DEWA 200MW Solar PV Phase 2

Environmental Impact Assessment (EIA)

Dubai, UAE

Volume 1 - Executive Summary

Prepared for:

ACWA Power

February 2015

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Document Information

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EXECUTIVE SUMMARY

INTRODUCTION

This 200MW Solar PV plant will play an important role in the Dubai government's strategy of energy diversification and sustainability. The Sheikh Mohammad Bin Rashid Al Maktoum Solar Park, which this Phase 2 project is part of, will eventually produce 1GW of energy.

The proposed 200MW PV Plant will consist of numerous PV cells within modules arranged in arrays upon mounting structures in a specific arrangement across the proposed site. The arrays will be designed to ensure the most efficient alignment to capture solar rays.

ACWA Power has been appointed as the Developer for the project, whilst 5 Capitals Environmental and Management Consulting, has prepared the Environmental Impact assessment in accordance with DM-EPSS EIA guidelines, FEA environmental policies and international best practice.

The EIA document has several objectives in relation to its preparation, use and application for the 200MW Solar PV site. These include the recording of baseline conditions prior to development of the site, assessment of potential environmental impacts relating to the construction and occupation phases of the project, and the recommendation of mitigation and/or management measures to ensure that potential impacts are avoided or minimised.

REPORT STRUCTURE

In order to comply with the DM-EPSS requirements for environmental assessment and also international best practice, this report is presented in the following format:

Volume 1: Executive Summary

Volume 2: Main Text, Tables, Figures and Plates

Volume 3: Environmental Management and Monitoring Plan (EMMP)

Volume 4: Technical Appendices

Volume 2 comprises the main text of the report and has been presented under the following chapter structure, which follows the DM-EPSS report structure for environmental impact assessments:

1. Introduction
    - Basic project Information
    - Project Rational
    - Project Alternatives

- EIA Objectives

2. Description of the Project's EIA process
    - Scope of Work and Key Deliverables
    - EIA Team
    - EIA Methodology
3. Legal Framework
4. Description of Project
    - Type of project
    - Project location
    - Project Overview
    - Project Phases
    - Construction Management
    - Project Cost, Duration and Schedule of activities
5. Description of the Environment (baseline conditions by environmental parameter);
    - Meteorology and Air Quality
    - Noise and Vibration
    - Topography, Geology/Hydrogeology
    - Terrestrial Ecology
    - Traffic and Transportation
    - Utilities
    - Socio-Economic
    - Landscape and Visual
    - Archaeology and Cultural Heritage
6. Assessment of Impacts
7. Mitigation Measures
8. Residual Impacts
9. Conclusions and Recommendations
10. References

The cumulative effects of any identified neighbouring commercial and industrial facilities have been included in the assessment of impacts (where appropriate), in addition to the potential residual impacts following the implementation of the recommended mitigation measures.

Volume 3 comprises the outline environmental management and monitoring plan, which provides detailed environmental actions and initiatives that will be developed within the contractors Construction Environmental Management Plan (CEMP) and the proponents

Occupational Environmental Management Plan (OEMP), and will therefore be implemented during the construction and occupation phases of the project.

Volume 4 comprises all of the Technical Appendices (consultation letters, baseline survey reports and other technical studies).

BASELINE INFORMATION

Meteorology, Climate and Air Quality

Ambient Air Quality Monitoring was undertaken at two locations on the proposed site between from the 31st of January, till the 1st of February 2015, using a continuous high volume mass sampler for NO_2, SO_2, O_3, $PM_{2.5}$ and PM_{10}. BTEX was also measured for a short-term grab sample of 150 litres of ambient air, on each day of monitoring. Equipment to continuously monitor wind speed, wind direction, humidity, and temperature was also installed for the monitoring period.

Both monitoring locations returned 24hour average concentrations below the standards stipulated by DM, the FEA and the IFC for NO_2, SO_2, O_3, and Particulates. Data in regard to BTEX was returned as being under the detectable limit of 20 µg/m3 for the entire monitoring period.

Noise and Vibration

An environmental noise survey was undertaken in the daytime and night time of Saturday 31st January 2015. During the surveys, noise measurements were taken at 5 locations to monitor the ambient noise levels at the site and to determine the influence of existing noise sources.

The Dubai Municipality noise standards are set in relation to the measured average noise level, or Leq (A) noise level. Considering the future site as a 'Industrial Area (Heavy Industry)' (as defined by DM) the allowable noise limits are up to 70dB (A) in the daytime and up to 60 dB (A) in the night time. The results of the monitoring have shown that the site is not particularly variable for ambient noise.

In terms of a baseline, no noticeable vibrations were encountered on the site during the visits. There are also no existing facilities in the vicinity of the proposed 200MW Solar PV site that are likely to result in vibrations. Localised vibrations may be encountered adjacent to the roads that border the site, however these will typically be dependent on vehicle flows, vehicle classification (e.g. ratio of HGV's to LGV's and private vehicles). The dissipation of any such

vibrations is expected to occur over a short distance due to the low magnitude of vehicular vibrations.

Topography, Soil, Geology/Hydrogeology

The location of the 200MW Solar PV site is approximately 42 km from the Dubai Gulf coastline. Topographical studies indicate that the elevation of the site varies from approximately 111m – 124m MSL due to the sand dune formations, with peaks and troughs. The sand dunes appear to be larger towards the south of the site, away from previous working areas that had been established in the southern half of the site as a laydown area for RTA construction works.

Soil samples were collected for laboratory analysis from 4 locations at the on 31st of January 2015. These particular sampling sites were selected to provide results representative of the entire site, as the site is largely unused.

The results of the soil laboratory analysis indicate that all soil samples are within the DM Land Contamination and Dutch Soil Standards 'action' guidelines for all parameters. This indicates uncontaminated soils at those areas sampled.

Groundwater

A specific groundwater survey was not undertaken as part of the EIA. Due to the elevation of the site being approximately 110m above sea level. There is not likely to be an interaction with groundwater during construction and operation. Previous studies have found the water level to have been between 13 and 15 metres deep.

Flora and Fauna

The site shows a very low biodiversity. No fauna and only a Heliotropium bacciferum plant were identified during the site surveys.

There are 3 feeding stations within a few kilometres of the site. In previous surveys, sightings of Arabian Oryx and Mountain gazelles have been recorded. The existing 13MW plant, adjacent to the project site, is a barrier to wildlife movement and decreases the attractiveness of the area for local wildlife.

The Arabian Oryx is an IUCN species of Near Threatened to Critically Endangered status. Therefore mitigation measures need to be implemented prior to construction of other phases.

Traffic and Transportation

At the time of the field surveys, the proposed 200MW Solar PV plot could only be accessed at one location, by driving off-road from the main paved road leading to the site.

Presently, no other transport links such as rail or public transport services are available at the site.

The traffic on the road at the time was not congested and the sighting of cars was very intermittent. In total about 4 vehicles were seen during the entire site visit.

Utilities

The 200MW PV Phase 2 development is located within an undeveloped area, and consequently all the major municipal services, such as potable water, power connections, wastewater treatment, irrigation, telecommunications and solid waste handling are not currently in place.

Socio-Economic

In comparison with the estimated wider UAE population of approximately 5,470,000, Dubai represents approximately 40% of the national population, forming the largest urban area. The resident population of Dubai was estimated in 2012 to stand at 2,105,875 individuals. Of these, 1,602,925 were male and 502,950 female, representing approximately 75% and 25% respectively of the total population. The higher proportion of males to females (approximately 3:1) is attributed to the large expatriate working population, a majority of which are males who are not accompanying their family members. Equally, a total of approximately 3.15 million individuals are understood to be active in Dubai on an average day, this includes residents, those in employment in Dubai and residing outside the Emirate, and an average of the number of businessmen, tourists, sailors, and those transiting the Emirate.

As of 2011, 79.5% of the Emirate's resident population of working age is judged to be economically active, with the remaining percentage largely comprised of students, housewives, and a small percentage classed as unable to work. Official unemployment in the Emirate (2011) is calculated to be 0.4%, with figures of 0.2% and 2.3% for male and females respectively.

Using the United Nations Development Index as a guide, the UAE as a whole ranks as "High" for overall Human Development, with an index score of 0.818 (2012). This compares favourably with the regional average (0.652), and places the UAE within the global top 50 at

an overall level. Within the key indicator areas of Health & Education, the UAE index ranks as "High" and "Medium" respectively.

The project site is located in a desert area, known as Saih Al Dahal. The area is very remote and there is little development in the local area.

Population statistics from the DM Population Bulletin 2013 indicate that Saih Al Dahal has a residential population of 2.

Landscape and Visual

The proposed 200MW PV Phase 2 development will be constructed on a largely greenfield open area of land within Dubai, U.A.E. The landscape of the site is characterised by flat plains of sand and gravel. Further south of the southern boundary of the site, are a system of dunes which have number of Ghaf Trees dispersed randomly throughout the system. However it should be noted that these trees are not on the site proposed for the 200MW PV plant.

The immediate landscape surrounding the site has largely been unaffected by any development. There are no other paved roads near the site, and the only large scale development is the 13MW Solar PV plant, to the north of the proposed site.

The site has good visibility, with clear unobstructed views of the surrounding landscape. To the East of the Solar Park is the high voltage power corridor, however these present virtually no visual obstruction for any receptors. There are no visual intrusions on the site at present, due to its open and undeveloped nature. Current views on the site extent for its whole length and width when viewing from any point within the site.

Cultural Heritage and Archaeology

Although there are numerous sites of archaeological and cultural importance in the Emirate of Dubai, initial site visits did not identify any features of archaeological or cultural significance. It should also be noted that although unlikely, there is always potential to encounter undiscovered buried archaeology.

Environmental Impacts and Mitigation Measures

The table below outlines the key environmental impacts, mitigation measures and the relevant impact significance prior to and following mitigation. To provide a concise overview, the impacts/mitigation measures as detailed in Volume 2 have been grouped into general categories within the following table.

The summary table details the worst-case impacts and residual impacts for each environmental parameter assessed. The worst-case impacts are typically encountered at receptors of highest sensitivity/importance, e.g. residential communities (existing or future), mosques, hospitals and schools. The impacts and residual impacts of highest significance in regard to the generalised categories have been summarised in the Table below.

Phase	Key Impacts	Worst-Case Impact Significance	Key Mitigation Measures	Worst-Case Residual Impact
Air Quality				
Construction	Dust creation (e.g. Dust from earthworks, wind blown stockpiles and vehicle movements on unpaved/ uncompact roads)	Moderate to Major	Dust reduction techniques. E.g. wetting down, sheeting of trucks and stockpiles, reduction of earthworks during high wind periods & designated transport routes for vehicle movements.	Moderate
	Gaseous, Particulate and Volatile Emissions (e.g. Dust from vehicles, construction plant/equipment and inappropriately stored materials)	Minor to Moderate	Maintenance of vehicles and plant to ensure good working order. Appropriate use of vehicles and plant (e.g. turning off engines/generators when not in use and reduction in trips). Appropriate storage of hazardous/volatile materials and wastes.	Minor

Phase	Key Impacts	Worst-Case Impact Significance	Key Mitigation Measures	Worst-Case Residual Impact
Operation	Vehicle Emissions: Gaseous, Particulate (e.g. Internal and external road network use)	Minor to Moderate	Increase landscaping along the boundaries with the major roads. Optimise the set backs of the buildings. Reduce the number of vehicle trips outside the project by ensuring that necessary basic services and amenities are located within the development. Also deliveries should be managed efficiently.	Minor to Moderate
Noise and Vibration				
Construction	Construction Noise (e.g. Creation of construction noise from processes such as earthworks, vehicles, piling, hammering, drilling etc.)	Moderate to Major	Highest noise activities to be undertaken during weekday daylight hours. Silencers and/or attenuation features to be installed on;/around machinery. Noise barriers are to be erected where appropriate to limit exposure, particularly to areas off site.	Moderate
	Construction Vibration (e.g. Creation of construction vibration from processes such as earthworks, vehicles, piling, hammering, drilling etc.)	Minor	Key vibration creating activities are to be undertaken during weekday day times.	Minor
	Vehicle Noise (off site) (e.g. Noise from the movement of construction vehicles on local routes)	Minor to Moderate	The majority of trips to the site will be effectively planned and staggered during daytime off peak traffic periods.	Minor

Phase	Key Impacts	Worst-Case Impact Significance	Key Mitigation Measures	Worst-Case Residual Impact
Operation	Vehicle Noise off site (e.g. Vehicles from within 200MW PV site causing additional noise to receptors off-site)	Minor to Moderate	Increase landscaping along the boundaries with the major roads. Typically the vegetation should be wide, dense and high (1.5-2m) in order to be effective. Optimise the set backs of the buildings. Install noise barriers/berms if construction noise monitoring shows non compliances Position commercial and office buildings/floor spaces so that these face the highways and screen out the high noises. Manage traffic for commercial deliveries outside peak time. Ensure that speed limits within the project are limited to 35km/hr. Ensure that the design and machinery of major facilities utilise low-noise motors, pumps and the like.	Minor to Moderate
	Vehicle Noise On site	Moderate to Major		Moderate

Soil, Geology and Hydrogeology				
Construction	Spillages to soils (e.g. contamination due to chemicals, oils, fuels and other hazardous substances/liquid)	Moderate	Appropriate storage and handling of hazardous materials. Clean up, spill prevention and spill control plans in place with appropriate training to site personnel	Minor to Moderate
	Inadequate waste management (e.g. contamination of soils during storage, handling and transportation)		Implementation of an effective waste management plan to ensure waste collection, segregation, transport and disposal by a suitably licensed waste company at a licensed facility.	
	Cross-contamination of soils (e.g. contamination during grading or earthworks)		Identification and removal/ disposal of contaminated soils prior to grading and earthwork activities.	
	Dewatering (very minor quantities, if any)		Evaporation ponds.	
Operation	Spills and Accidental Releases (e.g. contamination due to spills and leaks during transport and handling of hazardous substances)	Minor	Appropriate storage and handling of hazardous materials. Clean up, spill control plans and training in place (including availability of spill kits)	Negligible
	Inappropriate Waste Management (e.g. contamination of soils during storage, handling and transportation)		Appropriate handling, storage, transportation and disposal of waste materials.	
Terrestrial Ecology				
Construction	Direct Loss of Habitat (e.g. Removal of site vegetation and associated loss of habitats/species)	Minor to Moderate	Loss of vegetation is to be offset in line with IFC/WB requirements. This is to include areas used for construction laydown.	Minor
	Loss of Seed Bank (e.g. Removal of topsoil reducing seed bank and availability of future growth)	Negligible to Minor	Topsoil's are to be stored in a separate area of the site and reused after construction in landscapes areas or at the laydown areas.	Negligible

	Noise impacts (e.g. Disturbance to fauna at or surrounding the site through noise exposure)		No fauna observed on or adjacent to the site. However, machinery and plant is to be well maintained and used with silencers and/or other abatement equipment to reduce impact on other sensitive receptors.	
Operation	Pests (e.g. attracted to site by Domestic Waste and potential spread of disease)	Negligible to Minor	Provision of effective waste management facilities and processes, including sealed waste containers.	Negligible
	Herbicide, Pesticide and Fertiliser use (e.g. Leaching of non organic herbicides, pesticides and fertilisers used on site landscaping areas to unmanaged soils)		Planting of native xerophytic and halyophytic vegetation is to be incorporated to landscaped areas to reduce resource use e.g. water, pesticides, herbicides and fertilisers. Only organic additives should be used in landscaped areas.	
	Landscaping (e.g. Planting of indigenous species)	Negligible to Minor Positive	Use of local and native species to enhance the site and provide similar character to the past environmental nature of the site.	Minor Positive

Traffic and Transportation				
Construction	Increased Congestion on Highways and local roads	Minor	Provision of worker transport to reduce vehicle numbers. Staggering trips/deliveries and removals to reduce congestion at site entrance and access roads.	Minor
	Development of on-site roads	Negligible to Minor Positive	Designated roads, internal traffic management	Minor Positive
Operation	Increased Congestion on Highway and local roads (e.g. Increased road movements by staff, maintenance and typical operational vehicles to and from the site)	Minor Negative	Deliveries and shift movements should be staggered and scheduled outside of peak traffic hours	Negligible to Minor
Utilities				
Construction	Waste Management (e.g. solid hazardous and non hazardous)	Moderate	Implement a waste management plan; ensure that appropriate housekeeping measures are implemented, ensure that hazardous waste are appropriately stored and recycle as much as possible.	Moderate
	Wastewater Management (e.g. domestic, dewatering and stormwater)	Negligible to Minor	Routinely monitor wastewater quality, and storage compartments for leaks. Provide chemical toilets for workers, routinely inspect to prevent overflow	Negligible to Minor
	Power and Water	Minor	Use of on-site generators and tankered water, will not cause additional strain on current DEWA supplies.	Negligible to Minor
Operation	Waste Management (e.g. solid hazardous and non hazardous)	Moderate to Major	Ensure the OEMP has an integrated waste management plan; ensure waste storage facilities are well maintained and free of pests, encourage recycling.	Moderate
	Wastewater Management	Minor	Routinely monitor wastewater storage and transfer	Negligible

	(e.g. domestic and stormwater)		facility. Check pipelines for leaks.	
	Power and Water Consumption	Moderate to Major	Install water and power saving appliances	Moderate
Socio-Economics				
Construction	Employment creation (e.g. job requirements during construction)	Minor Positive	Employment should comply with local regulations as well as Emiratisation requirements, local people as part of the recruitment plan. Personnel should be provided with high quality housing, with all appropriate amenities.	Minor to Moderate Positive
	Dissemination of skills (e.g. teaching of new skills to the workforce)	Minor Positive	Training should be offered to enhance the development of skills within the local workforce	Minor Positive
	Use of Local Services (e.g. Purchase of goods and materials from the local / regional economy)	Moderate Positive	The use of local goods and services should be made where possible to support local businesses and individuals.	Minor Positive
	Cumulative Impacts to Residents in the area	Minor to Moderate	Combination of all described construction mitigation measures	Minor to Moderate
Operation	Employment creation (e.g. job requirements during operation)	Minor Positive	Seek to employ local populations as part of the recruitment plan.	Moderate Positive
	Dissemination of skills (e.g. teaching of new skills to local workforce)	Minor Positive	Training should be offered to enhance the development of skills within the local workforce	Moderate Positive
	Provision and Improvement of infrastructure, facilities and services	Moderate Positive	Growing population will require increased supply of community services	Moderate Positive
	Cumulative Impacts to Local Residents (off-site)	Neutral	Combination of all described occupation mitigation measures	Neutral
Landscape and Visual Impacts				
Construction	Topographical impacts to landscape (e.g. landscape changes due to ground	Minor Negative	Impacts are generally unavoidable due to the direct change in topography brought about by	Minor to Moderate

	preparation works and vegetation removal)		site clearance and grading	
	New features in the landscape (e.g. the addition of structures and vertical intrusions to the existing landscape)	Moderate	Security fencing should be erected around the proposed site, to shield identified sensitive receptors from the construction views.	
	New features impacting views (e.g. existing views being disrupted by the addition of structures and other vertical intrusions to the existing landscape)	Moderate		
	Light Pollution	Moderate	Any flood lights required during night time construction activities will be directed onto the site, with a maximum position angle of 30° from vertical.	
Operation	Influence on Land use Landscape character and visual impact	Moderate to Major	Efforts will be made to design landscaping to fit in with the surrounding landscape character of nearby districts.	Moderate
	Lighting at night	Minor Negative	Directional lighting will be used, with protectors to limit light spill into the environment	
Cultural Heritage and Archaeology				
Construction	Destruction or loss of unknown archaeological artefacts onsite (e.g. potential destruction or damage to buried archaeological remains)	Minor	Any suspected archaeological discoveries will be communicated to all staff. When work is conducted near identified heritage items, the items should be clearly marked and an exclusion zone should be created around the items. The find will be reported to the Ministry of Museums and Antiquities for advice prior to removal.	Minor
	Impacts to off-site cultural receptors (e.g. Secondary impacts acting upon off site cultural receptors)	Neutral	None – Off site cultural receptors have not been identified and will not be impacted by the proposed development.	Neutral
Operation	Destruction of unknown archaeological remains onsite	Neutral	None – Excavations will not take place during occupation and any impacts would have previously occurred during construction.	Neutral

Key Points of EIA

With the suitable inclusion of all recommended mitigation measures, the EIA has concluded that no negative impacts of major significance will be anticipated during the construction and operation phases of the proposed project.

The potential approval for this project is also aided by the fact that a previous development of a similar nature to this (the 13MW Solar PV Phase 1 plant to the north of the proposed 200MW plant) has been constructed and is operating successfully. Its also important to note, that an EIA for the entire 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park (of which this Phase 2 project is located within), was completed and successfully approved on the 5th November 2013.

The successful implementation of the proposed mitigation measures will depend heavily on the proponent's ability to ensure that the CEMP and OEMP is developed in accordance with the recommendations of the EIA (EMMP Volume 3) and any recommendations by the DM-EPSS.

Following the implementation of the recommended mitigation strategies and adoption of best practices at the construction and operational phases the highest impact significance to any environmental parameter is considered moderate.

There are also several positive impacts identified, the main being the provision of an additional 200MW of clean and sustainable energy and the socio-economic benefits from employment and use of local resources.

In summary the EIA identified the following key environmental impacts for construction and operation of the project. Again, all the identified issues are considered minor and can be controlled easily with the mitigation methods discussed earlier.

Table 0-1 Summary of Environmental Issues

Construction	
Air quality	Dust from earthworks and vehicle movements. Minor increased emissions from plant.
Noise/Vibration	Noise from plant and construction activities, particularly in close proximity to project boundaries (especially north boundary).
Ecology	Barrier effect to local species, rstricitng movements on known routes. New feeding station should be installed.
Traffic & Transportation	Increase traffic during peak of construction program. Minor construction traffic impacts to other road users
Socio-Economic	Positive impacts socially relating to increased employment and

	dissemination of skills to the workforce.
Landscape and Visual	Disturbance to the landscape and views of the local area from construction machinery, fencing, increased dust levels and light pollution at night from spotlights.
Operation	
Air Quality	Slight increase in emissions from vehicle use.
Noise	Traffic generated by the project will result in increased noise at the site and to nearby receptors.
Traffic & Transportation	Local roads will be impacted by increased traffic during project operation, particularly from Water trucks on Al Qudra Road, potentially resulting in higher instances of congestion increased journey times.
Socio-economic	Positive impact resulting from the generation of clean and sustainable energy, as well as local employment and purchase of local goods and services
Utilities	Increased pressure will be placed upon utilities for freshwater.

A framework Environmental Management and Monitoring Plan (EMMP) has been developed in Volume 3, which provides a guidance for both the project proponent and contractor to develop their project and activity specific Construction Environmental Management Plan/ Operational Environmental Management Plan (CEMP/OEMP).

Recommendations

This document is a high level environmental assessment of the specific 200MW PV Phase 2 project, since the overall 1GW solar park project will be built over several years.

The overall minimisation and elimination of environmental impacts at the construction and operational stages will depend on the development and implementation of the CEMPs/OEMPs by the contractor and operational company respectively.

Therefore, it is recommended that the EPC contractor is provided with a copy of the EIA (Volume 2) and framework CEMP/OEMP (Volume 3), to ensure that the appropriate mitigation measures and monitoring plans are implemented during the construction program.

The operations company should develop a project specific OEMP, to be used by the Operation management team as a planning, management and monitoring tool. The OEMP should also be provided to any sub-contractors who may work on the operational site. In this instance there will be full integration of the environmental mitigation activities across all project operators at the 200MW Solar PV Phase 2 site.

DEWA 200MW Solar PV Phase 2

Environmental Impact Assessment (EIA)

Dubai, UAE

Volume 2 - Main Text, Tables and Figures

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List of Abbreviations

Abbreviation	Meaning
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CEMP	Construction Environmental Management Plan
DA	Degraded Airshed
DM	Dubai Municipality
DM EPSS	DM Environmental Planning and Studies Section
DM WMD	DM Waste Management Department
dB(A)	A-weighted decibels
dB(C)	C-weighted decibels
EEC	European Economic Community
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Program
EMS	Environmental Management System
F&CM	Facilities and Community Management
GDP	Gross Domestic Product
GFA	Ground Floor Area
GW	Giga Watts
HGV	Heavy Good Vehicle
HVAC	Heating, Ventilation, and Air Conditioning
ICNIRP	International Commission on Non- Ionization Radiation Protection
IUCN	
KWh	Kilowatt Hour
LAeq	A-weighted Equivalent Continuous Sound Level
Lamax	A-weighted Maximum Sound Level
Lcpeak	C-frequency weighted Peak Sound Pressure
LGV	Light Goods Vehicle
MSL	Metres above Sea Level
MW	Mega Watts

Abbreviation	Meaning
NDA	Non-Degraded Airshed
OEMP	Operational Environmental Management Plan
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 micrometers.
TPH	Total Petroleum Hydrocarbons
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organisation
5 Capitals	5 Capitals Environment and Management Consultancy

1 INTRODUCTION

5 Capitals Environmental & Management Consulting has been appointed by ACWA Power to prepare the Environmental Impact Assessment (EIA) for the DEWA 200MW Solar PV Phase 2 development. This EIA has been prepared in accordance with Dubai Municipality Environmental Planning and Safety Section (DM - EPSS) environmental requirements.

1.1 Project Information

Table 1-1 Key Project Information

Project Title	DEWA 200MW Solar PV Phase 2
Project Proponent	Dubai Electricity and Water Authority (DEWA)
Project Developer	ACWA Power
Point of Contact	Andrea Lovato, Project Director alovato@acwapower.com
Environmental Consultant Company Name & Address	5 Capitals Environmental and Management Consulting P.O.Box 119899 Dubai, UAE Tel: +971 4 343 5955 Fax: +971 4 343 9366
Point of Contact	Ken Wade Director Environment Planning Email: Ken.wade@5capitals-group.com

1.2 Project Rational

The proposed project will add an additional 200MW of solar generated energy, to the Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will produce a total of 1GW of solar energy, once it is completely finished. Phase 2 is within this Solar Park and is in an area of Dubai called Seih Al-Dahal, approximately 40km southeast from the Arabian Gulf coastline. An EIA for the entire Solar Park was previously conducted and was approved by Dubai Municipality. The Project Affection Plan is presented in Appendix B.

1.3 Project Alternatives

Under UAE and international guidelines for Environmental Impact Assessment, the evaluation of various project design and activity alternatives should be considered, in order to ensure that the objectives of the proposed project have accounted for social, ecological, economic and technological options, the following project alternatives were discussed in the review:

- No Project

- Phase 2

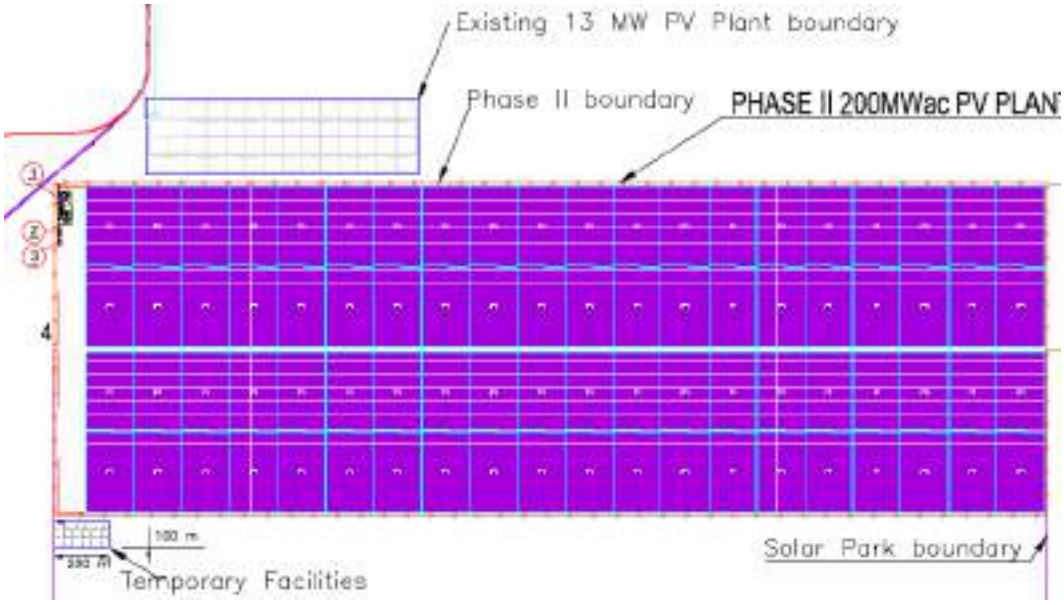
No Project

The development of Phase 2 is part of an intended 1GW solar facility and in order to reach this goal, additional power generating capacity has to be added to the site. Diversifying Dubai's energy sources is also an important aspect of the Emirate's sustainability plans. Therefore the 'No Project' option should not be considered.

Phase 2

The proposed Phase 2 development is essentially an extension of the existing Solar park. Phase 1 has contributed 13MW to the site and with the addition of Phase 2 the Solar Park will in theory be producing energy at just over 21% of its future capacity. Phase 2 was originally intended as a 100MW PV plant, however after discussion with DEWA, it was agreed that the development of Phase 2 would be for a 200MW PV plant. The proposed site layout is presented below.

Figure 1-1 Proposed Phase 2 Layout



***1.** PV Substation, **2.** Control Building, **3.** Maintenance & Spare Building*

Alternatives Comparison

By carrying out a basic comparison of the projected impacts from the development of the proposed plan project versus the option of "no project", the following table is developed.

The table indicates a very basic impact assessment of developing the project compared to not developing the project, per environmental parameter.

Table 1-2 Evaluation of the "No Project" alternative

Environmental issue	No Project	Construction Phase	Operation Phase
Air quality	**No change = 0**	**Negative = -1**	**No Change = 0**
Soil/Groundwater	**0**	**0**	**0**
Ecology	**0**	**0**	**0**
Noise	**0**	**-1**	**0**
Transport	**0**	**0**	**0**
Resource/utilities	**0**	**-1**	**+1**
Socio-Economic	**0**	**Positive = +1**	**+1**
Cultural/Heritage	**0**	**0**	**0**
Landscape	**0**	**0**	**-1**
Total	**0**	**-3**	**+1**

Although the construction phase of the project will likely result in an overall negative impact, the operation phase will likely result in a minor positive impact, particularly due to the development of resources/utilities and socio-economic parameters. The implementation of appropriate mitigation measures, and management programs will ensure that the negative impacts are minimised, and the positive impacts brought on from the operation of the project will help to balance the overall impact for the development option of the project.

1.4 EIA Objectives

The following EIA document has several objectives in relation to its preparation, use and application for the proposed project. Such objectives include and are not limited to the following:

- The recording of baseline conditions prior to development at the site;
- The assessment of potential environmental impacts relating to construction and operation phases of the project;
- Ensuring that potential impacts are avoided or minimised through the recommendation of mitigation and/or management measures;
- Inclusion, informing and consultation with the public, public bodies and local populations regarding the project; and
- Exploration of alternatives that can be used for the project leading to greater social and environmental gains.

EIA Report Structure

To align with DM-EPSS requirements for environmental assessment and international best practice, this report is presented in the following format:

Volume 1: Non-Technical Summary

Volume 2: Main Text, Tables, Figures and Plates

Volume 3: Environmental Management and Monitoring Plan (EMMP)

Volume 4: Technical Appendices

Volume 2 comprises the main text of the report and has been presented under the following chapter structure, which follows the DM-EPSS report structure for environmental impact assessments:

1. Introduction
    - Basic project Information
    - Project Rational
    - Project Alternatives
    - EIA Objectives
2. Description of the Project's EIA process
    - Scope of Work and Key Deliverables
    - EIA Team
    - EIA Methodology

3. Legal Framework
4. Description of Project
    - Type of project
    - Project location
    - Project Overview
    - Project Phases
    - Construction Management
    - Project Cost, Duration and Schedule of activities
5. Description of the Environment (baseline conditions by environmental parameter);
    - Meteorology and Air Quality
    - Noise and Vibration
    - Topography, Geology/Hydrogeology
    - Terrestrial Ecology
    - Traffic and Transportation
    - Utilities
    - Socio-Economic
    - Landscape and Visual
6. Assessment of Impacts
7. Mitigation Measures
8. Residual Impacts
9. Conclusions and Recommendations
10. References

Volume 3 EMMP provides the framework CEMP and OEMP based on the findings of the EIA, and is to be used by the project proponent and contractors to develop the project specific environmental management plans.

Volume 4 comprises all Technical Appendices (consultation letters, baseline survey reports, and other technical studies).

2 DESCRIPTION OF THE EIA PROCESS

2.1 Scope of Work and Key Deliverables

The main deliverables of the Environmental Impact Assessment (EIA) process are the Environmental Scoping Report and the EIA report. The purpose of the Environmental Scoping Report is to identify the key environmental issues and sensitive receptor sites at an early stage to ensure that the baseline surveys and investigations, and assessment techniques for the subsequent EIA addresses these issues specifically. In addition, it will identify at an early stage the structure and content of the EIA and provides a Terms of Reference for DM- EPSS.

A Scoping Report was prepared shortly after award of the project and delivered to DM-EPSS for review. The scoping (Terms of Reference) for the EIA was approved by DM-EPSS on 15th February 2015 (See Appendix A). The general content of the Scoping report includes:

- The environmental assessment, documentation and approval requirements for the proposed development;
- The key features of the proposed project facilities and a description of the existing environment;
- An outline and evaluation of existing environmental information on the area;
- A gap analysis to determine the additional information that needs to be gathered.
- Potential environmental issues and constraints (and opportunities) associated with the proposed project facilities based on the existing information; and
- Outline of the scope of work, structure and content of the EIA Report.

The scope, aim and structure of the EIA report are described in section 1.4, and the EIA methodology is described in section 2.3.

2.2 EIA Team

This project was lead by one of our Directors from 5 Capitals who has more than 30 years experience in environmental impact assessment including the assessment of many Master planning developments. The Project Director is Ken Wade, who is familiar with the process required by the Regulator, Dubai Municipality.

Ken Wade, MSc – Project Director

Ken is the Project Director and has overall responsibility for the quality of deliverables and Client liaison.

Ken leads the Environmental Planning team having more than 35 years experience in the environmental field both as a Water Industry Regulator from the UK and as a Consultant in

the UK and Middle East. He has undertaken Management planning and Strategic planning studies as part of major urban regeneration projects in the UK and city planning in Saudi Arabia.

Ken has wide experience of planning and leading Equator Principles compliant ESIA/SEA studies for Project Sponsors, Banks and Development Companies with a combined construction value in excess of US $50 billion. In the GCC his EIA experience on major infrastructure, industrial and development projects has included the environmental impact assessment of projects in Saudi Arabia, UAE, Qatar, Oman, Kuwait and Bahrain exceeding US $35 billion.

Ken also has specialist knowledge of wastewater treatment, solid waste management, lighting impacts and ecology/water quality and has provided expert evidence at Public Inquiry and Courts in the UK on behalf of developers for major projects.

Edward Levine, BSc- Project Manager

As Project Manager, Edward will lead the EIA team, conduct quality reviews, ensure that all necessary data is obtained, coordinate with sub-consultants (e.g. accredited laboratories), and oversee the timely submission of the deliverables.

Edward is based in Dubai with 5 Capitals, as an Environmental Consultant. Edward is a qualified Lead Auditor for ISO 14001, ISO 14064 AND ISO 50001. He has gained extensive experience in auditing Environmental Management Systems for Government and Military customers in remote and challenging locations such as Afghanistan and Somalia. He has also been responsible for the design and implementation of Environmental Management Plans for operations working on behalf of these customers. In addition he has been heavily involved in the development of CSR strategies and reporting methods, in line with Global Reporting Initiative (GRI) Guidelines, which involves aspects such as carbon footprint reporting and environmental initiative development.

At 5 Capitals, Edward is currently involved with auditing work, the preparation of Environmental studies and management plans and practical work, such as baseline studies and marine ecology surveys. The majority of his work ensures project compliance with the Equator Principles, World Bank/IFC EHS Guidelines and applicable local regulations of the country.

He has a degree in Environmental Science from the University of Plymouth (UK) and is currently undertaking a distance learning Masters in Environmental Law and Practice. Edward was also heavily involved in the operations required to remediate and clean up sites

in Afghanistan and involved in the organisation of the safe disposal of hazardous and non-hazardous wastes, as well as the remediation of soil from the sites.

Carlos Ponte, MSc – Environmental Consultant

Carlos obtained his BSc degree in Environmental Management at Lancaster University and his MSc in Sustainable Development in the specialism of Environmental Analysis at the Imperial College of London. He has worked in the Strategic Environmental Assessment of Local Land Use Plans and undertaken other environmental reports in Spain and in the Sustainability Appraisal of the new High Speed Rail network and the EIA of rail projects in the United Kingdom.

In the Middle East, Carlos has worked in the development of environmental regulations for the Economic Cities Authority (ECA) in the Kingdom of Saudi Arabia (KSA), as an Environmental Advisor for King Abdullah Economic City (KSA) and in several Environmental Impact Assessments of multiple water and power projects for ACWA Power in the MENA region, including natural gas, heavy fuel oil, solar energy and wind power plants.

Carlos also has experience of undertaking construction environmental audits of major construction sites, following the Equator Principle's requirements for submission to the regulators and lending banks.

2.3 EIA Methodology

This chapter outlines the methodology that will be used to describe the environmental baseline and to identify, predict & assess the environmental impacts of the project on each relevant environmental component. It also covers the mitigation and monitoring measures that will be recommended to address these impacts.

Impact Assessment Significance Criteria

In order to obtain a credible assessment of environmental impacts, the assignment of an 'impact significance' to each identified impact needs to be a robust, consistent and transparent process. The methodology to assess 'impact significance' is outlined below and follows an International Best Practice based on the assumption that the significance of an impact on resources or receptors is considered to result from an interaction between three factors:

- The nature and magnitude of the impact or change;
- The number of resources or receptors affected; and
- The environmental value (sensitivity) of those resources or receptors to the change.

A three-step approach has been used to determine the significance of environmental effects, as follows:

- Step 1 – evaluation of value / sensitivity of resource;
- Step 2 – assessing the magnitude of the impact on the resource; and
- Step 3 – determining the significance of effects.

The environmental value (or sensitivity) of the resource or receptor has been defined by using the criteria below in Table 2-1:

Table 2-1 Environmental Value of Receptor or Resource

Value (sensitivity)	Description of Value
Very High	• High importance and rarity on an international scale and limited or no potential for substitution. • The receptor has already reached its carrying capacity, so any further impact is likely to lead to an excessive damage to the system that it supports. • Locations or communities that are highly vulnerable to the environmental impact under consideration or critical for society (e.g. indigenous peoples, hospitals, schools).
High	• High importance and rarity on a national scale, and limited potential for substitution. • The receptor is close to reaching its carrying capacity, so a further impact may lead to a significant damage to the system that it supports. • Locations or communities that are particularly vulnerable to the environmental impact under consideration (e.g. residential areas, vulnerable/marginalized groups).
Medium	• High or medium importance and rarity on a regional scale, limited potential for substitution. • The receptor is already significantly impacted, but it is not close to reaching its carrying capacity. Further impacts will get increase the stress of the underlying system, but evidence does not suggest that it is about to reach a critical point. • Locations or groups that are relatively vulnerable to the environmental impact under consideration (e.g. commercial areas).
Low (or Lower)	• Low or medium importance and rarity on a local scale. • The receptor is not significantly impacted and shows a large spare carrying capacity. Impacts are not likely to generate any noticeable stress in the underlying system. • Locations or groups that show a low vulnerability to the environmental impact under consideration (e.g. industrial areas).
Very Low	• Very low importance and rarity on a local scale. • The receptor is not impacted and shows a very large spare carrying capacity. Impacts are very unlikely to generate any noticeable stress in the underlying system. • Locations or groups that show a very low vulnerability to the environmental impact under consideration (e.g. industrial areas).

The existence of receptors that are legally protected (e.g. designated areas, protected habitats or species) will be taken into consideration for the assessment of the sensitivity of the receptors.

The magnitude of the impact is defined where possible in quantitative terms. The magnitude of an impact has a number of different components, for example: the extent

of physical change, the level of change in an environmental condition, its spatial footprint, its duration, its frequency and its likelihood of occurrence where the impact is not certain to occur.

The criterion that has been used for assessing the magnitude of impacts includes the geographical scale of the impact, the permanence of impact and the reversibility of the impacted condition. A brief description of the magnitude of the impacts is provided in Table 2-2 below.

Table 2-2 Criteria for Magnitude of Impacts

Magnitude of Impact	Description of Magnitude
Major	Adverse: Loss of resource and/or quality and integrity; severe damage to key characteristics, features or elements. A major impact is usually large scale, permanent and irreversible. Beneficial: Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate	Adverse: Significant impact on the resource, but not adversely affecting the integrity; Partial loss of/damage to key characteristics, features or elements. Moderate impacts usually extend above the site boundary, and are usually permanent, irreversible or cumulative. Beneficial: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor	Adverse: Some measurable change in attributes quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements. Minor impacts usually are only noticeable within the site and are temporary and reversible. Beneficial: Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse: Very minor loss or detrimental alteration to one or more characteristics, features or elements. Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

In addition to the factors outlined in the table above, the possibility of any standards being breached will be taken into consideration in the determination of the magnitude of the impact.

The significance of effects is a combination of the environmental value (or sensitivity) of a receptor or resource and the magnitude of the project impact value (change). Table 2-3 below shows the criterion used for determining the significance of effects. Definitions of each significance categories are provided for in Table 2-4.

Table 2-3 Criteria for Determining Significance of Effects

		Magnitude of impact (degree of change)				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Environmental value (sensitivity)	**Very High**	Neutral	Minor	Moderate to Major	Major	Major
	High	Neutral	Minor	Minor to moderate	Moderate to Major	Major
	Medium	Neutral	Negligible to minor	Minor	Moderate	Moderate to Major
	Low	Neutral	Negligible to minor	Negligible to minor	Minor	Minor to moderate
	Very Low	Neutral	Negligible	Negligible or minor	Minor	Minor

Table 2-4 Definition of Significance of Effects

Significance Category	Criteria
Very Large	Only adverse effects are assigned this level of importance as they represents key factors in the decision-making process. Effects are associated with sites and features of national or regional importance. Effects exceed statutory limits. Mitigation measures are unlikely to remove such effects.
Large	Important considerations at a local scale but, if adverse, are potential concerns to the project and may become key factors in the decision making process. Mitigation measures and detailed design work are unlikely to remove all of the effects upon the affected communities or interests.
Moderate	These effects, if adverse, while important at a local scale, are not likely to be key decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource. They represent issues where effects will be experienced but mitigation measures and detailed design work may ameliorate or enhance some of the consequences upon affected communities or interests. Some residual effects will still arise.
Minor	Local issue unlikely to be of importance in the decision-making process. Effects do not exceed statutory limits. Nevertheless they are of relevance in enhancing the subsequent design of the project and consideration of mitigation or compensation measures.
Neutral or Negligible	No effect or effect which is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error. No mitigation is required.

Project Stakeholder Analysis and Consultations

Considering the nature and scale of the proposed development, the viewpoints of relevant stakeholders should be obtained and their concerns regarding social and environmental impacts should be incorporated into the identification, assessment and mitigation of impacts as early as possible.

The following national laws are relevant for the project:

- Ministry of Labour and Social Affairs Federal Law No. (8) of 1980; and
- Ministry of Labour and Social Affairs Ministerial Order No. (32) of 1982.

Consultation with relevant stakeholders allows the identification of existing information for the area, particularly with regards to heritage/cultural resources and sensitive receptors.

5 Capitals has conducted consultation with relevant stakeholders, such as government ministries, DM Departments, infrastructure and service providers, and Non-governmental Organizations. The stakeholder consultation included:

- DM Departments: GIS, Drainage & Irrigation, Planning and Surveying;
- Roads and Transport Authority (RTA): Rail Agency, Road Agency;
- Local Communications providers: Etisalat, Du;
- Municipal Waste Department;
- National Bureau of Statistics and the Dubai Statistical Centre;
- Dubai Department of Tourism and Commerce Marketing;
- Dubai Civil Aviation Authority;
- Emirates Environment Group; and
- World Wildlife Fund

Following a period of two months after consultation, a response was only received from the Dubai Civil Aviation Authority, Rail Agency (RTA) and DM Waste Management Department. The consultation letters and received correspondence are provided in Appendix C.

3 LEGAL FRAMEWORK, STANDARDS AND GUIDELINES

Requirements For Environmental Assessment

The EIA study undertaken in support of the Project will adopt and comply with the following relevant national and local environmental standards and requirements:

- National and local environmental legislation, regulations and standards (UAE Federal and Dubai Municipality (DM) requirements, respectively);
- International (World Bank, IFC, Equator Principles) Regulations; and
- International and Regional Conventions/Protocols ratified by UAE.

Since the project is a mix-use development, it will be a Category A (3.3 - Electricity, gas or water utilities projects: specifically Nuclear, solar, wind or hydro power, according to Technical Guidance number 2, EIA requirements for major projects (March 2014).

3.1 UAE Federal Law

Federal Law No. (24) of 1999 for the Protection and Development of the Environment establishes the framework for the protection of the environment in the UAE, and specifies the following relevant objectives:

- Protection and conservation of the quality and natural balance of the environment
- Control of all forms of pollution and avoidance of any immediate or long-term harmful effects resulting from developments
- Conservation of biological diversity
- Compliance with international and regional conventions

3.2 Dubai Municipality Environmental Legislation

Within Dubai Municipality, the Environmental Planning and Studies Section (EPSS) is the entity responsible for transposing the requirements of UAE Federal law through Local Order 61/1991 – The Environmental Protection Regulations for the Emirate of Dubai. This sets out a legislative framework to ensure compliance with Federal Law 24/1991 at Emirate Level.

The main technical areas addressed by Local Order 61/1991 relate to the disposal of wastewater, air pollution, noise pollution and protected areas for wildlife.

The following environmental legislation, standards and guidance implemented in the Emirate of Dubai, are pertinent to the Project:

- Local Order No. 61 of 1991 on the Environment Protection Regulations in the Emirate of Dubai;

- Administrative Order No. 211 of 1991 on the Issue of the Executive Regulations for the Local Order No. 61 / 1991 on the Environment Protection Regulations in the Emirate of Dubai;
- Explanatory Memo with Regard to Local Order No. 61 / 1991 on Environment Protection Regulations in the Emirate of Dubai;
- Ministerial Decree No. (12) of 2001 for the Protection of Air from Pollutions;
- Local Order 11 of 2003 Concerning Public Health and Community Safety in the Emirate of Dubai (Local Order 02 of 2004 Amending Local Order 11 0f 2003);
- Environmental Standards and Allowable Limits of Pollutants on Land, Water, and Air Environment (May 2003, Dubai Municipality);
- All Applicable Codes of Practice, Information Bulletins and Circulars issued by Dubai Municipality Environment Protection and Safety Section (EPSS); and
- Technical guidelines published by the DM EPSS, specifically:
    - Technical Guidance number 1, EIA system (April 2011);
    - Technical Guidance number 2, EIA requirements for major projects (April 2011).
    - Technical Guidelines No. 5 Environmental Site Assessment and Restoration of Contaminated Site, April 2011;
    - Technical Guidelines No. 6 Waste Minimisation, April 2011;
    - Technical Guidelines No. 7 Policy on the control of Ozone Depleting Substances, April 2011;
    - Technical Guidelines No. 8 Requirements for the Discharge of Waste Gases, Fumes and Particulates to the Atmosphere, April 2011;
    - Technical Guideline No. 9 Requirements for the Reduction of Construction/Demolition Noise, April 2011;
    - Technical Guideline No. 10 Guidelines for the Disposal and Re-Use of Used Chemical Containers, June 2011;
    - Technical Guideline No. 11 Requirements for Temporary and Permanent Concrete Batching Plants, April 2011;
    - Technical Guideline No. 12 Replacement of Chlorinated Solvents (CFCs, CTCs, MCFs) for Degreasing and Cleaning, April 2011;
    - Technical Guideline No. 12 Environmental Regulations for the Reuse of Treated Wastewater for Irrigation & Thermal Treated Sludge for Agricultural Purposes, June 2011;
    - Environmental Control Technical Guideline No. 1 Disposal of Hazardous Wastes, January 2013;

- Environmental Control Technical Guideline No. 2 Disposal of Trade Wastewater, January 2013.
- Environmental Control Technical Guideline No. 5 Requirements for the transport of Hazardous Waste, June 2011;
- Environmental Control Technical Guideline No. 6: Bunding of Storage Tanks and Transfer Facilities, June 2011.

3.3 International (World Bank/IFC/Equator Principles) Requirements

As part of the project funding is likely being sought from international lending institutions who are signatories of the Equator Principles, the project must comply with the requirements of the Equator Principles, including the IFC performance standards and EHS guidelines. These principles are a voluntary set of guidelines for managing environmental and social risk, the requirements have been described below.

Background to the Equator Principle

On 4th June 2003, ten banks from seven countries signed up to the Equator Principles (EPs), a voluntary set of guidelines for assessing and managing environmental and social risks in project financing. Currently, over seventy-five major financial institutions from around the world have adopted the EPs. These financial institutions operate in more than 100 countries worldwide. As a result, the Equator Principles have become the project finance industry standard for addressing environmental and social issues in project financing globally. The Equator Principles were updated in 2006 (EP II) to include projects with a capital cost of US$10 million or more across all industry sectors and these are the prevailing applicable conditions for this project.

The Equator Principles Financial Institutions (EPFIs) Steering Committee reviewed the Equator Principles in 2011 and underwent a public consultation process in 2012. The updated EP III was officially launched on 4th June 2013 and was fully implemented on 31st December 2013.

