disposal sites.	Disposal of domestic or industrial wastes to appropriate disposal sites as necessary	Proponent	$2,000	$2,000
	No materials will be disposed of on-site and in the surrounding area especially at the near shallow wadies.	Environmental Manager will ensure that staff are made aware of the requirement. Any materials found will be removed	Proponent	$500	$500

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Parking on areas outside the designated parking area will not be allowed unless strictly necessary.	Managers will ensure that staff are made aware of the requirement as necessary.	Proponent	Part of best working practice	N/A
	Directional lighting and buffer planting to screen the plant.	Part of plant design and requirement of EPC Contract	Proponent	$40,000	N/A
	Any accidents resulting in the death of wild life will be reported to the Ministry of Environment and RSCN.	Environmental Manager will ensure that staff are made aware of the requirement.	Proponent	Part of best working practice	N/A
Landscape and Visual					
	The architectural design of the buildings will be carefully considered to provide a high standard of visual amenity, given practical and economic constraints.	Part of plant design and requirement of EPC Contract	Contractor	Inherent in design	N/A
	The development generally will be in materials to match nearby buildings and particularly at upper levels colours will be neutral and subdued to provide the least visual intrusion and to minimize contrasts with the existing environment.	Part of plant design and requirement of EPC Contract	Contractor	$25,000	N/A
	The external structures of the buildings will be designed such that there will be no deterioration in the power station's appearance over the 30 years lifetime of the plant with steel structures of the plant painted with surface protected suitable for local conditions in accordance with the standards and practices of the Steel Structures Painting Council.	Part of plant design and requirement of EPC Contract	Contractor	$80,000	N/A
	Directional lighting will be employed to minimize light pollution.	Part of plant design and requirement of EPC Contract	Contractor	Inherent in design	N/A
	Light will be switch off lights when not required for safety, security.	Staff will be made aware of this requirement by the management	Proponent	Part of best working practice	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Trees and bushes may be planted to provide screening for local receptors.	Part of plant design and requirement of EPC Contract	Proponent	$5,000	N/A
	Visual inspection will be made to check for any degradation of the power stations appearance.	Visual inspection will be made to check for any degradation of the power stations appearance.	Proponent	Part of best working practice	N/A
	Visual inspections will be made to ensure that plant wastes are not escaping to the surrounding environment.	Visual inspections will be made to ensure that plant wastes are not escaping to the surrounding environment.	Proponent	Part of best working practice	N/A
Transport and Infrastructure					
	Regular servicing and maintenance of vehicles will be undertaken to minimize emissions to air, noise, leaks etc.	As necessary	Proponent	$15,000 (period of contract)	N/A
	Safety training may be provided to vehicle drivers if considered necessary	As necessary	Proponent	$500	$500
	Transport of HFO and DFO to the site would endeavour to avoid the peak traffic congestion rush hours at 6:30 am and 4.30 pm to minimize the impact to the local traffic network.	Plant Manager to ensure compliance	Proponent	N/A	N/A
	Drivers will be instructed to obey all relevant speed limits and other relevant laws.	Drivers will be made aware of the requirement and complaints investigated	Proponent	N/A	N/A
Socio-economics					
	Labor law (No. 8,1996) will be applied and complied with throughout the duration of the project as necessary.	Managers will be made aware of the requirements of the law	Proponent	Part of best working practice Minimal cost	N/A
On-site Health and Safety					
	Equipment, tools and substances will be suitable for their use and selected to minimize dangers to safety or health when used correctly.	Part of EPC Contract. Guidance and training will be provided on equipment use etc as necessary.	Contractor/ proponent	Equipment supplied by EPC see above tables	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Work places will where possible receive natural light and be supplemented with sufficient artificial illumination, and signage will appropriately mark hazards, exits, materials etc.	Part of plant design	Contractor	N/A	N/A
	Ventilation design factors will consider physical activity, substances in use and process related emissions. Temperatures will be maintained at levels appropriate for the purpose of the facility.	Part of plant design, then regulation of plant conditions though monitoring of temperatures	Proponent	$200	$200
	Fire prevention and protection will be adequate for the dimensions and use of the premises, equipment installed, physical and chemical properties of substances present, and the maximum number of people present. Fire detection and protection systems will be provided throughout the plant and site area. These will include fixed foam protection systems, fire alarms, portable appliances, etc. The plant will also store firewater sufficient to meet the requirements of the Jordan Fire Department and the local fire code requirements.	Part of plant design and best working practice, will be automatically applied	Contractor/ proponent	$300,000 (one off payment)	N/A