The current Equator Principles consist of the following 10 Principles:

Table 3-1: Equator Principles III (2013)

Equator Principle	Details
Principle 1	**Review and Categorisation** EPFIs will categorise a project proposed for financing based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of the International Finance Corporation (IFC). These categories are: 1. ***Category A***- Projects with potential significant adverse social or environmental risks and/or impacts that are diverse, irreversible or unprecedented; 2. ***Category B*** – Projects with potential limited adverse social or environmental risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures; and 3. ***Category C*** – Projects with minimal or no social or environmental risks and/or impacts.
Principle 2	**Environmental and Social Assessment** For all Category A and Category B Projects, the EPFI will require the client to conduct an Assessment process to address, to the EPFI's satisfaction, the relevant environmental and social risks and impacts of the proposed Project (which may include the illustrative list of issues found in Exhibit II). The Assessment Documentation should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project. The Assessment Documentation will be an adequate, accurate and objective evaluation and presentation of the environmental and social risks and impacts, whether prepared by the client, consultants or external experts. For Category A, and as appropriate, Category B Projects, the Assessment Documentation includes an Environmental and Social Impact Assessment (ESIA). One or more specialised studies may also need to be undertaken. Furthermore, in limited high-risk circumstances, it may be appropriate for the client to complement its Assessment Documentation with specific human rights due diligence. For other Projects, a limited or focused environmental or social assessment (e.g. audit), or straightforward application of environmental siting, pollution standards, design criteria, or construction standards may be carried out. For all Projects, in all locations, when combined Scope 1 and Scope 2 Emissions are expected to be more than 100,000 tonnes of CO_2 equivalent annually, an alternatives analysis will be conducted to evaluate less Greenhouse Gas (GHG) intensive alternatives. Refer to Annex A for alternative analysis requirements.
Principle 3	**Applicable Environmental and Social Standards** The Assessment process should, in the first instance, address compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. EPFIs operate in diverse markets: some with robust environmental and social governance, legislation systems and institutional capacity designed

	to protect their people and the natural environment; and some with evolving technical and institutional capacity to manage environmental and social issues. The EPFI will require that the Assessment process evaluates compliance with the applicable standards as follows: 1. For Projects located in Non-Designated Countries, the Assessment process evaluates compliance with the then applicable IFC Performance Standards on Environmental and Social Sustainability (Performance Standards) and the World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) (Exhibit III). 2. For Projects located in Designated Countries, the Assessment process evaluates compliance with relevant host country laws, regulations and permits that pertain to environmental and social issues. Host country laws meet the requirements of environmental and/or social assessments (Principle 2), management systems and plans (Principle 4), Stakeholder Engagement (Principle 5) and, grievance mechanisms (Principle 6). The Assessment process will establish to the EPFI's satisfaction the Project's overall compliance with, or justified deviation from, the applicable standards. The applicable standards (as described above) represent the minimum standards adopted by the EPFI. The EPFI may, at their sole discretion, apply additional requirements.
Principle 4	**Environmental and Social Management System and Equator Principles Action Plan** For all Category A and Category B Projects, the EPFI will require the client to develop or maintain an Environmental and Social Management System (ESMS). Further, an Environmental and Social Management Plan (ESMP) will be prepared by the client to address issues raised in the Assessment process and incorporate actions required to comply with the applicable standards. Where the applicable standards are not met to the EPFI's satisfaction, the client and the EPFI will agree an Equator Principles Action Plan (AP). The Equator Principles AP is intended to outline gaps and commitments to meet EPFI requirements in line with the applicable standards.
Principle 5	**Stakeholder Engagement** For all Category A and Category B Projects, the EPFI will require the client to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders. For Projects with potentially significant adverse impacts on Affected Communities, the client will conduct an Informed Consultation and Participation process. The client will tailor its consultation process to: the risks and impacts of the Project; the Project's phase of development; the language preferences of the Affected Communities; their decision-making processes; and the needs of disadvantaged and vulnerable groups. This process should be free from external manipulation, interference, coercion and intimidation. To facilitate Stakeholder Engagement, the client will, commensurate to the Project's risks and impacts, make the appropriate Assessment Documentation readily available to the Affected Communities, and where relevant Other Stakeholders, in the local language and in a culturally appropriate manner.

	The client will take account of, and document, the results of the Stakeholder Engagement process, including any actions agreed resulting from such process. For Projects with environmental or social risks and adverse impacts, disclosure should occur early in the Assessment process, in any event before the Project construction commences, and on an ongoing basis. EPFIs recognise that indigenous peoples may represent vulnerable segments of project-affected communities. Projects affecting indigenous peoples will be subject to a process of Informed Consultation and Participation, and will need to comply with the rights and protections for indigenous peoples contained in relevant national law, including those laws implementing host country obligations under international law. Consistent with the special circumstances described in IFC Performance Standard 7 (when relevant as defined in Principle 3), Projects with adverse impacts on indigenous people will require their Free, Prior and Informed Consent (FPIC).
Principle 6	**Grievance Mechanism** For all Category A and, as appropriate, Category B Projects, the EPFI will require the client, as part of the ESMS, to establish a grievance mechanism designed to receive and facilitate resolution of concerns and grievances about the Project's environmental and social performance. The grievance mechanism is required to be scaled to the risks and impacts of the Project and have Affected Communities as its primary user. It will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate, readily accessible, at no cost, and without retribution to the party that originated the issue or concern. The mechanism should not impede access to judicial or administrative remedies. The client will inform the Affected Communities about the mechanism in the course of the Stakeholder Engagement process.
Principle 7	**Independent Review** ***Project Finance*** For all Category A and, as appropriate, Category B Projects, an Independent Environmental and Social Consultant, not directly associated with the client, will carry out an Independent Review of the Assessment Documentation including the ESMPs, the ESMS, and the Stakeholder Engagement process documentation in order to assist the EPFI's due diligence, and assess Equator Principles compliance. The Independent Environmental and Social Consultant will also propose or opine on a suitable Equator Principles AP capable of bringing the Project into compliance with the Equator Principles, or indicate when compliance is not possible. ***Project-Related Corporate Loans*** An Independent Review by an Independent Environmental and Social Consultant is required for Projects with potential high risk impacts including, but not limited to, any of the following: • adverse impacts on indigenous peoples • Critical Habitat impacts • significant cultural heritage impacts • large-scale resettlement

	In other Category A, and as appropriate Category B, Project-Related Corporate Loans, the EPFI may determine whether an Independent Review is appropriate or if internal review by the EPFI is sufficient. This may take into account the due diligence performed by a multilateral or bilateral financial institution or an OECD Export Credit Agency, if relevant.
Principle 8	**Covenants** An important strength of the Equator Principles is the incorporation of covenants linked to compliance. For all Projects, the client will covenant in the financing documentation to comply with all relevant host country environmental and social laws, regulations and permits in all material respects. Furthermore for all Category A and Category B Projects, the client will covenant the financial documentation: a) to comply with the ESMPs and Equator Principles AP (where applicable) during the construction and operation of the Project in all material respects; and b) to provide periodic reports in a format agreed with the EPFI (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third party experts, that I) document compliance with the ESMPs and Equator Principles AP (where applicable), and ii) provide representation of compliance with relevant local, state and host country environmental and social laws, regulations and permits; and c) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan. Where a client is not in compliance with its environmental and social covenants, the EPFI will work with the client on remedial actions to bring the Project back into compliance to the extent feasible. If the client fails to re-establish compliance within an agreed grace period, the EPFI reserves the right to exercise remedies, as considered appropriate.
Principle 9	**Independent Monitoring and Reporting** ***Project Finance*** To assess Project compliance with the Equator Principles and ensure ongoing monitoring and reporting after Financial Close and over the life of the loan, the EPFI will, for all Category A and, as appropriate, Category B Projects, require the appointment of an Independent Environmental and Social Consultant, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI. ***Project-Related Corporate Loans*** For Projects where an Independent Review is required under Principle 7, the EPFI will require the appointment of an Independent Environmental and Social Consultant after Financial Close, or require that the client retain qualified and experienced external experts to verify its monitoring information which would be shared with the EPFI.
Principle 10	**EPFIs Reporting** ***Client Reporting Requirements*** The following client reporting requirements are in addition to the disclosure requirements in Principle 5.

	For all Category A and, as appropriate, Category B Projects: • The client will ensure that, at a minimum, a summary of the ESIA is accessible and available online4. • The client will publicly report GHG emission levels (combined Scope 1 and Scope 2 Emissions) during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually. Refer to Annex A for detailed requirements on GHG emissions reporting. ***EPFI Reporting Requirements*** The EPFI will report publicly, at least annually, on transactions that have reached Financial Close and on its Equator Principles implementation processes and experience, taking into account appropriate confidentiality considerations. The EPFI will report according to the minimum reporting requirements detailed in Annex B.

Equator Principle number 2 details that projects that are classified in Category A or B are required to complete an Environmental and Social Impact Assessment (ESIA) as part of the assessment documentation. This process determines the environmental and social impacts and risks (including labour, health and safety) of a proposed project in its area of influence. The Assessment should also propose mitigation and management measures relevant and appropriate to the nature and scale of the proposed project.

The Categorisation of the project with regards to the Equator Principles' project categories will be "**Category A**" in line with the categorisation of lending institutions such as World Bank, IFC and the OECD Common Approach.

IFC Sector Specific Guidance

The World Bank Group International Finance Corporation (IFC), Environmental, Health and Safety (EHS) General Guidelines of April 2007 superseded the World Bank Handbook issue of 1998. In addition, a number of sector specific guidelines have been revised or are undergoing peer review.

The updated EHS Guidelines serve as a technical reference source to support the implementation of the IFC Performance Standards, particularly in those aspects related to Performance Standard 3: Pollution Prevention & Abatement, as well as certain aspects of occupational and community health and safety. The IFC updated its Performance and Sustainability Standards from 1st January 2012, which are applicable to this project.

The World Bank Environmental Safeguard Policies

The World Bank (WB) has 10-major Social and Environmental Safeguards that are applicable in development projects. The World Bank considers these policies to be the cornerstone of its

support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for bank and borrowers in the identification, preparation, and implementation of programmes and projects. The potentially relevant policies include:

- Environmental Assessment; and
- Natural Habitat;

Where relevant, these policies would be considered within the assessment of the impacts of the project.

3.4 International Treaties and Conventions

The proposed Project must comply with the environmental requirements of the following international and regional treaties and conventions to which the UAE is a signatory:

- Convention on Biological Diversity, 1992 (Ratified 1999);
- Vienna Convention for the Protection of the Ozone Layer, 1985 (Ratified 1989);
- Montreal Protocol on Substances that deplete the Ozone Layer, 1989 and amendments to 1999. (Ratified 1989);
- Stockholm Convention on Persistent Organic Pollutants (POPs), 2001 (Ratified 2002);
- Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal, Basel, 1989 (Ratified 1990) Amendment 2004;
- United Nations Framework Convention on Climate Change (1992) (Ratified 1995) and Kyoto Protocol to the UN Framework on Climate Change (1997) (Ratified 2005); and

3.5 National Standards

The following sections provide the environmental standards as set out by Dubai Municipality and which are therefore applicable to the proposed project. Where standards for environmental subjects are absent WHO guidelines have also been quoted in order to provide a basis for the evaluation of the baseline and potential impacts.

3.5.1 Air Quality Standards

The DM Local Order 61/91 for environment Protection prescribes specific standards for ambient air quality conditions, as summarised in the following table.

Table 3-2: Ambient Air Quality Standards (μ g/m3 unless otherwise specified)

Parameter	FEA			DM EPSS Env Standards		
	µg/Nm³ unless stated			µg/Nm3 unless stated		
	1 hour	24 hour	Annual	1 hour	24 hour	Annual
PM_{10}	-	70	-	300	150	-
Nitrogen Dioxide	400	150	-	150 ppb	60 ppb	-
Sulphur Dioxide	350	150	60	130 ppb	-	20 ppb12 months
Ozone	200	120 8hr	-	-	-	-
Hydrogen Fluoride	-	-	-	-	3.5 ppb	0.6 ppb 3 month
Carbon Monoxide	30 mg/m3	10 mg/m3 (8hr)	-	-	-	-
TSP	-	230	90	-	-	-
Lead	-	-	1	-	-	-

3.5.2 Water Discharge Standards

During construction of the proposed project, dewatering of the groundwater may be required in order to build basements of administration buildings, below ground car parks, or for underground utility excavations. Any dewatered effluent will be discharged to temporary evaporation ponds in the desert. Effluents will not be discharged to land.

3.5.3 Soil and Groundwater

The proposed project will be required to comply with the DM standards for prevention of land contamination. The following table summarises the Land Contamination Indicator Levels as provided in DM – Information Bulletin; May 2003. Environmental Standards and Allowable Limits of Pollutants on Land, Water and Air environment.

Additionally, the use of the Dutch standards is common practice for the analysis of soils and groundwater, as they are viewed as international best practice. Where contaminants are found to exceed 'action' levels, this is considered to be a case of soil contamination, which is dangerous to the health of humans and the natural environment. Such a level of contamination will require remediation, appropriate treatment and disposal.

Table 3-3 Soil and Groundwater Guidelines

Contaminant	Dutch Soil (mg/kg dry weight)		DM Soil mg/kg	Dutch Groundwater (µg/l)	
	optimum	action		optimum	action
Arsenic	29	55	50	10	60
Barium	200	625	400	50	625
Cadmium	0.8	12	5	0.4	6
Chromium (total)	100	380	250	1	30
Cobalt	20	240	-	20	100
Copper	36	190	100	15	75
Lead	85	530	200	15	75
Manganese	-	-	700	-	-
Nickel	35	210	-	15	75
Mercury	0.3	10	2	0.05	0.3
Zinc	140	720	500	65	800
Benzene	0.05	2	-	0.2	30
Selenium	-	-	2	-	-
Pesticides	-	-	2	-	-
Fluoride	-	-	500	-	-
Phenol	-	-	1	-	-
Benzene	-	-	1	-	-
BTEX(total)	-	-	100	-	-
Chlorinated Hydrocarbons (total)	-	-	1	-	-
Polychlorinated Biphenyls	-	-	0.5	-	-
TPH <C9	-	-	1,000	-	-
TPH>C9	-	-	10,000	-	-
Cyanide (free)	-	-	10	-	-

The optimum and action values identified in the Dutch guidelines are based on a "Standard Soil" type, which contains 10% Organic matter and 25% Luteum (Clay). The proposed sites soil

characteristics are dominated by sand. Therefore, organic matter and luteum content will be significantly lower than the 'standard soil' constituent.

Consequently, the "Standard Soil" values have been converted to values that are applicable to the actual soil being tested for the proposed project. A soil type correction formula, provided in the Soil Remediation Circular 2009 has been used to adjust the Optimum and Action values. An assumption of 2% organic matter and 5% luteum content has been made, which from past experience working in Dubai exhibits typical soil values for the desert/coastal plain. The following 'adjusted' Dutch Soil Intervention values therefore apply to this assessment.

Table 3-4 Adjusted Dutch Soil Intervention Values

Adjusted Intervention Values		
	Optimum	**Action**
Arsenic	15.0	28.5
Barium	39.0	122.0
Cadmium	0.4	6.1
Chromium	9.3	35.2
Cobalt	4.5	53.7
Copper	15.0	79.4
Lead	50.1	312.2
Mercury	0.2	6.6
Nickel	10.1	60.3
Zinc	50.2	258.1

3.5.4 Noise

The proposed project will be required to comply with the noise limits as specified by the Dubai Municipality and UAE Federal Environment Agency Guidelines for residential, commercial and industrial areas, as well as during construction works. The following tables therefore provide a summary of the maximum allowable noise limits based on activity and zoning.

DM Local Order No. 61/91 Chapter VII instructs that "*it shall be the duty of the occupier of any premises or persons operating mechanical devices or drivers of public or private transportation vehicles, houses owners or supervisors of worshipping place, to adopt the best practicable means of ensuring that the emission of noise from those premises does not exceed a reasonable level*". These levels are set as:

- Does not exceed 55dB during 7am to 8pm
- Does not exceed 45 dB during 8pm to 7am.

In accordance with FEA noise limits the following table summarises the environmental noise requirements in regard to community noise, which is broken down by the sensitivity of the community and the time of day. Source: Technical Guideline No. 9 – Requirements for the Reduction of Construction and Demolition Noise. April 2011 by DM-EPSS.

Table 3-5 FEA - Free Field External Noise Limits for Community noise

Receptor Areas	Allowable Limits of Noise (dbA)	
	Day (7am -8 pm)	Evening (8pm-7am)
Residential Areas with Light Traffic	40-50	30-40
Residential Areas in Downtown	45-55	35-45
Residential Areas with some workshops & Commercial or near highways	50-60	40-50
Commercial areas & Downtown	55-65	45-55
Industrial Areas (Heavy Industry)	60-70	50-60

The Environment Department also imposes restrictions on working hours and therefore any noisy activities undertaken outside of these hours should be approved. The working hours are: Saturday to Thursday 7am to 7pm, and no work allowed on Friday and Public holidays.

Further to the above, it is outlined that incremental allowable noise level may be implemented when the background noise level is higher than the allowable limit measured due to traffic and other activities under direction from EPSS. However these shall not exceed the following sliding scale:

Table 3-6 Allowable incremental increase, in noisy areas

Measured Average Noise Level (dbA)	Allowable Increase (dbA)
50 to 60	5
61 to 65	4
66 to 70	3
71 to 75	2
76 to 80	1
81 and higher	0

With regards to noise levels and exposure in workplaces, the Administrative Order No. 211/91 Article 42 lists the maximum number of hours of exposure for a worker.

Table 3-7 Maximum hours of exposure to noise, for workers

Sound Level in decibels	Max Hours of Exposure per employee per day
87<db<90	8
90<db<92	6
92<db<95	4
95<db<97	3
97<db<100	2
100<db<102	1.5
102<db<105	1
105<db<110	0.5
110<db<115	0.25
115<db	0

3.5.5 Waste Minimisation

Technical Guideline No. 6 – DM EPSS April 2011

The TG No. 6 emphasises the environmental aspects with regards to waste reduction, recycling and re-use. The guidelines describe the practise and methods that should be implemented to minimise waste generation, which include:

- Waste reduction at the source by either substituting raw materials with less toxic materials, altering process controls to increase efficiency, ensuring good housekeeping and training of personnel in such issues as waste segregation, storage and handling.
- Waste re-use and Recycling, either on site or by third parties
- Treatment of Waste in order to reduce toxicity, risk of contamination and appropriate disposal.

The guidelines also includes a waste classification and handling scheme:

- Wastewater: Domestic Wastewater, Industrial Wastewater, Hazardous Wastewater, and Grey Wastewater.
- Solid Wastes from commercial, industrial and commercial activities.
- Other wastes: oils, chemicals and other such wastes that can be recycled following treatment.

Finally, the guideline specifies that all wastes must be handled by companies, which are licensed with the Department of Economic Development (DED). These companies are only authorized to collect the wastes generated in Dubai for recycling & recovery purpose. Any exportation of these materials is prohibited unless approved in writing by the Director of the DM Environment Department.

The FEA Article 10 stipulates further requirements for hazardous wastes that relate to generation, management, handling, storage, transportation, reuse, recycling, treatment, recovery and disposal. The regulations describes the procedures that should be implemented by any organisation with generates hazardous wastes, and this includes:

- Waste reduction
- Auditing of quality and quantities generated
- Treatment at source
- Designated storage areas with appropriated labelling and containment techniques
- Implementing a disposal program to minimise the duration of on-site storage.
- Ensuring that hazardous wastes are transported and handled by authorised carriers.

4 PROJECT DESCRIPTION

4.1 Type of Project

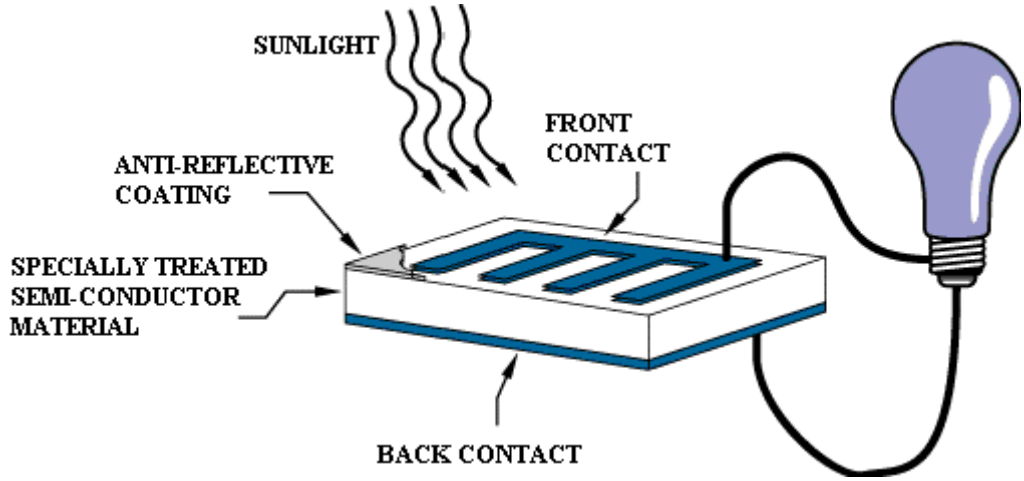
The proposed 200MW PV Plant will consist of numerous PV cells within modules arranged in arrays upon mounting structures in a specific arrangement across the proposed site. The arrays will be designed to ensure the most efficient alignment to capture solar rays. The electricity generation process using photovoltaic technology and the main components required for this process are briefly described below.

PV Cell: A single photovoltaic cell comprises a specially treated semi-conductor material (typically silicon) with separate front and back electrical contacts (positive and negative) that are connected to form a circuit. Upon exposure to light, electrons are knocked from the semi-conductor material under the photoelectric effect and are transported around the electrical contacts to form a direct current.

PV Module: A module is the assembly of multiple PV cells mounted into a module. Modules are designed to supply electricity at a certain voltage. PV modules typically are covered with an anti-reflective glass or coating to protect the solar cells and to limit the amount of reflected sunlight.

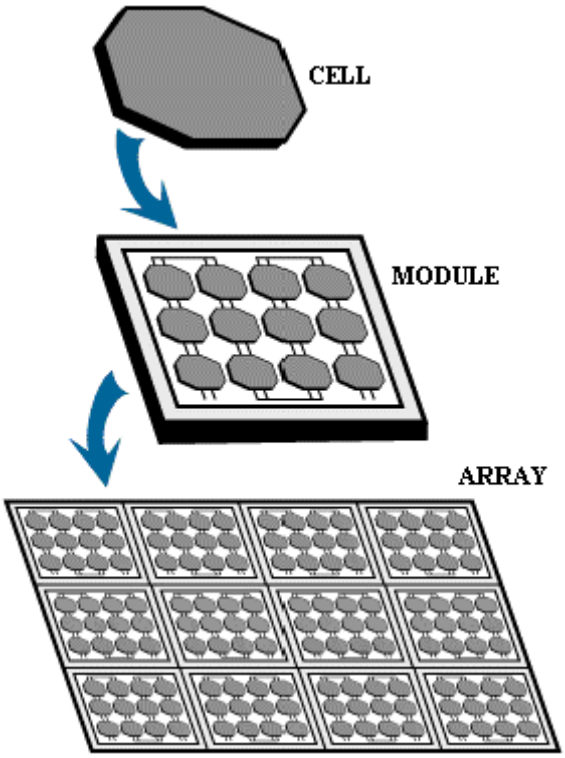
PV Array: Multiple modules wired together form an array, or 'panel' that are then arranged to form the solar plant. The arrays will be mounted onto a structure to provide the optimum solar alignment.

Figure 4-1 PV Cell



Source: NASA, How Do PhotoVoltaics Work (2002)

Figure 4-2 PV Cell, Module and Array



The characteristics of the PV technology is summarised below for the Phase 2 200MW Plant:

1. Module: First Solar Series 4™ modules produced by FIRST SOLAR or similar. Limited Warranty for 10 years. 25 Year linear output power warranty. Up to 8% more energy than conventional crystalline silicone solar modules.

4.2 Project Location

The 200MW Phase 2 development of the Sheikh Mohammed Bin Rashid Al Maktoum Solar Park is located in an area called Saih Al-Dahal in Dubai, UAE, approximately 23km southeast from Al Maktoum International Airport (DWC). The closest highway is the Emirates Road (E611) and this runs along the Eastern edge of DWC airport. To the north-west of the site is a DEWA corridor and another corridor for Emirates Power Lines. These two corridors run parallel to the north-western border of the Solar Park.

Figure 4-3 Solar Park Boundary Outlined in Red, (Phase 2 outlined in Yellow)

Satellite Image Source: Google Earth

The site area for the whole Solar Park is 40,453,752.84m^2 (4045.4 hectares). The actual plot for Phase 2 (the area in yellow) is measured at 3660m in length and 1224m in width and has an area of approximately 448 hectares. The purple line above Solar Park, is the afore mentioned corridor for the Emirates Power Lines

The approximate centre co-ordinates of Phase 2 are provided in the following table and its relative location in the Emirate of Dubai is illustrated in figure 2-1.

Table 4-1 Project Site Centre Coordinate of the Proposed Development

Northing	Easting
24° 45'30"N	55° 22'59"E

Figure 4-4 Project Location (Solar Park boundary outlined In red)

Satellite Image Source: Google Earth

4.2.1 Identified Receptors within 5km Radius

Based on previous studies, satellite images (from Google Earth), and site visits, a number of receptors within an approximate 5km radius of the proposed site have been identified. These are listed below and their locations are presented in the following satellite image.

N.B. These receptors have been present in their respective locations since before construction work for the Solar park began, with the distances between the nearest site boundary and the Receptor.

Table 4-2 Potential Sensitive Receptors with 5km Radius

Reference	Reference Name	Approximate Distance from Phase 2	Time of Presence*
A	13MW Solar PV Plant	50 metres	2 years (since 2013)
B	Small Settlement with Mosque	250 metres	4 Years (since 2011)
C	Falcon Majlis	580 metres	9 Years (since 2006)
D	Agricultural Development #1	1km	4 Years (since 2011)
E	Agricultural Development #2	2.8km	11 Years (since 2004)

*The length of presence is calculated by using Google Earth, however there is a gap between 2006 and 2011 where the maps are not updated. Therefore reference points C and E could have been present for longer.

Figure 4-5: Location Of Receptors within 5km radius of Phase 2 site

A – 13MW Solar PV site

B - Small Settlement with Mosque

C – Falcon Majlis

D - Agricultural Development – North

E - Agricultural Development – South

4.2.2 Project Overview

The 200MW Solar PV plant will be comprised of rows of solar arrays. These arrays or 'panels' will be placed side by side in long rows

The arrays will be attached to a metal frame, with shallow foundations into the underlying soils. The structures are made of trestles and cross bars, designed for serving the entire lifetime of the facility

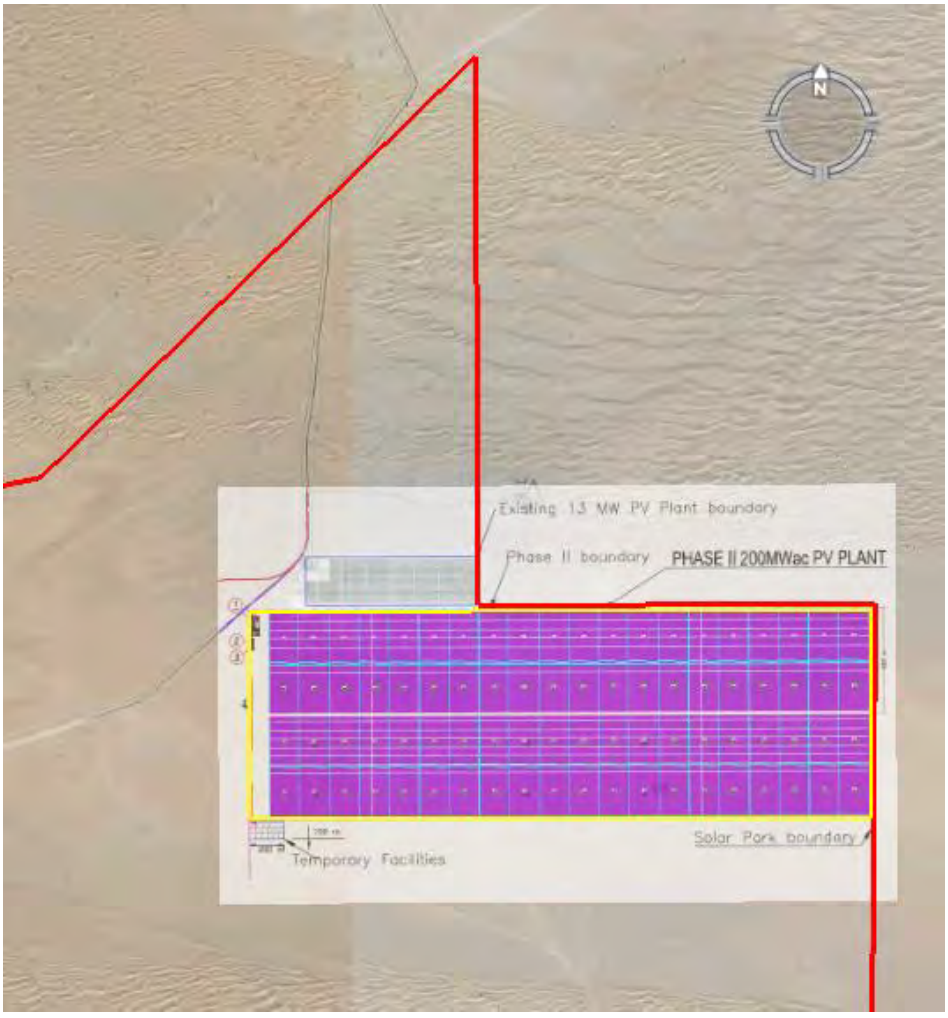
2. Module Power: 110WV
3. Number of modules: 2,362,640
4. Module size: 1200mm/600mm/6,8mm (Landscape orientation)
5. Alignment direction: South
6. Slope of arrays: 20º
7. The assembly structure will be fixed, not moving during the day to maximize the panel's exposure to the sun.

The proposed assembly structure to hold the modules and fixes them to the ground is the T40-FA model designed by TSK and guarantees that the support is appropriate for up to 6 rows of thin film modules.

The main characteristics of the assembly structure are cited below:

1. 6 meter length supporting substructure composed by 3 trestles (made of 3 legs and a crossbar), 3 crossbeams and accessories for assembling. Includes the elements to join the structures to create the rows.
2. Structure weight: ~150 kg.
3. Fixed to ground by 6 supports (one front and one rear support every 2 m) by anchoring spikes driven into the ground properly.
4. Capable to withstand winds of up to 180 km/h.
5. Adequate for a location up to 2.000 meters height.

Figure 4-6 Proposed Phase 2 layout within boundary of 1GW Solar Park



Potable Water Supply

Construction

During construction, potable water will be supplied via tanker to be undertaken by the separate contractors/sub-contractors. These water supply practices will continue for the duration of the project, unless infrastructure is developed to supply the area.

Operation

Sub-Station and Grid Connection

In order to keep a high reliability of the plant, and a high availability of the system, two power transformers, from the manufacturer ABB, will be installed in the Plant Substation. The

cooling design system of the transformers will be ONAN/ONAF in order to get a better electrical behaviour and lower loses during the normal work of the PV Plant.

The control system will manage the transformers bays in order to keep the transformers in the optimum point of working and lower the losses.

Access Roads and Internal Road Network

Construction

A hard standing access road for access to the operational site already exists. This extends from outside of the Solar Park, past Phase 1 and 2 and stops in the middle of the site.

Operation

A number of paved internal roads will also be constructed around the PV array structures for access within Phase 2 itself.

Water Requirements

Construction

For the water supply for the Plant Construction phase, portable systems will be used, unless a private contract with the water and electricity companies is achieved in the site. The requirements for the freshwater to be used are specified below;

1. Fresh water (TDS < 1500 mg/L);
2. Water must be free of floating oil or other immiscible liquids, floating debris, excessive turbidity, and objectionable odors;
3. Tap water with low mineral content (total hardness <75 mg/L) or deionized water;
4. Calcium should not exceed: 75 mg/ml;
5. Chlorides should not exceed 250 mg/ml;
6. Water electrical conductivity should be < 250 mS/cm.

Operation

Potable water will be used for human consumption and domestic use at the project site. It will also be used to clean the PV arrays. Approximately 90,000 litres of water will be required for each cleaning session of the 200MW plant. This cleaning will occur 1.5 to 2 times a month, or 16-24 times per year. At the most, this results in annual water consumption of 2.16 million litres of water for just the cleaning process.

Waste Management

Construction

During the Construction phase, any waste that is produced will be segregated and disposed of in accordance with the applicable requirements and legislation. Any hazardous waste will be collected and stored separately away from regular waste. This waste will the be disposed of by a properly licensed waste vendor.

Operation

Small quantities of waste will be generated during the operational phase, as a result of administration and domestic activities. These wastes will be stored on site and removed by a licensed waste services company on a routine basis.

Wastewater Management

Construction & Operation

Water used for the cleaning of the solar arrays will evaporate.

An applicable and suitable wastewater handling system to avoid any pollution to the environment will be installed. Therefore, new water treatment facilities will be installed directly on the Site to neutralize and detoxify the particular wastewater or an external waste handling system can be installed and set, including storage facilities, transportation study and required equipment, disposal in official and sufficient treatment plant.

The waste water system will be designed as a zero liquid discharged design system, i.e. there will be no liquid discharge off-site. The wastewater will be collected, separated from solid proportions and stored in buried tanks. The tanks and the collected solid proportions will be emptied and evacuated by suitable trucks. The disposal of the water and solid proportions will be made according to all applicable codes and standards.

Rainwater or any other surface water flows from areas which are likely to be contaminated in any way will also be handled as waste water for treatment;

Clean rainwater from areas without contamination collected in drainage ditches and suitable drainage systems for the whole area will be subject to a study and a detailed design report. TSK will seek the Employer's and the authorities' approval for the system including the correct options for the discharge.

The wastewater streams must be separated according to their origin and/or type of pollution and the type of treatment that they require. Thus, as a minimum requirement, the following separate treatment system has to be provided:

1. **Oily waste water treatment system:** All oily waste water has to be treated at least by oil separators and further adequate and suitable treatment steps; and
1. **Industrial and process waste water system:** All industrial and process related waste water such as from (chemical) cleaning, from rinsing and flushing processes, from chemical storage areas and workshops etc. must be treated in an applicable wastewater treatment plant, that is adequately and suitably designed to neutralize and detoxify the particular wastewater.
2. **Sanitary waste water system**: The wastewater from toilets, tea kitchens, showers and related rooms will be properly collected in a storage tank with separation of solid proportions and liquid proportions. The solid waste and the wastewater will be collected by a truck as required and disposed of according to all applicable codes and standards and local and national guidelines of environmental protection.

There will be very little waste water generated, due to the size of the site and the number of employees that will be present there at any one time. Therefore, odour from the wastewater is not likely to have any impact.

Power Supply

Construction

Power supplies during construction are likely to be provided by the use of generators (semi permanent and mobile), which will be positioned around the site.

Operation

During site operations, power provided to the site will be sourced from the local power grid.

Fuel Requirements

Construction

Fuel requirements for vehicles and generators are currently unknown and are dependant on the requirement of electrical energy and construction plant during this period. Diesel is anticipated to be the main fuel for this use and will be used for the operation of the generators and construction plant. Where required, fuel will be the responsibility of the relevant contractor/sub-contractor as required.

Operation

Fuel usage during operations will be minimal, with the only expected demand for fuel coming from the cleaning vehicles and other Operational Management owned vehicles.

Fuel for these vehicles will either be stored on site and the tank will have a scheduled refuelling programme, or vehicles will refuel offsite a refuelling station.

Chemical and Hazardous Material Storage

Construction

Chemical and hazardous material storage during the construction phase will be undertaken by the relevant contractor/sub-contractor responsible for such chemicals or hazardous materials. Requirements for the storage of such substances will be set out in the site specific, standalone Construction Environmental Management Plan (CEMP) to be produced by each contractor, prior to the commencement of construction works at the site.

Operation

Chemical and hazardous material storage during the operations phase will be undertaken by the Operations Management. The volume of chemicals and hazardous materials is expected to be low.

4.3 Duration and Schedule of Activities

Construction Time Plan

This time plan is taken from the technical proposal. Although the original Phase 2 project was for a 100MW project, the timescales for the construction should not change too much, as the construction methods used for the site will be very simple and straightforward

200 MW DEWA PV PLANT, Phase 2		
Task Name	**Start Date**	**Finish Date**
Contract	Mon 01/06/15	Mon 02/05/16
LNTP	Mon 01/06/15	Mon 01/06/15
NTP	Mon 02/05/16	Mon 02/05/16
Engineering	**Mon 01/06/15**	**Sat 26/12/15**
Supplies	**Mon 28/12/15**	**Mon 28/11/16**
Procurement Negotiations	Mon 28/12/15	Tue 29/03/16
PV Plant	Mon 02/05/16	Fri 30/09/16
Substations	Mon 02/05/16	Mon 28/11/16
Job Site Installations	**Mon 02/05/16**	**Wed 18/05/16**

Civil Works	**Thu 19/05/16**	**Wed 14/12/16**
PV Plant	Thu 19/05/16	Wed 14/12/16
Substations & OHL Works	Thu 19/05/16	Wed 09/11/16
Mechanical Works	**Mon 15/08/16**	**Thu 02/02/17**
Structures	Mon 15/08/16	Mon 30/01/17
Photovoltaic Modules	Sat 17/09/16	Thu 02/02/17
Substations & UGL Works	Mon 19/09/16	Thu 12/01/17
Electrical Works	**Sat 24/09/16**	**Sat 11/02/17**
PV Plant	Sat 01/10/16	Sat 11/02/17
Substations & UGL Works	**Sat 24/09/16**	**Sat 31/12/16**
Various	Mon 02/01/17	Sat 11/02/17
Start-Up & Commisioning	**Mon 02/01/17**	**Sat 01/04/17**

Heavy Machinery and Man Power Requirements

Heavy plant and machinery will be required for use on site during the construction period. Such plant and machinery will be managed by the individual contractor/sub-contractors working in their specific areas of the site. Heavy plant and machinery is likely to include the use of cranes, excavators, lorries, dump trucks, bulldozers, concrete pumps, generators, piling equipment, pavers and graders amongst other equipment.

The majority of manpower on the site will likely be supplied by subcontractors brought to the site for specific works. Manpower will be limited, as the construction process will mostly involve just the assembly and installation of prefabricated parts.

Building materials

Other then specialist equipment procured for the solar array construction, basic construction materials will be sourced locally where possible and will include:

- Ready mix concrete;
- Building blocks;
- Steel beams;
- Pipework and metalworking;
- Cladding materials;
- Road kerbs and pavers; and
- Asphalt and road base.

High quality finishing products may be imported if they are not available locally.

Construction Logistics

Contractors will be responsible for the daily transport of workers to and from the site. This is likely to include buses, vans, pickups and cars, which will temporarily increase traffic on the local roads during the construction period.

5 BASELINE ENVIRONMENTAL CONDITIONS

5.1 Meteorology

5.1.1 Climate, Weather and Meteorology

Climate and meteorology are variable dynamics and are influenced by numerous factors including geography, topography, and proximity to water bodies amongst various other aspects. Climate refers to the widespread and long-term atmospheric conditions of a region, whereas weather refers to the atmospheric conditions of a location at a particular point in time and includes temperature, wind speed, wind direction, atmospheric pressure and humidity. Meteorology is the science of climate and weather.

In general the climate of the United Arab Emirates is characterised by extreme heat during the daytimes with abrupt temperature decreases at night (particularly in more central regions of the country). Very little rainfall typically occurs, with humidity variable due to the presence of a sub-tropical high-pressure system. The geographical proportions of the UAE allows for differences in climate dependant on location. For example, areas near the coast experience higher levels of humidity throughout the year than those inland, and mountainous regions tend to be cooler for the same time of year.

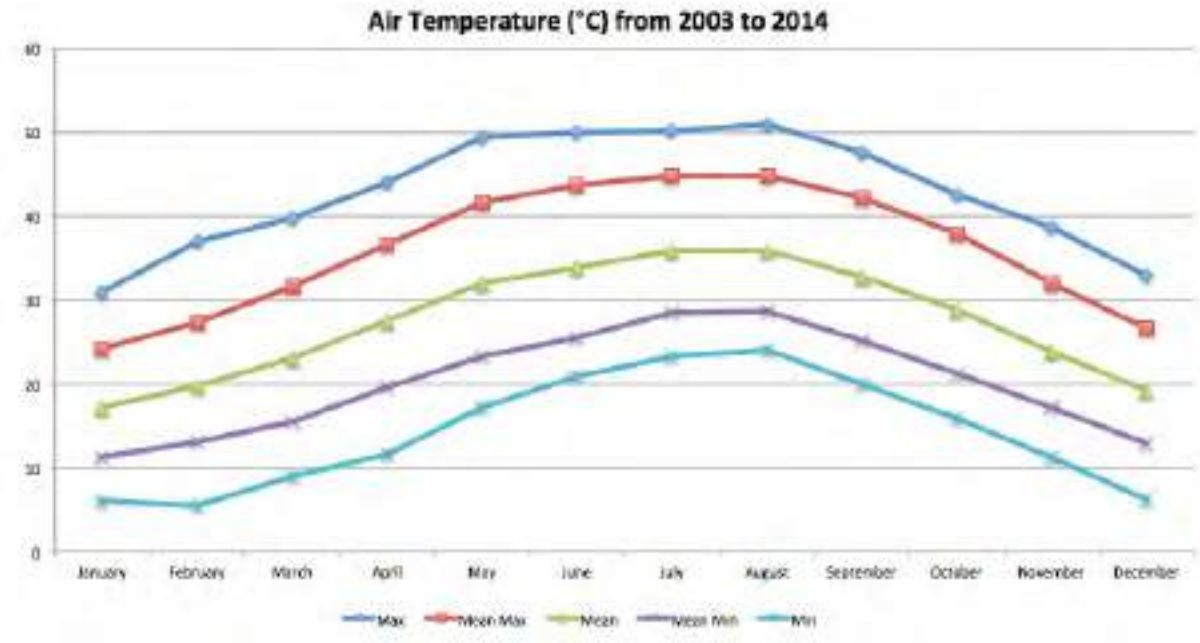
The UAE is located within the arid subtropical desert belt, and its climate is influenced by the Asian Monsoon Cycle. Therefore the Arabian Gulf Region generally experiences a distinct winter (December to March) and summer (May to September) season, with shorter transitional periods. The weather in Dubai includes extreme high daytime temperatures that can peak above 50 degrees Celsius (50˚C) in summer periods (typically in July and August), with minimum daily temperatures being generally no lower than 11 ˚C throughout the year.

The following table summarises the mean monthly temperatures in Dubai between 2003-2014. Source: National Centre of Meteorolgy & Seismology, Saih Al Salem station.

Table 5-1 Dubai Average Monthly Temperature Statistics (2003 to 2014)

MONTHS	Temperature in °C				
	Max	Mean Max	Mean	Mean Min	Min
January	30.9	24.2	17.2	11.3	6.1
February	37	27.4	19.7	13	5.5
March	39.7	31.6	23	15.5	9.1
April	44.1	36.6	27.6	19.6	11.6
May	49.4	41.6	31.9	23.2	17.2
June	49.9	43.7	33.9	25.5	20.9
July	50.2	44.7	35.8	28.5	23.2
August	50.9	44.7	35.9	28.7	24
September	47.6	42.1	32.8	25.2	19.9
October	42.6	38	28.9	21.2	15.8
November	38.6	31.9	23.9	17.1	11.2
December	33	26.6	19.2	12.9	6.3

Figure 5-1 Dubai Average Monthly Temperature Statistics (2003 to 2014)



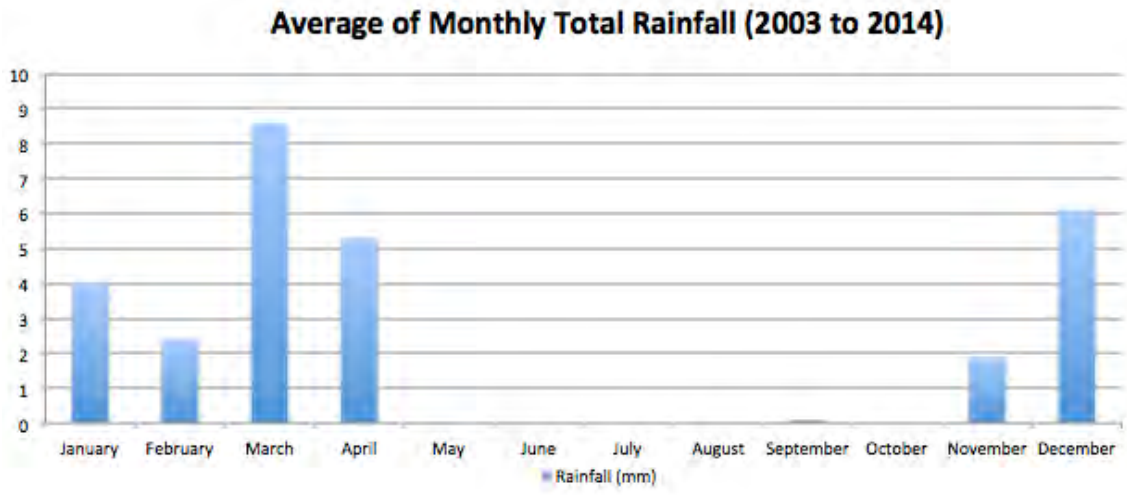
Precipitation occurs rarely and is variable in intensity/volume but is more frequent during the winter months (December to April), with the number of wet days (+0.1mm precipitation) at approximately 6 days per year. The following table summarises the precipitation data in Dubai between 2003 and 2014. During this period, the monthly rainfall ranged from 0mm to 8.6 mm. It should also be noted that individual rainfall events could be quite high, for example November in 2012 experienced 42.2mm during a 24Hr period.

Given the low precipitation rates, Dubai experiences mostly clear skies throughout the years with an average of 8 hours of sunshine per day in the winter months, and 11 hours per day during the summer months.

Table 5-2 Dubai Average of Monthly Total Rainfall (2003 to 2014)

MONTHS	Rainfall in mm
January	4
February	2.4
March	8.6
April	5.3
May	0
June	0
July	0
August	0
September	0.1
October	0
November	1.9
December	6.1

Figure 5-2 Dubai Average of Monthly Total Rainfall (mm) (2003 to 2014)

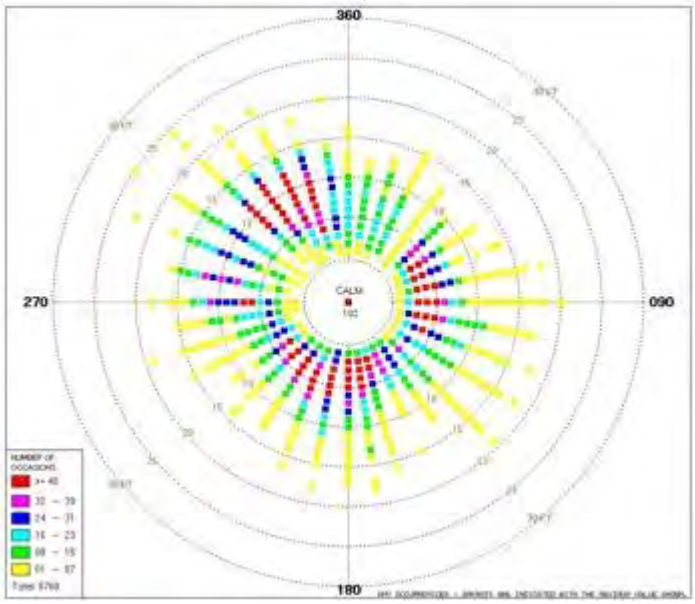


Winds across the Arabian Gulf are predominantly from the northwest. Winds can reach up to 39 knots during the winter Shamal season (December to March), but are more commonly up to 22 to 23 knots. The average wind speed throughout the year is significantly lower, at around 7knots.

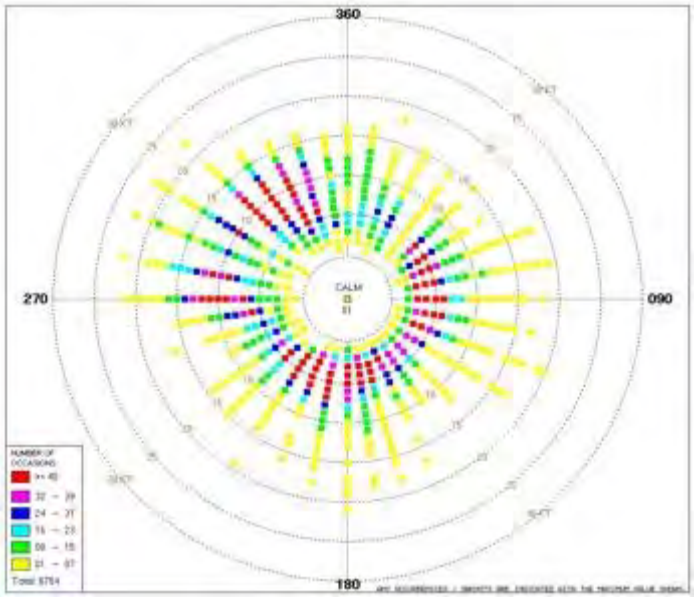
Wind conditions for the years 2010 – 2012 have been provided in the wind roses below.

Figure 5-3 Wind Rose Data

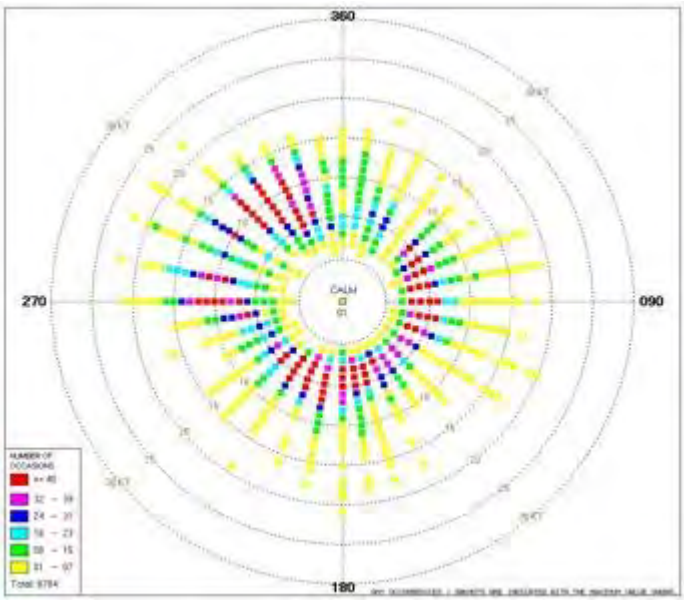
Annual Wind Rose 2010



Annual Wind Rose 2011



Annual Wind Rose 2012



It is clear to see from the 3 years of data that the wind conditions are inherently similar throughout these periods, with wind directions and strength changing constantly throughout the day in response to the sea breeze created by the heating and cooling of the landmass. Wind speeds are in the range of 5 knots more often than not, whilst rarely being greater than 15 knots.

The Shamal

Translated from the Arabic meaning 'north', the Shamal's are strong north-northwesterly winds unique to the Gulf region, and have varying characteristics according to their seasonal occurrence. The summer Shamal (May to September) is a more or less continuous wind that blows throughout the day and weakens at night, and frequently causes duststorms. It is influenced by the secondary low pressure centre forming south of the Zagros mountains in Iran. The 40-day Shamal occurs between late May and early July and is the most defined period of the summer Shamal.

The winter Shamal follows the cold front associated with a depression moving south-eastwards from the Mediterranean which brings strong cold northerly winds down from the mountains of Iran. Thunderstorms may form along the cold front, but if no rain falls then severe sandstorms may occur, which can reduce visibility to a few meters.

Between the winter and summer Shamal periods, the winds become bimodal cyclonic in March, followed by a moderate easterly spring phase in April thus leading to the transitional May phase, where wind directions are complex but velocities are usually high. There is again a transitional phase in September and October where the winds are variable but of low energy.

Storm events from easterly directions (75° to 135°) are also reasonably common, they are referred to as 'Kaus' events, the easterly storms tend to be less intense than Shamals.

5.2 Topography, Soil, Geology/Hydrogeology

5.2.1 Topography

The location of the 200MW PV Phase 2 site is approximately 42.5km from the Dubai Gulf coastline in an area of the desert that is relatively flat and lies at approximately 111m MSL. Although the Topographical studies indicate that the elevation of the site varies from approximately 111m – 124m MSL, the land appears to be flat and any elevations in occur very gradually on site.

To the south of the site, there is an extended area of sand dunes with peaks and troughs. At its closest, these sand dunes are approximately 800 metres away from the southern boundary of the Phase 2 site and although does not pose any construction problems for the Phase 2 development, it will be problematic as the Solar Park progresses and expands further South.

The following images show examples of the topography at the site.

Plate 5-1 Flat and graded land, found throughout the entire site

This plate shows how the land is flat and is ready for grading and construction to begin. This view is looking to the South of the site.

Plate 5-2 Sand Dune Formation to the south of the site

In one particular location on the site there were 3 clearly defined separate colourations of sand. The likely cause was attributed to a small water tank was present at this location and a water truck that was observed to be dumping water.

Plate 5-3 Different coloured sand, with the small water tank visible

Plate 5-4 Red coloured sand, with water marks visible as a resulting of dumping.

5.2.2 Geology/Hydrogeology

The UAE and Dubai lie over the Arabian Platform, which is a Phanerozoic terrain consisting of clastic, calcareous and evaporitic successions dipping gently eastward away from the Arabian Shield. These sedimentary layers crop out as relatively flat lying beds of sandstone, siltstone, limestone, and evaporites (salt deposits), and were deposited on the underlying Precambrian base. Therefore the age of the platform is from the pre-Cambrian to the modern era.

The youngest deposits in the region include coral limestone and unconsolidated sand, silt, gravel, and sabkha, which have accumulated in well known areas such as the Rub al Khali and An Nafud, and have filled dried-up lake beds and wadis, and fringed the coastlines.

The coastal plains of the UAE rise gently towards the Hajar mountains, consisting of granular soils (sands, gravels, boulders and cobbles), overlying tertiary limestone, shale, siltstone and sandstone) or crystalline rocks.

Figure 5-4 Map of the Arabian Peninsula

Source: The Emirates A Natural History and Saudi Geological Survey

Geology

Generally, the geomorphology is uniform and dominated by eolian deposits.

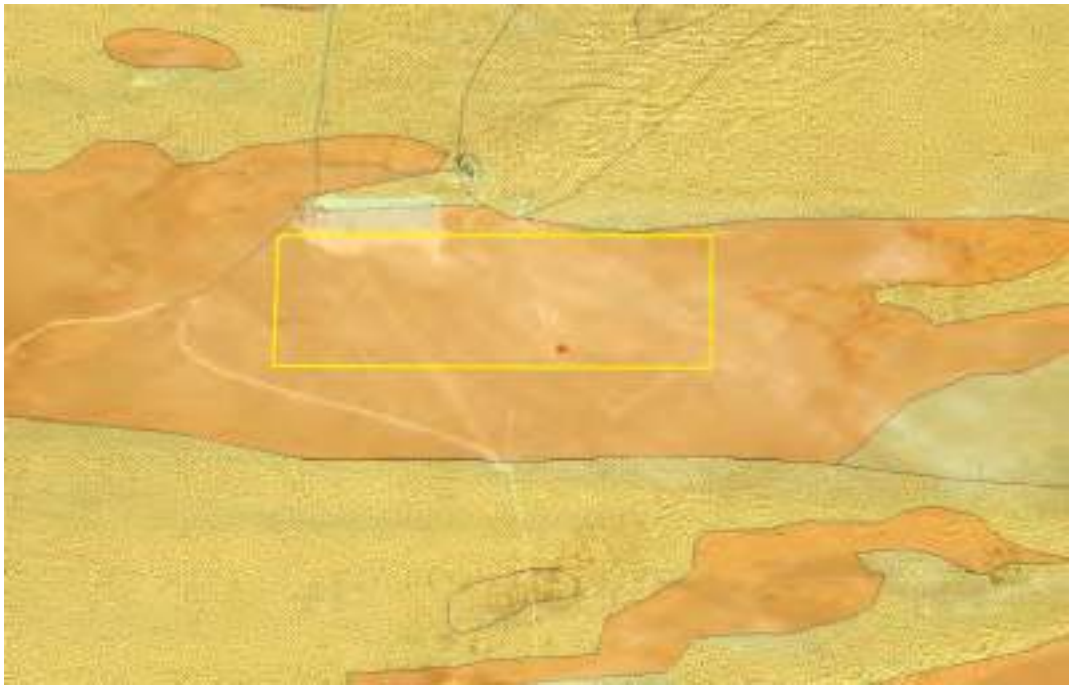
Features of specific geological significance (e.g. outcropping rocks or designated geological features) were not identified during the site visits and are not present in any areas of the site. This is consistent with the local region which is characterised by a low lying sand dunes and sand/gravel interdunal plain.

The main shallow geological characteristics encountered during the site visit were:

- Sand/gravel

Figure 5-7 is taken from the Abu Dhabi Environment Agency's Enviroportal site. It shows that the predominant land classification is Eolian Deposits, in the proposed area for the 200MW PV Phase 2 development (which is inside the yellow box, within figure 5-7).

Figure 5-5 Geological map of the UAE



Map Image Source: EAD Enviroportal

Site Soil Condition

The site for the actual construction of the 200MW PV Phase is completely greenfield and has not had a previous land use. For this reason the soil should be free of contaminants.

Historical satellite imagery (source: Google Earth) dating back to March 2004 in the following Figure shows that no activity had previously been undertaken on the site, with the exception of moving vehicles and a water tank being installed towards the southern boundary of the site. Therefore the soils in these areas can be considered natural to the site.

It is common for large open sites to be subject to instance of fly-tipping. However, only one instance was found off site, beyond the southern boundary.

Plate 5-5 Fly-Tip Waste (off-site)

Soil Contamination

Soil samples were collected for laboratory analysis from four (4) locations on 31st January 2015. The locations of the soil sampling sites were chosen to provide results representative of the entire site, as the it is largely unused, however one sample (S3 was taken from the brown coloured area of soil on the satellite image below. The soil sampling locations are shown in the Figure below.

Figure 5-6 Soil Sample Locations

Satellite Image Source: Google Earth

After scraping off the top layer of soil, the samples were collected at a depth of 0.1m and taken to a DM accredited laboratory for analysis. The samples were analysed for a suite of Heavy Metals and Total Petroleum Hydrocarbons (TPH).

Typed field notes and photos of the sampling are presented below, along with analytical results.

Table 5-3 Soil Sampling DLTM Coordinates

Sampling Location	Location Description	DLTM	Sampling Photographs
S-1	Flat sandy area, some car activity along the northern boundary of the site.	N - 2739913.352 E - 503210.115	
S-2	Flat sandy area, close to sand dune ranges	N – 2738689.276 E – 503210.115	
S-3	Area of darker coloured sand, possibly saturation as water truck was seen spraying water there.	N – 2738873.017 E – 505656.234	
S-4	Area of potential hydrocarbon contamination identified on east boundary of site	N – 2739913.352 E – 506869.281	

Table 5-4 Soil Analysis: Field Notes and Observations

ID	Sample Depth	Moisture	Odour	Staining	Soil Composition
S-1	0.1m	Dry to the touch, however condensate did form once sealed inside the sampling container	None	None	Crusty surface above compacted sand
S-2	0.1m				Crusty surface above compacted, dark sand
S-3	0.1m				Semi-compacted surface above dark, compact sand beneath.
S-4	0.1m				Crusty compact sand with organic soil and salt crystal surface.

Table 5-5 Soil Analysis: Results (heavy metals in mg/Kg)

Parameter	S-1	S-2	S-3	S-4	DM Soil Standards mg/kg
Arsenic	<1.0	<1.0	<1.0	<1.0	50
Barium	85.7	36.6	21.3	60.6	400
Cadmium	<2.0	<2.0	<2.0	<2.0	5
Chromium	22.2	26.7	18.7	24.8	250
Cobalt	2.8	2.3	<2.0	2.6	-
Copper	8.5	7.4	9.4	7.3	100
Lead	<1.0	<1.0	<1.0	<1.0	200
Mercury	<1.0	<1.0	<1.0	<1.0	2
Nickel	38.1	41.9	40.2	34.6	-
Zinc	12.9	10.5	12.1	10	500
TPH Gasoline Range <C9	<2.0	<2.0	<2.0	<2.0	<C9: 1,000
TPH Diesel Range C10 – C28	<20	<20	<20	<20	>C9: **10,000**
TPH Heavy Fraction C29 – C40	<0.50	<0.50	<0.50	<0.50	

The results of the soil laboratory analysis as displayed above indicate that all soil samples are within the DM Land Contamination standards for all heavy metals and TPH. The full set of the soil analysis results from the laboratory is presented in Appendix E. These results indicate uncontaminated soils at all the locations sampled and for the wider site.

5.2.3 Soil Receptors

The table below outlines the identified receptors in relation to Soil as well as the determined sensitivity of those receptors.

Table 5-6 Soil – Sensitivity of Receptors

Receptor	Sensitivity	Justification
Soil	Low	The soil is not contaminated and therefore has a

		high tolerance for environmental contaminants
Groundwater	Low	Groundwater is unlikely to be found on the site due the site being at approximately 110 meters above sea level.

Site Hydrogeology

The natural hydrology in the coastal regions of the UAE is characterised by relatively shallow groundwater, with the levels fluctuating in accordance to the change in tide regime. Fluctuations are also likely to occur due to construction activity in the vicinity of areas where groundwater dewatering occurs.

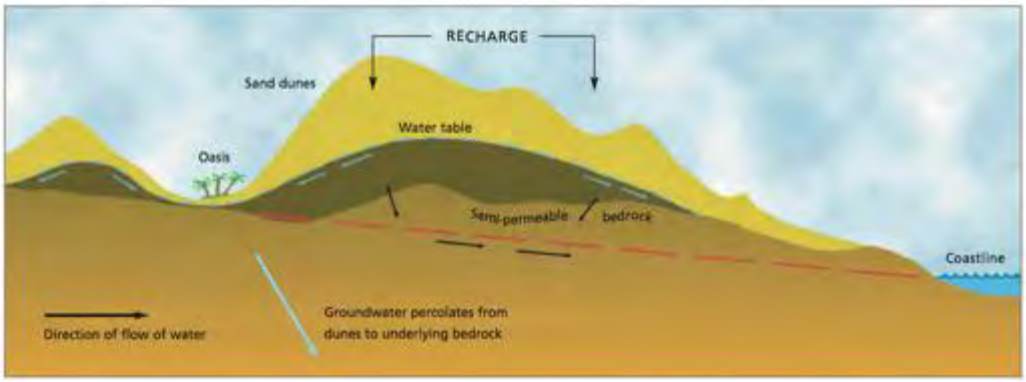
Given that the site is within 42Km from the coastline, it is expected that the groundwater will not be encountered close to the soil surface. Conversely, in areas of accumulation of dune sands, the depth to the water table will typically increase. As there will be no interaction with groundwater at the construction or operational phase of the project, groundwater sampling was not conducted.

Previous studies undertaken by 5 Capitals have indicated that the groundwater quality and chemistry closer to the coastline in Dubai is strongly linked to the seawater and is typically concentrated brine (hyper saline). With an equally high concentration of calcium sulphate, due to leaching from the sedimentary layers. The groundwater quality analysis results from such studies indicate that the concentration of sulphate and chloride in coastal groundwater can reach up to 5.79 g/l and 30.92 g/l. Finally, if agricultural activity is high, then leaching of nitrates will occur, resulting in elevated levels of nitrate in the groundwater.

Within the inland areas of the UAE, where groundwater is typically less brackish (according to WHO drinking water standards, water is considered brackish when the TDS concentration exceed 1,600mg/L) and the recharge is driven by rain events, the groundwater systems have been tapped for agricultural activities. However, due to levels of abstraction being higher than those of their replenishment, the depletion of groundwater and deterioration of the water quality continues to occur. In 1999 the World Bank reported that 70% of non-renewable groundwater sources in the UAE were being extracted[1]. The high levels of abstraction have consequently led to an increase in salinity of the groundwater, particularly in coastal regions where the saltwater intrusion from the sea is prevalent.

[1] Non-Renewable Groundwater Resources. UNESCO, 2006

Figure 5-7 Groundwater recharge in the UAE



5.2.4 Receptors

The table below outlines the identified receptors in relation to geology and hydrogeology as well as the determined sensitivity of those receptors.

Table 5-7 Soil and Groundwater - Receptor Sensitivity

Receptor	Sensitivity	Justification
Soil	**Low**	The site soils are uncontaminated at the areas sampled. Other areas of the site are similar with those areas sampled, with little other areas of previous activity or surface disturbance to soils.
Groundwater	**Low**	The groundwater at the site is likely to be heavily influenced by interactions with the sea and the quality will typically exhibit a highly concentrated mixture of salts. As such, the shallow groundwater is not suitable for human or animal consumption. There are no signs that the groundwater in the local area is being used as a water resource and it is unlikely to be contaminated.

5.3 Air Quality

Air quality and in particular instances of poor air quality are influenced less by geographical considerations and more by proximity to pollution sources (e.g. cities, highways and industrial facilities). Typically the air shed closer to a pollution source is of poorer quality than at a greater distance (due to pollutant dispersion), however air quality at a particular location is typically dependant on the current weather conditions and in particular wind direction and wind strength; which has a large effect on the direction and dispersion of the pollutant plume.

Ambient Air Quality Monitoring was undertaken at two locations in the proposed site between 31st January and 1st February 2015 using a continuous high volume mass sampler for NO_2, SO_2, O_3, $PM_{2.5}$ and PM_{10}. BTEX was also measured for a short-term grab sample of 150 litres of ambient air, on each day of monitoring. Equipment to continuously monitor wind speed, wind direction, humidity, and temperature was also installed for the duration of monitoring period.

The monitoring locations were chosen to provide ambient concentrations at the both extents of the site, given that the length of the area is approximately 3 km long. The monitoring station A-1 (for NO_2, SO_2, O_3, $PM_{2.5}$, PM_{10} and BTEX grab sample) was sited in the western extent of the site close to Al Qudra Street (650m away) and 650m from the existing 13MW PV Plant, as shown in the plate below.

The placement of this monitoring station was chosen with the primary intention of identifing the current influence of exterior vehicular emissions upon the proposed site (from Al Qudra Street). Vehicular emissions are known to be a major source of air pollution for a number of pollutants including Particulate Matter, NO_2, CO and O_3 (ozone is not a direct emission, but is formed due to reactions between NO_x and VOC's in the presence of UV light). SO_2 is not a major emissions source as a result of vehicle use (except from Diesel operating vehicles), but is typically a factor as a result of industrial processes operating on diesel or higher sulphur content fuel.

Monitoring station A-2 (also for NO_2, SO_2, O_3, $PM_{2.5}$, PM_{10} and BTEX grab sample), was positioned in the eastern extent of the site, as shown in the plate below. This location was chosen to represent a background concentration of air pollution, as it is more than 3km away from any roads or other point/diffuse air emission sources.

Table 5-8 Air Quality Monitoring Locations

Site ID	Decimal Degrees		DLTM	
	Northing	Easting	Northing	Easting
A-1	24°45'31.08"N	55°22'3.51"E	2739318.143	503470.165
A-2	24°45'30.37"N	55°23'57.13"E	2739297.465	506662

Plate 5-6 Ambient Air Quality Monitoring Station

Satellite Image Source: Google Earth

Plate 5-7 Ambient Air Quality Monitoring Station A-1

Plate 5-8 Ambient Air Quality Monitoring Station A-2

Ambient Air Quality Monitoring Results

The full average results of the ambient air quality monitoring survey are provided in the following tables for stations A-1 and A-2 respectively. The results reveal several notable trends in terms of ambient pollutant concentrations, which have likely human and meteorological influences. These trends are discussed following the results tables.

In addition to the average results, separate summary tables have been prepared to show the max, min and average data from each monitoring station. The full set of the air monitoring results from the laboratory is presented in Appendix D. The subcontractors Registration and Calibration Certificates, are included in Appendix F.

Table 5-9 24 Hour Average Ambient Air Quality Monitoring Results

NO2	SO2	O3	BTEX	PM2.5	PM10	Temp'	Humidity	Wind Direction	Wind Speed
µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	µg/m³	°C	%	°	kph
Detection Limit									
50	50	0.1	5	1	1	-	-	-	-
UAE Federal Law Limits									
150	150	120 (8hr)	-	-	150	-	-	-	-
09:25Hrs , 31st January 2015 – 09:25Hrs, 1st February 2015									
A1									
109	<50	31.9	<5	15	31	23.2	54.6	183.4	8.7
A2									
63	<50	30.8	<5	17	42	22.8	40.6	191.0	8.7

Nitrogen Dioxide - NO_2

The results of the nitrogen dioxide monitoring indicate the ambient NO_2 concentrations for both locations are well within the UAE federal standards. There is a difference between the concentrations of NO_2 at the two sites, with station A-1 yielding a higher concentration. This is possibly due to the influence of gaseous vehicular emissions, from the vehicles passing on Al Qudra road.

Sulphur Dioxide - SO_2

Concentrations of SO_2 at both monitoring locations are less than detectable and are below the UAE Federal Law Limits, which is set at 150µg/m³ for a 24 hour average period.

Ozone – O_3

Ozone is not a direct emission, but is formed by a secondary photochemical reaction between NO_x and VOC's in the presence of UV light. As such, ambient ozone levels tend to be elevated in close proximity to sources of both these pollutants (e.g. combustion processes). Ambient concentration of ozone also tend to be higher during the summer due to longer exposure of UV light, or during the middle of the day where the sun is at its strongest.

With respect to the monitoring results from the site, both locations measured similar concentrations of ozone (i.e. 32 & 31µg/m³ respectively), which were below the UAE Federal Law Limits, which are set at 120µg/m³.

Benzene, Toluene, Ethyl-Benzene and Xylene – BTEX

Grab sample concentrations of BTEX were recorded to be below the detectable limit of 20 µg/m³ and suggests low levels of BTEX exposure at the site location.

Particulates

The results of the continuous particulate monitoring for $PM_{2.5}$ and PM_{10} at both monitoring locations are well below the UAE Federal limits.

In a sandy and dusty terrestrial environment, it is generally considered that periods of high wind will 'kick up' dust and sand, which will consequently increase ambient concentrations.

5.3.1 Receptors

Existing receptors within 5km of the proposed development have been identified in Chapter 4.2. Those that are susceptible to air quality impacts have been presented in the Table below.

Table 5-10 Air Quality Receptors with 5km Radius

Receptor Name	Approximate Distance from Phase 2
13MW Solar PV Plant	50 metres
Small Settlement with Mosque	250 metres
Falcon Majlis	580 metres

Table 5-11 Air Quality - Receptors sensitivity

Receptor	Sensitivity	Justification
Air Quality (Gaseous)	**Low**	The existing air shed is non-degraded and background levels for all regulated pollutants are well within the UAE FEA and DM EPSS Ambient Maximum Allowable concentrations.
Air Quality (Particulate)	**Low**	The existing air shed is non-degraded and background levels of particulates are generally low.
Falcon Majlis	**Medium**	The villa complex is used to train Falcons and given its within 1km of the site, could be affected by the development.
Small Setlement with Mosque	**High**	The area is of unknown use, however from satellite imagery and from the field investigation, a small mosque was present on the site.
13MW Solar PV Plant	**Medium**	This operating solar power plant is only likely to be affected by the dust created by site activity.

5.4 Noise & Vibration

5.4.1 Noise

In order to determine the baseline noise level at the 200MW PV Phase 2 site, an environmental noise survey was undertaken in the day and night time of Saturday 31st January 2015.

During the surveys, noise measurements were taken at five (5) locations to monitor the existing noise levels and to determine the influence of existing noise sources. The monitoring was undertaken using a Cirrus CR: 811C sound level meter (S/N D20575FD), which has been UKAS calibrated at an accredited laboratory in the UK (Calibration cert' in Appendix G). The noise meter was secured to a tripod at a height of 1.5m and the microphone sensor directed towards the main source of noise (e.g. road). Directing the microphone sensor towards the main source of noise allows for an assessment of the worst-case noise impacts acting at the monitoring location. Measurements were taken for 5-minute periods at each monitoring station using a broadband noise setting, within a measurement range of 30-100 dB.

The details of the noise monitoring survey are recorded in the following table, with the locations illustrated on the satellite image Figure 5-4. The locations were chosen to represent typical noise levels for the current site along its boundaries and at key locations within the proposed development.

Table 5-12 Noise Monitoring DLTM Coordinates

Monitoring Station	Location	DLTM
N-1	N-1 is positioned in the north western corner of the PV Phase 2 site. This position is closest to the road and the already operating 13MW section of the Solar Park.	N - 2739913.352
		E - 503210.115
N-2	N-2 is positioned in the south west corner of the PV Phase 2 site. This has no fixed source of noise close by.	N – 2738689.276
		E – 503210.115
N-3	N-3 is positioned in the north eastern corner of the PV Phase 2 site. This has no fixed source of noise close by.	N – 2739282.031
		E – 505097.231
N-4	N-4 is positioned in the south east corner of the PV Phase 2 site. This has no fixed source of noise close by and is also the furthest away from the other fixed noise sources.	N – 2739913.352
		E – 506869.281
N-5	N-5 is positioned in the approximate centre of the PV Phase 2 site. This represents the general noise level of the area, which is not significantly influenced by one particular noise source.	N – 273868.276
		E – 506869.281

The following Plate shows the typical noise meter arrangement, (photograph taken during the daytime monitoring survey at location N-3). The noise meter is securely attached to the tripod at a height of 1.5m and is located away from reflective surfaces. A wind muffler is placed over the microphone to minimise the recording of background wind and air turbulence.

Plate 5-9 Noise Monitor Arrangement (Site N-4)

Figure 5-8 Noise Monitoring Locations

Satellite Image Source: Google Earth

The results of the noise monitoring survey are presented below. This includes observations regarding the background noises that were observed during this period.

Table 5-13 Baseline Noise Monitoring Results (Day time)

Noise station	Date & Time	Measured Noise Level						Field Observations*
		Leq dB(A)	Lmax dB(A)	Lpeak db(C)	L10 dB(A)	L50 dB(A)	L90 dB(A)	
N1	31/01/2015 11:13	47.00	61.70	101.00	50.60	42.80	36.20	1. Constant and noticeable hum from Phase 1 PV plant transformers. 2. Aero[lane landing at DWC (approach from Southwest) 3. Wind 2-3m/s
N2	31/01/2015 11:30	46.60	59.70	100.20	50.80	40.90	28.40	1. Small construction works for temporary structure, approx. 850m away, northwest 2. Aeroplane landing at DWC (approach from northeast) 3. Wind 2-3m/s
N3	31/01/2015 12:21	44.50	57.30	94.00	48.00	38.80	30.00	4. Water truck approaches but steers away 5. Wind 2-3m/s
N4	31/01/2015 12:45	38.40	55.00	92.30	41.80	34.70	29.20	1. Distant reversing vehicle indicator 2. Wind 2-3m/s
N5	31/01/2015 13:19	42.00	59.00	96.80	45.70	38.80	32.10	3. Private vehicle drive by 4. Wind 2-3m/s

*Throughout all the noise monitoring periods, there was a calm wind constantly blowing, which otherwise would have made the results far quieter.

Table 5-14 Baseline Noise Monitoring Results (Night time)

Noise station	Date & Time	Measured Noise Level						Field Observations
		Leq dB(A)	Lmax dB(A)	Lpeak db(C)	L10 dB(A)	L50 dB(A)	L90 dB(A)	
N-1	31/01/2015 22:12	38.00	54.60	80.50	40.10	36.00	33.40	5. Constant and noticeable hum from Phase 1 PV plant transformers 6. Very calm
N-2	31/01/2015 22:25	31.30	51.30	79.00	32.90	28.50	26.70	7. Water truck approaches but steers away 8. Very calm

When comparing the daytime noise monitoring results against the DM standards with the lowest boundaries for noise ('Residential Area with Light Traffic'), all monitored locations were below the permissible standard requirements. However, two locations were above the

permissible standard for night time noise at Residential Areas, these were N1 and N2. Therefore these were the only two locations that required further monitoring at night. When these were monitored, they did not exceed the DM noise levels for night time activity.

Leq (A) Results

The Leq (A) measurement represents the average noise level observed over a time period and is the representative noise level to compare to the Dubai Municipality standards.

The baseline noise monitoring results as presented above indicate that noise levels of the equivalent continuous sound pressure level (Leq (A)) vary between 31 and 47dB(A) during day time and night time monitoring periods, dependant on monitoring location.

Monitoring location N–4 is observed to receive the lowest magnitude of noise in comparison to the five monitoring locations (38.4dB(A)). This monitoring station is the furthest most location away from the key noise sources in the project area (i.e. existing PV plant transformers and road).

Monitoring location N-1 was the noisiest location in the daytime at 47.0 dB(A) and receives noise from the road and operational Phase 1 PV plant transformers. During the night time survey, N-1 also received the highest noise of the locations monitored at 38.0 dB(A). Please note that this level of noise is consistent with free field noise levels with no significant noise sources.

The noise survey suggests that current noise levels at both day and night are low around the project boundary due to the remoteness of the site and the lack of activity in the local area.

In regard to the most stringent DM noise standards ('Residential Areas with Light Traffic') of 50 dB (daytime) and 40 dB (night time), these standards are not being exceeded during the respective daytime or night time periods.

L90(A) Results

The L90(A) noise measurement represents the noise level, which was observed or exceeded for the 90% of the time under consideration. As such, the L90(A) measurement is generally taken to provide a representative background noise level as it filters out low magnitude noise episodes that are observed during a monitoring period. In the case of the 200MW PV Phase 2 project, the day time L90(A) noise range is between 28.4 and 36.2 dB(A) dependant on location and proximity to existing noise sources and between. The night time range is between 33.4 and 26.7 dB(A).

L10(A) Results

The L10 (A) noise measurement can provide a suitable baseline in locations where traffic is the main source of noise. The L10(A) measurement represents the noise level, which is observed or exceeded for 10% of any given monitoring period. E.g. during the 5 minute monitoring period the ambient noise level range was at or above 41 – 50 dB(A) for 1 minute, depending on the location of the monitoring station.

The Dubai Municipality noise standards are set in relation to the measured average noise level, or Leq(A) noise level. Considering the proposed activities at the future site, the site should be designated in the 'Commercial Area & Downtown' bracket for noise regulation, which has allowable noise limits are up to 65 dB(A) in the daytime and up to 55 dB(A) in the night time.

The results of the monitoring indicate that none of the areas monitored exceeded the specified noise standards, during both daytime and night time monitoring. It is apparent that those areas closest to the existing 13MW plant and the road are most likely to receive the highest noise levels. The existing 13MW Solar PV plant is in close proximity to the proposed site and although has a distinctive low level hum form its transformers, it is barely audible.

5.4.2 Vibration

In terms of a baseline a specific baseline assessmrnt was not undertaken. However, no noticeable vibrations were encountered during the site visits. There are also no existing facilities in the vicinity of the proposed site that are likely to result in vibrations.

Localised vibrations may be encountered adjacent to the highways/roads, however these tend to dissipate rapidly over distance. In regards to possible road vibrations, a distance of approximately 600m from the main road will ensure that vibrations are not recognised.

5.4.3 Noise and Vibration Receptors

The table below outlines the identified receptors in relation to noise and vibration as well as the determined sensitivity of those receptors.

Table 5-15 Noise and Vibration – Sensitivity of Receptors

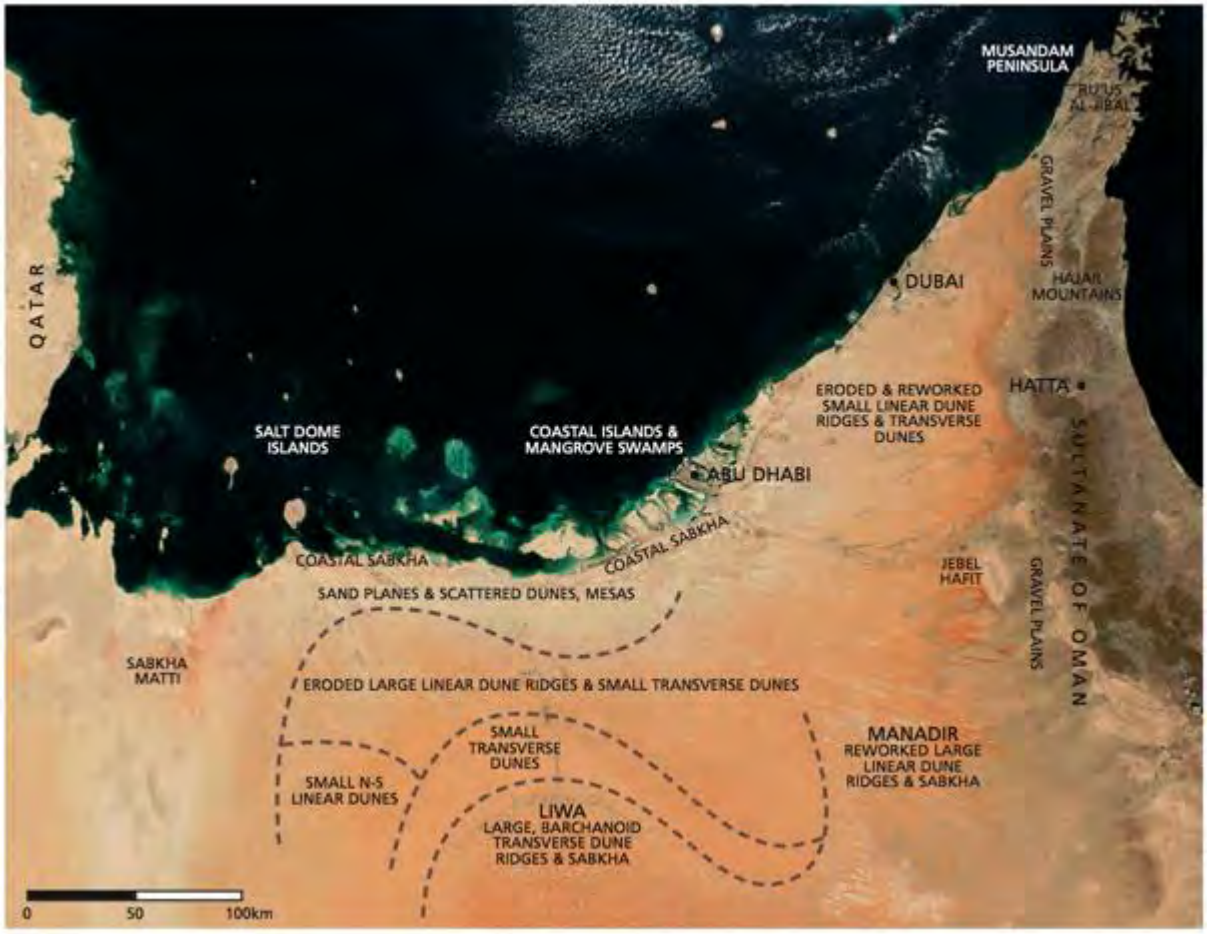
Receptor	Sensitivity	Justification
Noise at site boundaries	Low	The site boundaries do not have any development in close proximity which will be affected by noise and/or vibration
Falcon Majlis & Small Settlement with Mosque	High	The mosque is within audible range of the site, as isthe Falcon Majlis

5.5 Terrestrial Ecology

An ecological survey was conducted over the entire site through the course of several visits by vehicle and on foot, in order to collect baseline flora and fauna information. The vegetation, fauna and any visible animal tracks were examined. The survey represented a snapshot of the ecological status of the site in January 2015. Although, a full seasonal variation account could not be provided at the time of survey, the remoteness and lack of features, would likely limit the availability of suitable habitat for supporting a wider range of fauna during the year.

The following figure depicts the broad categorisation of desert environments identified in the UAE.

Figure 5-9 Distribution of environments in the UAE



5.5.1 Project Site

The project site is an empty plot of land, with a 13MW PV plant to the north and a very small road to the west. As previously identified, the site is a mostly greenfield site, and has approximately 10 separate routes of vehicle tracks.

Habitats

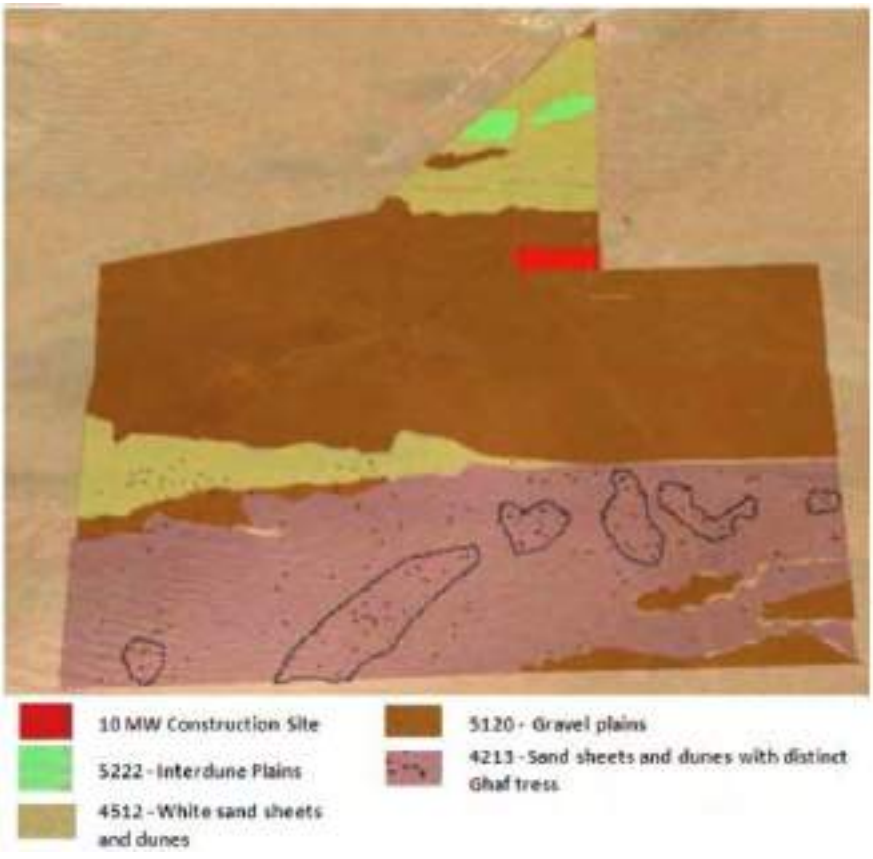
The habitats identified on site are broadly categorised, with rapid transition zones. Generally, the plant communities identified on the site follow the geomorphological features of the site.

The geomorphological structure of the main habitats including typical plant species, are described in accordance with Brown & Boer 2004.

- 5120 – Gravel plains with dwarf shrubs and grasses Sand sheets and dunes;

The following satellite image portrays an approximate distribution of the identified habitat types. As is obvious from the image, the site of the proposed 200MW site, is entirely gravel plains

Figure 5-10 Habitat Map



Habitat Map Source: EIA for 1GW PV Plant

Flora

Within the actual site, there was only one observation of vegetation on site. The *Heliotropium bacciferum* plant.

Several Ghaf trees (*Prosopis cineraria)* were identified outside of the site boundary, predominantly to the south of the site.

Table 5-16 Recorded Flora

Species Name	
Heliotropium bacciferum – on site	
Prosopis cineraria (Ghaf) – off site	

Fauna

During the site visits there were no observations of any fauna. Camel footprints were idenitifed, however these are very likely to be domesticated camels and come from a nearby farm.

The Arabian Oryx (*Oryx leucoryx*) is classified as endangered on the IUCN Red List. This species has previously been identified within the Solar Park boundary and recorded in the EIA Report for 1000MW Solar PV Power Plant (completed by Dome HSE Consulting).

Feeding Stations

Three (3) feeding stations (FS's) have been identified within the 1GW Solar Park, and none of them are within the 200MW project site. However, their presence could potentially lead to a minor disruption to the wildlife in the area. These feeding stations are most likely used by the big mammals in the area, namely the Arabian Oryx and Mountain Antelope. Below is an image of the Solar Park, with the 3 FS's identified.

Feeding Station 1

Feeding Station 2

Feeding Station 3

These feeding stations are all at least 1km away from the proposed 200MW PV site. There is already an impact to the potential movements of mammals in the area, due to the existence of the 13MW PV plant, which would have prevented certain paths being taken by the animals between the different feeding stations.

5.5.2 Receptors

The table below outlines the identified receptors in relation to flora and fauna as well as the determined sensitivity of those receptors.

Table 5-17 Terrestrial Ecology - Receptors sensitivity

Receptor	Sensitivity	Justification

Flora	**Low**	The site was extremely bare and devoid of flora species. The species that were present on the site were not of particular importance.
Fauna	**Low**	Arabian Oryx and Gazelle are known to be in he area, however given the proximity to an already functioning PV plant and there being no feeding stations within 1km of the site, there is likely to be very little activity from wildlife.

5.6 Socio-economic

5.6.1 Regional

This section provides an overview of the socio-economic environment of Dubai and, where necessary, of the wider UAE. This is compiled from data released by the Government of Dubai, via the Dubai Statistics Centre, and from international sources such as the World Bank and United Nations.

The sensitivity of key receptors to impacts arising from the development is also detailed in the table shown at the end of this section.

Population and Demographics

The resident population of Dubai was estimated in 2013 to stand at 2,213,845 individuals. Of these, 1,677,330 were male and 536,515 female, representing approximately 75% and 25% respectively of the total population. The higher proportion of males to females (approximately 3:1) is attributed to the large expatriate working population, a majority of which are males who are not accompanying their family members. The large expatriate population is reflected in the high net migration rate (UAE wide statistics) of 15.04 migrants per 1,000 population (2013 estimate), placing the UAE 6th globally relation to this indicator.

In comparison with the estimated wider UAE population of approximately 5,470,000, Dubai represents approximately 40% of the national population, forming the largest urban area. Native Emiratis comprise approximately 13% of the wider UAE population, with Dubai understood to be slightly below this at approximately 11%. The national population growth rate for 2013 is estimated at 2.87%, with historical trends suggesting that the rate for Dubai will be slightly ahead of this (3.5 – 4.5%).

Looking beyond the resident population, a total of approximately 3.28 million individuals are understood to be active in Dubai on an average day. This includes residents, those in employment in Dubai and residing outside the Emirate, and an average of the number of businessmen, tourists, sailors, and those transiting the Emirate (excluding those who do not enter UAE territory). A significant portion of this figure arises due to the cost differential between accommodation in Dubai and the Emirates to its North.

Economy & Employment

Official figures from 2011 place the Gross Domestic Product of Dubai at approximately AED 305 billion (or approximately US$85billion). This corresponds to a per capita figure of approximately 152,250 AED (or approximately US$41,500). National GDP growth rates for 2012 have been estimated at 3.9%. Target growth for the Emirate in 2013 is 4.5%.

As of 2011, 79.5% of the Emirate's resident population of working age is judged to be economically active, with the remaining percentage largely comprised of students, housewives, and a small percentage classed as unable to work. Official unemployment in the Emirate (2011) is calculated to be 0.4%, with figures of 0.2% and 2.3% for male and females respectively. This figure largely represents the native population, with the link between residency and employment suppressing the overall level of unemployment by removing those out of work out of the resident population.

Official inflation figures for 2011 place the level of general Inflation rate at 0.52%, with a major influencing factor being a decline in the cost of the "Housing, water, electricity, gas and other fuels" category (-3.3%), which carries the highest weighting in the inflation calculations. It is highly likely that the trend in this indicator has been reversed in 2012, and continues into positive territory in 2013. When coupled with wider inflationary pressures, particularly in relation to Food and Education, it is highly likely that there has been a corresponding increase in the overall inflation rate through 2012 and 2013. Unofficial estimates place 2012 inflation at 1.4% (UAE wide) and estimate a figure of 1.6% for 2013. This remains significantly lower than the regional average.

Social Development & Infrastructure

Using the United Nations Development Index as a guide, the UAE as a whole ranks as "High" for overall Human Development, with an index score of 0.818 (2012). This compares favourably with the regional average (0.652), and places the UAE within the global top 50 at an overall level. Within the key indicator areas of Health & Education, the UAE index ranks as "High" and "Medium" respectively.

5.6.2 Project Site

The project site is located directly in a desert area, known as Saih Al Dahal. The area is very remote and there is little development in the local area.

Population statistics from the DM Population Bulletin 2013 indicate that Saih Al Dahal has a residential population of 2. The population of the surrounding local areas in regard to the proposed development site are tabulated below and have been extracted from the Dubai Municipality 'Population Bulletin, Emirate of Dubai, 2012':

Table 5-18 Local Area: Population Statistics

Community Name	Population	% of Population in Dubai
Al Fagaa	327	0.01
Saih Al Salam	1,171	0.05
Al Hathmah	0	0.00
Ghadeer Barashy	2	-
Al O'Shoosh	0	0.00
Hefair	0	0.00

Source: DM, Dubai Population Bulletin, 2013

Commercial and Industrial

Other than the existing 13MW PV plant, there are no other facilities of commercial or industrial importance near the project site.

5.6.3 Socio-Economics Receptors

The table below outlines the identified receptors in relation to socio-economics as well as the determined sensitivity of those receptors.

Table 5-19 Socio-economic – Sensitivity of Receptors

Receptor	Sensitivity	Justification
Employment	Low	The structure of the labour market in the UAE provides a relatively flexible labour supply coupled with limited unemployment.
Local / Regional Economy	Low	Dubai has a booming economy and in comparison to many other regional cities.
Local Residents (Off-Site)	High	The local area has a total population of 2. Depending on their proximity to the site, they may experience negative impacts during the construction phase.

5.7 Transportation

5.7.1 Project Site Road Network

At the time of the field surveys, the proposed 200MW Phase 2 PV site had no official roads directly to it, and there was only one road that went within 30 metres of it. The road is not officially titled and has no designated highway code. The adjacent cycle path to the road is known as the Al Qudra cycle path and as such, this track is sometimes referred to as the Al Qudra Road. It runs from the north, through the northern boundary of the Solar Park in a southerly direction, and then turns to the west, where it continues and runs through the western boundary of the Solar Park. In the figure below, the blue line shows the route of this road, through the site. After the passing the Phase 2 site, the road then goes from a paved surface to an unpaved, sand track.

Figure 5-11 Route of Unmarked Road (Al Qudra Road)

No official routes exist within the proposed site. There are various semi-compacted sand tracks going across the site, from North to South. The roads seem to be used frequently as a number of vehicles were observed whilst conducting the fieldwork. The most frequently used tracks two main points of interception; one being at the northwest corner of the site near the road and the other point is at the small settlement with a Mosque. The site itself is not fenced off and is therefore not secure, allowing anyone to drive over the site. There is also a semi-compacted sand track that runs along the northern site boundary, in front of the existing 13MW PV plant. These tracks are shown in the following Plates.

Plate 5-10 Compacted Sandy Track 1 (on-site)

Plate 5-11 Compacted Sandy Track 2 (on-site)

5.7.2 Public Transport

Public transport links are not currently available to any areas of the proposed site.

5.7.3 Transportation Receptors

The table below outlines the identified receptors in relation to transport as well as the determined sensitivity of those receptors.

Table 5-20 Transport – Sensitivity of Receptors

Receptor	Sensitivity	Justification
Al Qudra Road	Medium	This road is almost exclusively used by the vehicles, which are associated with the Solar PV developments. However other vehicles do use it.

5.8 Utilities

5.8.1 Project Site

The 200MW PV Phase 2 development is located within an undeveloped area, and consequently all the major municipal services, such as potable water, power connections, wastewater treatment, irrigation, telecommunications and solid waste handling are not currently in place.

Solid Wastes

Waste is an undesired by-product of every development, contributing to a number of environmental problems, for example, emissions of greenhouse gases, exposure of sensitive receptors to high concentration of heavy metals and exposure of other environmentally hazardous chemicals/materials could threaten public health. With proper management, a large amount of materials discarded can be recovered and either reused directly or disassembled and their components reutilised.

Solid waste generation in Dubai is growing rapidly due to significant industrial and economic growth. Consequently, responsible waste management is essential to minimise direct and indirect impacts upon the environment as a result of waste generation and resource consumption. Rapid economic development often precedes the required infrastructure to handle the wastes generated. Therefore, in order to allow sustainable and environmentally friendly economic development of Dubai, it is vital to consider the methods for handling, storage and management of waste generated in conjunction with progressions in a country's economy. This principle is the same for developments as it is for cities and even countries.

Waste management sites and facilities in Dubai are operated and managed by DM-Waste Management Department (WMD). Smaller private organisation are involved in the recovery and resale of recyclable products, in particular paper, glass, plastics, aluminium and steel to the industrial operators in Jebel Ali. Currently DM WMD operates several municipal waste landfills, specifically Al Qusais for Municipal wastes, Jebel Ali for hazardous wastes and Bayadah for construction/demolition wastes.

Al Warqa construction waste landfill was closed in 2006 and is currently undergoing planning for redevelopment into the Emirates main Zoo Safari.

The following table summarises the quantities of the waste generated in the second quarter of 2013 (Source: Dubai Statistics Centre)

Table 5-21: Waste quantities generated in second quarter 2013 (metric tonnes)

Waste Type	Transport Source			Total
	DM	Private Sector	Other	
Construction	7,701	1,900,649	14,547	**1,922,897**
Agriculture	11,552	10,952	12,723	**35,227**
Solid	200,510	489,761	3	**690,274**
Hazardous	46,065	-	-	**46,065**

Studies on waste generation in the Emirate of Dubai, has shown that on average 2.8 Kg of waste is generated per person per day, and the Qusais landfill, a 3.5km^2 landfill receives 5,000 tonnes daily. Consequently, the municipality is on a drive to decrease domestic waste generation by 15 to 20%.

The primary method of waste reduction is by encouraging waste segregation and recycling. Campaigns such as "My City, My Environment" have previously been launched within residential areas of Dubai. The campaign involved providing each home with two waste bins: one for organic waste and one for recyclables. The municipality would then carry out the more detailed waste separation and recycling, thereby requiring minimal effort from the residents to implement green initiatives. In three months, the programme saved 500 tonnes of waste.

Another initiative implemented by DM WMD was to harness the methane gases generated by the landfills in order to provide power for operating the landfill. Such methods of energy recovery can also reduce the potency of the greenhouse emissions being released as methane gas is greatly reduced.

The following information is extracted from the DM Portal (Source: http://www.dm.gov.ae/wps/portal/CommonPageEn?WCM_GLOBAL_CONTEXT=/wps/wcm/connect/DMContentEn/Home/News/news_pr_04082013_01)

In July 29, 2013, Dubai marked a historic moment in its evolution as one of region's most sustainable cities. Eng. Hussain Nassir Lootah, Director General of Dubai Municipality along with Dr. Rashid Ahmed Bin Fahad, Minister of Environment and Water formally unveiled the first of its kind project in the Middle East, where landfill gas was used to completely power the internal requirements of the Al Qusais Landfill.

- *First time that landfill gas is converted to generate 1MW electricity in the region; in line with Dubai Municipality's vision to generate 20 MW of power from landfill gas by 2020*
- *Fully registered with UN, the large-scale CDM project underlines Dubai's focus on sustainable development*

- *Initiative will reduce greenhouse gas (GHG) emissions equivalent to over 250,000 tonnes of carbon dioxide into the atmosphere*
- *Project development, design and construction by Green Energy Solutions & Sustainability LLC with GE's Jenbacher gas engine deployed on site to generate power.*

Solid and Hazardous Waste

Waste can exhibit certain characteristics according to the process stream from which it is generated and any pre-treatment processes that are undertaken. Different types of waste require different management and disposal techniques according to the potential risk that the material poses to human health or the environment. In order to categorise the different risks to these receptors, it is often useful to demarcate the streams into 3 main categories that effectively equate to the level of the management and disposal which are required for each:

- **Hazardous waste -** materials which pose a potential hazard to the environment or health of employees or the general public;
- **Non-hazardous wastes** - solid materials which are not hazardous and degrade, chemically or biologically in the environment; and
- **Non-water soluble wastes** - materials that do not breakdown in the environment, and are otherwise inert.