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Places of work, traffic routes and passageways shall be kept free from waste and spillage, regularly cleaned, and maintained. First aid facilities will be provided and will be easily accessible throughout the place of work. Welfare facilities will include locker rooms, an adequate number of toilets with washbasins, and a room dedicated for eating. An ample supply of drinking water will be provided at all places of work.	Visual inspections will be made as necessary to ensure that facilities remain adequate	Contractor/ proponent	$10,000 (one off payment then part of best working practice)	N/A
	Buildings and structures will be designed according to local and internationally recognized standards. They will be structurally safe, provide appropriate protection against the climate and have acceptable light and noise conditions.	Part of plant design and requirement of EPC Contract.	Contractor	Inherent in design	N/A
	Personal protection equipment will be identified and provided, that will offer adequate protection to the worker, co-workers and occasional visitors without incurring unnecessary inconvenience. The use of PPE will be actively enforced if alternative technologies, work plans or procedures cannot eliminate or sufficiently reduce a hazard or exposure. The employer shall ensure that PPE is cleaned when dirty, properly maintained and replaced when damaged or worn out. Proper use of PPE shall be part of the recurrent training programs for employees.	Personal protection equipment will be identified and provided. The use of PPE will be actively enforced by site managers/foremen etc.	Proponent	$15,000 (initially then replaced as necessary)	$1000

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
	Exposure to vibration from equipment will be controlled through selection of equipment and limitation of time of exposure. The limits for vibration and action values will conform to those provided by the IFC guidelines for OHS.	Exposure to vibration from equipment will be controlled through selection of equipment and limitation	Contractor/ Proponent	$50,000 (one off payment)	$1000
	Indoor temperatures will be maintained such that they are reasonable and appropriate for the work at site. Risks of heat related stress will be adequately addressed and feasible control measures implemented for work.	Part of plant design.	Contractor/ Proponent	$150,000 (one off payment then minimal additional costs)	$1000
	First aid facility adequately and appropriately stocked	Visual inspections and reordering of supplies as necessary	Proponent	$15,000 (one off payment then minimal additional operational costs)	$500
	A health and safety plan would be prepared with the aim of preventing accidents and injuries for both and construction and operation stages of the project.	A health and safety plan would be prepared	Contractor/ Proponent	$20,000 (one off payment)	N/A
	A training register for Employees would be maintained and kept up to date with evaluation of training sessions made.	A training register for Employees will be maintained	Proponent	Responsibility of Project Manager/ plant manager Zero cost	N/A
	Daily visual inspection of use of PPE equipment would be made.	Daily visual inspection by site managers/foremen etc	Proponent	Responsibility of safety Manager Zero cost	N/A
	A register of accidents on-site would be maintained with prevention training sessions held.	As necessary accidents will be registered.	Proponent	Responsibility of safety Manager (Zero cost)	N/A
	Review site specific health and safety plan would be made on an appropriately regular basis.	Annual review by safety manager/officer	Proponent	$2000	$2000

Concern	Mitigation / Monitoring Measure	Implementation Procedure	Responsibility	Capital Cost	Re-Current Costs per Year
Off-site Health and Safety					
	The plant will be located within a security fence ensuring to prevent trespass or accidental entry of the site by local peoples. The plant will also be fitted with security cameras	Part of EPC contract/plat design	Contractor/ Proponent	$500 for camera operation (fence part of EPC Contract)	$500
	The transport of raw materials and the transport and disposal of waste will be undertaken in an appropriate manner.	Best working practices will be applied and any complaints investigated.	Proponent	$2000	$2000
	Project vehicles and equipment will be well maintained with project-related traffic will be requested to travel no faster than the speed limit.	Staff will be made aware of the requirement. Preparation of traffic management plan will be made and consideration of any complaints as necessary	Proponent	Part of best working practice Minimal cost	N/A
	Accidents and incidents involving the public will be documented and reported to management.	As necessary	Proponent	Responsibility of Project Manager/ plant manager Zero cost	N/A
	A complaints register will be maintained as necessary.	As necessary	Proponent	Responsibility of Project Manager/ plant manager Zero cost	N/A

ENVIRONMENTAL REPORTING TIMETABLE – OPERATION

Theme	***Report***	***Frequency***
Air	All emissions (NO_x, SO_2, CO, dust)	Annual
Water	Analysis of discharges from the site, inspections of bunded areas and treatment systems	Annual
Noise	Noise levels at nearest sensitive receptors	3 years
Waste	Amounts, transport options and disposal route (incl. recycling rates)	Annual

SECTION 6

CONCLUSION

6 CONCLUSION

6.1.1 This EMMP has been prepared to ensure that there are measures in place to mitigate against any potential impacts from the Power Project on the surrounding environment.

6.1.2 Mitigation measures have been developed for the construction, operational and decommissioning phases of the project and monitoring procedures have been developed which will allow accurate and timely reporting of emissions to air, land and water as well as any other potentially adverse impacts.

6.1.3 To ensure that the monitoring and mitigation measures outlined in the EMMP are successfully implemented a environmental and safety manager will be appointed during the construction and operational phases to oversee the process.

6.1.4 It is considered that so long as the plant implements the mitigation and monitoring measures outlined in the EMMP the project will comply fully with all relevant Jordanian, Standard, Laws and Regulations as well as the requirements of the World Bank / IFC.