Hazardous waste refers to waste with properties that pose danger or can be potentially harmful to human health or the environment. It exhibits any of the following characteristics:

- Ignitibility - Ignitable waste can create fires under certain conditions, are spontaneously combustible, or have a flash point less than 60 °C (140 °F). Examples include waste oils and used solvents.
- Corrosivity - Corrosive wastes are acids or bases (pH less than or equal to 2, or greater than or equal to 12.5) that are capable of corroding metal containers, such as storage tanks, drums, and barrels.
- Reactivity - Reactive waste are unstable under "normal" conditions. They can cause explosions, toxic fumes, gases, or vapours when heated, compressed, or mixed with water. Examples include lithium-sulphur batteries and explosives.
- Toxicity - Toxic waste are harmful or fatal when ingested or absorbed (e.g., containing mercury, lead, etc.).

It is considered likely that the proposed project may use or generate hazardous materials in at least one of the categories listed above during the construction phase and also some small quantities will be produced during the Operation phase.

Wastewater

The treatment of domestic wastewater is controlled and managed by Dubai Municipality. The two main sewage treatment plants (STP) are in Al Aweer and Jebel Ali, which are activated sludge plants with tertiary treatment that consist of sand filtration and chlorination.

The Al Aweer STP is the main treatment facility and has been significantly expanded in recent years in order to meet the rapid expansion of City. The plant was originally designed with a capacity of 260,000 m³ per day, however in 2007 it was treating almost 500,000 m³ per day. Consequently, the capacity was expanded by another 145,000 m³ to ensure that the treated wastewater quality is compliant with DM's standards for irrigation use.

The two phases of the Jebel Ali plant was completed in 2010 and with a capacity 300,000 m³ it has helped to relieve the pressure on the Al Aweer plant.

In addition to the municipal STPs, several large mixed used developments, such as the Jumeirah Golf Estates, The Gardens and Palm Jumeirah maintain privately operated STP to serve their specific wastewater generation and irrigation needs.

Finally, all treated sewage effluent (TSE), is used for irrigation of public parks, public landscaping, and in District Cooling (per Executive order No.27).

Table 5-22 Dubai Water treatment and TSE Volumes

Treated Wastewater	TSE used for irrigation
180 Million m3	167 Million m3

Power & Water

Dubai Electricity and Water Authority (DEWA) are responsible for the provision of power and potable water to the domestic, commercial and industrial sectors of the city. DEWA currently operates two power generating facilities and one desalination facility. Future expansion plans include the development of a new desalination and power production plant along the Jebel Ali coast adjacent to the Ghantoot border with Abu Dhabi Emirate. The following table summarises the installed capacity for power and water supplied by DEWA.

Table 5-23 DEWA Installed Capacity

Station	MIGD	MW
Jebel Ali Station D	35	1,027

Jebel Ali Station E	25	616
Jebel Ali Station G	60	818
Jebel Ali Station K	60	918
Jebel Ali Station L Phase1	70	969
Jebel Ali Station L Phase2	55	1,393
Jebel Ali Station M	140	2,060
Aweer Station H Phase 1	-	607
Aweer Station H Phase 2	-	421
Aweer Station H Phase 3	-	818
Jebel Ali RO Desalination Plant	25	-
TOTAL	**470**	**9,646**

The following table summarises the proportion of resource consumption by consumer type.

Table 5-24 Proportion of Power and Water Consumed

Consumer	Power		Water	
	GWh	%	MIGD	%
Power Station	3,023	8.61	-	-
Industrial	2,567	7.30	2,622	3.09
Commercial	16,623	47.33	23,931	28.17
Residential	9,815	27.94	49,112	57.82
Other	3,099	8.82	9,281	10.92

DEWA is also responsible for the construction and management of the power transmission lines across the city. All major transmission lines are currently built above ground, and form corridors that are typically 100-200m wide with 132 to 400Kv transmission lines extending for several kilometres. The lower voltage lines of 22Kv are underground cables, and in denser parts of the city some 132Kv will also be underground cables.

5.8.2 Utilities Receptors

The table below outlines the identified receptors in relation to utilities as well as the determined sensitivity of those receptors.

Table 5-25 Utilities – Sensitivity of Receptors

Receptor	Sensitivity	Justification
Local Landfills	High	The construction and occupation phases will result in an additional input of waste materials into these landfills. Both hazardous and non-hazardous wastes will likely be generated. DM- Al Qusais Municipal waste landfill will likely receive all the wastes
Wastewater Treatment	Medium	DM-Al Aweer treatment plant or the under construction treatment plant at Jebel Ali will likely receive all wastewater generated by the project.

		Typically, new projects are being requested to provide on site treatment plants in order to alleviate the load on the municipal facility.
Soil and Groundwater	Medium	In the event of any spills or leaks of hazardous waste materials, contamination to both soil and groundwater may occur.
Power and Water	Medium	DEWA's water & power planning department projects water and power demand based on specific average consumption rates. If the daily rates of a project significantly exceed the capacity projections, then insufficient resources will be available for other development.

5.9 Landscape and Visual

The landscape and visual impacts baseline aims to define the landscape specific to the proposed site and adjoining areas, by considering its general landscape typology and characterising features. It also aims to identify existing receptors that may be sensitive to variations within their visual envelopes.

Landscape Character

The proposed 200MW PV Phase 2 development will be constructed on a largely greenfield open area of land within Dubai, U.A.E. The landscape of the site is characterised by flat plains of sand and gravel. Further south of the southern boundary of the site, are a system of dunes which have number of Ghaf Trees dispersed randomly throughout the system.

The immediate landscape surrounding the site has largely been unaffected by any development. There are no other paved roads near the site, and the only large scale development is the 13MW Solar PV plant, to the north of the proposed site.

Plate 5-12 Sand Dune Formation in the North and Central Areas of the Site

Visual Impact

The site has good visibility, with clear unobstructed views of the surrounding landscape. To the East of the Solar Park is the high voltage power corridor, however these present virtually no visual obstruction to any existing receptors. There are no visual intrusions on the site at present, due to its open and undeveloped nature. Current views on the site extent for its whole length and width when viewing from any point within the site.

To the north, the site is partially enclosed by the 13MW Solar PV plant already in operation, as well as the slope leading up to the two previously identified receptors.

Plate 5-13 Open Nature of Site (Day time)

Plate 5-14 Open Nature of Site (Night time looking North towards the 13MW PV plant)

Night views from the site typically relate to the lights from the 13MW PV plant, adjacent to the site. There are however no light sources present on the existing site.

5.9.1 Landscape and Visual Receptors

The table below outlines the identified receptors in relation to landscape and visual impacts as well as the determined sensitivity of those receptors.

Table 5-26 Landscape and Visual - Receptors sensitivity

Receptor	Sensitivity	Justification
Landscape Character	**Medium**	There are no specific landscape designations in the locality. The landscape character is common within the inland areas of Dubai Emirate, however such areas are becoming rare towards the costal regions due to development
Visual Impact	**Medium**	The visual envelope of the local area includes a natural landscape at close range with distant views to high-rise areas of the city and iconic buildings.

5.10 Cultural heritage and archaeology

There are numerous sites of archaeological and cultural importance in Dubai and preservation and protection of such resources is vital. Sites of cultural and archaeological importance include ancient forts, trading camps, fishing villages, cemeteries and tombs.

The following information has been extracted from the UAE National Council of Tourism & Antiquities.

Archaeological

Al-Qusais was the site of an important settlement and associated cemetery. Excavations revealed the existence of a settlement dating to the second and first millennium BC. Shaft graves, yielded large numbers of copper or bronze vessels and weaponry, as well as many soft-stone vessels.

Al-Sufouh was a site where a tomb of typical Umm al-Nar-type was excavated, along with parts of an adjacent settlement. The most striking feature of the tomb was the discovery four pits containing human bone, most of it burnt. It is possible that this bone, which may or may not have come from the main tomb itself (i.e. been re-buried), represented the remains of extensive cremation episodes.

Jumeirah Archaeological Site dating from the sixth century AD, and was once a caravan station along a trade route linking Iraq to northern Oman.

Cultural

- Al Fahidi Fort, built in 1799 and houses the Dubai Museum
- Grand Mosque
- Al Shindaga Area and Tower, which includes the diving and heritage village
- Sheikh Saeed Al Maktoum House, built in 1896 as a residence for the ruling family
- Bastakia quarter, one of the original trading districts of Dubai

5.10.1 Project Area

The site visits conducted to date have not revealed evidence of any culturally significant features present on the proposed project site.

5.10.2 Cultural Heritage and Archaeology Receptors

The table below outlines the identified receptors in relation to cultural heritage and archaeology as well as the determined sensitivity of those receptors.

Table 5-27 Archaeology - Receptors sensitivity

Receptor	Sensitivity	Justification
Potentially unidentified archaeological sites	**Very Low**	There is no evidence of any archaeological sites onsite. However if discovered, any such features could potentially be of regional or national importance

6 IMPACT ASSESSMENT

6.1 Meteorology and Air Quality

6.1.1 Environmental Concerns

The impacts of poor air quality can be profound and can adversely affect human health, ecosystems and vegetation. Such impacts can include long-term health impacts and premature mortality related to heart and lung problems, as well as discomfort to humans and other health effects (e.g. asthma). Short-term exposures can also be dangerous and can lead to increases in hospital admissions. The air quality impacts on the environment can have direct effects on vegetation, as well as indirect effects to the acid and nutrient characteristics of soils and waters, which in turn impact upon species and habitats.

In the UK for example, it is estimated that air pollution reduces the life expectancy of every person by 7-8 months with estimated equivalent healthcare costs of up to £20 billion per year (Source: UK Air Quality Strategy, 2007). Such impacts are typically exacerbated when considering the proximity of receptors to pollution sources.

Air Quality impacts will arise during ground-preparation activities, construction activities, but will be virtually absent throughout the operational lifetime of the proposed project. The duration, frequency and severity of these impacts and their significance will vary in accordance with the various phases of the proposed development.

The assessment of the construction impacts on air quality has been developed using the information provided by the client regarding the construction methods and program. Desktop analysis of empirical emissions data for typical construction activities has been used to provide a qualitative assessment of the likely impacts.

At present, it is likely that the project will be completed in one continuous phase of construction, as it was initially supposed to be starting operations at the start of 2017. As there is an already operating Solar PV plant adjacent to the this proposed development, the assessments of construction air quality impacts will consider the impacts of increased dust dispersal over the existing PV plant and its possible reduction in efficiency.

6.1.2 Construction

During construction, the ambient air quality at local receptor sites may potentially be affected by increased dust, particularly during earthworks and by exhaust fumes from heavy machinery.

The principle sources of particulate and gaseous emissions during construction will be:

- Excavations and earthworks, such as ground breaking, cutting, filling and levelling;
- Truck movements on unpaved, or compacted surfaces;
- Particulate dispersion from uncovered truckloads;
- Unregulated stockpiles;
- Vehicle and Construction Plant emissions (e.g. NO_x, SO_x and CO) and particulates from vehicles, generators and other mechanical equipment; and
- Stored VOCs and other volatile hazardous materials.

Dust resulting from construction activities typically comprises large diameter particles, which settle rapidly and close to the emission source, e.g. within 500m under low/calm conditions. Far field dust impacts from construction works are therefore not considered significant.

The significance of dust impacts from construction works will largely be based on the direction of the wind conditions and the proximity of sensitive receptors. The prevailing wind direction in Dubai is north/north westerly (afternoon and evening) and southerly (morning), with the strongest winds coming from N/NW. The strongest winds are likely to result in dust being dispersed towards the sand dunes to the south.

The following table summarises the predicted impact levels from the various sources on the nearest sensitive receptors.

Table 6-1 Air Quality – Magnitude of Construction impacts

Impact	Magnitude	Justification
Dust from Earthworks <500 from site	**Minor Negative**	Temporary impacts are anticipated, although these impacts will be small in nature due to the slow moving vehicles on unpaved site roads.
Dust from Vehicle Movements <500 from site	**Moderate Negative**	Significant, temporary effects and cumulative loss of air quality in the site and immediate surroundings due to dust dispersion outside project boundary.
Gaseous and Particulate emissions from Vehicles	**Minor Negative**	Noticeable temporary impacts are likely to occur at the site itself. Where vehicle emissions are combined with existing emissions from local traffic flows the cumulative effect is likely to be minimal.
VOCs and other hazardous volatiles	**Minor Negative**	Noticeable temporary impacts are anticipated, but these will be limited to the site.

Table 6-2 Air Quality - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Dust from Earthworks <500 from site	Minor Negative	Air Quality (Particulates)	Low	**Minor**
		Falcon Majlis	Medium	**Minor**
		13MW Solar PV Plant	High	**Moderate to Major**
Dust from Vehicle Movements <500 from site	Moderate Negative	Air Quality (Particulates)	Low	**Negligible to Minor**
		13MW Solar PV Plant	High	**Minor to Moderate**
Gaseous and Particulate emissions from Vehicles	Minor Negative	Air Quality (Particulates)	Low	**Negligible to Minor**
		13MW Solar PV Plant	Low	**Negligible to Minor**
VOCs and other hazardous volatiles	Minor Negative	Air Quality (Gaseous)	Low	**Negligible or Minor**

6.1.3 Operation

The proposed project will provide an additional 200MW of solar generated energy to the planned total of 1000MW to be produced from the entire Solar Park. No specific air pollution emissions sources, other than those from vehicles used for the cleaning of the PV panels and potential odour impacts from the waste water systems, are anticipated at the site.

Direct emissions from vehicles will include BTEX, CO, SO_2 (for diesel vehicles) and NO_x, whilst O_3 is a secondary emission resulting from the reaction between NO_2 and VOC's. Taking into consideration the existing local air quality which is well within the DM standards (monitoring results detailed in the Air Quality baseline section), the air quality impacts arising from the proposed cleaning routine at the development site alone are not anticipated to result in an exceedance of the standards. This is due to the small number of vehicles anticipatd to be used for cleaning (<5 vehicles in total).

Nonetheless, there will be a cumulative air quality impact to local receptors due to the addition of emissions to existing background pollutant concentrations. However this impact will likely be undetectable.

In addition to the air quality impacts from vehicles, there is the potential for impacts relating to odour due to the placement of the wastewater system, which are likely to be located at the west of the site, close to the administrative buildings . Impacts relating to odour are unlikely to occur due to the controls that will be in place to limit or eliminate odour. Cumulative odour impacts relating to the combined effect of the future wastewater treatment area and the wastewater treatment are of the 13MW Solar PV plant are also considered unlikely due to the low volumes of wastewater that would be produced on a daily basis.

Table 6-3 Air Quality – Magnitude of Operation impacts

Impact	Magnitude	Justification
Air Emissions from Vehicles within Phase 2	**Minor Negative**	A permanent impact is anticipated due to the consistency of the cleaning procedure of the PV panels. The cumulative impact in addition to current traffic levels in the local area will be minor, as the number of vehicles will steadily increase, but the air quality impacts will likely remain within the project boundaries.
Air Emissions from Vehicles along key roads outside of Phase 2	**Negligible Negative**	Very small percentage increases of vehicle flows may result in a negligible increase to pollutant concentrations.
Odour	**Negligible Negative**	Impacts relating to odour from the on-site wastewater treatment area are unlikely to result in the localised detection of odour due to the low volumes produced each day.

Table 6-4 Air Quality - Significance of Operation Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Air Emissions	Minor Negative	Air Quality	Low	**Negligible to**

from Vehicles within Phase 2		(Gaseous & Particulate)		**Minor**
		13MW Solar PV Plant	Low	**Negligible to Minor**
Air Emissions from Vehicles along key roads outside of Phase 2	Negligible Negative	13MW Solar PV Plant	Low	**Negligible**

6.2 Topography, Soil, Geology and Hydrogeology

6.2.1 Environmental Concerns

This chapter assesses the potential impacts of the proposed 200MW Solar PV project (and the likely on-site activities) to soil quality, geology and the underlying hydrogeology. The assessment considers both the construction and operation phases of the project.

Soils will be susceptible to contamination from various sources during the construction and operation phases of the project, especially when considering accidental interactions of soils with hazardous substances. The main sources of contamination are typically those associated with the handling and processing of products where liquid waste and hazardous material can escape into the soil. These are commonly associated with the transport, handling and storage of such materials and the potential threat of releases and spills/leaks to the ground.

Geology is less susceptible to impacts as the depth of soil in the sandy site is deep. Interactions with underlying geology are unlikely, due to the low level nature of proposed administrative buildings and likely shallow foundations required for these. Interaction from the PV panel support structure will be minimal if at all, as it will only penetrate to a minimum depth into the ground.

Groundwater is not likely to be prevalent at shallow depths in this site and the extraction of groundwater during construction is unlikely to occur. Its worth noting that, due to long term extraction and growing pressure on the groundwater resource, DEWA has imposed a licensing and permitting program to restrict, control and monitor the extraction of groundwater, thereby protecting the long term quality and availability of groundwater.

6.2.2 Construction Phase Impacts

Soils: There are a wide range of construction related activities that could pose a threat and lead to changes in the chemical properties of site soils resulting in potential contamination. Impacts can occur from the spillage of liquid materials, improper management of generated waste and cross contamination of soils at the site. Adequate waste management and soil protection measures must be outlined in the contractor's CEMP prior to the start of construction activities. These control measures are required in order to prevent the risk of soil contamination.

Spillage: The risk of accidental spillage and leakage of various chemical products, such as paints, oils, fuels, lubricants, vehicle oil changing or re-fuelling, sanitary wastewater and cleaning agents is present. Impacts such as these can take place at the storage areas of the

construction site as well as during the transportation of such materials on and off the site. Improper methods of storing, transferring, and handling of these products can result in spillage to the ground and result in soil contamination. Furthermore, percolation to the groundwater could occur, resulting with contamination. If contamination reaches groundwater, the spread of pollution can increase quite rapidly to a greater area. This is a function of the physical and chemical properties of the contaminants and the velocity of the groundwater.

Inadequate Waste Management: Construction of the proposed project will involve activities that generate solid and hazardous waste, as well as potential liquid wastes. Waste generated during these activities poses a threat to the site soils. Of particular concern is the management of hazardous waste generated during the construction phase. Although the hazardous fraction of construction waste such as used oil, machinery lubricants, paints and sludge will represent a very small proportion of the total amount of construction waste, it requires special attention. If the temporary storage and handling of such waste on the construction site is inadequate prior to being removed for disposal, the risk of soil and groundwater contamination increases.

Cross Contamination of Soil: During construction works cross contamination is the transfer of contaminated earth from one location to another, thereby exacerbating an existing environmental problem through poor management. Currently the general soil conditions on site appear to be good, based on site observations and soil analytical results. Although the survey concluded that contamination is generally not present across the site, there was a hotspot of hydrocarbon contamination identified during the baseline surveys. There is also the possibility for isolated points of contamination, which may result in cross contamination if transported to another area of the site. It is also possible that construction activities may lead to contamination as set out above, with there being potential resulting cross contamination impacts. In addition, if contaminated soil is dispersed through dust generation as a result of construction activities like ground excavation, then further spreading of contaminants will also occur.

Dewatering: Excavation activities may require an element of dewatering, although this is not confirmed. In the short term, dewatering will result in the removal of the groundwater in a localised area. If dewatering is required, due to the low levels that would be produced, the water would most likely be pumped to an evaporation pond.

Table 6-5 Topography, Soil, Geology and Hydrogeology- Magnitude of Construction Impacts

Impact	Magnitude	Justification
Spillage/Leakage of Hazardous Materials	**Moderate Negative**	The volumes and quantities of hazardous materials being transported and handled during the construction phase are likely to be minor, but poor handling practices will increase the likelihood of spills. Impacts may contaminate localised areas of site soil.
Inadequate waste management	**Moderate Negative**	Small volumes of hazardous wastes will be generated during the construction phase. If these wastes are not properly handled, separated, stored and disposed of, contamination is very likely to occur. Impacts may contaminate localised areas of site soil.
Cross contamination of soils	**Moderate Negative**	During ground preparation works, levelling of the site, or disposal of soils to off site areas, the likelihood of cross contamination is high if management and monitoring mechanisms are not implemented.
Dewatering	**Minor Negative**	Temporary localised impacts are anticipated due to minor dewatering processes on site. The impacts will be reversible due to natural groundwater recharge.

Table 6-6 Topography, Soil, Geology and Hydrogeology - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Spillage/Leakage of Hazardous Materials	Moderate Negative	Soil	Low	**Moderate**
Inadequate waste management	Moderate Negative	Soil	Low	**Moderate**
Cross contamination of soils	Moderate Negative	Soil	Low	**Moderate**
Dewatering	Minor Negative	Groundwater	Low	**Negligible or Minor**

6.2.3 Operation Phase Impacts

Although there will be little or no interaction with hazardous materials or chemicals, the potential for uncontrolled releases to soils during the operational phase is still possible. Such releases have the potential to occur during material transportation, handling and storage as well as during cleaning activities and accidental spillages to the ground. The potential sources for these contaminants are the following;

- The use of solvents/cleaning fluids is likely to be extremely limited. Although these materials may be used in small quantities, attention must be paid to proper storage, handling and transportation of these.
- The transformers on site will contain oils. These units are generally very well self-contained, but precaution should be given to ensure adequate spill prevention measures are in place.
- Wastewater generated on site could leak and has the potential to contaminate soils and groundwater. The waste water systems should be designed to prevent the occurrence of leakages.

Table 6-7 Topography, Soil, Geology and Hydrogeology - Magnitude of Operational Impacts

Impact	Magnitude	Justification
Spills and Accidental Releases	**Minor Negative**	Within the PV panel area, water may be used in conjunction with chemicals to clean the panels, oil will be stored in the transformers and wastewater will be produced on site from the ablutions used by staff. If the materials associated with these are not appropriately handled and stored, then contamination from spills and leaks are likely to result with impacts to unprotected soils.

Table 6-8 Topography, Soil, Geology and Hydrogeology - Significance of Operational Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Spills and accidental releases	Minor Negative	Soil	Low	**Negligible to Minor**

6.3 Noise and Vibration

6.3.1 Environmental Concerns

Noise is an environmental impact that will mostly be generated during the construction activities and to a lesser degree during the operation phase as a result of vehicular traffic. Vibration may also be generated by equipment during the construction period but is not likely during operation due to the type of development.

6.3.2 Construction

Noise

During construction it is envisaged that the work activities, are likely to include the following:

- Site preparation - back-filling, levelling and grading and excavations in areas where foundations are to be constructed. It is assumed that these activities will require the use of dozers, excavators and muck-away lorries.
- Civil Works – It is assumed that piles will be required for some of the building foundations during this phase. In the absence of detailed information on construction methodologies it is assumed that cast in-situ bored piles and driven piles may be required.
- Construction and Installation - This phase of works is assumed to involve the casting of reinforced concrete slabs 'in-situ', blockwork, steel/scaffold erection. It is assumed that these works will require the use of concrete truck mixers, compressors, generators, heavy lifting equipment (including cranes) and hand tools.
- Drainage and road paving - This stage of the works will comprise of several operations that will likely include excavation for and laying of drainage pipes and road surfacing, to include use of planers, dozers and pavers.

With regard to the impacts upon ambient noise levels, a basic assessment of the likely construction noise levels to be experienced at the site boundary has been undertaken in regard to the expected heavy plant/machinery to be used at the site. This basic assessment is provided below, but it should be noted that the predicted noise levels are indicative and are subject to variables including location, buildings, specifications of construction plant (including power output, silencers etc) and works phasing.

Noise data for the likely plant/equipment to be used at the site has been obtained from 'BS:5228, British Standards: Code of practice for noise and vibration on construction and open sites'. Noise values for likely site plant/equipment have been set out in Table 6-5. These

noise levels represent the typical magnitudes observed at 10m from the operation of the construction plant.

Table 6-9 Noise Levels of Anticipated site plant/Equipment

Construction Plant	BS:5228 Noise level at 10m (db(A))	BS:5228 Reference
Excavator	79	C.2, 14
Loader	82	C.6, 33
Motor lorry	80	C.2, 34
Scraper/leveller	82	C.5, 8
Roller	80	C.5, 19
Asphalting machine	84	C.5, 32
Truck mixer	80	C.4, 18
Concrete-pumping machine	80	C.4, 29
Truck crane	77	C.4, 53
Stationary crane	77	C.4, 49
Generator	84	C.4, 84
Motor-driven compressor	75	C.3, 19
Fork Lift	67	C.4, 57
Cumulative noise at 10m assuming 50% on time	**89**	

For the above basic assessment it is assumed that each item of plant/equipment is utilised at approximately half its operational capacity (over a given period of time), rather than continuously at full power; as is typical with any construction process. A 50% time factor has therefore been applied in the calculation.

As such, the accumulation of the noise levels from all the above equipment at a reception point 10m away will be approximately 89 dB(A). It should be noted that this basic assessment assumes that the noise is being received at a distance of 10m from the source and does not account for any other background noises.

It is known that noise levels dissipate with distance propagation and the following table sets out the anticipated noise levels at distances from the construction sources. The propagation due to distance has been calculated from the appropriate attenuation formula for distance, as set out in the BS:5228 British Standard.

Table 6-10 Construction noise levels in terms of distance from the source

Distance from Construction Works (m)	Noise Level dB (A)
10	89
20	83
50	73
100	66
200	58
300	53.6
500	48.1
1000	40.6

The above table demonstrates that the attenuating effects of distance on a noise source is profound; reducing noise levels when at greater distances from the source.

Since noise is attenuated by distance, and given the distances between likely construction works and noise receptors (typically over 300m), including other intervening noise sources from existing roads/highways, the construction activities on site are unlikely to significantly affect the offsite ambient noise levels from current baseline levels recorded during the monitoring study.

Noise impacts relating to heavy vehicle movements have the potential to occur along routes where a significant increase in traffic flows will arise due to increase dedicated movement of vehicles to the project site. The only current transport route that can be used during construction is the two lane road that follows the same route as the Al Qudra cycle path, unless a new road is built specifically for the Solar Park.

When considering noise impacts from vehicle flows, a doubling in the vehicle flow from a road will only increase noise levels by 3 dB(A). Over a short term period, the UK's Highways Agency Design Manual for Roads and Bridges (DMRB) guidance considers a 3dB(A) change as a Moderate impact.

Considering the current low volumes of traffic on the available route and its low carrying capacity, the proportional increase in noise contributed by the heavy vehicles related to the project may be significant and could result in perceptible noise increases within the vicinity of these roads. However with the nearest noise receptor approximately 1.2km from the road, it is not likely that there will be a significant impact resulting from the increased vehicle flows.

Vibration

Certain construction processes, particularly those involved with site preparation and civil works, e.g. breaking, levelling and excavations, have the potential to create vibrations within

the vicinity of the works. Vibrations are also anticipated to occur sporadically around the construction site due to the movement of materials and equipment. However, it should be noted that vibrations dissipate rapidly as they spread due to losses of energy radiating 360 degrees from the source.

Due to the vast majority of construction works being at significant distances away from the nearest existing residential receptors, this is not anticipated to result in an impact of any significance.

Table 6-11 Noise and Vibration - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Construction noise adjacent to the northern boundary	**Minor Negative**	The distance to the nearest receptors (>300m) will likely result in the majority of the noise created from the Phase 2 construction dissipating before reaching the receptors.
Construction noise adjacent to eastern, southern and western boundary	**Negligible Negative**	Other nearby receptors on these boundaries are too far away from the construction site to be affected by the noise emissions.
Construction Vibration	**Negligible Negative**	Very minor vibration impacts may occur during construction activities, which will be limited to the site
Construction Vehicle Noise (off site Roads)	**Negligible Negative**	Adverse impacts may occur to receptors adjacent to local roads in proximity to the site, where vehicle flows may significantly increase due to construction.

Table 6-12 Noise and Vibration - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Construction noise adjacent to northern boundary	Minor Negative	Noise at site boundaries	Low	**Minor**
Construction noise adjacent to eastern, southern and western boundary	Negligible Negative	Noise at site boundaries	Low	**Negligible**

6.3.3 Operational

As the 200MW PV plant will be purely for generating solar power, there will be very few specific point noise sources at the site, other than local roads, solar panel cleaning vehicles and electrical transformers. Additional vehicular flows to surrounding roads by people accessing the Phase 2 site, may also result in additional noise generation, with impacts to local receptors.

Impacts from vehicles are only likely to be significant where traffic flows will double due to the on-going construction of the various different phases of the Solar Park. A doubling of traffic flows would result in a 3 dB increase in average noise levels, typically regarded as a perceptible and significant value.

The following list gives details of the equipment that will be on the site, and its likely noise levels that will be produced;

- Transformer : 65 db
- Inverter : 65 db
- Air conditioning and ventilation : 70 db

The noise levels produced from these pieces of equipment are high and are just on the acceptable level of the '*Industrial Area (Heavy Industry)*' (DM definition).

Table 6-13 Noise and Vibration - Magnitude of Operation Impacts

Impact	Magnitude	Justification
Vehicle noise (from on site cleaning vehicle movements)	**Minor Negative**	Traffic volume in areas of the operational Phase 2 site will not be noticeable, but may include LGVs.
Electrical Equipment	**Negligible Negative**	The noise generated by the electrical equipment on the PV site will be at a low dB and will sound like a constant humming

Table 6-14 Noise and Vibration - Significance of Operation Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Vehicle noise (from on site cleaning vehicle movements)	Minor Negative	Falcon Majlis & Small Settlement with Mosque	High	**Minor to Moderate**

Electrical Equipment	Moderate Negative	Falcon Majlis & Small Settlement with Mosque	High	**Moderate to Major**

6.4 Terrestrial Ecology

6.4.1 Environmental Concerns

The terrestrial ecology (flora and fauna), e.g. individual species and habitats of an area can play an important role in the aesthetics and character of a particular locality, region or nation. Flora and fauna is intrinsically linked to the surrounding physical environment (e.g. carbon cycle) and can often be dynamic in its interactions with other flora and fauna, which may include the provision of food sources and benefits to humans.

6.4.2 Construction Phase Impacts

The habitat survey did not identify any habitats or species on the site of high conservation value, or those that are locally/regionally/nationally/internationally designated. Ghaf trees were identified off the site.

The site will be generally prepared for the construction and installation of the infrastructure, utilities and PV Panels. Any removal of sand due to levelling and grading of the site may reduce the seed bank for future growth. It is possible that regrowth will occur to a certain extent where areas of ground are undeveloped. However, given the fact that there is little growth currently occurring on the site, future growth would not be considered likely.

Table 6-15 Terrestrial Ecology - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Direct Loss of habitat	**Major**	Loss of on site habitat will be permanent.
Loss of seed bank	**Minor**	The loss of seed bank is an impact only relating to the site area. The impact will be permanent due to the paving of the road infrastructure and buildings.
Noise impact on fauna	**Minor**	The impact of construction noise and vibration will be temporary and limited to the localised site area.

Table 6-16 Terrestrial Ecology - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Direct Loss of habitat	Major	Fauna	Low	**Minor to Moderate**

Loss of seed bank	Minor	Flora	Low	**Negligible to Minor**
Noise impact on fauna	Minor	Fauna	Low	**Negligible to Minor**

6.4.3 Operational Phase Impacts

The DEWA 200MW PV Phase 2 design will have very little impact during its operation phase as the environment does not currently support a wide range of flora or fauna. As mentioned before, the Arabian Oryx and Mountain gazelles were not spotted during the site visit, but if they are still in the area, the 200MW PV plant will prevent the mammals from crossing the land that was previously open to them. In addition to this prevention of using familiar routes, further development of the Solar Park, will eventually mean the relocation of the feeding stations in the Solar Park. It is better to do this at the sart of the Parks development, to allow the wildlife as much time as possible before the site is complete, to migrate to another area.

Any landscaped areas would provide a positive net gain against the identified negative impacts of the operation phase of the project. Additionally, incorporating native trees and plants, would likely require less irrigation and pesticide/herbicide use, thereby further maximizing the opportunities to offset any negative impacts from the development of the project.

However, the inadequate design of waste facilities and inappropriate storage and handling of waste materials, may attract pest species and spread disease. The magnitude of these impacts on other fauna, is not anticipated to be high, and the implementation of a pest management program will help to minimise any impacts.

Table 6-17 Terrestrial Ecology - Magnitude of Operation Impacts

Impact	Magnitude	Justification
Pests from domestic waste	**Negligible Negative**	Inadequate design of waste facilities and inappropriate storage and handling of waste materials may attract pest species and spread disease.
Landscaping using indigenous species	**Minor Positive**	Landscaped areas will provide new habitat suitable for common species of fauna, including birds, insects and small mammals.
Restriction of Movement for Species	**Minor Negative**	The PV plant will be fenced, which will restrict the movement of animals across the site.

Table 6-18 Terrestrial Ecology - Significance of Operational Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Pests from domestic waste	Negligible Negative	Flora	Low	**Negligible to Minor**
Landscaping using indigenous species	Minor Positive	Flora	Low	**Negligible to Minor**
Restriction of Movement for Species	Minor Negative	Fauna	High	**Minor or Moderate**

6.5 Socio-economic

6.5.1 Environmental Concerns

This chapter of the EIA Report focuses upon the social and economic issues, both direct and secondary, associated with the development and subsequent operation of the 200MW PV plant.

6.5.2 Construction Phase Impacts

The primary economic impact during construction is likely to result from employment creation during this phase. As well as the direct monetary uplift to the families of those employed, money paid to workers will also stimulate the local economy via the multiplier effect, whereby money earned on the project expended locally will re-circulate within the local economy. Whilst we have no evidence quantifying the multiplier effect within the UAE, studies undertaken in Europe and the US suggests the impact of expenditure on a local economy prior to leakage to be in the order of 4:1.

Notwithstanding the above, our experience of similar sites within the UAE suggests that a lack of available construction workforce among the immediate local population makes it probable that a significant proportion of work on the site will be undertaken by expatriate workers. This could result in the repatriation of wages and a reduction in the benefit to the local economy of wage expenditure.

In addition to the direct monetary impact of employment created during construction, there also exists the potential for the project to promote the dissemination of construction and construction support skills from expatriate workers into the local labour force.

A further secondary impact is likely to arise from spending on foreign goods and services during the construction process. The nature of the development, and specialised nature of required materials, suggests that these will be sourced internationally, or via local intermediaries, rather than being directly imported, apart from construction materials (e.g.

concrete, cabling, etc). Similarly, the status of Dubai as a regional services hub increases the likelihood that core services will be procured within the local market.

From a social perspective, however, the impacts to surrounding local residents may be negative, as construction activities will result in localised increased traffic, noise, and air pollution. For those few residents who have direct views onto the 200MW PV plant site they may experience unsightly views during the construction period and a loss of amenity fro the current natural landscape (assessed specifically in the landscape and visual impacts section).

Table 6-19 Socio-economic - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Employment creation	**Moderate Positive**	A significant temporary creation of employment relating to construction will be likely and should benefit the local/regional area.
Dissemination of skills	**Minor Positive**	Dissemination of know-how among the construction force.
Purchase goods and materials from the local / regional economy	**Minor Positive**	The project will generate demand for basic goods and services by the workforce and of construction materials within the local/regional area.
Cumulative Impacts to Local Residents	**Minor Negative**	Potential cumulative impacts resulting from increased noise, air emissions, vehicle traffic and visual impacts. Impacts are likely to be more significant for those resident within close proximity of the 200MW PV site, and those with direct views to the 200MW PV site.

Table 6-20 Socioeconomic - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Employment creation	Moderate Positive	Employment	Low	**Minor**
Dissemination of skills	Minor Positive	Employment	Low	**Negligible or Minor**
		Local /regional economy	Low	**Negligible or Minor**
Purchase goods and materials from the local / regional economy	Minor Positive	Local /regional economy	Low	**Negligible or Minor**
Cumulative Impacts to	Minor Negative	Local Residents (Off-Site)	High	**Minor or Moderate**

Local Residents				

6.5.3 Operation

The projected power output of the 200MW Solar PV Phase 2 project is 200MW. This energy will have been generated in a sustainable way, without the need for energy expenditure and can then be distributed across the Emirate. This project is one of many phases that will seek to contribute a combined total of 1000MW to the power grid of Dubai. This will help to reduce the Emirates dependency on fossil fuel generated power, which is not only unsustainable but contributes to atmospheric pollution.

Table 6-21 Socioeconomic - Magnitude of Operation Impacts

Impact	Magnitude	Justification
Sustainable Power Supply of Dubai	**Moderate Positive**	The project will provide an additional 200MW of clean and sustainable power to the power grid of Dubai.

Table 6-22 Socioeconomic - Significance of Operation Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Sustainable Power Supply of Dubai	Moderate Positive	Dubai Energy Sources	Medium	**Moderate**

6.6 Transportation

6.6.1 Environmental Concerns

This chapter focuses on the transportation related impacts associated with the construction and operation of the 200MW Solar PV Phase 2 site. The baseline transportation infrastructure within the immediate vicinity of the project has been described and assessed. Consequently, the impacts of the increased traffic generated by the construction and operation phases are considered below.

6.6.2 Construction Phase Impacts

The construction period will result in an increase of vehicles entering the 200MW PV Phase 2 site. Construction vehicles will include a variety of vehicle classifications, e.g. HGV's, LDV's, trucks, pick-up trucks, excavators and other heavy/light plant. It is envisaged that all the construction vehicles will enter the site from the Al Qudra cycle track road, however, it is possible that other site entrances may be used if a new road is constructed.

It is anticipated that traffic levels (particularly HGV's) on local roads to the site will increase during the construction phase. The volume of traffic will vary over the course of construction, in accordance with the various phases as will the demand for materials, removals and construction personnel on the site. The main factors that will affect the number of vehicles on the roads will be related to manpower needs, material usage and waste generation. Other forms of transport (e.g. by sea, or by air) will not be directly used during the main construction phase, other than for the shipping of specialist materials.

Potential impacts relating to the increase of vehicles may include congestion, increased journey times and higher accident risks, or higher fear of accidents.

Currently there are no official roads on the site, however there are a number of unofficial tracks which cut across the area. These tracks will cease to be used once construction starts.

Table 6-23 Traffic and Transportation - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Increased vehicles on Al Qudra road	**Minor Negative**	Traffic flows on Al Qudra Road are currently low and any additional construction vehicles are likely to result in a significant increase to traffic flows from current levels. There is also potential that additional vehicles could exacerbate congestion issues at times of peak traffic flows.

Table 6-24 Traffic and Transportation - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Increased vehicles on Al Qudra road	Minor Negative	Al Qudra Road	Medium	**Minor**

6.6.3 Operational Phase Impacts

Once construction for the 200MW Solar PV site is complete, there will be almost no traffic associated with the Phase 2 development, apart from employee vehicles and fuel and water trucks.

It should be noted that at this stage a traffic impacts study has not been prepared, therefore the impact assessment has been based on professional judgement.

There will be daily vehicle movement on the site, however these vehicles will be driving around internal roads.

The proposed internal road network will include one separate entrance to the proposed development along the Al Qudra road.

The baseline established that at present no public transportation systems are in place at the proposed 200MW PV Phase 2 site. Further to this, no future plans are in place to create links to the site. The provision of any future transport links would result in more effective access to the area and would result in a positive impact to the wider transportation network in Dubai with provision of public transportation.

Table 6-25 Traffic and Transportation - Magnitude of Operation Impacts

Impact	Magnitude	Justification
Increased congestion of existing road network	**Negligible Negative**	There is likely to be a small measurable increase in vehicles flows due to those users working at the PV plant. However this is not expected to lead to increased congestion.
Movement of vehicles on Phase 2 site roads	**Negligible Negative**	Vehicles on roads within the site will not have an impact on transportation routes.

Table 6-26 Traffic and Transportation - Significance of Operation Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Increased congestion of existing road network	**Negligible Negative**	Al Qudra	Medium	**Negligible to Minor**

Movement of vehicles on Phase 2 roads	**Negligible Negative**	Internal Roads on site	Low	**Negligible to Minor**

6.7 Utilities

6.7.1 Environmental Concerns

This chapter provides an assessment of the environmental impacts that may occur as a result of the resource uses (power and water) and resultant solid waste and wastewater generation during the construction and operation phases of the 200MW Solar PV Phase 2 project.

During the construction phase typical solid wastes streams will comprise of biodegradable, non-biodegradable and hazardous wastes, whilst wastewater will include; sanitary wastewater, domestic wastewater, storm water run-off, and oil-contaminated and/or chemical containing wastewater.

All wastes generated by the proposed project will be required to be collected and then treated/handled by an appropriate and adequate service provider in accordance with the national and/or international requirements/standards.

With regards to water resources, the natural freshwater and potable sources of water in the UAE are scarce and being rapidly depleted by irrigation, commercial and domestic use. However, the majority of the potable water will be created by desalination processes in order to meet the requirements from construction and demands of the project during operation. Also, to ease the pressure on potable water demand, TSE is used for landscape irrigation, fire-fighting systems and District Cooling systems.

6.7.2 Construction Phase

Solid wastes

Waste management during the construction phase will be governed by a site wide waste management strategy, which will form part of the Construction Environmental Management Plan (CEMP), dealt with through a combination of actions undertaken by the contractor and sub-contractors working at the site. It is likely that the sub-contractors will be responsible for their own waste management, however their practices must be in line with the prescribed requirements of the CEMP and/or site waste management plan to be enforced and updated as necessary by the contractor.

Arrangements are anticipated to be made with DM Waste Management Department regarding the disposal of construction waste streams at the Baddiyah landfill site.

Small quantities of waste will be generated during the construction phase which could include, but not be limited to, concrete, steel, aluminium, PVC piping, electric cabling. A significant portion of these wastes are recyclable and re-usable. However, those waste streams that cannot be recycled should be sent to the construction waste landfill. Furthermore, if any hazardous materials are identified, these will require special handling by a licensed contractor and licenced disposal facilities.

Given the small size and basic layout of the project site, the amount of waste generated should be minimal but if not properly managed will look unsightly, with potential issues of contamination to the soils and/or the groundwater and potential encouragement of pests.

Non-Hazardous Waste

During the construction phase, a number of activities will result in waste generation. These activities include, but are not limited to:

- Site clearance and levelling;
- Backfilling;
- Excavation;
- Road construction;
- Constructing property and boundary walls;
- Power and water connections; and
- Temporary sewerage and drainage network construction etc.

The types of waste generated by these activities include:

- Topsoil;
- Clay;
- Sand;
- Gravel;
- Concrete;
- Asphalt paving;
- Lumber;
- Scrap steel;
- Glass;
- Plastics;
- Packaging materials;
- Wood; and
- Municipal waste from construction workers.

Concrete may be found in two forms on the construction site; structural elements containing reinforced concrete, while foundations have mass non-reinforced concrete.

Construction waste is often bulky and heavy and mostly unsuitable for disposal by incineration or composting. Other than the hazardous waste fraction, construction materials are typically inert and do not pose a threat to human health or the environment. However, proper management is required in order to reduce associated secondary impacts such as resource use, dust emissions, habitat destruction, fly tipping, etc. Increased pressure may also be placed upon local landfills and result in a reduced capacity for handling waste from municipal sources.

Typically, general waste quantities per worker per day average at 2Kg. The amount of waste containers/waste areas will need to be commensurate to the number of workers on site and their waste generating potential.

Hazardous Waste

Although the hazardous fraction of construction waste represents a relatively small portion of the total amount of construction waste likely to be generated, its disposal requires careful consideration. Typical hazardous waste streams that may arise during construction include, but are not limited to:

- Solvents;
- Used oil;
- Hydraulic fluid;
- Resins and paints;
- Batteries;
- Roofing cement;
- Adhesives;
- Machinery lubricants;
- Waste solvents/chemicals - used in the concrete forming process or from excess paints/solvents etc. used over the site;
- Clean-up materials (such as rags) contaminated with the items listed above;
- Drums, containers and tins with remains of hazardous substances, etc.

The hazardous fraction of the construction waste can potentially cause significant adverse impacts on human health and the environment if managed improperly. Inappropriate handling through lack of personnel training on site may lead to accidental spills or leaks to the soil or groundwater may lead to a contamination event, resulting in a potential health risk to workers and environmental impacts. Contamination may also arise as a result of

transportation by waste contractors who have not been approved by DM or disposal to unlicensed landfills. Increased pressure may be placed upon local hazardous waste landfills and result in a reduced capacity for handling waste from municipal sources.

The projected quantities of hazardous wastes generated at peak construction time will be a fraction of the estimated general wastes produced. None the less, appropriate storage and frequent removal of the hazardous waste would help minimise the risks of contamination events.

Table 6-27 Solid Wastes - Magnitude Construction Impacts

Impact	Magnitude	Justification
Non Hazardous wastes	**Moderate Negative**	Moderate volumes of non-hazardous wastes will be generated during construction and could increase pressure upon local landfills.
Hazardous Wastes	**Minor Negative**	Low volumes of hazardous wastes will be generated, and if not appropriately disposed or handled may result in potential exposure of contamination to soils and/or groundwater, as well as increased pressure on local landfills.

Table 6-28 Solid Wastes - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Non Hazardous wastes	Moderate Negative	Local Landfills	High	**Moderate to Major**
Hazardous Wastes	Minor Negative	Local Landfills	High	**Minor to Moderate**

Wastewater

During construction the main issues regarding wastewater are related to sanitary and domestic wastewater generation, as well as dewatering effluent streams and storm water runoff events on site.

For the sanitary wastewater, it is anticipated that there will be a significant number of workers at the peak period of the construction. The quantities of sanitary wastewater can be estimated as an average of 100 litres/person/day. Such wastewater will be generated and stored within septic tanks on-site at the office facilities, prior to removal by a licensed contractor, which may cause contamination to soil or groundwater if not properly handled/managed. Increased pressure may be placed onto local treatment facilities in

regard to sanitary wastewater. However, this will only occur if new migrant workers to Dubai are employed. Existing workers from Dubai would otherwise have the same input to this utility as previously.

Dewatering of excavations may be necessary for certain works at the site, particularly where basements are being constructed. It is possible that dewatered effluent from construction areas could be contaminated and also may be very high in Total Suspended Solids (TSS). Dewatered effluent will either be directed to the storm water sewer network for discharge, or it will be managed through an evaporation pond on the site.

Storm water has the potential to run off into areas containing hazardous materials and either leach these into the soil or carry these off the site, potentially contaminating other areas and groundwater. However, heavy rainfall is rare and only a small number of rainy days per year occur in this region/area.

Table 6-29 Wastewater - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Pressure upon Sanitary Wastewater treatment	**Negligible**	Increased pressure may be placed onto local treatment facilities in regard to sanitary wastewater. However, this will only occur if new migrant workers to Dubai are employed. Existing workers from Dubai would otherwise have the same input to this utility as previously.
Dewatered Effluent Impacts	**Negligible**	Any dewatering discharges are likely to be small, but still has the potential to result in either contamination to receiving waters, or elevated TSS concentrations being discharged.
Impacts of Storm Water Runoff	**Negligible**	Although infrequent, the result of storm water runoff may contaminate the soils and groundwater, through the washing off of pollutants on open surfaces.

Table 6-30 Wastewater - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Pressure upon Sanitary Wastewater treatment	Negligible	Municipal Sewage treatment Plant	Medium	**Negligible to Minor**

Dewatered Effluent Impacts	Negligible	Soil and Groundwater	Medium	**Negligible to Minor**
Impacts of Storm Water Runoff	Negligible	Soil and Groundwater	Medium	**Negligible to Minor**

Power and Water Demand

Potable water resources for construction are likely to be tankered to the site for domestic use, drinking supplies and construction processes. The source of this water will likely be from existing/operational desalination plants.

Power supplies are likely to be provided by the use of generators (semi permanent and mobile), which will be positioned around the site.

Table 6-31 Power and Water - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Pressure upon Power and Water Resources	**Negligible**	Increased pressure is unlikely to be placed upon DEWA's power and water network during construction due to the use of generators for electricity and tanked water being brought to the site.

Table 6-32 Power and Water - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Pressure upon Power and Water Resources	Negligible	Power and Water	Medium	**Negligible to Minor**

6.7.3 Operational Phase

Waste Management

The operational phase of the Project will result in the production of a number of waste streams from the administrative facilities being generated, with the vast majority of theses streams being non-hazardous. Nevertheless, if these waste streams are not managed and disposed of effectively they could result in significant impacts upon the surrounding environment.

The likely waste streams to be generated during the operation are as follows:

Domestic Waste

The Operation of the proposed Project will generate domestic waste from the employees on site. This waste can be classified as both recyclable and non-recyclable. Recyclable waste includes paper, tin cans, plastics, cartons, rubber, and glass, while non-recyclables will consist mainly of food residues and other organic waste.

The following table summarises the estimated quantity of waste generated by the project, the waste generation factors for residents has been calculated based on the World Bank's estimation for high income level residents in the MENA region. The waste generation rate of non-residents has been factored as 25% of the residential rate, as a rule of thumb.

Table 6-33 Projected waste generation

	Number	Generation rate	Total/day	Total/year
Employees	24	0.70kg/person/day	16.8kg	6 tonnes

As the table shows, the project quantities of waste generated by the project is negligible compared to the yearly waste production for the emirate in the year 2012. The total quantity of general waste collected by DM in 2012 was 13,797,000 tonnes. Therefore the operational phase of the 200MW PV project would not even increase the general waste by 0.0001%.

Hazardous Waste

The hazardous fraction of waste can potentially cause significant adverse impacts on human health and the environment if improperly managed. Examples of likely hazardous waste streams that may arise during the operation of the Project include the following:

- Oily rags, chemicals, solvents from general maintenance of hospitality/retail buildings;
- Soil contaminated by potential spills and leaks of hazardous materials/liquids;
- Miscellaneous wastes such as batteries, waste cables, etc.

Inappropriate handling of hazardous waste streams through lack of personnel training on site may lead to accidental spills or leaks to the soil or groundwater. Contamination may also arise as a result of transportation by waste contractors who have not been approved by Dubai Municipality or disposal to unlicensed landfills. Increased pressure may be placed upon local hazardous waste landfills and result in a reduced capacity for handling waste from municipal sources.

Table 6-34 Solid Wastes - Magnitude of Operation Impacts

Impact	Magnitude	Justification
Non Hazardous wastes	**Minor Negative**	Domestic and office waste is likely to form the major component of the operations waste. Where not segregated, such wastes will result in unnecessarily large volumes of waste being generated, with extra pressure placed upon municipal waste facilities.
Solid Hazardous Wastes	**Negligible Negative**	Since the project is entirely a PV Plant, only very small quantities of hazardous wastes will be generated, with minimal impacts or additional pressures to treatment and disposal facilities.

Table 6-35 Solid Wastes - Significance of Operation Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Non Hazardous wastes	Minor Negative	Local Landfills	High	**Minor to Moderate**
Solid Hazardous Wastes	Negligible Negative	Land fills & Treatment Facilities	High	**Minor**

Wastewater

The waste water system will be designed as a zero liquid discharged design system, i.e. there will be no liquid discharge off-site. The wastewater will be collected, separated from solid proportions and stored in buried tanks. The tanks and the collected solid proportions will be emptied and evacuated by suitable trucks. The proportion of wastewater that's produced everyday, is not expected to be a significant amount.

The storm water drainage system will comprise roadside collection gutters and drains interconnected by pipework to storm water evaporation ponds in the north west and south west of the site. All storm water will be directed to the dedicated evaporation ponds, with none being discharged elsewhere.

Table 6-36 Wastewater - Magnitude of Operation Impacts

Impact	Magnitude	Justification
Sanitary Wastewater treatment	**Negligible Negative**	The waste which will be transported out by truck, will place a minor additional demand upon existing Dubai wastewater treatment utilities.

Storm Water Runoff to Storm water network	**Negligible Negative**	Rain events are infrequent, the storm water connection system has been designed to forward storm water to the storm water network. The runoff of pollutants into surrounding soils is also possible and potential leaks to soils and groundwater are also possible from pipes, which may result in very localised low concentration contamination.

Table 6-37 Wastewater - Significance of Operation Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Sanitary Wastewater treatment	Negligible Negative	Municipal Sewage treatment Plant	Medium	**Minor**
Storm Water Runoff	Negligible Negative	Soil and Groundwater	Medium	**Negligible to Minor**

Power and Water Demand

The projected fresh water demand for the cleaning will be approximately 5918litres/day, for the 200MW PV Panels. This consumption rate is based on the implementation of best practices and using methods to reduce the water consumption wherever possible.

Table 6-38 Water Resources - Magnitude of Operational Impacts

Impact	Magnitude	Justification
Potable Water	**Minor Positive**	The project is predicted to use less water than a conventional PV plant, as improved techniques will be used to reduce the water consumption.

Table 6-39 Water Resources - Significance of Operational Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Potable Water	Minor Positive	DEWA	Medium	**Moderate or Major**

6.8 Landscape and Visual Impact

6.8.1 Environmental Concerns

This chapter of the EIA focuses upon the potential landscape and visual receptor impacts, both direct and secondary, associated with the development and subsequent operation of the site.

The construction of a new development, particularly those on a large scale have the potential to result in changes to the landscape character of a locality through land use and topographical changes, as well as causing a disturbance to the visual envelope of nearby receptors, by changing or blocking their views.

6.8.2 Construction Phase Impacts

One of the first stages of construction activities will result in the levelling, grading and preparation of the site, ahead of construction beginning. The proliferation of such activities throughout the construction period and across the site will eventually result in major land use changes, with the subsequent construction of small buildings and the installation of the solar panels.

The movement of heavy construction vehicles and earthworks on sandy surfaces are also likely to result in dust generation and the resulting haze may disturb the visual envelopes of receptors.

Impacts to landscape character and the visual envelope of surrounding receptors will also occur at night where the addition of lighting during construction will illuminate this area that has previously been free of any light sources. The addition of light and eventual widespread use of lighting across the 200MW PV construction site will result in a night time light haze being emitted in the air above the general site area.

It is worth noting that there is already night time lighting installed at the 13MW PV plant, which is adjacent to the proposed site of the 200MW PV plant.

Table 6-40 Landscape and Visual - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Topographical Impacts to landscape	**Negligible Negative**	Construction activities will result in the loss of any vegetation on site (if any), but not in the overall topography of the area.

New features in the landscape	**Moderate Negative**	Construction machinery, boundary fencing and new laydown /site offices will change the landscape character to an industrial/working area feel during construction, as will the development of infrastructure.
New features impacting views	**Moderate Negative**	Increased dust and the boundary fence will reduce visibility and views within or onto the 200MW PV site area.
Light Pollution	**Minor Negative**	Construction flood lights will increase the illumination in the area, with potential light spill outside of the site area.

Table 6-41 Landscape and Visual - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Topographical Impacts to landscape	Negligible Negative	Landscape Character	Medium	**Negligible or Minor**
New features in the landscape	Moderate Negative	Landscape Character	Medium	**Moderate**
New features impacting views	Moderate Negative	Visual Impacts	Medium	**Moderate**
Light Pollution	Minor Negative	Visual Impacts	Medium	**Minor**

6.8.3 Operation Phase Impacts

Following the impacts of construction, the operation of the proposed 200MW PV site will not result in further major 'direct' alterations to the landscape character of the local area.

The transition to the operational phase will result in the change of landscape character to a more industrial character and feel.

During the night, significant lighting will be installed around the site. Such lighting will include security lighting or light from vehicles. Therefore the areas directly overlooking certain areas of the project may observe increased light pollution and illumination intrusion into their properties.

Table 6-42 Landscape and Visual - Magnitude of Operation Impacts

Impact	Magnitude	Justification
Influence on Landscape	**Minor Negative**	The landscape character will be majorly altered from its existing style, with an industrial character in place across the site.
Impact of Lights	**Minor Negative**	There will be a measureable change in the visual amenity of the area at night, particularly for the residences and other properties overlooking the site . The addition of lights to the area will change the night time landscape character only marginally, as it was previously lit by the 13MW plant.
Disruption of views	**Minor Negative**	Any existing residents with direct views onto the site will experience partial or total loss of their current views, which will be blocked by aspects of the future development.

Table 6-43 Landscape and Visual - Significance of Operation Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Influence on Landscape	Minor Negative	Landscape Character	Medium	**Minor**
Impact of Lights	Minor Negative	Landscape Character	Medium	**Minor**
		Visual Impacts	Medium	**Minor**
Disruption of views	Minor Negative	Visual Impacts	Medium	**Minor**

6.9 Cultural heritage and archaeology

6.9.1 Environmental Concerns

This chapter of the EIA Report focuses upon the potential cultural heritage and archaeological impacts, both direct and secondary, associated with the development and subsequent Operation of the 200MW PV plant Phase 2.

6.9.2 Construction Phase Impacts

The baseline study comprising site observations and consultation has not identified any specific cultural or archaeological features at the proposed 200MW PV site. However, there is always potential for unknown buried artefacts to be disturbed or unearthed during earthworks. Should such an impact occur, this may result in the damage or destruction of such items, with resulting losses in the value of such features. Due to the lack of evidence of cultural heritage or archaeological features in the local area, the risk of unearthing archaeological features is very low.

Table 6-44 Cultural Heritage and Archaeology - Magnitude of Construction Impacts

Impact	Magnitude	Justification
Destruction of unknown archaeological remains onsite	**Major**	Construction activities could cause the destruction of archaeological remains onsite, resulting in permanent loses of the archaeological features.
Effects on off-site archaeological sites	**No Change**	Construction activities will have no impacts on archaeological sites outside the project boundaries.

Table 6-45 Cultural Heritage and Archaeology - Significance of Construction Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Destruction of unknown archaeological remains onsite	Major Adverse	Potentially unidentified archaeological sites	Very low	**Minor**

6.9.3 Operation Phase Impacts

As ground breaking activities will be limited to the construction phase, impacts to unknown buried archaeology are not expected to occur during operation.

Table 6-46 Cultural Heritage and Archaeology - Magnitude of Operation Impacts

Impact	Magnitude	Justification
Destruction of unknown archaeological remains onsite	**No Change**	Major earthworks will not be conducted during the operation phase and as such will not result in the damage/destruction of archaeological remains onsite.

Table 6-47 Cultural Heritage and Archaeology - Significance of Operation Impacts

Impact	Magnitude	Receptor	Sensitivity	Impact Significance
Destruction of unknown archaeological remains onsite	No Change	Potentially unidentified archaeological sites	Very low	**Neutral**

7 MITIGATION PLAN

A full description of the mitigation measures to be incorporated for the construction and operation of the 200MW PV Phase 2 site shall be set out in the site specific Construction Environmental Management Plan (CEMP) and the Operation Environmental Management Plan (OEMP). An outline CEMP and OEMP for the site has been included within the Environmental Monitoring and Management Program Volume 3 of this EIA, for development into the full CEMP and OEMP documents.

The contractor appointed to deliver the works will be responsible for the preparation and implementation of a detailed Construction Environmental Management Plan, in accordance with the requirements included within the Environmental Management and Monitoring Volume of this EIA. This will include a detailed list of the potential environmental aspects associated with the construction process.

The commercial and retail operators will each be responsible for the development of an OEMP specifically tailored to their work activities. However, their OEMP will be based on the Framework OEMP provided in Volume 3 and will incorporate as a minimum the following recommended mitigation measures. Therefore the project owner will provide to each subcontractor, a copy of the EMMP and EIA for their use and integration within their own Environmental Management System.

7.1 Air Quality

7.1.1 Construction Phase

The air quality mitigation measures will be followed by contractors on site and will include at least the following:

Table 7-1 Air quality –Mitigation Measures during the Construction Phase

Impact / Source	Mitigation Measure	Responsibility	Schedule
Particulates - Earthworks	Any land grading, excavations and moving of uncovered waste/materials should be undertaken during periods of low winds (<15 km/h)	Contractors	CEMP – Site preparation
	Large sand piles (Higher than 5 metres) will be avoided where possible, with dust suppression sprays being utilized on any piles during periods where the wind speed exceeds 15km/h.	Contractors	CEMP – Construction Management
	Earthworks will be stopped when high winds are present (15 km/h).	Contractors	CEMP – Construction Monitoring
	Where sand and other dusty materials are transported to the site, trucks will not be overloaded and will be appropriately covered / sheeted to avoid loses en-route.	Contractors and Suppliers	CEMP – Construction Monitoring
	Dusty material stockpiles are to be located away from the site boundaries and effectively screened.	Contractors	CEMP – Management and Monitoring
	Dust generating activities such as stone cutting and grinding are to be undertaken away from the site boundaries and/or should be effectively screened.	Contractors	CEMP – Management and Monitoring
	Powdery materials (e.g. cements) will be stored and transported in sealed containers.	Contractors and Suppliers	CEMP – Management and Monitoring

Impact / Source	Mitigation Measure	Responsibility	Schedule
Particulates	Access roads from the entrance to the site will be compacted and sprayed with water to minimise the dust generated from the vehicles.	Contractors	CEMP –Management and Monitoring
	Construction roads will be designated and made clear to the drivers with signage for directions and speed limits placed all along the roads.	Site Project Manager & Contractors	CEMP – Management
	The provision of a wheel-washing facilities or high-pressure hose to ensure all vehicles leaving the site are in a satisfactory state of cleanliness. Dry wheel cleaning is recommended, unless adequately treated water can be reused.	Contractors	CEMP – Management
	A visual assessment of dust emissions will be undertaken on a daily basis and actins taken to reduce emissions, where they are identified as excessive.	Contractors	CEMP –Monitoring
Gaseous Pollutants	Deliveries of equipment/plant to the site will be efficiently managed to reduce the number of trips.	Site Project Manager & Contractors	CEMP – Management
	Exhaust fumes and particulates emitted from trucks and vehicles will be minimised by assuring the use of good condition vehicles. Vehicles entering the site for the first time will be inspected for their worthiness and where necessary will not be permitted to enter the site.	Site Project Manager & Contractors	CEMP – Management and Monitoring
	Lorries and trucks engines will be turned off while waiting on site to minimise gaseous emissions. Air-conditioned shelters should be provided for drivers in designated waiting, loading and unloading areas.	Site Project Manager & Contractors	CEMP – Management
VOCs & other Hazardous Volatiles	Hazardous materials stored and used on site with potential gas emissions (e.g. Volatile Organic Compounds) will be located in well-ventilated, but secure low-risk areas, away from major transport routes.	Contractors	CEMP – Management
	Fires and material burning will not be allowed on the Project site.	Contractors	CEMP – Management and Monitoring

Impact / Source	Mitigation Measure	Responsibility	Schedule
Odours	Adequate and sufficient sanitary facilities for site workers must be provided. The placement of the facilities should be downwind of populated areas and should be regularly maintained.	Contractors	CEMP – Management and Monitoring

7.1.2 Operation Phase

The proposed project will not generate significant emissions to the air in the local area, however increased traffic volumes on existing roads, as well as new traffic flows on the site will impact air quality in areas near roads (vehicle emissions will include NO_x, SO_x and Particulates). Therefore, the following mitigation measures are proposed in order to alleviate any perceived air quality issues raised by the 200MW PV Phase 2 operation:

Table 7-2 Air quality – Mitigation Measures during Operation Phase

Impact / Source	Mitigation Measure	Responsibility	Schedule
Vehicle Emissions (Gaseous & Particulates)	Optimise the set backs of new buildings, to provide more potential for air emission mixing, prior to exposure at the building façade.	Designers	OEMP - Planning
	Increase landscaping along the project boundaries Increase landscaping along the project boundaries	Operational Management Team	OEMP - Planning
	Reduce the number of vehicle trips outside the project by ensuring that all basic services and amenities are located at suitable places within the development.	Operational Management Team	OEMP - Planning
	Ensure that the design of the internal road network controls speeds, and the placement of public amenities promotes the use of alternative transport means.	Operational Management Team	OEMP - Planning
	Advise commercial operators to schedule deliveries outside of peak hours and to avoid idling of delivery vehicles.	Commercial Operators and Suppliers	OEMP - Management

Impact / Source	Mitigation Measure	Responsibility	Schedule
Odours	Effective controls should be installed at the on site sewage holding tanks (prior to connection to the DM sewerage system) to ensure that odours during operations are minimised or eliminated. A procedural document stating the methodology for sewage collection by tanker shall be in place, with specific training given to operators in regard to the procedures. Monitoring of odour shall be undertaken to identify any situations of odour emissions.	Operational Management Team and STP Management	STP Design, OEMP – Management and Monitoring

7.2 Topography, Soil, Geology and Hydrogeology

7.2.1 Construction Phase

As far as the construction of the proposed project is concerned, the CEMP will cover all the necessary measures to be taken prior to and during the construction phase. This will include outlining the appropriate waste storage protocols and soil and groundwater protection measures required to prevent the occurrence of spillage to the ground, and the risk of contamination. The contractor employed on site will be required to design and operate a CEMP during the construction phase. A key part of this document will be the soil and land contamination protection measures on the site, which should include the following measures:

Table 7-3 Topography, Soil Geology and Hydrology – Mitigation Measures during Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Spillage	All permanent or semi-permanent hazardous materials storage areas must have suitable leak tight bunding, to contain 110% of the total stored volume, in the event of a spill or leakage.	Contractor	CEMP – Management
	Spillage and leakage prevention measures including regular inspection of containers.	Contractor	CEMP – Training and Monitoring

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	A spill prevention and emergency contingency plan will be established. The plan will outline methods for the prevention of incidents, response and remediation of any contamination. A framework for emergency response and contingency plan is provided in the Environmental Management Plan Chapter. It is suggested that the contractor must incorporate this in their CEMP and implement throughout the site.	Contractor	CEMP – Training and Monitoring
	The clean up of any spillage or leakage will be made by spill absorbents, available at all hazardous material storage locations on the site.	Contractors	CEMP – Training and Monitoring
	Refuelling should only be carried out in designated areas following specified procedures, and not at machinery work locations to minimise potential spillages. A dedicated refuelling area near to the servicing area will be established. Refuelling areas should be clearly designated and communicated to all site personnel.	Contractors	CEMP – Training and Monitoring
Cross contamination of soils	Implementation of good housekeeping practices during construction activities including procedures and requirements for proper handling, storage, and transport of hazardous materials and waste.	Contractors	CEMP – Training and Monitoring
	If contaminated soils are observed during construction activity, the identified contaminated soil should be excavated separately, and stored or disposed off in accordance with environmentally adequate measures for waste management, to avoid cross-contamination.	Contractors	CEMP – Training and Monitoring
	Contaminated aggregate wastes or excavation material shall be disposed through registered/approved waste contractor at appropriate facilities.	Contractors	CEMP – Management and Monitoring
	The contractors and sub-contractors employed for the construction period will be required to put in place adequate training programmes, safety induction sessions with regards to the transportation and handling of hazardous materials and wastes.	Contractors	CEMP – Management and Training
	Washing of equipment, machinery and vehicles will not be permitted on site, or on un-paved surfaces.	Contractors	CEMP – Monitoring
Storage and waste management	All hazardous materials or waste being temporarily stored outside of its designated storage areas should be kept in well-equipped, leak-tight containers with drip protection to avoid leaks to the ground.	Contractors	CEMP – Management and Monitoring
	Wherever possible, reduce the quantity of chemicals and fuel stored on site to	Contractors	CEMP – Planning

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	minimum practical level. Infrequently used chemicals should be ordered in suitable quantities only when required.		
	Excavated materials will be kept in the stockpiles for as short a time as possible.	Contractors	CEMP – Planning
	No hazardous material are to be be stockpiled.	Contractors	CEMP – Start of Planning
	Minimise the size and height of the stockpiles as far as possible.	Contractors	CEMP – Start of Monitoring
	A mandatory training programme for site personnel should be employed to increase awareness of chemical management protocols including proper handling and storage of chemicals, emergency response and contingency plans.	Contractors	CEMP – Management and Training
Dewatering (if necessary)	Where possible, evaporation ponds should be used to manage dewatered effluent.	Contractors	CEMP – Start of Construction
Site Drainage and Erosion Control	The areas requiring excavation/filling shall be clearly demarcated to ensure that the soils are not disturbed outside of the working area.	Contractors	CEMP – Management, Planning and Monitoring
	Adequate drainage systems will be provided to minimise and control infiltration.	Contractors	CEMP – Management
	Sediment traps (i.e. filter fabric) will also be installed at drainage areas.	Contractors	CEMP – Management
	Temporary road gradients will be minimised in order to reduce run-off induced erosion.	Site Project Manager & Contractors	CEMP - Planning
	Stockpiles will be located on flat and hard standing areas.	Contractors	CEMP – Management
	Stockpiles will be covered and their height and slope limited, to minimise erosion during rainfall.	Contractors	CEMP - Management
	Regular inspection of the sedimentation/erosion controls will be conducted regularly, particularly during times of rainfall.	Contractors	CEMP - Monitoring

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	Disturbed areas will be stabilised to minimise further erosion.	Contractors	CEMP - Management
	The site will be fenced to ensure that no soil disturbance occur outside of the site area.	Site Project Manager & Contractors	CEMP – Planning and Management

7.2.2 Operation Phase

The threat to soil and groundwater contamination during the operation phase is significantly reduced from the construction phase. However, the commercial facilities may generate hazardous waste and undertake activities, which could lead to contamination to the soil if not adequately controlled. Therefore, similar control techniques and mitigation measures should be in place to tackle such risks. Best housekeeping practices should be adopted to ensure proper measures are in place.

Day to day measures included in the OEMP should outline the requirements for storage of hazardous chemicals, as well as provide a procedure for spill prevention and clean up where necessary.

Table 7-4 Topography, Soil Geology and Hydrology – Mitigation Measures during Operation

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Spillage	Storage areas for hazardous material should be sealed, covered and paved with secondary containment such as bunded walls, leak tight collection reservoirs, leak tight flooring, and correct shelving / cabinets in order to prevent spillage and leakage into the ground.	Operational Management Team	Project Design And OEMP – Planning and Management
	The storage tanks of fuels/chemicals should be properly maintained and stored within		

	a bunded area of 110% of their storage capacity.		
	Leakage monitoring system should be installed in order to determine any leakage issue at an early stage and minimize any relevant environmental issues associated with the leakage	Operational Management Team	OEMP – Monitoring
Storage and Waste Management	A dedicated storage for large volumes of solid and liquid (especially for hazardous waste) material from several sources is recommended. This storage area should be provided with leak tight flooring, secondary containment as bunded walls, leak tight collection reservoirs and correct shelving/cabinets to prevent spillage.	Operational Management Team	Project Design And OEMP – Planning and Management
Cross Contamination of Soils	Proper procedures, such as regular inspections, audits, and monitoring, will be put in place to ensure that all necessary mitigation measures are being implemented.	Operational Management Team	OEMP – Management, training and monitoring

7.3 Noise

7.3.1 Construction Phase

Table 7-5 Noise – Mitigation Measures during Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Construction Noise and Vibration	Activities emitting with the highest noise levels will be undertaken during daytime hours between Saturday and Thursday and not during official holidays.	Contractors	CEMP – Planning
	Diesel engine vehicles and compression equipment will be equipped with effective silencers.	Contractors	CEMP – Monitoring
	Electrically powered plant will be preferred, where practicable, to mechanically powered alternatives. All mechanically powered plant should be fitted with suitable silencers.	Contractors	CEMP – Planning
	Where appropriate, bored piling techniques will be considered in preference to impact piling.	Contractors	CEMP – Design and Planning
	Delivery vehicles should be prohibited from waiting within or near the site with their	Contractors	CEMP –

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	engines running. The movement of heavy vehicles during the night will be avoided wherever practical.		Monitoring
	Items of plant on site operating intermittently will be shut down in the intervening periods between use.	Contractors	CEMP – Monitoring
	The contractors and their sub-contractors will, at all times, carry out all work in such a manner as to keep any disturbance from noise and vibration to a minimum.	Contractors	CEMP – start of Monitoring
	Where appropriate, noise barriers /attenuation to be employed (e.g. for generators) to ensure that the maximum noise level at 1 m distance from a single source will not exceed 85 dB(A).	Contractors	CEMP – Planning
	Where noise levels exceeds 85dB(A) noise protection devices shall be provided to personnel on-site.	Contractors	CEMP – Monitoring
	Notices and letters should be provided to affected tenants and residents, informing them of working hours and any activities that will potentially cause excessive noise and /or vibration.	Contractors	CEMP – Management and Planning

7.3.2 Operation Phase

The proposed project will not directly generate noise, although secondary increases in noise will result from new or increased flows of vehicles to and from the site. Although no mitigation measures can be proposed for the reduction of vehicle noise, the following noise mitigation and abatement techniques are recommended for incorporation to the infrastructure design of the project to minimise disturbance to the local area.

Table 7-6 Noise and Vibration – Mitigation Measures during Operation

Impact/ Source	Mitigation Measure	Responsibility	Schedule

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Operational Noise and Vibration	Increase landscaping along the project boundaries with the major roads. Typically the vegetation should be wide, dense and high (1.5-2m) in order to be effective	Operational Management Team	OEMP - Planning
	Optimise the set backs of the buildings, in order to ensure that the noise levels at sensitive receptors has attenuated to acceptable levels as per DM guidelines	Designers	Planning and Plot Planning
	Use sound insulation on walls facing the roads, or build cavity walls. Increasing the air space in the cavity from 6cm to 12cm reduces the noise level by 5dB(A).	Developers	Property Design
	Minimise the size and number of windows on the road facing walls, and use sealed windows and double-glazing.	Developers	Property Design
	Selected low-noise road surfaces, which are typically, 3 to 5 dB(A) quieter than standard surfaces at high speeds.	Designers	Planning and Plot Planning
	Since the project includes commercial facilities, develop a traffic management plan which identifies preferred access routes and times for HGVs within the project.	Operational Management Team	OEMP - Management
	Ensure that speed limits within the project are limited to acceptable levels, in order to help reduce road noise levels.	Operational Management Team	OEMP - Management
	Ensure that the design of major facilities and the plant/mechanical components of the facilities utilise low-noise motors, pumps etc.	Designers	Planning and Plot Planning

7.4 Terrestrial Ecology

Although the overall terrestrial ecology on the site is not of high ecological value, the Ghaf trees should be either preserved on site and incorporated into the landscape, or protected by translocation to an alternative location, preferably within the project area. Other measures that could be implemented in the landscape design of the project, which could help to offset the loss of habitat, are also described.

7.4.1 Construction Phase

Table 7-7 Terrestrial Ecology –Mitigation Measures for Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Degradation of the terrestrial ecosystem by earthworks and laydown areas	The laydown areas of the site will be minimised in size wherever possible, and preferably located in areas with little or no vegetation.	Contractor	CEMP – site preparation
	To aid re-vegetation, the topsoil (containing the most nutrient rich soils) should be removed and stored safely and spread over the site once construction has been completed.	Contractor	CEMP – site preparation
	The contractor should ensure that no encroachment to the nearby, adjacent land should occur.	Contractor	CEMP – site preparation
	All construction vehicles adhere to clearly defined transportation routes. Transport routes should be identified and training provided to emphasise the need to adhere to the designated routes in order to protect the existing vegetation and reduce encroachment on adjacent land, and reduce dust fall across the site.	Contractor	CEMP – Planning and management
	Hazardous materials used during the construction stage should be adequately managed, in order to minimise the potential risk of spillage and therefore potential contamination to the ecosystem.	Contractor	CEMP – Management and training
	Transportation within and to and from the site should be minimised through efficient transport management in order to minimise noise and vehicle pollution and the risk of running animals over.	Contractor	CEMP – Management and monitoring
	Machinery should be maintained on a regular basis to ensure smooth efficient running to control emissions and prevent contamination events as a result of faulty equipment etc.	Contractor	CEMP – planning and monitoring
Feeding Stations	During construction, unless for a specific work related task, workers are not to approach feeding stations or the wildlife, in an effort to leave them as undisturbed as possible. This information should be provided to workers and visitors to the site as part of the induction training.	Project Proponent Contractor	CEMP – planning and monitoring

7.4.2 Operation Phase

The proposed project has no allocated land for open areas, landscaped areas or green space. In order to ensure that appropriate ecological mitigation measures have been implemented to offset the loss of native vegetation, the following mitigation measures are recommended.

Table 7-8 Terrestrial Ecology –Mitigation Measures for operation

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Loss of Seed bank and degradation of terrestrial ecosystem	Any landscaping on site should incorporate indigenous halophytic and xerophytic plant species to minimise irrigation requirements and the need for fertilisers/pesticides. Intentional replanting of vegetation and incidental recolonisation with native species from the seeds retained from the stockpiling of topsoil would enhance the biodiversity of the site as well as improve the visual aesthetics of the site. Areas used for laydown and storage should be sclarified if compacted, in order to facilitate the recolonisation of native species;	Operational Management Team	Project Design OEMP – Design and planning
	Since human settlement attracts pests and also has a large impact on birds, consideration should be given to developing a plan to manage pests identified on the site attracted by the waste facilities and kitchens.	Operational Management Team	OEMP – Management and monitoring
Herbicide Pesticide Use	Appropriate storage of hazardous materials, should be designed in accordance with the DM guidelines, preventing any major spillages on the site.	Operational Management Team	OEMP – Planning, design, monitoring
	Implement an integrated pest management scheme instead of using large scale application of pesticides.	Operational Management Team	OEMP – Planning, monitoring
Feeding Stations	During the subsequent operation phase, unless for a specific work related task, workers are not to approach feeding stations or the wildlife, in an effort to leave them as undisturbed as possible. This information should be provided to workers and visitors to the site as part of the induction training.	Operational Management Team	OEMP – Planning, monitoring
	Due to the future impact from other PV developments in the Solar Park, relocating or installing a new feeding station outside of the Solar Park area would allow time for local wildlife that use the feeding stations to adapt and move out of the area.	Project Proponent	OEMP – Planning, design, monitoring

7.5 Socioeconomic

7.5.1 Construction Phase

Table 7-9 Socioeconomic – Selected Mitigation Measures during Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Employment creation	The project should seek to employ local workers where these are available	Contractor	CEMP – Planning
Purchase goods and materials from the local / regional economy	Purchase goods and materials from the local / regional economy where possible	Contractor	CEMP – Management
Dissemination of skills	Training should be offered to enhance the development of skills within the local workforce.	Contractor	CEMP – Training
Cumulative Impacts to Local Area Residents	The boundary fence line should not encroach on any areas outside of the project land ownership. Diversionary routes with clear signage should be provided where existing routes are to be blocked by the development. Laydown areas and site offices should be confined within the footprint of the project. Public parking bays should not be blocked off or taken up by construction vehicles. Notice boards with points of contacts and complaints register should be installed and maintained at the site entrance.	Contractor	CEMP – Planning

7.5.2 Operation Phase

The one Socio-economic impact for the operation phase of the project is positive, since the proposed project will add 200MW of clean and sustainably produced energy for the region.

Table 7-10 Socioeconomic – Selected Mitigation Measures during Operation

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Employment creation and Dissemination of skills	The project should employ local staff where appropriate. Training should be offered for career development and advancement within the local workforce.	Operational Management Team	OEMP – Planning and Management
	Education and public notification for Environment protection and sustainability should be provided to the residents and guests.	Operational Management Team	OEMP – Planning and Management

Community Complaints

A complaints register should be established and used for documenting all community complaints. The complaints register should document how all complaints have been followed up and what actions have been taken to address these.

The F&CM and Commercial Operators must address all complaints, and responses should be prepared within an adequate time frame. If the complaint is serious, corrective measures should be taken immediately. All corrective actions should also be documented in the register, and any changes in work methods, resulting form the complaints, should be updated in the OEMP revisions.

7.6 Transportation

7.6.1 Construction Phase

Table 7-11 Traffic – Selected Mitigation Measures for Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Increased congestion on	In order to reduce congestion from labourers entering the site, buses should be used by the contractors and car pooling should be encouraged.	Contractors	CEMP – planning and

highway and local roads			management
	Staggering deliveries to the site will ensure that congestion on local and site roads is minimised, whilst reducing waiting times for drivers and over demand on receiving staff at the site.	Contractors	CEMP – planning and management
	Designated roads will be made clear to the drivers and signs for the directions and speed limit will be placed all along the roads.	Contractors	CEMP – planning and management
Movement of vehicles through the site	The movement of construction vehicles around the site will be minimised to essential construction-related activities.	Contractors	CEMP – management monitoring
	Manage delivery times of construction materials, outside of peak commute hours to reduce impacts upon local residents and communities.	Contractors	CEMP – management monitoring
	A 20 km/hr speed limit (the local speed limits outside the site area will be applicable) will be imposed across the construction site.	Contractors	CEMP – management monitoring
	Lorry and truck engines will be turned off while waiting on site to minimise the gaseous and noise emissions. This can be achieved by providing air-conditioned shelters for drivers especially when loading/unloading.	Contractors	CEMP – management monitoring
	Staff will not be allowed to rest in vehicles to prevent excessive fuel wastage through the need to use air conditioning. Appropriate facilities will be provided for the drivers to be used for periods of rest.	Contractors	CEMP – management monitoring

7.6.2 Operation Phase

Table 7-12 Traffic – Selected Mitigation Measures for Operation

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Increased congestion from waste removal trucks	Wherever possible waste removal will be scheduled outside of peak periods	Operational Management Team	OEMP – Planning and Management

Increased congestion on local roads	Develop a traffic management plan which identifies preferred times for HGVs within the project, so as to avoid the main roads used by residents. Ensure that major facilities (substations, sewage lifting stations), are positioned in an easily accessible sector of the development.	Operational Management Team	Project Design OEMP – Planning and Management
Public/Private Parking	Ensure that parking within the project is sufficient to meet the demands of visitors, who come to inspect/view the site. Also ensure parking for the workers who bring cars or who carpool	Operational Management Team	Project Design OEMP – Planning and Management

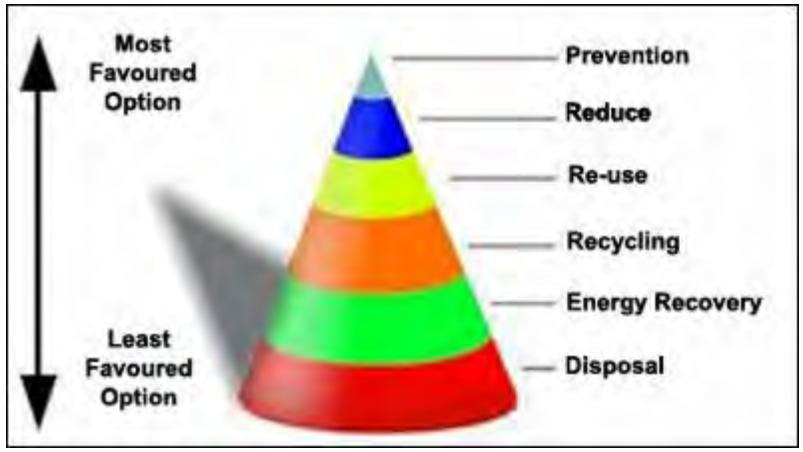
7.7 Utilities

7.7.1 Construction Phase

Waste Management Hierarchy

The waste management hierarchy is a well known method for ensuring appropriate and sustainable use of resources and waste by Preventing, Reducing, Re-using, Recycling, Recovering and Disposing of waste. The hierarchy as illustrated below will form a key element of any waste management strategy and if implemented effectively will achieve maximum reductions on waste quantities combined with the limited use of resources and landfill space. The waste management hierarchy also has the potential to reduce costs that may be incurred by the main contractor or the proponent for handling, transportation and the disposal of waste.

Figure 7-1 Waste Hierarchy



Initially, options to prevent or reduce waste will be considered. Where waste generation cannot be avoided or further reduced at source, opportunities for reuse of materials will be explored, either for use for the same or a different purpose. Disposal to landfill is the least favoured option in the waste hierarchy and is the last resort after all other options have been considered.

Such an approach is also used in other areas of the world. The US-EPA's Waste Minimisation Program presents the following objectives:

- Complete elimination of, or substitution for priority chemicals, wherever possible;
- Minimising the amount of priority chemicals used whenever elimination or substitution is not possible;
- Maximising recycling whenever elimination, substitution, or minimisation is not possible, creating closed loop materials management systems that eliminate or constrict release pathways;
- Promoting cradle-to-cradle waste management instead of cradle-to-grave waste management.

The UAE per capita waste production, which stands at 2.1 to 2.8 kg per day, is one of the world's highest levels. According to statistical data collected from the UAE Factbook approximately 52% of the waste is food leftovers, 16% paper products, 14% is plastic, 7% is glass and the remainder is tins, cloths and other products. Given these figures it is expected that once waste recycling and minimization strategies are initiated and implemented, they could be very successful within Dubai Emirate. Therefore, good practice and sustainability principles should be implemented to provide waste recycling facilities during both construction and operational phases of the project.

Solid Wastes and Hazardous Materials Management

The mitigation measures provided refer to both hazardous and non-hazardous wastes. Whilst some mitigation measures are specific to either hazardous or non-hazardous waste streams, many measures are applicable to both and therefore this section does not consider these measures separately, unless specified.

In order to minimise the impacts resulting from waste generation during the construction phase, the total amount of waste generated must be reduced to the greatest possible extent. The following mitigation measures will contribute to the reduction of overall waste generated by the Project:

Table 7-13 Solid Wastes – Mitigation Measures during Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Solid waste volumes/quantities	Waste concrete and masonry can be re-used in road construction and base fillings; reasonable levels of utilisation is 80 to 90%.	Contractors	CEMP – Planning
	The amount of waste timber generated can be reduced through ensuring accurate measurements and orders are placed, and re-use for general construction purposes. It is estimated that 50 to 60% of this waste stream can be recycled.	Contractors	CEMP – Planning
	Waste metal can readily be recycled, 100% of this waste stream can be eliminated	Contractors	CEMP – Planning
	It is conservatively estimated that 80% of oils can be recycled or reused through environmentally friendly energy recovery.	Contractors	CEMP – Planning
	Ordering materials that have reusable packaging and/or in bulk can significantly reduce waste generated.	Contractors	CEMP – Planning
	Suppliers should be requested to use minimal packaging. Chemicals should be ordered in returnable drums. "Buy-back" arrangements will be made with key suppliers so that any surplus chemicals or materials can be returned.	Contractors	CEMP – Planning
	Refillable containers should be used, where possible, for collection of waste fluids such as waste oil, hydraulic oils, and used grease.	Contractors	CEMP – Planning
Housekeeping	Separation of waste streams to facilitate recycling.	Contractors	CEMP – Monitoring
	Adequate storage facilities for non-hazardous waste storage in designated areas to prevent waste from dispersing throughout the site.	Contractors	CEMP – Planning
	Adequate hazardous waste storage in bunded containers stored in dedicated, covered storage areas with impermeable bases, sufficient containment capacity and equipped with spill kits.	Contractors	CEMP – Planning
	Immediate spill response protocol and contingency plans to detail the clean up of any spillages.	Contractors	CEMP – Training
	Procedures and rules for hazardous waste handling.	Contractors	CEMP – Training
	Mandatory training program for employees to increase their awareness of waste	Contractors	CEMP – Training

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	management protocols including proper handling and storage of waste, and emergency response and contingency plans.		
Waste Storage	Food waste must be stored within a sealed metal or plastic skip or bin, in order to prevent vermin/pests gaining access; Lightweight waste e.g. paper, cardboard, plastics: Must be stored within a skip sealed with a secured tarpaulin/netting sufficient to prevent any material being dispersed; Heavy waste must be contained within an open skip, providing that segregation occurs effectively enough to remove all lightweight material that could be blown away.	Contractors	CEMP – Planning, training, monitoring
	All storage areas must be well organised and waste appropriately managed through segregation of hazardous and non-hazardous waste. Waste within each category should be further segregated by type (paper, plastic, metal) and whether the material is recyclable or non-recyclable. Construction waste should be separated into combustible and non-combustible, and all flammable substances must be kept away from sources of ignition. For litter (food waste, domestic waste), an adequate number of bins should be placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area. On-going housekeeping training should be provided to all staff on the importance of the need to avoid littering.	Contractors	CEMP – Planning, training, monitoring
	Waste containers should be clearly marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, securely attached, and written in English and Arabic. Wherever possible, chemicals will be kept in their original container	Contractors	CEMP – Planning, training, monitoring
	Waste generated during construction should only be transported off-site for disposal by an appropriately licensed vendor. This contractor will follow the proper protocols to ensure that all waste handling and disposal from the site is carried out according to accepted environmental regulations. A record for all streams of generated waste should be kept onsite. This will be readily available for DM or concerned authority	Contractors	CEMP – Planning, training, monitoring
	Regular training of site personnel in proper waste management and chemical	Contractors	CEMP – training

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	handling procedures should be conducted at regular intervals.		
Hazardous Waste	Hazardous waste must be contained within impermeable containers with sufficient containment to prevent any spills. Storage containers should be bunded where necessary. The bunded base should have the capacity to contain 110% of the total volume of stored materials. This area must be placed away from any sources of ignition. Implement best practice and regulations procedures for adequate handling, establishment of secure temporary storage areas, and disposal of waste by approved contractors.	Contractors	CEMP – Planning, training, monitoring

Wastewater Management

During construction, the following mitigation measures will be taken:

Table 7-14 Wastewater –Mitigation Measures for Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Sanitary wastewater	Chemical toilets will be available on site and septic tanks will be installed at the administration buildings.	Contractors	CEMP – Planning
	The number of septic tanks will be increased in proportion to the increased number of workers on site. If possible, meters will be installed on the tanks, in order to monitor the volumes and prevent overflows. The septic tanks will be above ground where possible, though if buried should be placed in secure areas, away from general vehicle traffic, in order to prevent any damage to the tanks. Once the on site package STP is installed, all sanitary and domestic wastewater should be treated at this facility.	Contractors	CEMP – Planning and monitoring

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	No sanitary wastewater shall be discharged to the storm water, or road drainage system. All sanitary wastewater will be piped or tankered to a licensed treatment plant offsite.	Contractors	CEMP – Monitoring
	Site inspections will be carried out regularly by the contractor to ensure that all wastewater generated is properly managed, and no leakages or spillover occur. In the event of a spill or overflow, immediate action should be taken in accordance with spill containment procedures developed as part of the CEMP.	Contractors	CEMP – Monitoring
	In common with best practice, effort should be made in training employees including all sub-contractors at the site to minimise water consumption for ablutions and to ensure an understanding of wastewater issues	Contractors	CEMP – Training
	In addition, the contractor should develop procedures for the demobilisation of the septic tanks once site construction has ended to ensure that appropriate procedures/methods will be employed and no contamination to the site area will occur during the demobilisation period.	Contractors	CEMP – Management and planning
Storm water run-off	Following the installation of the storm water drainage system, all storm water will be conveyed to the two evaporation ponds on site. Adequate drainage systems will be provided to minimize and control erosion. Sediment traps (i.e. filter fabric) will be installed. Road gradient will be minimized (contour and slopes) in order reduce run-off induced erosion. Regular inspection of the sedimentation/erosion controls will be conducted to prevent flooding/pooling.	Contractors	CEMP – Management and planning

7.7.2 Operation Phase

Solid Waste Mitigation Measures

Suitable implementation of controls and procedures for handling, storage, transport and disposal of waste can prevent the generation of significant amounts of waste during operation. It is recommended that prevention or reduction at source, followed by reuse and recycling methods are implemented on site to reduce the residual impacts of waste generated as a result of the Project. Adherence to guidance and recommendations set out by DM and IFC/World Bank standards will form the basis of the mitigation measures prescribed in this section.

These measures will be fully described within, and implemented through, a detailed site specific Waste Management Plan within the Operational Environmental Management Plan (OEMP) to be developed by the facilities and communities management departments of each building owner, commercial tenant, or retail operator. The mitigation measures presented will be cross-referenced within the Waste Management Plan and focus predominantly on the appropriate handling, storage, segregation, transport, and disposal of all waste. The following mitigation measures are applicable during the operation phase.

Table 7-15 Solid Wastes – Mitigation Measures during Operation

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Waste Volumes and Hazardous Wastes	• Ensure that the temporary on-site storage waste facilities are fully enclosed to control / minimize odour, noise, and aesthetics impacts. • Install exhaust air cleaning systems in the building waste chutes. • Provide sufficient access space for waste collection vehicles • Siting of centralised waste storage facilities should be away from sensitive receptors and away from congested zones.	Operational Management Team	Project Design

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	The OEMP of each commercial operator should provide a detailed waste management strategy, which integrates the requirements of the proponents OEMP.	Operational Management Team	OEMP – Planning and management
	Segregate and store different types of waste in separate labelled containers, to promote the re-use and/or recycling of materials.	Operational Management Team	Project Design
	The Project management should appoint a specialist waste management contractor to provide: • The equipment for each transfer area, • The collection vehicles and • Carry out the removal and disposal of wastes	Operational Management Team	OEMP – Planning and management
	Implement a recording system for the amount of wastes generated on-site, and disposal locations.	Operational Management Team	OEMP – Planning, and monitoring
	Undertake regular inspections, audits, and monitoring of waste streams generated to ensure that all necessary mitigation measures are being implemented.	Operational Management Team	OEMP – Monitoring
	Hazardous materials should be collected in suitably bunded and protected areas. Such waste should be collected and transported by appropriately licensed transporters to approved hazardous waste disposal sites when re-use is not an option.	Operational Management Team	OEMP – Planning, training and monitoring
	Consignment details and records of the hazardous waste generated shall be maintained in the facility.	Operational Management Team	OEMP – Monitoring
	Implementation of spillage and leakage prevention measures such as a development of manuals for proper waste handling, regular inspection of containers and storage areas.	Operational Management Team	OEMP – Planning, training and monitoring
	Mandatory training program for employees to increase awareness of waste	Operational	OEMP –

Impact/ Source	Mitigation Measure	Responsibility	Schedule
	management including proper waste. Training and orientation on waste minimisation, segregation and proper good housekeeping practice at the beginning of work and at regular interval should be conducted.	Management Team	Planning, training and monitoring

Wastewater Mitigation

Sanitary and Domestic Wastewater

A complete system for the collection, containment, and pumping of sanitary and domestic wastewater will be installed and shall include, but not be limited to:

- Sanitary/domestic wastewater system including all necessary sewers, pipes, pumping stations, and separate collection systems;
- Metering at connection points in order to monitor any potential leaks;
- Removal of wastewater by tanker and taken for treatment at a local STP.

The DM sewerage system will not be connected to this site in the near future. Therefore the wastewater will be collected and removed to a local STP by road tanker.

Table 7-16 Wastewater – Mitigation Measures during Operation

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Sanitary and	Liquid wastes and wastewater (containing hydrocarbons, lubricants, and solvents) should be appropriately contained, stored and treated/disposed through the use of a	Operational Management	OEMP – Planning and monitoring

Domestic Wastewater	licensed waste contractor.	Team	
	All wastewater-producing facilities (e.g. laundry facilities) must implement appropriate wastewater collection and treatment systems to prevent any wastewater discharging into the storm water network.	Operational Management Team	OEMP – Planning and Management
	All sewage containment areas shall be sealed, leak tight and include odour controls.	Operational Management Team	OEMP – Planning and Management

Table 7-17 Power and Water – Mitigation Measures during Operation

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Power and Water	Green design elements should be incorporated to building design, materials, fixtures and appliances, in order to minimise power consumption, as follows: • Buildings should be sited to maximise crosswind ventilation and minimise heat gain; • Light-coloured reflective roofs will reduce cooling load; • Courtyards provide shaded exterior spaces; • Office windows should be oriented to minimize heat build-up;	Operational Management Team	Project Design OEMP – Design and management
	Green design elements should be incorporated in the building materials, fixtures and appliances, in order to minimise water consumption.	Operational Management Team	Project Design OEMP – Design and management

7.8 Landscape and Visual

7.8.1 Construction Phase

Table 7-18 Landscape and Visual – Selected Mitigation Measures during Construction

Impact/ Source	Mitigation Measure	Responsibility	Schedule
Topographical Impacts to landscape	Any key defining features to the landscape shall be retained where possible. Mitigation will include the retention of key slopes and topographical variations on the site. This will assist in the retention of the existing landscape and in keeping character of the development.	Contractors	Planning, CEMP - Management
New features in the landscape	Where appropriate, construction laydowns and working areas of the site shall be screened to reduce the visual intrusion to existing off site receptors. When not in use, cranes and other construction plant shall be lowered, so they are at their minimum height and do not protrude unnecessarily within the visual envelope of local receptors.	Contractors	CEMP – Management
New features impacting views	Mitigation measures relating to the generation of dust (as detailed in the air quality mitigation section) shall be implemented to ensure that visual impacts are not caused through construction activities.	Contractor	CEMP – site preparation
Light Pollution	Any flood lights required during night time construction activities will be directed onto the working areas, with a maximum position angle of 30° from vertical, and back spill shields, therefore minimising any unwanted light spill and impacts at night.	Contractor	CEMP – Management

Table 7-19 Landscape and Visual – Selected Mitigation Measures for Operation

Impact	Mitigation Measure	Responsibility	Schedule
Impact of Lights	Lighting provision shall not be excessive or unnecessary. Suitable light impact studies for on site lighting shall be undertaken at the design stages for roads. Minimise lighting intensity (lumens below 4050). Light fittings shall be directional as deemed appropriate for their use and intended areas of illumination. Lighting column and lighting head design should be chosen to limit back spill and any unwanted light spill to other site areas or, those areas off the site. Minimise illumination of building facades for aesthetic purposes. Strictly monitor the light intensity, direction and duration of lighting. Design and install lighting such that light bulbs and reflectors are not visible from public viewing areas. Lighting should not cause reflected glare.	Project Developers, F&CM, Commercial Operators	Design Planning and OEMP – Planning and Management
Disruption of Views	Consideration shall be given to the limitation of impacts to the views of existing sensitive receptors. Such impacts may include the materials used in the site perimeter fence/wall, choices of screening/landscape vegetation and the management of such vegetation to avoid unnecessary vertical or lateral growth, which may disrupt the views of existing receptors.	Project Developers, Proponent, Landscape Managers	Design Planning and OEMP – Planning and Management

7.9 Cultural Heritage and Archaeology

7.9.1 Construction Phase

No archeologically significant or cultural heritage sites have been identified within the 200MW PV Phase 2 site or in the immediate adjacent areas. However, in the event that any artefacts are unearthed during the excavation works, the following steps should be implemented to prevent and minimise any further damage to the site.

Potential heritage items or relics can include:

- Evidence of historical occupation (such as aged building remains), fishing or pearling artefacts, ship wrecks, pottery, flint and other tools;
- Evidence of early industrial heritage;
- Articles of religious heritage value; and
- Items or places of importance to the early Bedouin peoples.

- The possible or confirmed existence of heritage objects or places, and any suspected heritage discoveries, should be communicated to all staff including machinery operators.
- When work is conducted near identified heritage items, the items should be clearly marked with temporary flagging or fencing prior to the commencement of works.
- When work is conducted near identified heritage items, an exclusion zone should be created around the items to prevent damage by excavation, vehicle movement and vibration, resulting from vehicles and equipment.

8 RESIDUAL IMPACTS

8.1 Air Quality

Table 8-1 Air Quality – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Dust from Earthworks <500 from site	Moderate Negative	Air Quality (Particulates)	Low	Minor	Yes	**Negligible to Minor**
		Falcon Majlis	Medium	Moderate	Yes	**Minor**
		Small Settlement with Mosque	High	Moderate to Major	Yes	**Moderate**
		13MW Solar PV Plant	Medium	Moderate	Yes	**Minor**
Dust from Vehicle Movements <500 from site	Minor Negative	Air Quality (Particulates)	Low	Negligible to Minor	Yes	**Negligible**
		Falcon Majlis	Medium	Minor	Yes	
		Small Settlement with Mosque	High	Minor to Moderate	Yes	**Minor**
		13MW Solar PV Plant	Medium	Minor	Yes	**Negligible to Minor**
Gaseous and Particulate emissions from Vehicles	Minor Negative	Air Quality (Particulates)	Low	Negligible to Minor	Yes	**Negligible**
		Falcon Majlis	Medium	Minor		**Negligible to Minor**
		Small Settlement with Mosque	High	Minor to Moderate	Yes	**Minor**
		13MW Solar PV Plant	Medium	Minor	Yes	**Negligible to Minor**
VOCs and other hazardous volatiles	Minor Negative	Air Quality (Gaseous)	Low	Negligible or Minor	Yes	**Negligible**

Table 8-2 Air Quality – Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Air Emissions from Vehicles within Phase 2	Minor Negative	Air Quality (Gaseous & Particulate)	Low	Negligible to Minor	Yes	**Negligible to Minor**
		Falcon Majlis	Medium	Minor	Yes	**Negligible to Minor**
		Small Settlement with Mosque	High	Minor to Moderate	Yes	**Minor**
		13MW Solar PV Plant	Medium	Minor	Yes	**Negligible to Minor**
Air Emissions from Vehicles along key roads outside of Phase 2	Negligible Negative	13MW Solar PV Plant	Medium	Negligible to Minor	Yes	**Negligible**
		Falcon Majlis	Medium	Negligible to Minor	Yes	**Negligible**
		Small Settlement with Mosque	High	Minor	Yes	**Negligible to Minor**

8.2 Topography, Soil, Geology and Hydrogeology

Table 8-3 Soil and Hydrogeology – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Spillage/Leakage of Hazardous Materials	Moderate Negative	Soil	Low	Moderate	Yes	**Minor**
Inadequate waste management	Moderate Negative	Soil	Low	Moderate	Yes	**Minor**

Cross contamination of soils	Moderate Negative	Soil	Low	Moderate	Yes	**Minor**
Dewatering	Minor Negative	Groundwater	Low	Negligible or Minor	Yes	**Negligible**

Table 8-4 Soil and Hydrogeology – Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Spills and accidental releases	Minor Negative	Soil	Low	Minor	Yes	**Negligible**

8.3 Noise

Table 8-5 Noise and Vibration – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Construction noise adjacent to northern boundary	Minor Negative	Noise at site boundaries	Low	Minor	Yes	**Minor**
		Small Settlement with Mosque	High	Minor to Moderate	Yes	**Minor**
Construction noise adjacent to eastern, southern and western boundaries	Negligible Negative	Noise at site boundaries	Low	Negligible	Yes	**Moderate**
		Small Settlement with Mosque	High	Minor	Yes	**Minor to Moderate**
Construction Vibration	Negligible Negative	Small Settlement with Mosque	High	Minor	Yes	**Negligible**

Construction Vehicle Noise (off site Roads)	Minor Negative	Small Settlement with Mosque	High	Minor to Moderate	Yes	**Minor**

Table 8-6 Noise and Vibration – Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Vehicle noise (from on site vehicle movements)	Minor Negative	Falcon Majlis & Small Settlement with Mosque	High	Minor to Moderate	Yes	**Minor**
Electrical Equipment	Negligible Negative	Falcon Majlis & Small Settlement with Mosque	High	Minor	Yes	**Negligible**

8.4 Terrestrial Ecology

Table 8-7 Terrestrial Ecology – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Direct Loss of Habitat	Major Negative	Fauna	Low	Minor to Moderate	No	**Minor to Moderate**
Loss of Seed Bank	Minor Negative	Flora	Low	Negligible to Minor	Yes	**Negligible**
Noise Impact on Fauna	Minor Negative	Fauna	Low	Negligible to Minor	Yes	**Negligible**

Table 8-8 Terrestrial Ecology – Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Pests from domestic waste	Negligible Negative	Flora	Low	Negligible to Minor	Yes	**Negligible**
Landscaping Using Indigenous Species	Minor Positive	Flora	Low	Negligible to Minor	Yes	**Negligible**
Restriction of Movement for Species	Minor Negative	Fauna	High	Minor or Moderate	No	**Minor**

8.5 Socioeconomic

Table 8-9 Socioeconomic – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Employment creation	Moderate Positive	Employment	Low	Minor	No	**Minor**
Dissemination of skills	Minor Positive	Employment	Low	Negligible to Minor	No	**Negligible to Minor**
		Local /regional economy	Low	Negligible to Minor	No	**Negligible to Minor**
Purchase goods and materials from the local / regional economy	Minor Positive	Local /regional economy	Low	Negligible to Minor	No	**Negligible to Minor**
Cumulative Impacts to Local Residents	Minor Negative	Local Residents (Off-Site)	High	Minor to Moderate	Yes	**Minor**

Table 8-10 Socioeconomic – Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Sustainable Power Supply of Dubai	Moderate Positive	Dubai Energy Sources	Medium	Moderate	Yes	**Moderate**

8.6 Transportation

Table 8-11 Traffic – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Increased vehicles on Al Qudra Road	Minor Negative	Al Qudra Road	Medium	Minor	Yes	**Negligible to Minor**

Table 8-12 Traffic – Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Increased congestion of existing road network	Minor	Al Qudra Road	Medium	Minor	Yes	**Negligible to Minor**
Movement of vehicles on Phase 2 roads	Minor	Internal Roads on site	Low	Negligible or Minor	Yes	**Negligible**

8.7 Utilities

Table 8-13 Solid Waste– Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Non Hazardous wastes	Moderate Negative	Local Landfills	High	Moderate to Major	Yes	**Moderate**
Hazardous Wastes	Minor Negative	Local Landfills	High	Minor to Moderate	Yes	**Minor**

Table 8-14 Wastewater– Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Pressure upon Sanitary Wastewater treatment	Negligible	Wastewater Treatement	Medium	Negligible to Minor	n/a - Sanitary wastewater will be generated at the same rate by workers as otherwise would have been produced without the project	**Negligible to Minor**
Dewatered Effluent Impacts	Negligible	Soil and Groundwater	Medium	Negligible to Minor	Yes	**Neutral**
Impacts of Storm Water Runoff	Negligible	Soil and Groundwater	Medium	Negligible to Minor	Yes	**Negligible**

Table 8-15 Power & Water – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Pressure upon Power and Water Resources	Negligible	Power and Water	Medium	Negligible to Minor	Yes	**Negligible**

Table 8-16 Solid Wastes– Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Non Hazardous wastes	Minor Negative	Local Landfills	High	Minor to Moderate	Yes	**Minor**
Solid Hazardous Wastes	Negligible Negative	Land fills & Treatment Facilities	High	Minor	Yes	**Negligible to Minor**

Table 8-17 Wastewater - Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Sanitary Wastewater Treatment	Negligible Negative	Municipal Sewage treatment Plant	Medium	Negligible to Minor	Yes	**Neutral**
Storm Water Runoff	Negligible Negative	Soil and Groundwater	Medium	Negligible to Minor	Yes	**Negligible**

Table 8-18 Power and Water– Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Potable Water	Minor Positive	DEWA	Medium	Moderate to Major	Yes	**Moderate**

8.8 Landscape and Visual

Table 8-19 Landscape and Visual – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Topographical Impacts to landscape	Negligible Negative	Landscape Character	Medium	Negligible to Minor	Yes	**Negligible**
New features in the landscape	Moderate Negative	Landscape Character	Medium	Moderate	Yes	**Minor to Moderate**

New features impacting views	Moderate Negative	Visual Impacts	Medium	Moderate	Yes	**Minor to Moderate**
Light Pollution	Minor Negative	Visual Impacts	Medium	Minor	Yes	**Negligible**

Table 8-20 Landscape and Visual – Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Influence on Landscape	No Change	Landscape Character	Medium	Neutral	No	Neutral
Impact of Lights	Negligible Negative	Landscape Character	Medium	Negligible to Minor	Yes	**Negligible**
		Visual Impacts	Medium	Negligible to Minor	Yes	**Negligible**
Disruption of views	No Change	Visual Impacts	Medium	Neutral	No	Neutral

8.9 Cultural Heritage and Archaeology

Table 8-21 Cultural Heritage – Residual Impacts – Construction Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Destruction of	Major	Potentially	Very Low	Minor	Yes	**Minor**

unknown archaeological remains onsite	Adverse	unidentified archaeological sites				

Table 8-22 Cultural Heritage – Residual Impacts – Operation Phase

Impact	Magnitude	Receptor	Sensitivity	Impact Significance	Mitigation	Residual Impact Significance
Destruction of unknown archaeological remains onsite	No Change	Potentially unidentified archaeological sites	Very Low	Neutral	No	**Neutral**

9 CONCLUSIONS AND RECOMMENDATIONS

The Environmental Impact Assessment and resulting mitigation/enhancement recommendations have been based on the information provided to 5 Capitals by the Client. Since the overall phased 1GW proposed project will be built over several years, any subsequent EIA's for the proposed project will need to be considered in line with this EIA. Consideration of this EIA within other future EIA's will ensure suitable inclusion of all identified mitigation measures across the site.

Conclusions

Following the suitable inclusion of all recommended mitigation measures, the EIA has concluded that there will be no residual negative impacts of major significance during the construction and operation phases of the proposed project.

There are no discernable differences in soil or habitat type across the site. The approval for this project is also aided by the fact that a previous development of a similar nature to this (the 13MW Solar PV Phase 1 plant to the north of the proposed 200MW plant) has been constructed and is operating successfully. Its also important to note, that an EIA for the entire 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park (of which this Phase 2 project is part of), was completed by Dome Consulting and successfully approved on the 5th November 2013.

The successful implementation of the proposed mitigation measures will be ensured by the proponent's ability to develop the CEMP and OEMP in accordance with the recommendations of this EIA and any recommendations of the regulator.

All negative impacts are considered moderate to minor (or less) and after implementation of the recommended mitigation strategies and adoption of best practices.

There are however, also positive impacts, the main one being the provision of an additional 200MW of clean and sustainable energy. This energy production will not produce emissions of greenhouse gases, and will assist Dubai in the aim of reducing the carbon intensity of its energy generating activities, whilst diversifying its energy resources.

In summary the EIA identified the following key environmental impacts for construction and operation of the project. Again, all the identified issues are considered minor and can be controlled easily with the mitigation methods discussed earlier.

Table 9-1 Summary of Key Environmental Issues

Construction	
Air quality	Dust from earthworks and vehicle movements. Minor increased emissions from plant.
Noise/Vibration	Noise from plant and construction activities, particularly in close proximity to project boundaries (especially north boundary).
Traffic & Transportation	Increase traffic during peak of construction program. Minor construction traffic impacts to other road users
Socio-Economic	Positive impacts socially relating to increased employment and dissemination of skills to the workforce.
Landscape and Visual	Disturbance to the landscape and views of the local area from construction machinery, fencing, increased dust levels and light pollution at night from spotlights.
Operation	
Air Quality	Very minor increase in emissions from additional vehicle use.
Noise	Traffic generated by the project will result in increased noise at the site and to nearby receptors.
Traffic & Transportation	Local roads will be impacted by increased traffic during project operation, particularly from Water trucks on Al Qudra Road, potentially resulting in higher instances of congestion increased journey times.
Socio-economic	Positive impact resulting from the generation of clean and sustainable energy, with limited associated greenhouse gases.
Utilities	Increased pressure will be placed upon utilities for freshwater, waste and wastewater. Positive impact from production of 200MW clean energy.

A framework Environmental Management and Monitoring Plan (EMMP) has been developed in Volume 3, which provides a guidance for both the project proponent and contractor to develop their project and activity specific Construction Environmental Management Plan/ Operational Environmental Management Plan (CEMP/OEMP).

Recommendations

This document is a high level environmental assessment of the project, since the project will be built over several years. Therefore the overall minimisation of environmental impacts at the construction and operation stage will depend on the development and implementation of the CEMPs/OEMPs by the contractor and sub contractors, and by the project's Operations company.

Therefore, it is recommended that the project proponent provides to the contractors of the Phase 2 construction with a copy of the EIA (Volume 2) and framework CEMP/OEMP (Volume 3), to ensure that the appropriate mitigation measures and monitoring plans are implemented during the construction program.

The project proponent should develop a project specific OEMP, to be used by the Operation management team as a planning, management and monitoring tool. The OEMP should also be provided to any subcontractors. In this way there will be full integration of the environmental mitigation activities across all project operators at the 200MW Solar PV Phase 2 site.

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DEWA 200MW Solar PV Phase 2

Environmental Impact Assessment (EIA)

Dubai, UAE

Volume 3 - Environmental Management & Monitoring Plan

Prepared for:

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Table of Contents

1 Introduction

This outline Environmental Management and Monitoring Plan (EMMP) has been prepared as part of the EIA for the 200MW Solar PV Phase 2 project being developed by ACWA Power, with DEWA as the proponent.

This document is Volume 3 of the EIA and provides the environmental mitigation measures and initiatives detailed in Volume 2 of this EIA that will be developed within the contractors CEMP and the Operators OEMP, and will therefore be implemented during the construction and operation phases of the project. This plan is a requirement of Dubai Municipality EPSS and of the international lenders as part of their obligations to the Equator Principles.

The information provided in this outline EMMP, CEMP and OEMP is for use by the contractor and operations company as a guide to develop site-specific CEMP and OEMP's for construction and operation respectively. The mitigation and monitoring measures have been built upon from Volume 2 of this EIA by allocating timescales and responsibilities for implementation. The future CEMP and OEMP will be prepared to include all the requirements of this outline plan, but will also include further site-specific requirements and specific detail about the management of the construction and operational sites.

2 Purpose of an EMMP

The Environmental Management and Monitoring Plan (EMMP) is a detailed set of measures and procedures designed to ensure the implementation of the mitigation measures, which have been outlined in the 200MW Solar PV Phase 2 EIA, in order to eliminate, offset or reduce adverse environmental and social impacts to acceptable levels. These measures will be implemented at all stages of the project development, from construction to operation.

The EMMP also outlines the environmental management structure, which will be responsible for implementing the procedures of the EMMP, therefore this structure includes roles and responsibilities of team members.

The EMMP is interactive in nature and will be amended and configured during all project phases as circumstances or activities change. Other than specific mitigation measures, the EMMP includes processes to ensure long-term effectiveness, these include:

- Designated timescales;
- Designated responsibilities;
- Program of audits and inspections;
- Procedure for recording and reporting environmental incidents;
- Procedures for recording complaints regarding environmental issues;
- System for liaising with the environmental regulatory authorities;
- Procedures for regular review of the EMMP; and
- Program for environmental monitoring.

2.1 Objective of Environmental Management and Monitoring Plan

The main objective of the EMMP is to ensure that the various adverse impacts associated with the project are properly mitigated. The objective of the EMMP at various stages of the project planning and implementation are as follows:

Construction Phase

- To prevent and reduce the negative environmental and social impacts of the project by implementation of mitigation measures; and
- To ensure that the provisions of the EMMP are strictly followed and implemented.

Operation Phase

- To prevent deterioration of environmental and social components regarding air, water, soil, noise, ecology, society; and
- To improve the wellbeing of the end users and communities.

3 CEMP Requirements

In order to ensure compliance with environmental legislation, both national and international, the Construction Environmental Management Plan (CEMP) will be developed to manage environmental risks during the construction phase. The complete CEMP will need to be prepared by the CONTRACTOR and all sub-contractors will be obliged to adhere to procedures that are outlined. This also includes following and enacting proper management structures and procedures.

The key benefits of a CEMP are to:

- Establish a baseline against which environmental performance can be assessed;
- Provide a system for the formal identification of potential environmental impacts associated with construction processes;
- Enable the identification of objectives and targets; and
- Provide a mechanism for monitoring and measuring of performance during construction.

The CEMP will be required to cover all construction components of the proposed project and will provide detailed specifications for individual activities. The purpose of these is to reduce the severity of impacts of the construction of the 200MW Solar PV project through avoidance, prevention, reduction and rectification. The actions to be set out in the CEMP are intended to act as a guide and tool for anticipating, recording and ameliorating any potential or actual impacts that may arise. In this regard, the CEMP will be designed to specify timing and technical aspects of optimising or reducing positive and negative impacts, respectively and will evolve as the 200MW Solar PV project construction progresses to ensure that its content reflects the current construction programme.

As a more practical approach, the specific requirements of the CEMP may be finalised in accordance with the developing stages of construction.

Managers and supervisors are responsible for providing assurance that their work unit is following the CEMP. Including actions in the work method statements and conducting regular audits of the management system can achieve this. A documented auditable trail will be established for verification purposes.

The content of this chapter will be used as a basic structure to provide a foundation upon which the development of a CEMP can be achieved. The following chapter describes the anticipated key contents of the full CEMP.

3.1 Environmental Management Staff: Roles and Responsibilities

Documentation detailing the management structure that includes the organisational structure encompassing all staff responsible for environmental work will be outlined within the CEMP.

The CEMP will need to define the respective roles and responsibilities with regard to the environment and identify the site's responsible Environmental Manager. Descriptions of individual environmental team responsibilities will also be detailed and include, but not be limited to, the following team members:

Project Director/Manager is responsible for the delivery of the project, which includes environmental management requirements.

Construction Manager and Site Manager are responsible for ensuring that Environment, Health and Safety (EH&S) measures are managed during construction and operational phases.

Environmental Manager will be the responsible person on the site and first contact for all environmental related activities. They will ensure that environmental parameters on the site are monitored in accordance with the CEMP. They will implement Environmental training where necessary and ensure that all subcontractors are aware of the CEMP and how they must interact with it.

Contractors are responsible for consistently implementing environmental management measures in accordance with the mitigation and monitoring measures outlined in the EIA and are in compliance with the national and international applicable regulations.

Sub-contractor responsibilities parallel those of the Contractor's project personnel, and therefore all persons working on site will comply with the environmental requirements detailed in the CEMP.

The assigned contractor will be required to employ a dedicated and experienced Environmental Manager at all times on site, to ensure the CEMP mitigation measures are followed and resolve issues as and when they may arise.

The contracts placed on the Contractors will need to clearly specify the environmental requirements expected of contractors working on the 200MW Solar PV Area project.

Regulatory Authorities

The Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) has the regulatory responsibility to ensure the project is executed in accordance with relevant legislation, and best practice guidelines. Routine site inspections may be carried out by

representative Officers from the municipality in order to conduct compliance audits, they may also provide further guidance on any observed environmental issues.

Resources

All levels of management are accountable to ensure that the necessary resources are available for implementing and accomplishing environmental and social responsibilities. Therefore, the following issues will be provided and assured:

- Appointed Environmental Managers will be competent and experienced in the relevant issues;
- Suitable time will be allocated to manage these issues;
- Environmental and Community awareness training will be provided;
- Suitable documentation will be provided;
- Appropriate equipment will be appropriated; and
- Suitable budget will be allocated for managing environmental incidents.

3.2 Applicable Legislation, Policy and Environmental /Social Principles

The CEMP will need to include a section that:

- Specifies the overall policy statement for the project which may include aspects such as environmental induction training for all contractors, subcontractors and staff and other social, health and safety aspects; and
- Identifies the applicable national and international legislative requirements, guidelines and standards such as legislation in relation to pollution control, endangered species, hazardous waste standards, contaminated land, heritage and archaeology, and employment and social rights issues.

To ensure compliance with applicable laws and standards it is recommended that the project documents all applicable laws, regulations and standards. It is recommended that the Consortium develop a detailed 'Environmental, Social, Health and Safety (ESHS) Guide'. The guide will be updated annually, by a qualified professional and may be used as an audit protocol.

3.3 Environmental Requirements and Compliance

The CEMP will cover compliance requirements, monitoring and auditing procedures, roles and responsibilities and remedial actions. The CEMP will be agreed with the DM-

EPSS and will include the requirements set out in the approval permit. It will therefore include:

- Procedures for monitoring construction processes against the national and international standards and with regard to the project environmental objectives; and
- Procedures for dealing with major pollution incidents that could unexpectedly occur during the construction phase (including the reporting to the relevant authorities) and which are particularly related to air quality (e.g. dust), cultural heritage (e.g. archaeological finds), ecology (e.g. protected fauna/flora), ground/soil quality (contamination issues), noise and vibration, water resources, and waste management.

3.4 Site Description and Existing Conditions

The CEMP will be required to include the following:

- Location of the Project, including a site plan, showing construction site boundaries;
- Position of the project in relation to any sensitive receptors identified in the EIA; and
- Designated access routes to the site and on the site.

3.5 Description of the Construction Works

The CEMP will provide a detailed programme of the construction activities for the 200MW Solar PV project and will include, as a minimum:

- Proposed dates and sequences of the planned works with relation to the environmental issues outlined within this report in order to minimise disturbances to the sensitive receptors;
- Details of proposed normal working hours and intended start up and close down times;
- List of the equipment to be used;
- List of required equipment and site services such as water supply, sanitation, solid waste facilities, power supply, etc;

- Details of the storage facilities required, e.g. for fuels, hazardous substances, chemicals, etc. and describe the method and minimum requirements for building these storage facilities;
- Vehicle access routes/points;
- Methods of the delivery/removal of materials/wastes and equipment;
- Details of proposed site offices and accommodation (if any); and
- Location of storage facilities for pipe sections, tools, equipment, chemicals etc.

3.6 Environmental Training and Awareness Program

Training and awareness programmes are an extremely important part of the CEMP and of the overall project development. All staff and labourers working on site will be required to attend an environmental awareness and training program prior to commencing work, which will include:

- Induction training for general environmental awareness and the content of the CEMP;
- Site induction training that will highlight the specific environmental requirements and activities being undertaken at the worksite including hours of operation, noise and vibration limits, necessary mitigation measures, soil and water control measures, sensitive receptors and local community issues, traffic access, site entrance and exits etc.;
- Dealing with and handling hazardous and non-hazardous wastes;
- The importance of waste recycling and associated procedures;
- Training on the emergency preparedness plan;
- Training on incident notification, investigation and reporting; and
- Induction training for construction site visitors.

It is recommended that this be incorporated with a safety training programme, which will also be required for all employees working on the project site.

3.7 Identifying the Environmental Issues

A summary of the environmental issues and aspects will be included within the CEMP and prepared based on the findings and various risks identified in the EIA. This summary will be updated to reflect any additional risks resulting from the

contractors/subcontractors selected methods of working, changes in site conditions, changes in program, and changes in design.

Given the nature of the project and as per the environmental assessment, risks would be identified within the CEMP, which would include the categories for the environmental aspects outlined within this EIA.

3.8 Monitoring, Recording, Inspection and Auditing Program

Daily inspections of work areas by the Contractor Supervisor and weekly inspections as a minimum by the Environmental Manager will also need to be conducted to identify any issues or non-compliance with the CEMP and to monitor the daily work practices.

A weekly inspection checklist will be prepared and will be provided to the External Auditors for evaluation, which will involve all the subcontractors to discuss environmental issues and their rectifications.

External audits will be undertaken during construction and operation, following International Best Practice and IFC requirements. This audit will take place in order to ensure the following:

- Compliance with all standards and regulatory requirements, CEMP and method statements;
- Auditing the contractor and subcontractor activities for non-conformances,
- Checking monitoring records, inspection checklists, and other relevant documentation; and
- Identifying the requirements for corrective actions.

The outcomes of the audit will also need to be documented including the recommendations and corrective actions.

3.9 Communication

Communication, both internally and externally, is an important aspect of successful project delivery. Internal communication includes arranging regular meetings for the Project team to review and co-ordinate project progress with regards to environmental and community issues. External communications, with the local representatives will also need to be conducted regularly.

In addition, as a mechanism by which community members can have grievances aired, the site along the project boundary will need the provision of contact numbers on sign boards easily viewable in order for the local community to be able to contact the Project team.

3.10 Document Control and Review

All documents relevant to the CEMP will be controlled onsite. The controlled documents include the CEMP report, procedures, audit reports, incident reports, records, and community complaints. The contractor Environmental Manager will be responsible for the quarterly review of the CEMP, its procedures and its implementation on site. If any new machinery or process is introduced on site, the existing CEMP will be updated accordingly.

3.11 Management Structures and Procedures

All personnel in the contractor Project Team are responsible for protecting the environment and community by ensuring that appropriate protection measures are implemented.

Table 3-1 offers a general representation of the likely general management structure and assigned responsibilities. The contractor must assign these responsibilities to the concerned personnel and incorporate the roles within the CEMP.

Table 3-1 Roles and Responsibilities – Construction Phase

Role	Environmental Responsibilities
Project Director/ Manager	• Understand the requirements and objectives of the CEMP; • Ensure resources (personnel and financial) are provided to prepare and implement the CEMP; • Overall responsibility for environmental performance; • Approve reports of environmental issues and non-conformance to the client in the regular reporting and when any issues arise; • Facilitate proactive communication between all role-players in the interest of effective environmental management; • Implement temporary work stoppages where serious environmental infringements and noncompliance occur; • Enforce compliance with CEMP and all legal regulations; • Ensure all employees undergo environmental training; and • Ensure the CEMP is updated and approves the final updates

Role	Environmental Responsibilities
Environmental Manager	• Set up program for regular monitoring; • Follow up community complaints; • Conduct inspections to monitor environmental performance and compliance with the CEMP by contractors; • Check CEMP compliance with legal requirements on regular basis; • Ensure the environmental meetings are held on a regular basis; • Communicate and advise PM and subcontractors on environmental aspects; • Report, investigate and follow up on environmental incidents; • Establish corrective action plan for any non-compliance including action plan for prevention of such misconduct or incident; • Develop, implement and manage the environmental training program

Role	Environmental Responsibilities
Construction Manager and Site Manager	• Responsible for overall environmental performance of the contractor and subcontractors; • Allocate sufficient resources to ensure compliance and effectiveness of CEMP; • Ensure sub-contractors have a copy of the CEMP and are aware of their environmental obligations; • Enforce compliance with CEMP and all legal regulations; • Communicate environmental aspects with PM and HSE managers; • Ensure Environmental training is undertaken; • Ensure community complaints are addressed; and • Maintain document registers for training, incidents, waste management and other related environmental reporting requirements.
Site Manager	In addition to the above: • Enforce environmental measures on lower levels; • Ensure compliance with CEMP directly on site; • Communicate environmental aspects with Environmental Manager and lower level management and personnel; • Report all incidents and non-compliance to PM and Environmental Manager.

Role	Environmental Responsibilities
Sub Contractor - Foreman	• Implement the requirements of the CEMP; • Allocate the necessary resources to ensure compliance and effectiveness of the CEMP; • Cooperate with the Environmental Coordinate to ensure that site inspections and training are conducted; • Comply with the observations and requirements for corrective actions, which are issued by the inspector; • Report all incidents and non-compliance to Site manager; • Notify the Construction Manager/Site Manger of any changes on the program, construction method which may affect the environmental mitigation measures and ability to comply with the CEMP and regulations; • Maintain a register of incidents and waste management for future audits; • Maintain a register of complaints and correction actions
Construction Workers	• Undergo environmental awareness training; • Understand environmental procedures and environmental aspects relevant to activities; • In case of any accident or non-compliance report that immediately to foreman.
Visitors	• All visitors must comply with the CEMP, must receive an induction before entering the site and must comply with the instructions given by site staff.

3.12 Mitigation Measures, Regulations and Procedures

This CEMP requirements recommends mitigation measures for the identified potential environmental impacts at the construction phase.

Design phase mitigation measures have also been recommended for consideration during the detailed design of the project's layout. Typically, the recommendations involve the implementation of green building guidelines, the use of environmentally suitable materials and siting strategies to minimise the environmental and social impacts.

The mitigation measures presented have been developed from Best Management Practices (BMP) source controls and engineering controls.

It should be noted that the measures outlined in the relevant chapters of the EIA (Volume 2) will also be implemented in addition to the ones listed in the following sections.

The overall effectiveness of the mitigation measures will be assessed by site monitoring programs, which will be implemented during the construction and operation phases of the project. The monitoring activities will also be designed to evaluate the project's compliance against environmental guidelines.

4 OEMP requirements

The environmental management plan for the operation phase will serve as a general tool for managing all environmental aspects related to the activities and operations at the 200MW Solar PV Plant. It is recommended that the Proponents management team prepare a high level OEMP, which can be used by the Operations Management department operating in the project. The following chapter provides an outline of the environmental management plans, which will be required during the operational life of the proposed project.

4.1 Operational Environmental Management Plan (OEMP) Requirements

The OEMP establishes mechanisms for the identification and implementation of environmental protection, mitigation, monitoring and institutional measures that will be taken during the operation phase of the proposed 200MW Solar PV project.

The purpose of preparing and implementing the OEMP is to eliminate the potential adverse environmental impacts associated with the operation of the proposed project that have been identified within the EIA and then mitigating them or, at the least, offsetting them to acceptable levels.

The OEMP will also need to identity the monitoring objectives, specify the monitoring requirements and measures which will include all the parameters required to be monitored, methods, sampling locations, measurement frequency, detection limits and the threshold where corrective actions are required (see section below).

The OEMP, to be developed prior to project handover date, will be site specific and clearly state what issues are of specific relevance to the site. It will need to:

- Fulfil statutory requirements;
- Highlight the applicable environmental guidelines, regulations/the legislative context;
- Highlight the agreed community mitigation actions and awareness programs
- Establish operational Environmental Objectives;
- Establish significant Environmental Aspects;
- Develop and implement relevant procedures;
- Develop a programme of continuous environmental improvement

- Clearly specify roles and responsibilities; and
- Highlight the procedures to be considered in the event of an environmental monitoring trigger level being breached or an unforeseen impact arising.

The OEMP will also identify the operational briefing and training requirements. Training can be provided in different forms such as induction sessions, training packs detailing good practices, or 'toolbox talks'.

In addition, it is important for the OEMP to accommodate changes in conditions and respond to any need for further assessment requirements. Changes are most likely to arise if

I. A new environmental or social sensitivity is identified as a consequence of changing environmental conditions and more detailed survey work or

II. Changes are introduced to the project design or land use.

Documentation and communication protocols will also be required to be identified within the OEMP. Communication protocol will include

I. Incident/emergency communication procedure,

II. Internal communications, external communications,

III. Management of external/internal inquiries.

International good practice of EMMP structure details that the following items will be included: (source: Practitioner – Environmental Management Plan, Best Practice Series, The Institute of Environmental Management and Assessment, Vol. 12, December 2008):

- Introduction – including summary of the project and aim of the OEMP;
- Project team roles and responsibilities;
- Summary of procedures – to be followed in the event of an emergency or breaching of OEMP measures;
- Consents and permissions – this will provide a record of the consents with which the project is taking place;
- Environmentally significant changes – detailed procedures to be followed if any significant changes are encountered once a project commences on the ground which would result in any changes to the OEMP;
- Register of site-specific environmental actions and social initiatives – this information, forming the core of the document, will be detailed for each

action/initiative; a tabular format is often used to provide clarity and ease of reference. In addition, it will include (i) a programme that indicates when measures will be implemented and (ii) monitoring – to detail monitoring equipment/methods and schedule;

- Liaison and consultation requirements;
- Register of variation – a tabular format document to record changes to procedures, design and mitigation and the implications of these changes and authorised personnel; and
- Technical schedule – to provide further details on measures, e.g. monitoring methodologies to be followed, maps delineating boundaries/areas applicable to certain measures.

4.1.1 Procedural Mitigation Measures, Regulations and Procedure

The procedural measures the during operation phase will be similar to the construction phase. Therefore, similar control techniques and mitigation measures will be in place to tackle such risks. These typically include the use of resource control, and monitoring techniques to minimise the environmental impacts and community awareness and integration initiatives. The mitigation measures presented have been developed from Best Management Practices (BMP) source controls and engineering controls.

It should also be noted that mitigation measures outlined in the EIA (Volume 2) will also be implemented and included in the OEMP wherever necessary.

The overall effectiveness of the mitigation measures will be assessed by site monitoring programs, which will be implemented during the operation phase of the project. The monitoring activities will also be designed to evaluate the project's compliance against environmental guidelines and community awareness initiatives. Specifically, the project proponent will be required to carry out period monitoring of the site activities and operations, in order to ensure that the EMMP is effectively applied, and that any necessary corrective actions are implemented.

5 Mitigation Measures

The following chapter provides mitigation measures for potential negative environmental impacts resulting from the construction and operation of the 200MW Solar PV Phase 2 project.

The activities and measures suggested in these tables are for general working practices and typical working activities at both the construction and operation phases of the proposed project.

For detailed mitigation measures the relevant chapters for each environmental parameter discusses specific mitigation and abatement techniques that have been adopted or will be adopted in order to further minimise negative impacts.

The Action Plan provides the following information:

- Environmental and Social Aspects,
- Details of required Mitigation measures,
- Parties responsible for implementations/Monitoring, and
- Implementation Timetable/Costs

5.1 Air Quality

The primary impacts on air quality associated with the construction and operation of the 200MW Solar PV plant project are identified in EIA Volume 2. This chapter provides additional general mitigation measures for minimizing air emissions resulting from general working activities during the operation of the development.

The following table provides the suggested mitigation measures for the construction and operation phase. However, the information provided in the respective impact assessment chapters will also be consulted for the preparation of the CEMP and OEMP.

Table 5-1 Air quality mitigation measures – Construction phase

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule
Dust Generation	Minimise vehicles and plant movements over unsealed roads. Establish paved/tarred access roads in order to minimise dust.	Contractor and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Vehicle speeds will be restricted to 15Km/h on haul roads and un-surfaced areas of the site.			
	All vehicle loads will be covered by a tarpaulin and will not be overloaded.			
	Regular wetting down of haul roads by water trucks.		Several times a day	
	Contractor vehicles to access site on newly constructed tarmac road to avoid impact on local traffic		Daily	
	Any aggregate or dusty material stockpiles will be stored in enclosed structures. Alternatively temporary piles can be covered with impervious sheeting.			
	Avoid or minimize excavation activities on windy days.			
	Site will be fenced using either fabric or boards.			
	Routinely inspect dust generation and recommend corrective actions.			
	No burning of wastes will be allowed on site throughout the construction phase.			
Exhaust Emissions	Modern machinery, with adequate emission control equipment will be used.			
	Suitable fuels will be used for construction machinery, vessels and vehicles (particularly low sulfur diesel).			
	Trained personnel will operate machinery properly and efficiently.			
	Regular maintenance and inspection for all construction plant, vehicles and vessels (to be documented and checked by site supervisor's representative).			
	Minimise idling of construction machinery, maximise efficiency of trip times.			
	Plant maintenance will be carried out off-site in appropriate premises,			

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule
	unless in emergency situations, to contain a spill.			
	Routinely check equipment for smoky exhausts, and recommend appropriate corrective actions.			
	Smoky equipment to be given defect notices until repaired and approved for re-deployment by site supervisor.			As soon as the works start and throughout construction period.
Volatile Emissions, Odours	Chemical storage areas will be purposed built and well maintained. A data log of all chemicals with MSDSs will be provided at the storage facility within easy access.			
	Volatile fuels and chemicals will be in sealed containers. On site storage of large quantities of volatile fuels will be avoided, equally prolonged exposure to direct sun and heat will be avoided.			
	Pump out any stagnant waters from excavations		As needed	

Air quality mitigation measures – Operation phase

The proposed project will not generate significant emissions to air. Therefore no mitigation measures are required from the project in order to ensure compliance with DM Ambient air quality standards.

With regards to the impacts from the existing emissions of vehicles on adjacent roads and highways, the following design options are recommended for integration in the final Masterplan:

- Increase landscaping along the boundaries with the major roads.
- Optimise the set backs of the buildings, in order to ensure that the air quality at the sensitive receptor has dissipated to background levels
- Encourage the use of public transport or alternative forms of transport (Bicycles, walking). Discussions between the developer and RTA should be undertaken in order to explore the opportunities to expand the bus service into the proposed development.

- Reduce the number of vehicle trips outside the project by ensuring that all basic services and amenities are located within the development.
- Ensure that the design of internal road network controls speeds, and the placement of public amenities promotes the use of alternative transport means.

5.2 Noise and Vibration

The main impacts from noise and vibration associated with the proposed project are identified in EIA Volume 2. The following two tables provide the suggested mitigation measures for the construction phase. However, the information provided in the relevant impact assessment chapter will also be consulted for the preparation of the OEMP and CEMP.

Table 5-2 Noise and Vibration mitigation measures – construction phase

Subject	Mitigation measure (construction phase)	Parties responsible	Monitoring	Implementation Schedule
Noise and vibration	Plan activities with the greatest potential to generate noise during the day.	Contractor and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Mufflers will be used on all noisy plant and vehicles.			
	Regularly maintain all plant, machinery and vehicles. Replace any broken parts immediately.			
	Ensure efficient operation of all plant and vehicles.			
	Switch off the equipment and machineries when not in use i.e. 'no idling'			
	Provide personnel with hearing protection and advised of its proper use.			
	Monitor noise level at the site boundary to assess noise increase against baseline conditions and to ensure compliance with regulations.			
	Extremely noisy tasks will be conducted off-site if practicable.			
	Implement the noise-monitoring program. Ensure contingency plans are in place to deal with noise control if complains are received during the construction phase.			

Noise mitigation measures – Operation phase

The proposed project will not generate significant noise and is not subject to any significant levels of noise. Therefore no mitigation measures are required from the project. However, without any mitigation measures targeting noise reduction, the future noise levels within the proposed project are expected to exceed night-time noise standards, during the cleaning operations, which is expected to be the main source of noise on site.

It is recommended that the project proponent implement measures to reduce the potential impact from these cleaning operations.

Additionally, the following noise mitigation and abetment techniques are recommended for incorporation in the site design and infrastructure design of the project, in order to minimise disturbance to the area.

- Install noise barriers along the perimeter fence of the site. Noise barriers can achieve a 5 dB noise level reduction when the minimum height is set at the line-of-sight from the highway to the receiver, and further reductions of approximately 1.5 dB for each additional meter up to a maximum of 15 dBA can theoretically be achieved.
- Ensure that speed limits within the project are limited to 20Km/hr, in order to help decrease road noise levels.

5.3 Soil Protection

The main soil impact issues associated with the construction and operation activities of the proposed project are identified in EIA Volume 2. The following table provides the suggested general mitigation measures for the two project phases. Therefore, the information provided in the relevant impact assessment chapter will also be consulted for the preparation of the CEMP and OEMP.

Table 5-3 Soil mitigation measures – construction and operation phases

Subject	Mitigation measure (construction and operation phase)	Parties responsible	Monitoring	Implementation Schedule
Soil	Develop and implement: • Hazardous Materials Handling Plan; • Hazardous Waste Management Plan.	Contractor and Subcontractor.	Daily	As soon as the works start and throughout construction period, and during project life cycle
	Develop a spill response plan.			
	Store chemicals, hazardous substances and waste only in purpose built areas/structures			
	Routinely inspect storage areas and all containers for any spills and leaks			
	Routinely inspect all equipment handling hazardous materials for leaks and spills.			
	Spill kits will be readily available near refuelling stations, chemical storage areas and any potential spillage area. Back-up supplies will also be ensured.			
	All chemicals will be handled in accordance with relevant instructions (MSDS)			
	Reduce quantity of chemicals and fuels on site to minimum practicable levels			
	Only personnel with adequate training will be allowed to handle fuel and chemicals			
	Adequate control measures must be taken to ensure that all servicing, refuelling, storage and waste disposal will be carried out in designated, sealed areas.			
	Ensure all workers are aware of their responsibilities to minimize soil pollution.			

5.4 Groundwater

Potential impacts on water quality associated with the construction and operation of the 200MW Solar PV Plant are identified in EIA Volume 2. The following two tables provide the suggested mitigation measures for the construction and operation phase. However, the information provided in the respective impact assessment chapters will also be consulted for the preparation of the CEMP.

Table 5-4 Groundwater quality mitigation measures – construction phase

Subject	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule
Erosion	Adequate drainage systems will be provided to minimize and control infiltration. Sediment traps (i.e. filter fabric) will also be installed.	Contractor and Subcontractor	Daily	As soon as the works start and throughout construction period.
	Road gradient will be minimized (contour and slopes) in order reduce run-off induced erosion.			
	Stockpiles will be located on flat and sealed areas.			
	Stockpiles will be covered and the height and slope limited, to minimise erosion during rainfall.			
	Regular inspection of the sedimentation/erosion controls will be regularly conducted.			
	Disturbed areas will be stabilised to minimise further erosion.			
Chemical use and storage	Quantities of on-site stored fuel and chemicals will be controlled to a minimum, in order to ensure uninterrupted work.			
	Temporary storage of fuels and chemicals will be in secure bunds. Bunds will have a capacity of 110% of the volume of the container.			
	Copies of the Material Safety Data Sheets (MSDS) will be kept in the bunded area and at the site office.			
	All site construction equipment will be daily inspected for leaks.			
	Vehicle maintenance will not be carried out on site. A spill kit and bucket will be included in each vehicle in the event of a breakdown resulting with leak/spills.			
	Staff will be trained in the use of the spill kits, and an emergency spill response team will be established.			
	Chemical handling and refuelling will be conducted over sealed			

Subject	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule
	grounds/designated areas, in a controlled by trained personnel.			
	Construction-phase Emergency Response Plan will be developed and implemented by training and providing the necessary equipment.			

5.5 Terrestrial Ecology

The overall terrestrial ecology on the site is not of high ecological value. Measures that could be implemented in the landscape design of the project, which could help to offset the loss of habitat, are described below.

Table 5-5 Terrestrial mitigation measures – construction phase

Impact/ Source	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule
Degradation of the terrestrial ecosystem by earthworks and laydown areas	The laydown areas of the site will be minimised in size wherever possible, and preferably located in areas with little or no vegetation.	Contractor	Daily	As soon as the construction start and throughout construction period.
	To aid re-vegetation, the topsoil (containing the most nutrient rich soils) should be removed and stored safely and spread over the site once construction has been completed.			
	The contractor should ensure that no encroachment to the nearby, adjacent land should occur.			
	All construction vehicles adhere to clearly defined transportation routes. Transport routes should be identified and training provided to emphasise the need to adhere to the designated routes in order to protect any existing vegetation and reduce encroachment on adjacent land, and reduce dust fall across the site.			
	Hazardous materials used during the construction stage should be adequately managed, in order to minimise the potential risk of spillage and therefore potential contamination to the ecosystem.			
	Transportation within and to and from the site should be minimised			

	through efficient transport management in order to minimise noise and vehicle pollution and the risk of running animals over.			
	Machinery should be maintained on a regular basis to ensure smooth efficient running to control emissions and prevent contamination events as a result of faulty equipment etc.		Monthly	
Ghaf Tree	UAE Federal Law no 24 bans the felling of trees, including ghaf (Prosopis cineraria) without special permission. Preferably the trees should be maintained on site and incorporated into the landscape design. Alternatively, a permit should be obtained from DM in order to enable the lawful **relocation** of the trees.	Project Proponent Contractor	As Needed	
Feeding Stations	During construction, unless for a specific work related task, workers are not to approach feeding stations or the wildlife, in an effort to leave them as undisturbed as possible. This information should be provided to workers and visitors to the site as part of the induction training.		Daily	
	It is recommended that a new feeding station is established outside and away from the entire 1GW Solar Park, so as to allow the local mammals that rely on the feeding stations a chance to adapt to a new location before the entire 1GW project is completed, in approximately 15 years time.		As Needed	

Table 5-6 Terrestrial mitigation measures – operation phase

Impact/ Source	Mitigation Measure	Parties responsible	Monitoring	Implementation Schedule
Loss of Seed bank and degradation of terrestrial ecosystem	Landscaping on site should incorporate indigenous halophytic and xerophytic plant species to minimise irrigation requirements and the need for fertilisers/pesticides. Intentional replanting of vegetation and incidental recolonisation with native species from the seeds retained from the stockpiling of topsoil would enhance the biodiversity of the site as well as improve the visual aesthetics of the site. Areas used for laydown and storage should be sclarified if compacted, in order to facilitate the recolonisation of native species;	Proponent, and Operations Management	Weekly	Project design and throughout the landscape contact

	Since human settlement attracts pests and also has a large impact on birds, consideration should be given to developing a plan to manage pests identified on the site attracted by the waste facilities and kitchens.	Operations Management		Project lifecycle
	Transport routes on site and training will emphasise that vehicles and tenants should keep to the designated routes in order to prevent unnecessary land encroachment, thus protecting the natural resources and reducing dust emissions;	Operations Management	Weekly	
Herbicide Pesticide Use	Appropriate storage of hazardous materials, should be designed in accordance with the DM guidelines, preventing any major spillages on the site.	Operations Management	Daily	Project design and throughout the landscape contact
	No non-native species will be utilised in the landscaping of the plant, with an integrated pest management scheme being utilised in preference to the use of large scale pesticides and detailed within the Operation Environmental Management Plan.	Operations Management		
Feeding Stations	During operation, unless for a specific work related task, workers are not to approach feeding stations or the wildlife, in an effort to leave them as undisturbed as possible. This information should be provided to workers and visitors to the site as part of the induction training.			

5.6 Traffic and Transport

Potential traffic and transport impacts and recommended mitigation measures have been discussed in EIA Volume 2. The following tables provide general mitigations actions for the construction and operational phases.

In the event that alternative traffic management practices are needed, the following options will be considered:

- Increasing public transport services;
- Revising the timing and frequency of deliveries; and
- Providing alternative parking.

Table 5-7 Traffic mitigation measures – Construction and Operation phase

Issues	Mitigation Measure (Construction and Operation phase)	Parties responsible	Monitoring	Implementation Schedule
Off-site Traffic	Schedule major deliveries for off-peak hour traffic.	Contractor and Subcontractor.	Daily	As soon as the works start and throughout construction period. Project lifecycle
	Encourage car pooling for workers at construction phase			
	Designate parking/staging areas. Provide adequate parking stations for the estimated numbers of visitors to the site (workers and suppliers).			
	Clearly identify truck routes and entry points for heavy vehicles entering the site.			
On-Site Traffic	Develop a Traffic Management Plan (operation).			
	Clearly post site entry / exit signs. Use 24hr security and document all vehicles entering/exiting the site.			
	Clearly post on-site speed limits, recommended 5Km/hr during construction and 10Km/hr during operation.			

5.7 Utilities Management

The main waste impacts associated with the construction and operation activities of the 200MW Solar PV site are identified in EIA Volume 2. The following table provides the suggested general mitigation measures for the two project phases. Therefore, the information provided in the relevant impact assessment chapter will also be consulted for the preparation of the CEMP and OEMP.

Table 5-8 Utilities Management mitigation measures – construction phases

Subject	Mitigation measure (construction phase)	Parties responsible	Monitoring	Implementation Schedule
Waste Management	Prepare a site-specific Waste Management Plan (WMP).	Contractor and Subcontract		Before commencement of activities
	Materials will be purchased with minimum of packaging waste. "Buy-			As soon as the

Subject	Mitigation measure (construction phase)	Parties responsible	Monitoring	Implementation Schedule
	back" arrangements will be made with key suppliers so that any surplus chemicals or materials can be returned.			works start and throughout construction period.
	Re-use or recycle construction waste such as wood and metal.		Daily	
	Ensure appropriate disposal of empty containers (Hazardous Waste Management)			
	Ensure collection and disposal of putrescible waste			
	Waste collection and disposal will be carried out by licensed contractors to appropriate facilities.			
	A log will be kept to record the waste streams and volumes/weight of all wastes generated, treated and transported from the facility.			
	Introduce recycling initiatives. Including allowance in master planning and design phases for additional facilities.			
	Strictly prohibit littering and waste dumping to land or into waters.			
	Minimise the time and extent of waste stored on site.			
	Hazardous waste will be segregated from non-hazardous waste at the source. Hazardous wastes will be handled and stored in accordance with the relevant management plans.			
	The design and maintenance of waste containers will conform to local and international standards.			
	Liquid waste will be stored in tanks designed to international standards and placed in bunds with a capacity equal to 110% of the storage tank.			
	Flammable waste will be appropriately stored to prevent fire risk.			
	Auditing will be carried out to ensure that the waste management plan is implemented.		Monthly	

Subject	Mitigation measure (construction phase)	Parties responsible	Monitoring	Implementation Schedule
Wastewater and Stormwater	Chemical toilets will be available on site and septic tanks will be installed at the labour accommodation and administration buildings. The number of septic tanks will be increased in proportion to the increased number of workers on site. If appropriate, meters will be installed on the tanks, in order to monitor the volumes and prevent overflows. The septic tanks will be above ground where possible, though if buried should be placed in secure areas, away from general vehicle traffic, in order to prevent any damage to the tanks.	Contractor	Daily	As soon as the works start and throughout construction period.
	The sanitary wastewater from the workers at the plant will be treated at the nearest municipal Sewage Treatment Plant (STP).	Contractor	Daily	As soon as the works start and throughout construction period.
	Site inspections will be carried out regularly by the contractor who will ensure that all wastewater generated is properly managed, and no leakages or spill over occur. In the event of a spill or overflow, immediate action should be taken in accordance with spill containment procedures.	Contractor		
	In common with best practice, effort should be made in training employees including all sub-contractors at the site to minimise water consumption for ablutions and to ensure an understanding of wastewater issues			
	In addition, the contractor should develop procedures for the demobilisation of the septic tanks once site construction has ended to ensure that appropriate procedures/methods will be employed and no contamination to the site area will occur during the demobilisation period.			As soon as the works start and throughout construction period.
	Washing of concrete ready-mix tucks will be carried out in designated areas so as to prevent soil and groundwater contamination.			
	Mixing effluent streams – ground water, vehicle wash water, domestic grey water, sewage effluent etc., is prohibited and shall not be permitted anywhere on-site.			

Table 5-9 Utilities Mitigation measures – Operation phase

Subject	Mitigation measures (operation phase)	Parties responsible	Monitoring	Implementation Schedule
Solid wastes	Ensure that the temporary on-site storage waste facilities are fully enclosed to control / minimize odour, noise, and aesthetics impacts. Install exhaust air cleaning systems in the building waste chutes. Provide sufficient access space for waste collection vehicles Siting of centralised waste storage facilities should be away from sensitive receptors and away from congested zones. Segregation and storage of different types of waste in separate labelled containers, to promote the re-use and/or recycling of materials. The Project management should appoint a specialist waste management contractor to provide: The equipment for each transfer area, The collection vehicles and Carry out the removal and disposal of wastes Implement a recording system for the amount of wastes generated on-site, and disposal locations. Undertake regular inspections, audits, and monitoring of waste streams generated to ensure that all necessary mitigation measures are being implemented. Hazardous materials should be collected in suitably bunded and protected areas. Such waste should be collected and transported by appropriately licensed transporters to approved hazardous waste disposal sites when re-use is not an option.	Operations Management	Daily	Project design at the start of operation and throughout the project lifecycle.
Wastewater and Stormwater	Oily wastewater will be treated via interceptors. A specialist contractor will remove the recovered oil for recycling. Any residual sludge will be taken to a Municipality hazardous waste landfill.		As needed	As soon as the operation start and throughout operation period.
	Regularly maintain the stormwater system, in order to avoid flooding from storm events or blockages. Routinely monitor effluents		Routine	

Subject	Mitigation measures (operation phase)	Parties responsible	Monitoring	Implementation Schedule
	Liquid wastes and wastewater (containing hydrocarbons, lubricants, and solvents) should be appropriately disposed as described in water quality or waste management mitigation chapters.		Daily/Weekly	
Sewage	Any kitchen wastes should pass through a grease trap prior to discharge to the sewer line. Regularly maintain the sewage system, in order to avoid overflows during storm events or from blockages.		As per design specification	

5.8 Socio-Economic

The socio-economic opportunities arising from the project have been identified in the assessment described in EIA Volume 2. Namely, these include the creation of employment for the local population and skills transfers to the employed workers. The multiplier effect will also generate opportunities for a more dynamic economy in the region.

In order to maximise the socioeconomic benefit, the project will seek to employ local workers where possible and where appropriate will offer training to enhance the development of skills within the local workforce.

Table 5-10 Socio-Economic mitigation measures – Construction phase

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule
Social Environmental Management	Integrate Social Management Actions from the EIA into the contractor Project Environmental Health and Safety Plan (EHSP)	Contractor and Subcontractors	Review procedures, manuals, notice boards, points of contact etc…. as	Within one month of Financial Close
	Subcontractors to integrate requirements of contractor CEMP into their own documents and procedures.	Subcontractors		Within one month of Financial Close
	Undertake sufficient and necessary monitoring measures in accordance with the specifications in the relevant environmental issues discussed in the EIA	Contractor and Subcontractor		As soon as the works start and throughout construction period.

Issue	Mitigation measures (construction phase)	Parties responsible	Monitoring	Implementation Schedule
	Develop public and employee communication procedures and notice boards, to provide a means for raising any grievances.		need basis	
	Facilitate access to information by the public; ensure transparency in the Social actions implemented.			
Employees and Work Conditions	Protect and promote the health of employees, especially by promoting safe and healthy working conditions	Contractor and Subcontractors	HSE reports	As soon as the works start and, and throughout the construction phase
	Establish and maintain a sound worker-management relationship			
	Promote the fair treatment, non-discrimination and equal opportunity of employees			
	Comply with labour laws			
	Provide complaints mechanism for employees and an action plan to address them.			
Community Health, Safety and Security	Prevent or minimize impact on community by implementation of contractor EHSP		Monthly reporting	
	Prepare Emergency Response Plan			
	Maintain open communication channels with local communities			
	Provide construction program schedule to neighbouring population, which informs the work activities, timings and locations, and explains mitigation measures implemented		Update as needed	
	Notify community of any disruptions to services with a minimum of 1 week notice.			

Table 5-11 Socio-Economic mitigation measures – Operation phase

Issue	Mitigation measures (operation phase)	Parties responsible	Monitoring	Implementation Schedule
Social Environmental Management	Establish and manage an OEMP, which has to be consistent with actions identified in the EIA. Ensure that social management actions are integrated into the OEMP	Operations Management	Review procedures, manuals, notice boards, points of contact etc….on an as need basis. Minimum bi-yearly	OEMP to be established prior to project handover
	Undertake sufficient and necessary monitoring measures to check against compliance with environmental limits in accordance with the specifications in the relevant environmental issues discussed in the EIA.			
	Develop public communication procedures and notice boards, to provide a means for raising any grievances.			
	Facilitate access to the information by the public; ensure transparency in the Social actions implemented.			
	Prioritize employment and subcontracting at the local level			
Employees and Work Conditions	Protect and promote the health of employees, especially by promoting safe and healthy working conditions.	Operations Management		Project lifecycle
	Establish and maintain a sound employees -management relationship			
	Promote the fair treatment, non-discrimination and equal opportunity of employees.			
	Comply with labour laws.			
	Provide grievance mechanism.			
Community Health, Safety and Security	Prevent or minimize impact on community by implementation of EHSP.	Operations Management		Project lifecycle
	Prepare Emergency Response Plan.			

5.9 Archaeology and Cultural Heritage

No archeologically significant or cultural heritage sights have been identified within the 200MW Solar PV site or in the immediate adjacent areas. However, in the event that any artefacts are unearthed during the excavation works, the following steps will be implemented to prevent and minimise any further damage to the site.

Potential heritage items or relics can include:

  - Evidence of historical occupation (such as aged building remains), pottery, flint and other tools;
  - Evidence of early industrial heritage;
  - Articles of religious heritage value; and
  - Items or places of importance to the ethnic groups and tribes.

- The possible or confirmed existence of heritage objects or places, and any suspected heritage discoveries, will be communicated to all staff including machinery operators.
- When work is conducted near identified heritage items, the items will be clearly marked with temporary flagging or fencing prior to the commencement of works.
- When work is conducted near identified heritage items, an exclusion zone will be created around the items to prevent damage by excavation, vehicle movement and vibration, resulting from vehicles and equipment.

6 Emergency Response Plan

Emergency Response Plans (ERP) are general action plans to tackle emergencies that may occur within a construction or operational site. This will enable lives to be protected and damage to be kept to a minimum in an emergency. Contingency plans also serve as a guide to personnel to respond to emergencies in an orderly and effective manner.

The most common environmental emergency in construction site is the oil and chemical spill, which is a potential source of soil contamination, groundwater and water pollution. Spills of hazardous liquids and materials may include:

- Gasoline;
- Diesel;
- Adhesives;
- Hydraulic oil;
- Lubricating oil and grease;
- Cleaning solvents;
- Paint and paint thinners; and
- Concrete from release agents.

The ERP must be prepared to cover any potential risks of accidents or spills and will be made known and available to all pesonnel. Key personnel will know and understand their responsibilities as well as coordinate their response actions with their subordinates.

This plan serve as a guideline to organize a prompt and effective response to oil spills affecting or likely to affect the area of the site and to ensure preparedness, response and reporting following an oil and chemical pollution incident.

For this purpose the following specific actions are listed:

- Preparedness;
- Response; and
- Reporting.

Preparedness

Each individual will be introduced to their prospective Supervisor and Environment Manager within their introduction and training. Emergency services shall be notified as necessary by the Supervisor or Environment Manager.

A variety of equipment and personal protective equipment may be needed to support a chemical or oil spill incident response. Such materials are typically contained within spill kits that should be positioned in all hazardous liquid/material storage areas and waste areas. A list of equipment is detailed below:

- Sand;
- Sand bags;
- Buckets and shovels;
- Storage containers;
- Absorbent materials;
- Hazardous waste bags;
- PPE (e.g. gloves, eyewear etc.).

Sand stocks will be dry and buckets and shovels readily available. Mechanical loading shovels, excavators and dump trucks may also available for sand distribution and clean up. Storage containers for contaminated materials and earth will be bunded, located in the waste storage area, and labelled and treated as hazardous waste. All equipment will be stored in a safe location on site in close proximity to the storage and waste areas. This material is to be used to contain and clean up pollution/spills, care will be taken to dispose of any absorbent materials properly. The Supervisor and Environment Manager will keep stocks well maintained and replenished.

Response

In the event of a chemical or oil spill the following measures will be employed:

- Notify Supervisor or Environment Manager;
- Only attempt containment and cleanup operations of spilt substances when it can be performed safely;
- If spilled material is flammable, eliminate sources of ignition near spill area;
- Evacuate personnel and neighbours if they are at risk; and
- Secure the area and establish perimeter control at a safe distance from the spill.

Oil Spill Response Options

Remedial action to collect and remove all materials contaminated by the oil spillage or leakage event is to be taken immediately. The following actions are required:

- Any oil remaining on the ground is to be collected using oil spill kit. The spill is to be surrounded by the kit and then the area of the spill is to be slowly reduced by enclosing the absorbent. The absorbent pads will be used to absorb the oil. Once all of the oil on the ground surface has been collected, the absorbent agents themselves are to be appropriately stored and disposed;
- All contaminated materials are to be handled as hazardous waste. The contaminated material shall be collected and appropriately stored. A hazardous waste vendor will collect this;
- Contaminated materials will be stored in plastic barrels with tightly closing lids. These barrels are to be stored in a concrete lined bund if available. In absence of such a bund at the site as a short-term storage alternative, a double plastic lined bund will be used. Barrels will be placed on plastic or wooden pallets in the temporary double plastic lined bund and not directly on the plastic; and
- Conventional metal barrels will not be used, however if there are no alternatives the materials may be stored in them providing they are covered with plastic sheet tightly fastened to prevent Aeolian distribution and again are stored in an appropriately bunded location to prevent leakage will the barrels suffer corrosion.

All contaminated materials that cannot be collected and disposed are to be cleaned in-situ. This cleaning is to be undertaken by an approved service providers.

Chemical Spill Response Options

The following actions are to be taken in case of a chemical spill;

- Only attempt containment and cleanup operations of spilt substances when it can be performed safely;
- If spilled material is flammable, eliminate sources of ignition near spill area;
- Liquid spills – If the spill is liquid its path will be blocked or diverted and then soaked up using an absorbent material such as sand;
- Gaseous spills/leaks – A gaseous leak must be stopped at the source as soon as possible and will then disperse in the air;
- No spills will be rinsed away;
- Contaminated soils and clean-up materials from spills will be handled properly using personal protective equipment, stored in a suitable container that is then labelled and stored in the appropriate location for subsequent disposal;
- Any stockpiles of remnant contaminated materials will be covered;

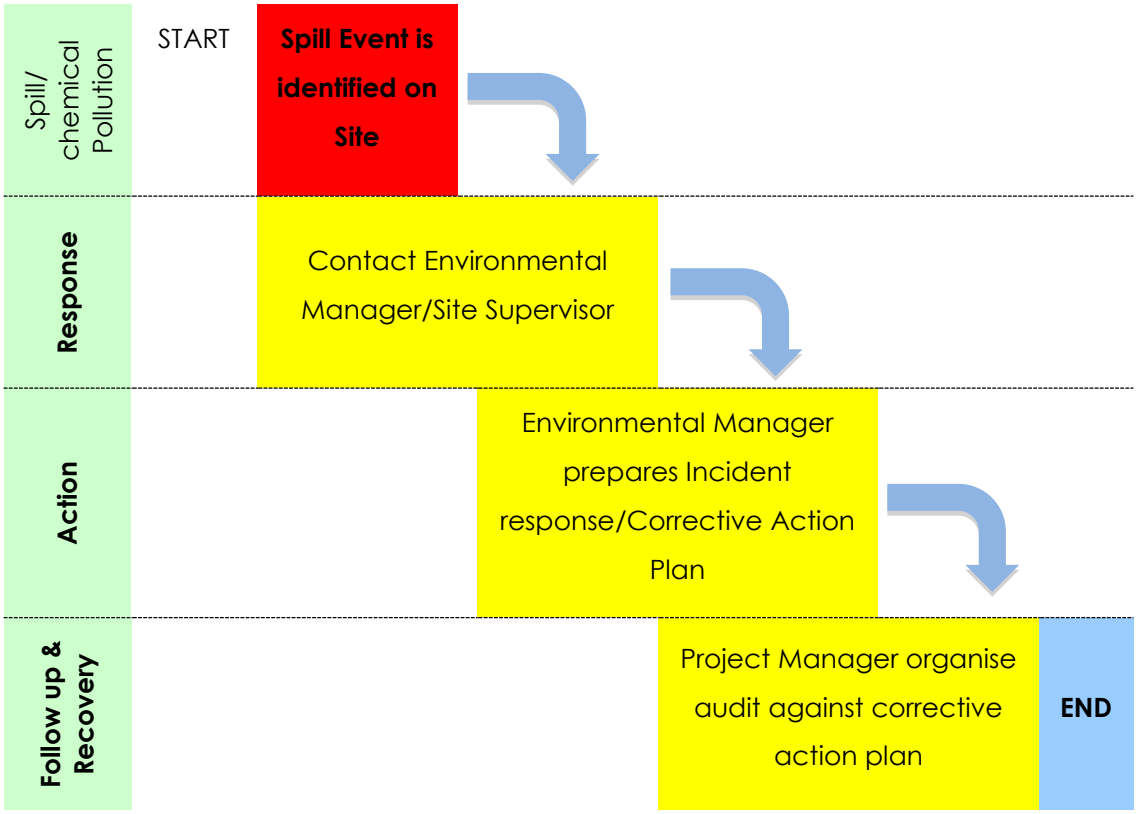
- Contaminated materials will be stored in plastic barrels with tightly closing lids. These barrels are to be stored in a concrete lined bund if available. In absence of such a bund at the site as a short-term storage alternative, a double plastic lined bund will be used;
- Barrels will be placed on plastic or wooden pallets in the temporary double plastic lined bund and not directly on the plastic; and
- Conventional metal barrels will not be used, however if there are no alternatives the materials may be stored in them providing they are covered with plastic sheet tightly fastened to prevent Aeolian distribution and again are stored in an appropriately bunded location to prevent leakage will the barrels suffer corrosion.

All contaminated materials that cannot be collected and disposed are to be cleaned in-situ. This cleaning is to be undertaken by an approved service providers.

Reporting

Any person involved in construction works that witnesses an incident must be able to report the incident to the responsible supervisor. The Environmental Manager shall be responsible for ensuring a report is filed describing the cause of the incident, action taken, the incident and recommended actions for ensuring the incident will not reoccur. A process flow that will be followed is shown in figure 6-1 below.

Figure 6-1 Incident Response



7 Environmental Monitoring Plan

The objective of an environmental monitoring plan is to establish the baseline indicators to assess the overall performance and effectiveness of the environmental management practices. A monitoring program has the objective of ensuring that the intended environmental mitigation measures are being effectively practiced and that environmental impacts are reduced or eliminated. The environmental monitoring program will aid management in redefining the environmental program objectives and where necessary, re-allocate the budget for implementing pollution control systems, employees' awareness and training programs, implementing pollution prevention opportunities etc. The broad objectives of the Environmental Monitoring Plan are:

- To evaluate the performance of mitigation measures proposed in the EMP;
- To evaluate the adequacy of Environmental Assessment;
- To suggest on going improvements in the management plan based on the monitoring and to devise fresh monitoring on the basis of the improved EMP;
- To enhance environmental quality through proper implementation of suggested mitigation measures; and
- To meet the requirements of the existing environmental regulatory guidelines and community obligations.

The detailed monitoring plan strategy will be determined in consultation with the DM-EPSS regulator, and will enable the 200MW Solar PV project to comply with regulatory requirements for monitoring during the operational phase and in order to monitor environmental aspects during the construction stage.

The following parameters, at a minimum, will be regularly monitored during both construction and operational phases. Procedures for undertaking this monitoring must be incorporated within the monitoring plan:

- Noise;
- Soil;
- Wastewater discharges, including dewatering of groundwater (continuous monitoring);
- Ambient air quality;
- Waste streams generated; and

- Public complaints.

A general monitoring plan for the proposed project is also suggested in the following sections. It is suggested to incorporate these in individual monitoring plans developed during construction and operation phase.

All monitoring results will be recorded in the site Environmental Monitoring Program register.

Based on the mitigation recommendations in the EIA, the following environmental parameters will be monitored. It should be noted that this table is a summary only, and the details of the methods, parameters and frequencies are provided in the subsequent discussion.

Table 7-1: Construction and Operational Phase Monitoring Activities

Subject to monitor	Construction	Operation
Wastewater and stormwater discharge	□	□
Ambient Air Quality	□	
Workplace Noise and Vibration	□	□
Traffic movements on/off-site	□	□
Waste Management	□	□
Complaints regarding environmental issues form all sensitive receptors	□	□

7.1 Monitoring Program for Construction Phase

Compliance Monitoring

The construction phase compliance monitoring will be carried out on a regular basis, using various techniques and at different intervals. This will ensure that all activities are carried out in compliance with existing local and international standards and according to the proposed CEMP. Recommended construction phase monitoring activities are described below.

Air Quality

Workplace dust/ Exhaust Air Quality

Monitoring of construction related dust will be carried out visually, and by using air filters for the measurement of PM (if required).

Vehicle exhausts will be monitored visually. If visual checks reveal smoky or malodorous fumes, this is particularly applicable to fixed site plant and specialised equipment.

Ambient Air Quality

At the boundaries of the construction site, air filters or dust collectors will be installed to monitor PM. Monitoring will be daily during significant dust generating activities or during periods of high winds (>20Knots), otherwise weekly.

Under both monitoring activities, the monitoring locations will be determined at the onset of construction activities, and the air quality analysis results will be assessed against the relevant air quality objectives.

Noise and Vibration

Workplace noise levels will be monitored weekly, using the same methods as for the baseline noise survey. The noise levels will be assessed according to guidelines for construction noise, taking into consideration the proximity of any sensitive receptors, time of day and location of the activity.

If required, vibration monitoring could be undertaken at sensitive receptors.

Water Quality

Wastewater discharges and wastewater quality

General construction techniques for handling dewatering water and wastewater is to collect it in evaporation ponds, re-use the water in soil and groundwater compaction/settling techniques.

There will be no discharges off the site during construction.

Waste Management

Waste management practices will be monitored on a monthly basis to ensure the proper implementation of the measures proposed in the EMP and compliance with relevant standards. A log on waste management will be maintained to record information on

waste reuse, recycling and disposal to demonstrate achieved levels of waste minimisation. The waste log will include the following information:

- Bi-weekly quantities and types of waste taken off site, the approved handler, and where the waste was disposed;
- Estimates of the quantities and types of waste recycled, reused, or recovered;
- List of persons that approved waste removal;
- Indication if waste disposal has met intended construction phase recycling, recovery or reuse targets.

Monitoring of Ecological Status

Any ecological impacts occurring during site clearance, land preparation, cut and fill activities need to be monitored and recorded. Equally, impacts on the Ghaf trees, off-site site should be monitored in order to ensure their health and survival during the construction phase.

Recruitment policy

In order to maximise the socioeconomic benefit, the project will seek to employ local workers where possible and where appropriate will offer training to enhance the development of skills within the local workforce. The number of local population employed in the project need to be monitored to assess the effectiveness of the Recruitment Policy that will be developed for the construction phase of the project.

Social Issues and Complaints

A point of contact and their details will be published at the entrance of the project site, in order receive complaints regarding any environmental grievances resulting from the construction activities. All complaints will be registered in the EMMP, including follow up results actions.

Emergency Monitoring

Emergency monitoring will be conducted following any incident to check whether appropriate measures have been taken to minimise environmental impacts. The Environmental Manager will carry out the monitoring and, if required invite a regulatory authority representative to cooperate.

7.2 Monitoring Program for Operation Phase

The monitoring program during the operation phase provides a means of validation of the implementation and effectiveness of the mitigation measures incorporated into the 200MW Solar PV project and developed during the EIA process, while allowing residual impacts to be predicted. This information can be used to refine the existing mitigation and, if necessary, aid in the development of additional mitigation measures.

Compliance Monitoring

Compliance monitoring will be conducted through regular environmental inspections, audits, control feed-back mechanisms, document control, and reviews to check if activities and operations are in compliance with proposed DM-EPSS standards or indicators proposed in the EIA.

Environmental compliance monitoring will be carried out on several different levels, namely:

- Trained technicians and/or environmental consultants will carry out the continuous and/or field and laboratory monitoring of physical measurements (e.g. air, water, noise);
- In some cases compliance monitoring will be carried out under the supervision of foremen, who will be specially trained in environmental procedures relevant to their fiduciary operation. An example of this is monitoring of waste generation, handling and disposal; and
- Environmental Manager will conduct daily inspections, spot checks, and overall compliance reviews (inspection of the monitored data verse standards and other indicators) on a regular periodic basis.

If any non-compliance is found during any of the control mechanisms, the adequate correction measures will be taken. Each non-compliance will be followed-up by an investigation which will be carried out to identify sources and/or reasons for non-compliance. Based on follow up investigation results, adequate prevention measures will be implemented to ensure that non-compliance will not reoccur.

Residual Monitoring

In order to check the implementation and effectiveness of the mitigation measures it is necessary to monitor specific environmental parameters that have been identified and assessed in the EIA.

It is recommended that the following items at a minimum will be regularly monitored.

- Wastewater discharges, wastewater quality (continuous monitoring);
- Traffic and transport;
- Waste deposit; and
- Public complaints.

Frequency, locations and parameters will be determined in consultation with the regulator to enable the 200MW Solar PV project to comply with regulatory requirements for monitoring during the operation phase. A detailed monitoring programme will be prepared and incorporated in the OEMP by the operations management.

Water Quality

Wastewater Discharge

Any wastewater discharged to the marine (i.e. stormwater) will be monitored per occurrence, prior to discharge. As a minimum the parameters that will be measured include: DO, Temperature, Salinity, EC, TDS, TSS, Turbidity, and pH.

Grab samples will also be collected and analysed for the following minimum parameters: Oil and grease, nutrients, BOD_5, COD, heavy metals (Cadmium, chromium, copper, lead and nickel) and cross referenced against DM-EPSS wastewater quality objectives for discharge to sea.

Traffic and Transport

If significant congestion is experienced, then a traffic-monitoring plan will be implemented. A specialist traffic consultant will determine the locations, frequencies and reporting requirements.

Waste Management

Waste management practices will be monitored on a monthly basis to ensure the proper implementation of the measures proposed in the EMMP and compliance with relevant standards. A log on waste management will be maintained to record information on

waste reuse, recycling and disposal to demonstrate achieved levels of waste minimisation. The waste log will include the following information:

- Bi-weekly quantities and types of waste taken off site, the approved handler, and where the waste was disposed;
- Estimates of the quantities and types of waste recycled, reused, or recovered;
- List of persons that approved waste removal;
- Indication if waste disposal has met intended construction phase recycling, recovery or reuse targets.

Social issues and Complaints

A point of contact and their details will be published at the site entrance and there will be a complaints procedure at the gate to the site, in order receive complaints regarding any environmental grievances resulting from the operation. All complaints will be registered in the EMMP, including follow up results actions.

Emergency Monitoring

Emergency monitoring will be conducted following any incident to check whether appropriate measures have been taken to minimise environmental impacts. The Environmental Manager will carry out the monitoring and, if required invite an environmental regulatory representative to cooperate.

7.3 Monitoring Plan Template

The following table is a very basic template design to help develop a more detailed procedure and reporting format. The government authorities will also provide the outline of the format and content of a monitoring plan that will be used for regulatory reporting purposes. In order to simplify the process, it is best to therefore adopt the regulatory authorities monitoring report template, in order to avoid duplication of works. Furthermore, the regulatory authority will provide further input to the content and methodology as is fitting to the project needs and phases of construction and operation.

Table 7-2 Basic Monitoring Template

MONITORING PLAN				
What (Is the parameter to be monitored?)	**Where** (Is the parameter to be monitored?)	**How** (Is the parameter to be monitored?)	**When** (Define the frequency / or continuous?)	**Who** (Is responsible for monitoring?)
Construction				
Air quality - PM_{10}	Site boundary	Air filters or dust collectors (follow testing equipment specifications for use)	Weekly. Daily when dust generating activities are undertaken or wind >20 knots	Contractor
Air Quality - Exhausts	Vehicle / equipment exhausts	Visual inspection of the smoke (follow testing equipment specifications for use)	Daily	Contractor / Subcontractors
Noise	Site boundary and sensitive receptors	Standard noise monitoring methodology, as described in the baseline monitoring survey.	Weekly	Contractor
Vibration	Sensitive receptors	Vibration meter recording for 24hrs (follow testing equipment specifications for use)	Weekly, for a full day (24h period)	Contractor
Wastewater –In situ parameters – Temperature, PH, DO, TDS, Turbidity, Conductivity, Salinity	Discharge from wastewater treatment	In-situ standard methodology (follow testing equipment specifications for use)	Continuous	Contractor
Wastewater –Ex situ parameters –BOD, COD, Heavy Metals (Cadmium, chromium, copper, lead and nickel), Nutrients, Oil and Grease	Discharge from wastewater treatment	Ex-situ analysis of samples following a certified laboratory methodology	Monthly	Contractor
Waste management	-	Waste log	Monthyl	Contractor /

				subcontractors
Ecological status	Wadies and canyons surrounding the site	Count of fauna species, monitoring flora	Monthly	Contractor
Operation				
Wastewater –In situ parameters – Temperature, PH, DO, TDS, Turbidity, Conductivity, Salinity	Discharge from stormwater	In-situ standard methodology (follow testing equipment specifications for use)	Per occurrence	Operations Management
Wastewater –Ex situ parameters –BOD, COD, Heavy Metals (Cadmium, chromium, copper, lead and nickel), Nutrients, Oil and Grease	Discharge from stormwater	In-situ standard methodology (follow testing equipment specifications for use)	Per occurrence	Operations Management
Waste management	-	Waste log	Monthly	Operations Management / subcontractors
Complaints register	Point of contact to be posted at the site entrance	Register complaints and how they are addressed	Every time there is a complaint	Operations Management
Emergency monitoring	Not applicable	Register emergencies and follow-up-remediation	Every time there is an emergency	Operations Management
Supervision (during the construction and operation phases)				
Independent Environmental Audits –Documentation	-	The auditors will review the environmental documentation kept at the plant, checking the adequate implementation of the environmental procedures establish in the EMMP (CEMP/OEMP) and the application of the mitigation and monitoring measures stated in the EIA, including	Quarterly	Contractor (construction) Operations Management (operation)

		the monitoring results		
Independent Environmental Audits — Site inspection	-	The auditors will visit the plant, to ensure that the environmental procedures are being adequately applied.	Quarterly	Contractor (construction) Operations Management (operation)
Independent Environmental Audits — Monitoring	-	The auditors will take their own samples and measurements of the monitoring elements outlined above for the construction and operational phases, if considered necessary to confirm the validity of the results provided by the contractor/ Operations Management.	Quarterly	Contractor (construction) Operations Management (operation)

8 Risk Assessment and Management

The content of this chapter will be used as a basic requirement of risk assessment during construction and operation phase of the 200MW Solar PV Plant.

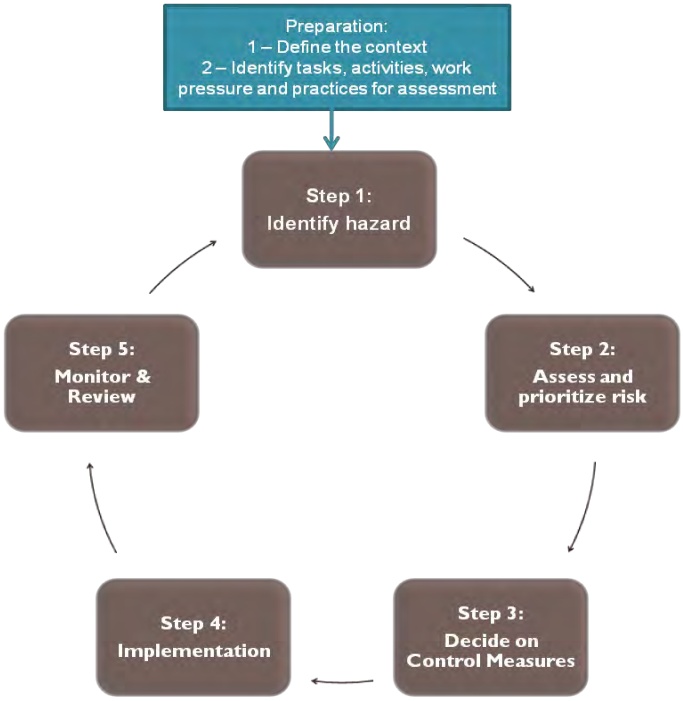
The risk assessment addresses the impacts to the environment that could occur as a result of mishaps or failures during the construction and operation phases of the project. These could be failure of equipment or material or utilities. Examples of mishaps are:

- Spills;
- Leaks;
- Fires; and
- Explosions.

To account for, control and avoid such potential hazards, this section provides for;

- Identify the hazards;
- Assess and prioritise risks and hazards;
- Decide on control measures;
- Implement the control measures; and
- Monitor and Review.

Figure 8-1 below defines the process for Contractor and Operations Management.



These steps cover identification of the major hazards to people and the environment, analysis of the related risks, as well as implementing measures to control these risks to improve in case these measures fail.

Risk Assessment shall be carried out in the following circumstances;

- When there is a change in the workplace, e.g. new plant, equipment, etc.
- When there is a change in procedures and/or processes;
- Induction of new personnel;
- Following an incident;
- When there is a change in the legislations;
- Prior to start of work;
- At regular intervals; and
- When carrying out high risk activities.

8.1 Identification of Hazards

The first Risk Assessment Process step is to systematically identify the potential health, safety, and environmental hazards and effects of activities and operations. Hazards and effects need to be identified as early as possible and tracked through the life cycle of each activity. It is imperative that sensitive environmental components and conditions are identified and priority protection areas delineated.

Hazards can be identified and assessed in a number of ways:

- Using checklists;
- By referring to codes and standards;
- By undertaking more structured review techniques;
- Previous experience in the area, including that of third parties;
- General observation and HSE awareness;
- Audits;
- Accident / incident investigations;
- Drills and exercises; and
- EHS/Environmental meetings.

Action to be taken by individuals on identifying a hazard include –

- Eliminating or controlling the hazard immediately;
- Isolating the hazard to prevent an accident; and
- Reporting the hazard using the standard form.

It must be noted that all hazards are to be reported, including those eliminated or controlled immediately. Any situation where an Equipment Incident could cause injury or other significant loss under different circumstances will first be reported as a Near Miss.

Analysis of Risk

Every reported hazard is analysed to decide how serious it is, and this is done by using the risk matrix, based on the knowledge and experience of the person(s) conducting the analysis.

The risk matrix is used to analyse the probability of occurrence (frequency) and severity of consequence or potential consequence, producing a rating as a code. The code is then classified into four (4) risk groups: low, moderate, high, and extreme risk. The level of risk is indicative of how much effort and urgency must be put in to controlling the problem.

Table 8-1 Potential EHS Impact and Potential Incidence Consequences Rating

Area impacted (a)	Insignificant consequences (Score = 1)	Minor consequences (Score = 2)	Moderate consequences (Score = 3)	Major consequences (Score = 4)	Catastrophic consequences (Score = 5)
Atmosphere/Waste/Other	Temporary nuisance from noise, dust, odour, other air emissions, greenhouse gases, vibration, visual impact. Results in the generation of significant quantities of non-hazardous wastes.	Minor environmental impact due to contained release of pollutant (including odour, noise and dust) fire of explosion with no lasting detrimental effects. No outside assistance required. Significant use of water, fuels, and energy and other natural resources.	Creation of noise, odour, dust, other controlled/uncontrolled air emissions, greenhouse gases, vibration, and visual impact at significant nuisance level. Results in the generation of significant quantities of hazardous wastes.	Major environmental impact due to uncontained release, fire, or explosion with detrimental effects. Outside assistance required.	Catastrophic environmental impact due to uncontained release, fire or explosion with detrimental effects. Outside assistance required. Extensive chronic discharge of persistent hazardous pollutant. Results in the generation of significant quantities of intractable wastes.

Human health and safety	Minor injuries, which may require self-administered first-aid. Injured personnel can continue to perform normal duties.	Injuries requiring on-site treatment by medical practitioner. Personnel unable to continue to perform normal duties	Serious injuries requiring off-site treatment by a medical practitioner or immediate evacuation to hospital. Potential long term or permanent disabling effects.	Single fatality	Multiple fatalities

Table 8-2 Probability of Occurrence

Description	Likely Frequency		Probability
	Environment	Health and Safety	
Frequent	Continuous or will happen frequently	Occurs several times a year at location	5
Often	5-12 times per year	Occurs several times a year in similar industries	4
Likely	1-5 times per year	Has occurred at least once in Morocco	3
Possible	Once every 5 years	Has occurred in industry (World-wide)	2
Rare	Less than once every 5 years	Never encountered in the industry	1

Table 8-3 Risk Assessment Matrix

Probability	Consequence				
	Insignificant - 1	Minor - 2	Moderate - 3	Major - 4	Catastrophic - 5
Rare-1	1	2	3	4	5
Possible-2	2	4	6	8	10
Likely-3	3	6	9	12	15
Often-4	4	8	12	16	20

Frequent-5 Almost Certain	5	10	15	20	25

15 to 25	Extreme Risk	Activity or industry will not proceed in current form
8 to 12	High Risk	Activity or industry will be modified to include remedial planning and action and be subject to detailed EHS Assessment
4 to 6	Moderate Risk	Activity or industry can operate subject to management and / or modification
1 to 3	Low Risk	No action required unless escalation of risk is possible.

The Risk Assessment Matrix helps to focus attention on the risks that matter by considering the following two questions:

- What is the probability of that incident occurring?
- What is the likely consequence of that occurrence?
- Use of the Risk Assessment Matrix will:
- Enhance appreciation of HSE risk and achieve "As Low As Reasonably Practicable" ALARP at all levels in all project operations,
- Assist in setting clear risk based strategic objectives,
- Provide the basis for implementation of a risk based EHS Management System,
- Provide a consistency in evaluating risk across all project activities.

8.2 Deciding on Control Measures

A 'control' is anything used to manage risks e.g. procedures, work permits, Personal Protective Equipment (PPE), training, and on-site supervision.

Once the hazards of activities have been identified and assessed, controls must be put in place to manage the risks. It is also important to put steps in place to be able to recover from an unplanned hazard and return to normal operating conditions.

Information on hazards, effects, and the risks connected to these and requirements to limit ('control') them such as limits of safe operation are prepared and recorded by Management.

Table 8-4 Hazard Controlling Measures

Control	Use	Description and example
Preventive measures	To reduce the likelihood of hazards or to prevent or avoid the release of a hazards	a. Examples include guards or shields (coatings, inhibitors, shutdowns), separation (time and space), reduction in inventory, control of energy release (lower speeds, safety valves, different fuel sources) and administrative (procedures, warning, training, drills).
Improvement measures	To reduce or limit the consequences arising from a hazardous event or effect	**Active systems:** **b.** Intended to detect and abate incidents, for example, gas, fire and smoke alarms, shutdowns, deluge **Passive systems:** c. Intended to guarantee the primary functions, for example, fire and blast walls, isolation, separation, protective devices, drain systems **Operational (non physical) systems:** d. Intended for emergency management, for example contingency plans, procedures, training, drills
Recovery Measures	Includes top events	All technical, operational and organizational measures which can – e. Reduce the likelihood that the first hazardous event or 'top event' will develop into further consequences. f. Provide life saving capabilities will the 'top event' develop further.

Any hazard and its associated risk are controlled by either reducing probability of occurrence or by reducing the effects. This may be achieved by one or more of the following steps shown in the figures below:

Table 8-5 Hazard and Safety Hierarchy of Controlling Hazards

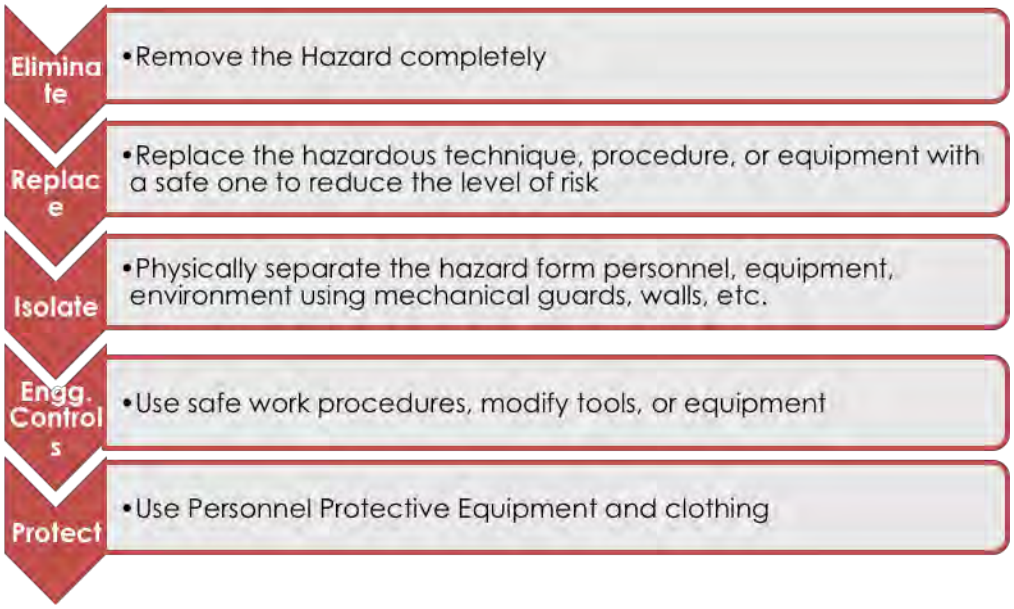
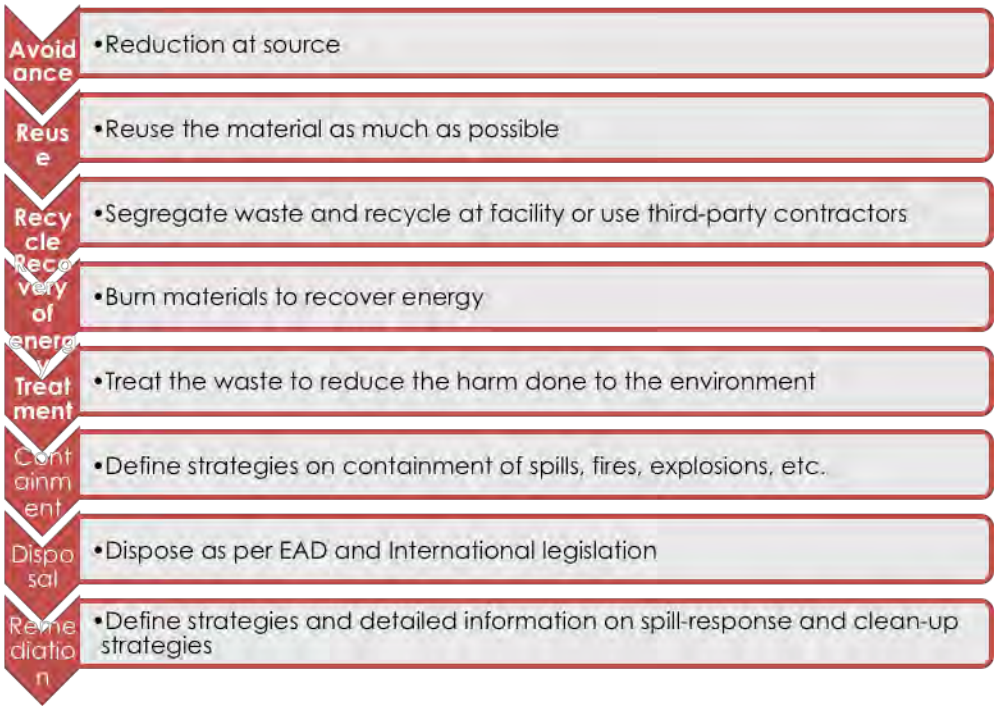


Table 8-6 Environmental hierarchy of Controlling Hazards



Note that these measures are listed from most effective to least effective. Efforts will be made to use the most effective possible measures to achieve results and several measures may be for each situation.

Once the control measures have been designed, the hazard can be re-analysed on the risk matrix to ensure that risk has been reduced to acceptable levels.

8.3 Implementing the Control Measures

- Contractor /Operations Management shall inform all relevant personnel about the control measures being implemented;
- Contractor /Operations Management shall provide adequate supervision to ensure that the new control measures are being implemented and used correctly;
- Any maintenance in relation to the control measures shall be defined in the Work Procedures;
- Risk will be reduced to ALARP. Consideration shall be given to;
  - Legal requirements;
  - International standards/guidelines;
  - Availability of resources;
  - Costs and benefits; and
  - The status of scientific and technical knowledge.
- The purpose of the implementation plan is to document how the chosen options will be implemented. These plans shall include;
  - Proposed actions;
  - Resource requirements;
  - Responsibilities;
  - Timing;
  - Performance measures; and
  - Reporting and monitoring requirements.

8.4 Monitor and Review

Monitoring and review is an on-going process and will not be considered as a one-off activity.

- Ongoing review is essential to ensure that everything planned is implemented. It is imperative that the Risk Management be considered a continuous process since the environment is always changing, e.g. the consequences of an event could change over time and/or the suitability or cost of mitigating the event;
- Monitoring and review also involves learning lessons from the Risk Management Process; and
- To compare the plans with the actual implementation provides a good performance measurement. Such results shall be incorporated into Performance Management, Measurement and Reporting System.

8.5 Record the Risk Management process

Procedures will be established and maintained to document the process and results of risk assessment and management. The recording shall include the following:

- Statutory requirements and codes applicable to the HSE aspects relevant to operations, products, and services;
- Identified hazards and effects in relation to HSE, Production, Services, Properties, and company reputation;
- Established risk criteria;
- Risks of consequence severity and likelihood of identified hazards; and
- Risk reduction measures.

DEWA 200MW Solar PV Phase 2

Environmental Impact Assessment (EIA)

Dubai, UAE

Volume 4 - Appendices

Prepared for:

ACWA Power

February 2015

5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE
☏+971 4 343 5955 🖷+971 4 343 9366

Document Information

Project	DEWA 200MW Solar PV Phase 2
Project Number	1305/001/021
Report Title	Appendices, Volume 4
Client	ACWA Power
Auditor	Edward Levine
Audit Date	Ken Wade

Document Control

Issue	Issue Date	Version	Author	Reviewed	Approved
1	19/02/2015	Final	EHL	CPM	KRW

APPENDIX A

Letter from Dubai Municipality

Scope of Work for the Environmental Impact Assessment of DEWA 200MW Solar PV plant Phase 2

15th February 2015

بلدية دبي
DUBAI MUNICIPALITY

Ref No EPSS/L/2015/095 10 February 2015

Mr. Ken Wade
5 Capitals Environmental and
Management Consulting
Tel 04-3435955/Fax 04-3439366

Subject : Scope of Work for the Environmental Impact Assessment of a 200 Megawatt PV Solar Plant – Phase 2

Dear Mr. Saeed Mohd. Al-Tayer,

This refers to the submitted Scope of Work (SoW) for the Environmental Impact Assessment (EIA) of the 200 Megawatt PV Solar Plant in Seih Al-Hadal Dubai

After the review of the submitted document, the Environmental Planning and Studies Section (EPSS) found out that the same is generally acceptable therefore, you may now commence with the project's EIA with the inclusion of the following

- Details and impact assessment of the proposed wastewater treatment plant
- Wildlife behavior in the area, which should be identified and mapped-out, particularly the movement of big mammals between feeding station/s within 10 square kilometer radius of the area

Kindly note however that our acceptance of the SOW is without prejudice to the requirements of producing an appropriate EIA Report as per Annex 1 of the EPSS Technical Guideline No 02 (EIA Requirements for Land Development, Infrastructure and Utility Projects) with complete supporting documents such as but not limited to the approved project's affection plan, related drawings/layouts, etc

Furthermore, we would like also to remind you about the restrictions on 5Capitals code-based registration with EPSS As provided in the "Information Bulletin for Registered Environmental Consultants in Dubai", environmental consultants are required to undertake only the environmental service(s) on which they are registered Hence, you are hereby advised to take the necessary actions to satisfy this requirement before you undertake the project's EIA, in particular the specialized studies on which you are not registered

We are looking forward to your submission of the EIA Report in hard and soft copies (in two properly labeled compact discs) as soon as possible to enable us to facilitate the processing of the project's Environmental Clearance (EC) application For more information/clarification, you may contact us at telephone nos 04-6066812 04-6065814, and 04-6066616

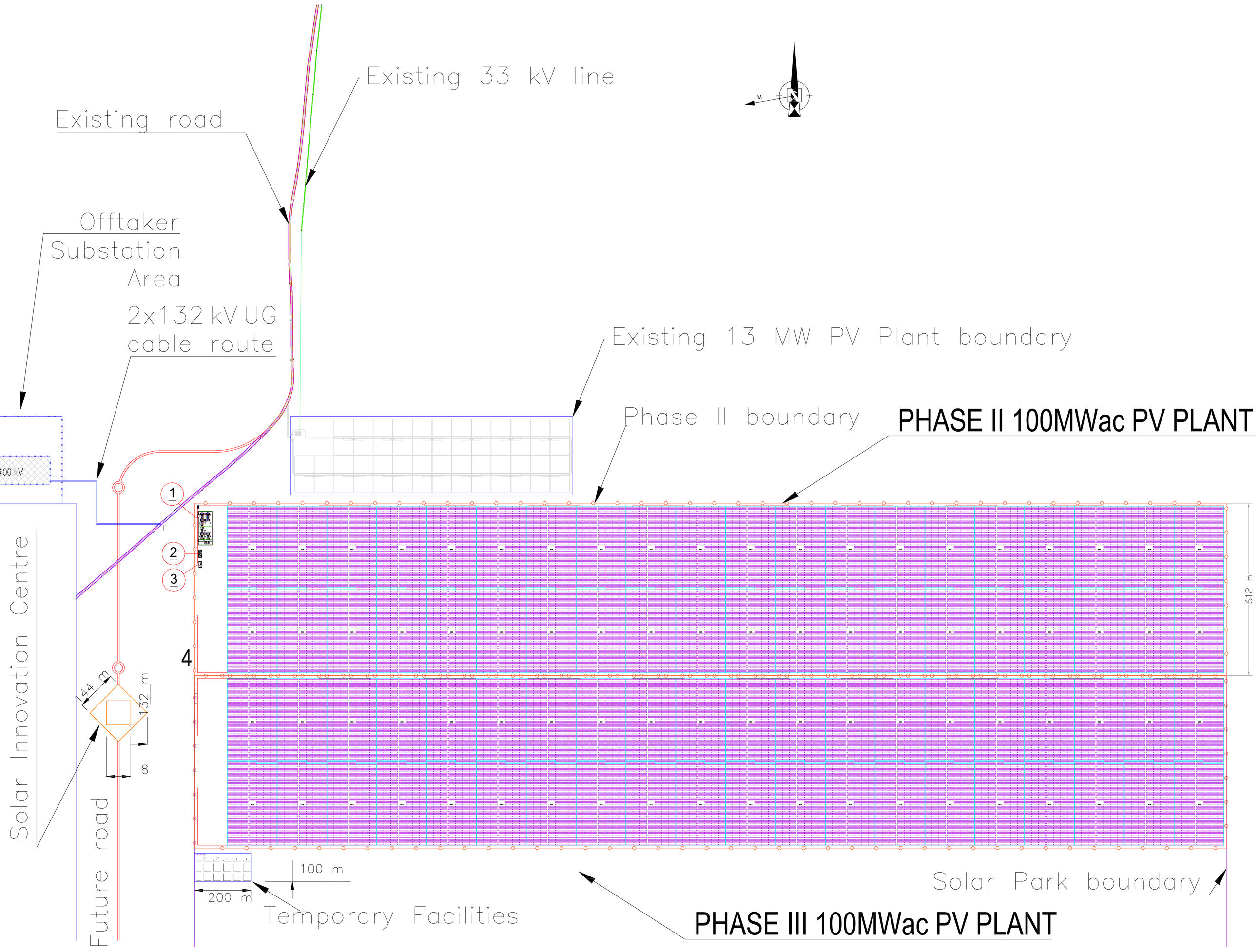
Yours truly

Eng. Hind Mahmoud Ahmed
Head of Environmental Planning & Studies Section

Copy to: [illegible]

APPENDIX B

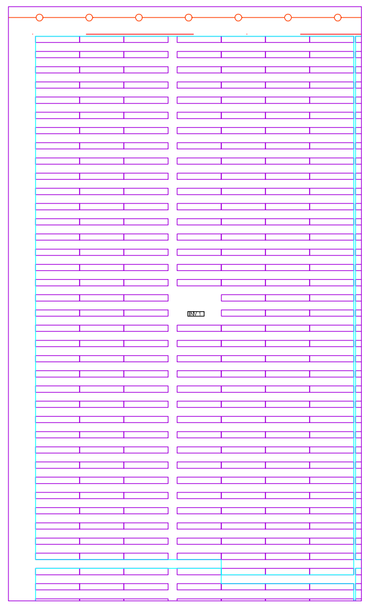
Project Affection Plan



Technical Data:	
Nominal DC-Power:	130 MWp x 2
Nominal AC-Power:	100 MW x 2
Panels Area:	~ 220-ha x 2
Length of fence:	~ ,
Tilt :	20º (south)
Module / Type and power:	110W
Size:	1200mm/600mm/6,8mm
Quantity:	1181320 x 2
Installation:	landscape
Inverter / Type:	2500 kW /
Quantity:	40
String connection:	10 modules per string

Legend:

1 PV SUBSTATION
2 CONTROL BUILDING
3 MAINTENANCE&SPARE BUILDING
Fence
Power station



3.250,5KW modules block
(one inverter)

REV	DESCRIPTION	DRAWN	CHECKED	APPROVED	DATE
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
1A	PRELIMINAR	J.L.S.	-	J.C.FIDALGO	19-11-2014

TSK | ACWA Power INTERNATIONAL

FORMATO A-1

SCALE

INVESTOR: هيئة كهرباء ومياه دبي Dubai Electricity & Water Authority

CAD FILE: -

PROJECT: 200 MW SOLAR PV IPP-PHASES II&III DEWA-DUBAI

TSK DWG Nr: 1143044-00-P00-PG-0002

REVISION: 1A

DRAWING TITLE: GENERAL LAYOUT

CUSTOMER DW Nr:

REVISION:

SHEET 1 OF 1

PROJECT Nº 1143044

APPENDIX C

Consultation Letters and Responses (when received)

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Director - GIS Centre
Dubai Municipality
PO Box 67
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

The proposed site layout is depicted below.

As part of the EIA process, 5 Capitals is collecting environmental baseline data of the area and conducting consultations with the relevant stakeholders. The information gathered will be used to ensure that the evaluation of impacts from the construction and operation of the project has accounted for the concerns and comments of the stakeholders and the existing environmental sensitivities of the area.

We therefore are contacting you to gather your opinions and comments on environmental issues associated with the construction and operation of this project.

With regards to mapping data, 5 Capitals has learned that GIS generated maps could be made available upon request by DM's GIS Centre. The information requested is specifically for the proposed project layout and surrounding area. Where possible, could you provide maps which illustrate the following:

- Existing and future land-use in the area;
- Social demographics (population, employment level of residents, etc.) of the area;
- Location of recreational areas;
- Location of existing wells and groundwater monitoring wells;
- Location of any cultural or archaeological relevant sites.

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

We would be grateful if you could forward your comments, opinions and the information requested above to our Dubai office (PO Box 119899) or to the following email address: edward.levine@5capitals.com We kindly request that all comments/data are received no later than 8th of February 2015.

Thank you very much for your assistance.

Best regards,

Edward Levine
Project Manager
edward.levine@5capitals.com
Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Head of Department
Dubai Municipality Planning Department
PO Box 67
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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We are therefore are contacting you to gather your opinions and comments on environmental issues associated with the construction and operation of this project.

With regards to land-use data, we kindly request that any relevant data that is held by your organisation be made available for this EIA process. The information requested is specifically for the project area. Where possible, could you provide the following information:

- Maps of existing and planned land uses in the area;
- Map of existing utilities and infrastructure corridors in the Sheikh Mohammed Bin Rashid Al Maktoum Solar Park area and its direct vicinity;
- Maps of future planned utilities and infrastructure corridors;

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

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Project Manager
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Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Head of Department
Dubai Municipality Drainage & Irrigation Department
PO Box 67
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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We are therefore are contacting you to gather your opinions and comments on environmental issues associated with the construction and operation of this project.

With regards to drainage and irrigation data, we kindly request that any relevant data that is held by your organisation be made available for this EIA process. The information requested is specifically for the project area. Where possible, could you provide the following information:

- Map(s) of the existing drainage and irrigation pipelines, underground wastewater pipelines, underground stormwater facilities, waste water management facilities, wastewater pumping stations (etc.);
- A map of the future planned utilities as described above, if available;
- A short description of these utilities.

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

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Best regards,

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Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

General Manager – Etisalat Dubai
Emirates Telecommunication Corp. (Etisalat)
PO Box 1150
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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We are therefore are contacting you to gather your opinions and comments on environmental issues associated with the construction and operation of this project.

With regards to services data, we kindly request that any relevant data that is held by your organisation be made available for this EIA process. The information requested is specifically for the project area. Where possible, could you provide the following information

- Map(s) of the existing underground optical cables, antenna/amplifier stations (etc.) in the project area;
- Map(s) of the future planned utilities as described above, if available;
- A short description of these utilities

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

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Best regards,

Edward Levine
Project Manager
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Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Head of Department
Emirates Integrated Telecommunications Company (DU) Engineering Department
PO Box 50266
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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- Map(s) of the existing underground optical cables, antenna/amplifier stations (etc.) in project area;
- Map(s) of the future planned utilities as described above, if available;
- A short description of these utilities

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Project Manager
edward.levine@5capitals.com
Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Head of Department
Dubai Statistical Centre
First Floor, Block #12, Dubai International Academic City (DIAC), Academic City RoadP.O.Box: 121222 Dubai. U.A.E
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Head of Department
National Bureau of Statistics
P.O.Box: 93000
Abu Dhabi, U.A.E

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Mrs. Habiba Al Marashi
Emirates Environmental Group
PO Box 7013
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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Project Manager
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Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

WWF United Arab Emirates
PO Box 45553
Abu Dhabi

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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Thank you very much for your assistance.

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5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Director General
Department of Tourism and Commerce Marketing
P.O. Box 594,
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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We are therefore are contacting you to gather your opinions and comments on environmental issues associated with the construction and operation of this project.

With regards to tourism data, we kindly request that any relevant data that is held by your organisation be made available for this EIA process. The information requested is specifically for the project area. Where possible, could you provide the following information:

- Information about plants for the Expo 2020 site and transportation requirements;
- Information about sites of touristic value in the area;
- Map(s) of the existing sites of touristic value in The Sheikh Mohammed Bin Rashid Al Maktoum Solar Park's direct vicinity;
- A short description of these.

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

We would be grateful if you could forward your comments, opinions and the information requested above to our Dubai office (PO Box 119899) or to the following email address: edward.levine@5capitals.com. We kindly request that all comments/data are received no later than 8th of February 2015.

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Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Director General
Dubai Civil Aviation Authority
P.O.Box No. 49888, Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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We therefore are contacting you, the Dubai Civil Aviation Authority to gather your opinions and comments on environmental issues associated with the construction and operation of this project.

Additionally, if you know of any potential constraints from nearby airports/helipads, we would appreciate the notification.

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

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Thank you very much for your assistance.

Best regards,

Edward Levine
Project Manager
edward.levine@5capitals.com
Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

Director of Waste Management Department
Dubai Municipality
P.O. Box 67
Dubai, UAE

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

The proposed site layout is depicted below.

As part of the EIA process, 5 Capitals is collecting environmental baseline data of the area and conducting consultations with the relevant stakeholders. The information gathered will be used to ensure that the evaluation of impacts from the construction and operation of the project has accounted for the concerns and comments of the stakeholders and the existing environmental sensitivities of the area.

We are therefore contacting you to gather your opinions and comments on environmental issues associated with the construction and operation of this project.

With regards to infrastructure data, we kindly request that any relevant data that is held by your organisation be made available for this EIA process. The information requested is specifically for The Sheikh Mohammed Bin Rashid Al Maktoum Solar Park and surrounding area. Where possible, could you provide the following information.

- Map(s) of the existing waste disposal areas and their waste type;
- A map depicting future planned expansion of waste disposal areas and any new waste disposal areas;

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

We would be grateful if you could forward your comments, opinions and the information requested above to our Dubai office (PO Box 119899) or to the following email address: edward.levine@5capitals.com. We kindly request that all comments/data are received no later than 8th of February 2015.

Thank you very much for your assistance.

Best regards,

Edward Levine
Project Manager
edward.levine@5capitals.com
Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

CEO - Traffic and Roads Agency
Roads and Transport Authority
PO Box 118899
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

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With regards to infrastructure data, we kindly request that any relevant data that is held by your organisation be made available for this EIA process. The information requested is specifically for The Sheikh Mohammed Bin Rashid Al Maktoum Solar Park and surrounding area. Where possible, could you provide the following information.

- Roads Department:
    - Map(s) of the existing highways, secondary roads, and associated underground and above ground facilities (etc.) in the project area and its direct vicinity;
    - A map depicting future planned road developments;
- QHSE Department:
    - Noise monitoring results near the main roads in the area;
    - Ambient air quality monitoring results near the main roads in the area;

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

We would be grateful if you could forward your comments, opinions and the information requested above to our Dubai office (PO Box 119899) or to the following email address: edward.levine@5capitals.com. We kindly request that all comments/data are received no later than 8th of February 2015.

Thank you very much for your assistance.

Best regards,

Edward Levine
Project Manager
edward.levine@5capitals.com
Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

25th January 2015

Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 – Environmental Impact Assessment

CEO – Rail Agency
Roads and Transport Authority
PO Box 118899
Dubai

Subject: DEWA 200MW Solar PV Phase 2 – Stakeholder Consultation for the Environmental Impact Assessment

Dear Sir or Madam,

5 Capitals Environmental and Management Consulting (5 Capitals) has been commissioned by ACWA Power to undertake the Environmental Impact Assessment (EIA) for the development of Phase 2 of the 1GW Sheikh Mohammed Bin Rashid Al Maktoum Solar Park, which will add a further 200MW to the Solar Park. The EIA will be submitted to Dubai Municipality Environmental Planning and Studies Section (DM-EPSS) to obtain the EIA NOC.

The proposed site layout is depicted below.

As part of the EIA process, 5 Capitals is collecting environmental baseline data of the area and conducting consultations with the relevant stakeholders. The information gathered will be used to ensure that the evaluation of impacts from the construction and operation of the project has accounted for the concerns and comments of the stakeholders and the existing environmental sensitivities of the area.

We are therefore are contacting you to gather your opinions and comments on environmental issues associated with the construction and operation of this project.

With regards to infrastructure data, we kindly request that any relevant data that is held by your organisation be made available for this EIA process. The information requested is specifically for The Sheikh Mohammed Bin Rashid Al Maktoum Solar Park and surrounding area. Where possible, could you provide the following information.

- Rail Planning & Projects Development:
    - Map(s) depicting future planned rail developments (approved or under consideration) in the project area;
- QHSE Department:
    - Noise monitoring results near the existing Green and Red metro lines and at sensitive receptors near the line;
    - Vibration monitoring results near the existing Green and Red metro lines and at sensitive receptors near the line;
    - Noise and vibration complaints.

Please note, we are not requesting an NOC from your Department. The EIA that we are preparing will be submitted to DM-EPSS. ACWA Power are the engineers for the project and will apply for all other required NOCs from the relevant Government Bodies. We only seek to obtain your opinions and concerns for the environment with regards construction and operation of the project and baseline information for the preparation of the EIA.

We would be grateful if you could forward your comments, opinions and the information requested above to our Dubai office (PO Box 119899) or to the following email address: edward.levine@5capitals.com. We kindly request that all comments/data are received no later than 8th of February 2015.

Thank you very much for your assistance.

Best regards,

Edward Levine
Project Manager
edward.levine@5capitals.com
Mobile number: + 971 55 718 3570
5 Capitals Environmental and Management Consulting
Principal office: PO Box 119899 Sheikh Zayed Road, Dubai, UAE

Ref: 812/02/02/1/1502283 19/02/2015

Edward Levine - Project Manager
5 Capitals Environmental and Management Consulting
P.O. Box- 119899
Dubai, UAE
Ph : No. +97155- 7183570

Reference: Your letter no. 1305/001/021 DEWA 200 MW Solar PV Phase 2 - Environmental Impact Assessment

Subject : **DEWA 200 MW Solar PV Phase 2 - Stakeholder Consultation for the Environmental Impact Assessment**

Dear Sir,

With reference to your above letter for the subject, please find the asked details as under :

(1) Existing waste disposal areas (landfills) & Treatment facilities details -

S. No.	Name of the landfill/ Treatment facility	Type of waste	Year of operation start	GPS Coordinates
1.	Al Qusais Landfill	MSW	1976	25°16'35"N, 55°26'00"E
2.	Bayada landfill	C & D	2007	25°02'06"N, 55°27'00"E
3.	Lehbab Landfill	MSW	1983	25°07'44"N, 55°31'40"E
4.	Warsan Landfill	MSW rejects	2007	25°09'06"N, 55°26'11"E
5.	Hatta Landfill	MSW	1984	24°50'35"N, 56°04'35"E
6.	Al Layan-2 Landfill	MSW	Not yet started	24°44'15"N, 55°09'41"E
7.	Tadweer MRF	MSW	2006	25°09'12"N, 55°25'47"E
8.	Green Mountain MRF	MSW	Under construction	25°02'15"N, 55°26'31"E
9.	West Coast MRF	MSW	Under construction	25°16'26"N, 55°26'14"E

MSW : Municipal Solid Waste, C & D : Construction & Demolition Waste
MRF : Material Recovery Facility

- Maps are not permitted to be released.

(2) There are no future plans for the expansion of waste disposal areas at present.

Sincerely,

Eng. Abdul Majeed Saifaie
Director of Waste Management Department

cc :
- Head of Waste Treatment Section

Dear Edward,
Further to out telephone conversation and your letter Ref: 1305/001/021 DEWA 200MW Solar PV Phase 2 EIA, please provide exact location (soft copy CAD drawing) of the solar park in order to address your queries by Rail Agency.
Kind regards,

Bashar Saadi Taha, *PhD. MIAust. MIAM.* | Acting Manager | **Rail ROW NOC & Service Coordination**
Rail Right of Way Department
Rail Agency
Roads and Transport Authority | HQ –Um Rummol – Block C Level 4 - Dubai - UAE
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www.rta.ae | bashar.taha@rta.ae

د. بشار سعدي طه | مدير بالإنابة | **قسم شهادات عدم الممانعة وتنسيق الخدمات** |
إدارة حرم القطارات
مؤسسة القطارات
المبنى الرئيس لهيئة الطرق والمواصلات – أم الرمول – دبي – إ.ع.م
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bashar.taha@rta.ae|www.rta.ae

Dear Dr Taha,

Thank you for your phone call earlier. Please find attached a screenshot of the project area. Unfortunately I do not have access to any CAD drawings for the project.

For your use Ive attached a file that can be opened in Google Earth, which will show you the exact location of the solar park and the location of the project we are currently working on, which is inside the solar park. Ive also written the coordinates of both the Solar park and the 200MW Solar PV project. Ive put these in DLTM format.

	Northing	Easting
Solar Park	2735613.26	506853.57
	2739933.134	506907.393
	2739933.673	504556.389
	2743168.93	504557.13
	2740699.64	501971.181
	2740078.6	499039.211
	2737477.53	499021.84
	2735615.06	498999.012
200MW Solar PV Phase 2	2739913.352	503210.115
	2739913.352	506869.281
	2738689.276	506869.281
	2738689.276	503210.115

I hope this helps. Please let me know if theres any other information I can provide you with.

Thank you,

Kind Regards

Ed
--
Edward Levine
Environmental Consultant
Email: edward.levine@5capitals.com
Mobile: +971 55 718 3670
Skype: ed_levine
Website: http://www.5capitals.com/

Hi Edward,
Thank you. The information received I will check if there is any future line is affected. Initially, I seems that the location of the solar park is outside the master plan of railway network. So there is nothing to do with Rail ROW Dept.
As for noise and EIA you can liaise with Mr. Bayan Abu Shaban the Environmental Specialist of Rail Agency or Mr. Arthur Bruce Rail QHSE Manager they are copied in the email.
Regards,

Bashar Saadi Taha, *PhD. MIAust. MIAM.* | Acting Manager | **Rail ROW NOC & Service Coordination**
Rail Right of Way Department
Rail Agency
Roads and Transport Authority | HQ –Um Rummol – Block C Level 4 - Dubai - UAE
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bashar.taha@rta.ae|www.rta.ae

Dear Edward Levine,

With reference to your letter dated 3rd February 2015 on the subject 'DEWA 200MW Solar PV Phase 2- Stakeholder Consultation for the Environmental Impact Assessment'.

The environmental impacts and issues of such projects come under the purview of the Dubai Municipality.

However in respect to obstacle height clearance kindly follow guidelines for the issuance of NOC, as appropriate for construction and/ or crane operation to ensure that such activities will not infringe the limitations imposed by the DCAA.

Information for NOC processes are available on the DCAA website and shall thank you to follow the following link.
https://www.dcaa.gov.ae/sitepages/en/Eservices_noc.aspx

Best regards,

On behalf of the
Director General DCAA

Best Regards

Abdulla Fikree
Head of Environment & Obstacle Control Section
Standards & Regulations Department
Dubai Civil Aviation Authority
PO Box +: 49888, Dubai – U.A.E
Tel (: 00971-4-2161830|Fax: +9714 -2244502
Mail: Abdulla.Fikree@dcaa.gov.ae
Website: www.dcaa.gov.ae

مع تحيات

عبدالله فكري
رئيس قسم السلامة وسلامة الأجواء
إدارة المقاييس و النظم
هيئة دبي للطيران المدني
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APPENDIX D

Air Quality Monitoring Results

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CORE LABORATORY
TESTING | INVESTIGATION | ASSURING

MONITORING REPORT
AMBIENT AIR MONITORING

Report No.:	CLR/15/0058/02/01	**Report Date:**	05/02/2015
Sample No.:	CLS/15/0058/02/01		

Client Details:

Client Name	**5 Capitals Environmental and Management Consulting**
Client Address	PO Box 119899 , Shk Zayed Road, Dubai, United Arab Emirates
Nature of Activity	Environmental Consultant
Project Name	**Ambient Air Monitoring and Soil Analysis at PV site near Bab Al Shams,**
Project Location	PV site near Bab Al Shams, Dubai, United Arab Emirates
Consultant	**5 Capitals Environmental and Management Consulting**
Contractor	No Specific Contractor

Monitoring Details:

Monitoring Point	**AQM # 1, Near Road**		
Monitoring start Date/Time	31/01/2015 / 09:25 Hrs	**Monitoring end Date/Time**	01/02/2015 / 09:25 Hrs

On-site Observation:

Monitoring Area Acitivity	Open Area	**Monitoring Area Condition**	Normal

METEOROLOGICAL DATA		**Date of Monitoring**			**31/01/2015 - 01/02/2015**
PARAMETER	**TEST METHOD**	**EXPOSURE TIME**	**UNIT**	**IDL**	**RESULTS (Average)**
Ambient Temperature	Direct Instrumental Method	24 Hours	°C	-	23.2
Relative Humidity		24 Hours	%	-	54.6
Wind Speed		24 Hours	kph	-	8.7
Wind Direction		24 Hours	°	-	183.4

MONITORING RESULTS		**Date of Monitoring**			**31/01/2015 - 01/02/2015**	
PARAMETER	**TEST METHOD**	**EXPOSURE TIME**	**UNIT**	**IDL**	**UAE Federal Law Limits**	**RESULTS (Average)**
Nitrogen Dioxide (as NO_2)	Direct Instrumental Method (Electrochemical Sensors)	24 Hours	$\mu g/m^3$	50	150 (24 Hrs)	109
Sulphur Dioxide (as SO_2)		24 Hours	$\mu g/m^3$	50	150 (24 Hrs)	< 50
Ozone (as O_3)		24 Hours	$\mu g/m^3$	0.1	120 (8 Hrs)	31.9
Benzene (as C_6H_6)	Active Air Sampling / USEPA 8260	N/A	$\mu g/m^3$	5	-	< 5
Toluene (as C_7H_8)		N/A	$\mu g/m^3$	5	-	< 5
Ethybenzene (as C_8H_{10})		N/A	$\mu g/m^3$	5	-	< 5
Xylene (as C_8H_{12})		N/A	$\mu g/m^3$	5	-	< 5
Particulate Matter 2.5 (PM 2.5)	Direct Instrumental Method (Light Scattering)	24 Hours	$\mu g/m^3$	1	-	15
Particulate Matter 10 (PM10)		24 Hours	$\mu g/m^3$	1	150 (24 Hrs)	31

Test Method Variation	None	**Monitored By**	SI / RD
Remarks	IDL - Instrument Detection Limit.		

Murtaza Huseni
Manager (Technical & Operation)
For CORE Laboratory

CORE LABORATORY
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Dubai Investment Park (DIP),
Dubai, UAE.

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CORE LABORATORY
TESTING | INVESTIGATION | ASSURING

MONITORING REPORT
AMBIENT AIR MONITORING

Report No.:	CLR/15/0058/02/02	**Report Date:**	05/02/2015
Sample No.:	CLS/15/0058/02/02		

Client Details:

Client Name	**5 Capitals Environmental and Management Consulting**
Client Address	PO Box 119899 , Shk Zayed Road, Dubai, United Arab Emirates
Nature of Activity	Environmental Consultant
Project Name	**Ambient Air Monitoring and Soil Analysis at PV site near Bab Al Shams,**
Project Location	PV site near Bab Al Shams, Dubai, United Arab Emirates
Consultant	**5 Capitals Environmental and Management Consulting**
Contractor	No Specific Contractor

Monitoring Details:

Monitoring Point	**AQM # 2, Near Boundary Area**		
Monitoring start Date/Time	31/01/2015 / 10:10 Hrs	**Monitoring end Date/Time**	01/02/2015 / 10:10 Hrs

On-site Observation:

Monitoring Area Acitivity	Open Area	**Monitoring Area Condition**	Normal

METEOROLOGICAL DATA		**Date of Monitoring**			**31/01/2015 - 01/02/2015**
PARAMETER	**TEST METHOD**	**EXPOSURE TIME**	**UNIT**	**IDL**	**RESULTS (Average)**
Ambient Temperature	Direct Instrumental Method	24 Hours	°C	-	22.8
Relative Humidity		24 Hours	%	-	40.6
Wind Speed		24 Hours	kph	-	8.7
Wind Direction		24 Hours	°	-	191.0

MONITORING RESULTS		**Date of Monitoring**			**31/01/2015 - 01/02/2015**	
PARAMETER	**TEST METHOD**	**EXPOSURE TIME**	**UNIT**	**IDL**	**UAE Federal Law Limits**	**RESULTS (Average)**
Nitrogen Dioxide (as NO_2)	Direct Instrumental Method (Electrochemical Sensors)	24 Hours	$\mu g/m^3$	50	150 (24 Hrs)	63
Sulphur Dioxide (as SO_2)		24 Hours	$\mu g/m^3$	50	150 (24 Hrs)	< 50
Ozone (as O_3)		24 Hours	$\mu g/m^3$	0.1	120 (8 Hrs)	30.8
Benzene (as C_6H_6)	Active Air Sampling / USEPA 8260	N/A	$\mu g/m^3$	5	-	< 5
Toluene (as C_7H_8)		N/A	$\mu g/m^3$	5	-	< 5
Ethybenzene (as C_8H_{10})		N/A	$\mu g/m^3$	5	-	< 5
Xylene (as C_8H_{10})		N/A	$\mu g/m^3$	5	-	< 5
Particulate Matter 2.5 (PM 2.5)	Direct Instrumental Method (Light Scattering)	24 Hours	$\mu g/m^3$	1	-	17
Particulate Matter 10 (PM10)		24 Hours	$\mu g/m^3$	1	150 (24 Hrs)	42

Test Method Variation	None	**Monitored By**	SI / RD
Remarks	IDL - Instrument Detection Limit.		

Murtaza Hussaini
Manager (Technical & Operation)
For CORE Laboratory

APPENDIX E

Soil Quality Laboratory Results

CORE LABORATORY
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CORE LABORATORY
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CLR-15-0058-01-01

LABORATORY TEST REPORT

CHEMICAL ANALYSIS OF SOIL

Report Number	CLR/15/0058/01/01	**Date**	10/02/2015
Sample Number	CLS/15/0058/01/01	**Sampling Certificate No.**	Not Applicable

Client Details:

Client / Establishment	5 Capitals Environmental and Management Consulting
Client Address	PO Box 119899, Sheikh Zayed Road, Dubai, UAE
Sampling Location	PV - 1
Nature of Activity	Environmental and Management Consultancy
Process	Existing Soil

Sample Details:

Sample Type	Soil		
Source of Sample	PV - 1		
Sampling Point	PV - 1	**Client Reference**	**PV - 1**
Sampling Apparatus	Not Given	**Sample Container/Size**	Plastic Bag (1 x 2Kg)
Sampling Date/Time	01/02/2015 / Not Given	**Sample Collected by**	Client Representative
Receiving Date/Time	01/02/2015 / 12:40 Hrs	**Sample Delivered by**	SI (Core Laboratory Rep.)
Sampling Method	Not Given	**Sample Received by**	MC (Core Laboratory Rep.)

On-site / Lab Observation / Test/s:

Appearance	Brown Fine Soil	**pH / Temperature**	Not Applicable
On-site Treatment / Preservation of Sample	APHA-AWWA-WEF 21st Ed. 2005 Standard Methods for the examination of Water and Waste Water		

RESULTS OF CHEMICAL ANALYSIS			**Date of Analysis**	**01/02/2015 - 09/02/2015**
PARAMETER	**TEST METHOD (Reference No.)**	**UNIT**	**DETECTION LIMIT**	**RESULT**
Trace Metals				
Arsenic as As	USEPA 3050 B/ APHA AWWA 3120 B : 2005	mg/Kg	1.0	< 1.0
Barium as Ba		mg/Kg	1.0	85.7
Cadmium as Cd		mg/Kg	2.0	< 2.0
Chromium as Cr		mg/Kg	1.0	22.2
Cobalt as Co		mg/Kg	1.0	2.8
Copper as Cu		mg/Kg	2.0	8.5
Lead as Pb		mg/Kg	1.0	< 1.0
Mercury as Hg		mg/Kg	1.0	< 1.0
Nickel as Ni		mg/Kg	1.0	38.1
Zinc as Zn		mg/Kg	2.0	12.9
Total Petroleum Hydrocarbon				
Gasoline Range	USEPA 8015 / 3540 / 5021	mg/Kg	2.0	< 2.0
Diesel Range			20.0	< 20
Heavy Fraction			50.0	< 50

Test Method Variation	None	**Tested by**	DT / LV / RD
Remarks	None		
Reference No.	APHA-AWWA-WEF 21st Ed. 2005 Standard methods for the examination of Water and Waste Water.		

Murtaza Huseni
Manager (Technical & Operations)
For CORE Laboratory

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CORE LABORATORY
TESTING | INVESTIGATION | ASSURING

CLR-15-0058-01-02

LABORATORY TEST REPORT
CHEMICAL ANALYSIS OF SOIL

Report Number	CLR/15/0058/01/02	**Date**	10/02/2015
Sample Number	CLS/15/0058/01/02	**Sampling Certificate No.**	Not Applicable

Client Details:

Client / Establishment	**5 Capitals Environmental and Management Consulting**
Client Address	PO Box 119899, Sheikh Zayed Road, Dubai, UAE
Sampling Location	PV - 2
Nature of Activity	Environmental and Management Consultancy
Process	Existing Soil

Sample Details:

Sample Type	Soil		
Source of Sample	PV - 2		
Sampling Point	PV - 2	**Client Reference**	**PV - 2**
Sampling Apparatus	Not Given	**Sample Container/Size**	Plastic Bag (1 x 2Kg)
Sampling Date/Time	01/02/2015 / Not Given	**Sample Collected by**	Client Representative
Receiving Date/Time	01/02/2015 / 12:40 Hrs	**Sample Delivered by**	SI (Core Laboratory Rep.)
Sampling Method	Not Given	**Sample Received by**	MC (Core Laboratory Rep.)

On-site / Lab Observation / Test/s:

Appearance	Brown Fine Soil	**pH / Temperature**	Not Applicable
On-site Treatment / Preservation of Sample	APHA-AWWA-WEF 21st Ed. 2005 Standard Methods for the examination of Water and Waste Water		

RESULTS OF CHEMICAL ANALYSIS			**Date of Analysis**	**01/02/2015 - 09/02/2015**
PARAMETER	**TEST METHOD (Reference No.)**	**UNIT**	**DETECTION LIMIT**	**RESULT**
Trace Metals				
Arsenic as As	USEPA 3050 B/ APHA AWWA 3120 B : 2005	mg/Kg	1.0	< 1.0
Barium as Ba		mg/Kg	1.0	36.6
Cadmium as Cd		mg/Kg	2.0	< 2.0
Chromium as Cr		mg/Kg	1.0	26.7
Cobalt as Co		mg/Kg	2.0	2.3
Copper as Cu		mg/Kg	1.0	7.4
Lead as Pb		mg/Kg	1.0	< 1.0
Mercury as Hg		mg/Kg	1.0	< 1.0
Nickel as Ni		mg/Kg	1.0	41.9
Zinc as Zn		mg/Kg	2.0	10.5
Total Petroleum Hydrocarbon				
Gasoline Range	USEPA 8015 / 3540 / 5021	mg/Kg	2.0	< 2.0
Diesel Range			20.0	< 20.0
Heavy Fraction			50.0	< 50.0

Test Method Variation	None	**Tested by**	DT / MC / RD
Remarks	None		
Reference No.	APHA-AWWA-WEF 21st Ed. 2005 Standard methods for the examination of Water and Waste Water.		

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for: Murtaza Husaini
Manager (Technical & Operations)
For CORE Laboratory

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CORE LABORATORY
TESTING | INVESTIGATION | ASSURING

CLR-15-0058-01-04

LABORATORY TEST REPORT
CHEMICAL ANALYSIS OF SOIL

Report Number	CLR/15/0058/01/04	**Date**	10/02/2015
Sample Number	CLS/15/0058/01/04	**Sampling Certificate No.**	Not Applicable

Client Details:

Client / Establishment	**5 Capitals Environmental and Management Consulting**
Client Address	PO Box 119899, Sheikh Zayed Road, Dubai, UAE
Sampling Location	PV - 3
Nature of Activity	Environmental and Management Consultancy
Process	Existing Soil

Sample Details:

Sample Type	Soil		
Source of Sample	PV - 3		
Sampling Point	PV - 3	**Client Reference**	**PV - 3**
Sampling Apparatus	Not Given	**Sample Container/Size**	Plastic Bag (1 x 2Kg)
Sampling Date/Time	01/02/2015 / Not Given	**Sample Collected by**	Client Representative
Receiving Date/Time	01/02/2015 / 12:40 Hrs	**Sample Delivered by**	SI (Core Laboratory Rep.)
Sampling Method	Not Given	**Sample Received by**	MC (Core Laboratory Rep.)

On-site / Lab Observation / Test/s:

Appearance	Brown Fine Soil	**pH / Temperature**	Not Applicable
On-site Treatment / Preservation of Sample	APHA-AWWA-WEF 21st Ed. 2005 Standard Methods for the examination of Water and Waste Water		

RESULTS OF CHEMICAL ANALYSIS			**Date of Analysis**	**01/02/2015 - 09/02/2015**
PARAMETER	**TEST METHOD (Reference No.)**	**UNIT**	**DETECTION LIMIT**	**RESULT**
Trace Metals				
Arsenic as As	USEPA 3050 B/ APHA AWWA 3120 B : 2005	mg/Kg	1.0	< 1.0
Barium as Ba		mg/Kg	1.0	21.3
Cadmium as Cd		mg/Kg	2.0	< 2.0
Chromium as Cr		mg/Kg	1.0	18.7
Cobalt as Co		mg/Kg	2.0	< 2.0
Copper as Cu		mg/Kg	1.0	9.4
Lead as Pb		mg/Kg	1.0	< 1.0
Nickel as Ni		mg/Kg	1.0	< 1.0
Mercury as Hg		mg/Kg	1.0	40.2
Zinc as Zn		mg/Kg	2.0	12.1
Total Petroleum Hydrocarbon				
Gasoline Range	USEPA 8015 / 3540 / 5021	mg/Kg	2.0	< 2.0
Diesel Range			20.0	< 20.0
Heavy Fraction			50.0	< 50.0

Test Method Variation	None	**Tested by**	DT / MC / RD
Remarks	None		
Reference No.	APHA-AWWA-WEF 21st Ed. 2005 Standard methods for the examination of Water and Waste Water.		

An ISO/IEC 17025 Accreditated Laboratory

Results relates only to the items tested.

كور لابوراتوري P.O.Box: 232686 CORE DUBAI, U.A.E. CORE LABORATORY

for Murtaza Husaini
Manager (Technical & Operations)
For CORE Laboratory

CORE LABORATORY
P. O. Box 232686,
Dubai Investment Park (DIP),
Dubai, UAE.

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CORE LABORATORY
TESTING | INVESTIGATION | ASSURING

CLR-15-0058-01-03

LABORATORY TEST REPORT

CHEMICAL ANALYSIS OF SOIL

Report Number	CLR/15/0058/01/03	**Date**	10/02/2015
Sample Number	CLS/15/0058/01/03	**Sampling Certificate No.**	Not Applicable

Client Details:

Client / Establishment	**5 Capitals Environmental and Management Consulting**
Client Address	PO Box 119899, Sheikh Zayed Road, Dubai, UAE
Sampling Location	PV - 4
Nature of Activity	Environmental and Management Consultancy
Process	Existing Soil

Sample Details:

Sample Type	Soil		
Source of Sample	PV - 4		
Sampling Point	PV - 4	**Client Reference**	**PV - 4**
Sampling Apparatus	Not Given	**Sample Container/Size**	Plastic Bag (1 x 2Kg)
Sampling Date/Time	01/02/2015 / Not Given	**Sample Collected by**	Client Representative
Receiving Date/Time	01/02/2015 / 12:40 Hrs	**Sample Delivered by**	SI (Core Laboratory Rep.)
Sampling Method	Not Given	**Sample Received by**	MC (Core Laboratory Rep.)

On-site / Lab Observation / Test/s:

Appearance	Brown Fine Soil	**pH / Temperature**	Not Applicable
On-site Treatment / Preservation of Sample	APHA-AWWA-WEF 21st Ed. 2005 Standard Methods for the examination of Water and Waste Water		

RESULTS OF CHEMICAL ANALYSIS			**Date of Analysis**	**01/02/2015 - 09/02/2015**
PARAMETER	**TEST METHOD (Reference No.)**	**UNIT**	**DETECTION LIMIT**	**RESULT**
Trace Metals				
Arsenic as As	USEPA 3050 B/ APHA AWWA 3120 B : 2005	mg/Kg	1.0	< 1.0
Barium as Ba		mg/Kg	1.0	60.6
Cadmium as Cd		mg/Kg	2.0	< 2.0
Chromium as Cr		mg/Kg	1.0	24.8
Cobalt as Co		mg/Kg	2.0	2.6
Copper as Cu		mg/Kg	1.0	7.3
Lead as Pb		mg/Kg	1.0	< 1.0
Nickel as Ni		mg/Kg	1.0	< 1.0
Mercury as Hg		mg/Kg	1.0	34.6
Zinc as Zn		mg/Kg	2.0	10.0
Total Petroleum Hydrocarbon				
Gasoline Range	USEPA 8015 / 3540 / 5021	mg/Kg	2.0	< 2.0
Diesel Range			20.0	< 20.0
Heavy Fraction			50.0	< 50.0

Test Method Variation	None	**Tested by**	DT / MC / RD
Remarks	None		
Reference No.	APHA-AWWA-WEF 21st Ed. 2005 Standard methods for the examination of Water and Waste Water.		

Murtaza Huseni
Manager (Technical & Operations)
For CORE Laboratory

APPENDIX F

Subcontractor Registration and Equipment Calibration certificates

ACCREDITATION CERTIFICATE

LB-073-TEST

Dubai Accreditation Department

has accredited

Core Laboratory

Dubai- United Arab Emirates

In accordance with the requirements of ISO/ IEC 17025: 2005 to undertake the tests in the fields of:

Environmental

Food Testing (Drinking Water)

For the tasks listed in the attached Scope of Accreditation

This Accreditation is invalid without the attached scope of accreditation and shall remain in force within the validity period printed below, subject to continuing compliance with the requirements of the accreditation program.

Validity of Certificate: from 10- 04- 2014 to 09- 04- 2017

Initial Accreditation Date: 10- 04- 2011

Director, Dubai Accreditation Department

C-AQ-04

Certificate of Calibration

Certificate Number: EDCQP200-4.11.5

Environmental Devices Corporation certifies the Haz-Scanner model HIM-6000 is calibrated to published specifications and NIST traceable.

Calibration Dust Specifications are NIST traceable using Coulter Mutisizer II e. ISO12103 –1 A2 Fine Test Dust and is designed to agree with EPA Class I and Class III FRM and FEM particulate samplers and monitors and EN 12341 and EN 14907 standards.

Gas sensors are Calibrated against NIST/EPA traceable Calibration Gas using NIST primary Flow Standard: LFE774300 to ISO 17025 and EPA Instrumental Test Methods as defined by 40 CFR Part 60.

Quality system standard to meet the requirements of ANSI/ASQC standard Q9000-1994 (ISO 9001), MIL-STD 45662A, and customer's specification if required.

Temperature = 22°C
Relative Humidity = 30%
Atmospheric Pressure = 760 mmHg
Measurement Uncertainty Estimated @ 95% Confidence Level (k=2)

Technician	Model	Serial Number	Date
Mark Gosselin	HIM-6000	913021	October 2014

Checked By _____

Manager: *Mark J. Sullivan*

Next Calibration Due Date October 2015

Environmental Devices Corporation
4 Wilder Drive Building #15
Plaistow, NH 03865
ISO-9001 Certified

PARTICULATES NOT OTHERWISE REGULATED, RESPIRABLE 0600

DEFINITION: aerosol collected by sampler with 4-µm median cut point

CAS: None RTECS: None

METHOD: 0600, Issue 3 **EVALUATION: FULL** **Issue 1: 15 February 1984**
Issue 3: 15 January 1998

OSHA: 5 mg/m³
NIOSH: no REL
ACGIH: 3 mg/m³

PROPERTIES: contains no asbestos and quartz less than 1%; penetrates non-ciliated portions of respiratory system

SYNONYMS: nuisance dusts; particulates not otherwise classified

SAMPLING

SAMPLER: CYCLONE + FILTER (10-mm nylon cyclone, Higgins-Dewell [HD] cyclone, or Aluminum cyclone + tared 5-µm PVC membrane)

FLOW RATE: nylon cyclone: 1.7 L/min
HD cyclone: 2.2 L/min
Al cyclone: 2.5 L/min

VOL-MIN: 20 L @ 5 mg/m³
-MAX: 400 L

SHIPMENT: routine

SAMPLE STABILITY: stable

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: 0.5 to 10 mg/m³ (lab and field)

BIAS: dependent on dust size distribution [1]

OVERALL PRECISION ($\hat{S}_{rT}$): dependent on size distribution [1,2]

ACCURACY: dependent on size distribution [1]

MEASUREMENT

TECHNIQUE: GRAVIMETRIC (FILTER WEIGHT)

ANALYTE: mass of respirable dust fraction

BALANCE: 0.001 mg sensitivity; use same balance before and after sample collection

CALIBRATION: National Institute of Standards and Technology Class S-1.1 or ASTM Class 1 weights

RANGE: 0.1 to 2 mg per sample

ESTIMATED LOD: 0.03 mg per sample

PRECISION: <10 µg with 0.001 mg sensitivity balance; <70 µg with 0.01 mg sensitivity balance [3]

APPLICABILITY: The working range is 0.5 to 10 mg/m³ for a 200-L air sample. The method measures the mass concentration of any non-volatile respirable dust. In addition to inert dusts [4], the method has been recommended for respirable coal dust. The method is biased in light of the recently adopted international definition of respirable dust, e.g., ≈ +7% bias for non-diesel, coal mine dust [5].

INTERFERENCES: Larger than respirable particles (over 10 µm) have been found in some cases by microscopic analysis of cyclone filters. Over-sized particles in samples are known to be caused by inverting the cyclone assembly. Heavy dust loadings, fibers, and water-saturated dusts also interfere with the cyclone's size-selective properties. The use of conductive samplers is recommended to minimize particle charge effects.

OTHER METHODS: This method is based on and replaces Sampling Data Sheet #29.02 [6].

C-AQ-04

ENVIRONMENTAL DEVICES CORPORATION

Date: 12/17/2014

Customer Name: Core Laboratory
System ID: HIM-6000 S/N 913021

BASIC CHECK		NOTES:
Turns On	PASS	
Terminal Block Screws	PASS	
Other Screws	PASS	
Logger Connections	PASS	
Battery Connection	PASS	
Fuses	PASS	
Sensor Boards	PASS	
Signal Board	PASS	
Memory Card	PASS	
Wires and Connectors	PASS	
Sensors and Switches	PASS	

CALIBRATION

SENSOR	LOW	ACTUAL	HIGH	ACTUAL
Temp	13°C	13°C	28°C	28°C
RH	13%	13%	36%	36%
Baro.	NA	NA	NA	NA
PM A (2.5μ)	0 μg/m³	0 μg/m³	20000 μg/m³	20000 μg/m³
PM B (10μ)	0 μg/m³	0 μg/m³	20000 μg/m³	20000 μg/m³
Wind Speed	0 kph	0 kph	10 kph	10 kph
Wind Direction	90°	90°	270°	270°
Sound	NA	NA	NA	NA
ELF	NA	NA	NA	NA
ARAD	NA	NA	NA	NA
UV/SolRad	NA	NA	NA	NA
Battery	10.5 VDC	10.5 VDC	12.2 VDC	12.2 VDC
CO	0 ppb	0 ppb	5000 ppb	5000 ppb
CO_2	NA	NA	NA	NA
NO_2	0 ppb	0 ppb	5000 ppb	5000 ppb
SO_2	0 ppb	0 ppb	5000 ppb	5000 ppb
NO	NA	NA	NA	NA
VOC	0 ppb	0 ppb	2000 ppb	2000 ppb
Indoor Light	NA	NA	NA	NA
O3	0 ppb	0 ppb	150 ppb	150 ppb
CHOH	NA	NA	NA	NA
NH3	0.0 ppm	0.0 ppm	25.0 ppm	25.0 ppm
H2S	0.0 ppm	0.0 ppm	5.0 ppm	5.0 ppm
Hydrocarbons	NA	NA	NA	NA
CH4	0 ppm	0 ppm	2500 ppm	2500 ppm

APPENDIX G

Noise Monitor Calibration Certificate

Certificate of Calibration

Cirrus Research plc

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:515
Description	Acoustic Calibrator
Serial Number	50571

Calibration Procedure

The acoustic calibrator detailed above has been calibrated to the published data as described in the operating manual. The procedures and techniques used to follow the recommendations of the IEC standard Electroacoustics – Sound Calibrators IEC 60942:2003, IEC 60942:1997, BS EN 60942:1998 and BS EN 60942:2003 where applicable.. The calibrator's main output is 94.00 dB (1 Pa) and this was set within the 0.01 dB resolution of the test system, i.e. one hundredth of a decibel. Numbers in {parenthesis} refer to the paragraph in IEC 60942.

Calibration Traceability

The calibrator above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards {A.0.6}. The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref.	S 6099
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref.	S 5964

Calibration Climate Conditions

The climatic test conditions were all maintained within the permitted limits of IEC 60942:1997.

Temperature	{B.3.2}	Permitted band 15°C to 25°C
Humidity	{B.3.2}	Permitted band 30% to 90% RH
Static Pressure	{B.3.2}	Permitted band 85 kPa to 105 kPa
Ambient Noise Level	{B.3.3.6}	Max permitted level 64 dB(Z)

Measurement Results

The figures below are the Calibration Laboratory test limits for this model calibrator and have a smaller tolerance than those permitted in IEC 60942.

94 dB Output	94.00 dB	Permitted band	93.95 to 94.05dB
104 dB Output	dB	Permitted band	103.80 to 104.30dB
Frequency	1000 Hz	Permitted band	990 to 1010Hz

Uncertainty

With an uncertainty coefficient of k=2, i.e. a 95% confidence level, the uncertainty of each measure is

94 dB Output	± 0.13 dB	104 dB Output	± 0.14 dB
Frequency	± 0.1 Hz	Level Stability	± 0.04 dB

Calibrated by T. A. Goodall

Calibration Date 05 March 2014

Calibration Certificate Number 215725

This Calibration Certificate is valid for 12 months from the date above.

Cirrus Research plc, Acoustic House, Bridlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Certificate of Calibration

Cirrus Research plc

Equipment Details

Instrument Manufacturer	Cirrus Research plc
Instrument Type	CR:811C
Description	Sound Level Meter
Serial Number	D20575FD

Calibration Procedure

The instrument detailed above has been calibrated to the publish test and calibration data as detailed in the instrument hand book, using the techniques recommended in the latest revisions of the International Standards IEC 61672-1:2002, IEC 60651:1979, IEC 60804:2001, IEC 61260:1995, IEC 60942:1997, IEC 61252:1993, ANSI S1.4-1983, ANSI S1.11-1986 and ANSI S1.43-1997 where applicable.
Sound Level Meters: All Calibration procedures were carried out by substituting the microphone capsule with a suitable electrical signal, apart from the final acoustic calibration.

Calibration Traceability

The equipment detailed above was calibrated against the calibration laboratory standards held by Cirrus Research plc. These are traceable to International Standards. [A 0.6] The standards are:

Microphone Type	B&K4180	Serial Number	1893453	Calibration Ref	S 6009
Pistonphone Type	B&K4220	Serial Number	613843	Calibration Ref	S 5964

Calibrated by T. A. Goodhill

Calibration Date	05 March 2014
Calibration Certificate Number	215726

This Calibration Certificate is valid for 12 months from the date above

Cirrus Research plc, Acoustic House, Bradlington Road, Hunmanby, North Yorkshire, YO14 0PH
Telephone: +44 (0) 1723 891655 Fax: +44 (0) 1723 891742
Email: sales@cirrusresearch.co.uk

Environment Department
Environmental Planning and Studies Section

إدارة البيئة
قسم الدراسات والتخطيط

تصريح بيئي
Environmental Clearance
No. 018/ 2015 رقم

Date Issued: 01 April 2015

Issued to	: **Dubai Electricity and Water Authority**
Project Name	: **200 Megawatt Solar Photovoltaic Power Plant – Phase II**
Location	: **Plot No. 971-7813, Saih Al Dahal**
Scope	: **Construction and Operation of a 200 Megawatt Solar PV Plant**
This EC has been issued in accordance with Articles 4 and 6 of "Federal Law No. 24 of 1999 for the Protection and Development of the Environment" as amended by "Federal Law No. 20 of 2006 and its Implementing Environmental Regulations". Failure to comply thereof or with any of the attached conditions shall result to the imposition of penalty and/or cancellation of this EC.	
Received by	: ________________
Mobile No.	: ________________
Signature	: ________________
Date	: ________________

اسم الشركة المصرح لها	: **هيئة كهرباء ومياه دبي**
اسم المشروع	: **محطة توليد طاقة شمسية بطاقة 200 ميجا وات – المرحلة الثانية**
الموقع	: **رقم الأرض: 971 – 7813، منطقة سيح الدحل**
مجال العمل	: **إنشاء وتشغيل محطة توليد طاقة شمسية بطاقة 200 ميجا وات**
تم إصدار هذه التصريح البيئي استناداً إلى المادتين (4) و (6) من القانون الاتحادي رقم (24) لعام 1999 بشأن حماية البيئة وتنميتها، والمعدل بالقانون الاتحادي رقم (20) لسنة 2006 والأنظمة البيئية المنفذة له، وفي حال الإخلال بأي من الشروط والأحكام المرفقة ستتعرض الشركة المذكورة أعلاه للمخالفات القانونية سواء بالغرامة و/ أو إلغاء التصريح البيئي.	
المستلم	: ________________
الهاتف المتحرك	: ________________
التوقيع	: ________________
التاريخ	: ________________

رئيس قسم الدراسات والتخطيط البيئي
Head of Environmental Planning and Studies Section

لمزيد من المعلومات الرجاء الاتصال على قسم الدراسات والتخطيط البيئي– هاتف: 04 606 6757
For more information please call Environmental Planning and Studies Section – Tel: 04 606 6757

GENERAL CONDITIONS

1. This Environmental Clearance (EC) covers the construction and operation of a 200 megawatt solar photovoltaic power plant based on the details as discussed in the submitted Environmental Impact Assessment Report (EIAR) dated February 2015. Prior approval shall be secured from Environmental Planning and Studies Section (EPSS) for any project expansion and/or modification, such as but not limited to increase in land area coverage, construction of additional solar panels and increase in power generation capacity .

2. A Construction Environmental Management Plan (CEMP) shall be submitted to EPSS at least thirty (30) days from the issuance date of this EC. This CEMP shall be prepared in accordance with the outline provided under EPSS Technical Guideline No. 2 and with the identified environmental aspects and impacts in the EIAR,

3. This EC is not a substitute to other regulatory permits, and its issuance does not exempt the project owner from securing other government approvals or preclude other agencies/departments from enforcing their rules and regulations.

ENVIRONMENTAL CONDITIONS

4. Implement all necessary environmental control measures, as committed in the EIAR, appropriate corrective actions as may be directed by EPSS for any environmental complaints, and settle environmental disputes that may arise during the project implementation.

5. The discharge of any wastewater from the project activities shall, at all times, comply with the permit requirements and applicable discharge limits/standards as prescribed by the Dubai Municipality-Environment Department.

6. Air and noise emissions resulting from the project implementation shall not exceed the applicable limits as prescribed under UAE Federal Law No. 12 of 2006.

7. All wastes (liquid and solid) generated from the project activities, which are classified as hazardous shall be segregated, collected, stored, treated and disposed off in accordance with the requirements of DM-Environment Department. Wastes generated shall be properly collected and disposed off in accordance with the requirements of Local Order No. 7 of 2002.

8. Importation of dangerous goods required for the implementation of the project must be covered by necessary permits from concerned governmental agencies. Safe procedures for handling and storage of dangerous goods as per relevant Material Safety Data Sheet shall be implemented.

9. Implement necessary measures to protect any wildlife and flora with conservation status categorized higher than "Least Concern" that may be encountered during the land development and construction works on-site. This should be in line with the requirements of Marine Environment and Wildlife Section (MEWS) Technical Guideline No. 3, on the Capture, Rescue, Translocation, Release and Restoration of Wildlife in the Emirate of Dubai.

MONITORING AND REPORTING REQUIREMENTS

10. Allow the access and assist the authorized representatives of DM-ED to carry out inspection, incident investigation, taking pictures and in obtaining relevant information of the sources of emission or waste and waste discharges at the site at anytime, except if it is unsafe to do so.

11. Immediately report any environment related incidents, describing the time of occurrence, the extent of impact, and the corrective actions undertaken.

12. Submit an Environmental Performance Report on a semi-annual basis based from the issuance date of this EC. The report shall be in accordance with the attached forms, and must be provided within seven (7) days after each reporting period.

==========

DM Legislations, Codes of Practice, Technical Guidelines & Information Bulletins are available at the DM website at http://www.dm.gov.ae