Environmental Impact Assessment (EIA)

Pre-Seismic and Drilling Activities

Tharwa (Siwa, Sallum, West Ghazalat, Farafra), and
East Ras Budran Concession Areas.

Apache Egypt, 2008

List of Acronyms

EGA	Environmental General Authority
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ERP	Emergency Response Plan
ESBS	Environmental and Social Baseline Study
FAO	Food and Agriculture Organization of the United Nations
HSE	Health, Safety and Environment
IUCN	International Union for the Conservation of Nature and Natural Resources (also known as the World Conservation Union)
PPE	Personal Protective Equipment
WBM	Water-based Mud
NEAP	National Environmental Action Plan

Contents

1 Executive Summary

1.1 Concise project description

An EIA is a comprehensive assessment of the diverse impacts of a project on the natural and ecological impacts on the human environment. It includes a detailed description of pre-existing conditions (baseline assessment), all project activities having a potential environmental impact (from pre-construction through decommissioning and site reclamation), and the net impacts of the project, taking into account alternative mitigation measures. It also considers the relationship of the project to the natural and ecological impacts on the human environment in the affected area and the cumulative impacts of those activities. EPSCO has been awarded by Apache Egypt to carry an Environmental and Social Impact Assessments (ESIA's) for the potential project within the concession areas hosted by Apache in two main areas Western Desert and Sinai and Gulf of Suez.

An environmental impact analysis was carried out and described, including a detailed classification of the potential positive and negative impacts from the proposed seismic, exploration and drilling activities. The major potential negative impacts are mainly due to the use of seismic heavy equipment, drilling rig, use of drilling fluids (mud), discharge of drill cuttings, and gas flaring during testing phase, in addition to accidental events (spills, well blow-out, fire and explosion). Positive socio-economic impacts are expected during both drilling and testing phases of the project. Appropriate mitigation procedures will ensure that no significant residual environmental impacts will result from the proposed seismic, drilling, exploration and production project.

The potential project of exploration and drilling activities will take place in the concession areas which are located in two main different areas: first concession area, Tharwa, located in Western Desert is composed of the Sallum, Siwa, West Ghazalat and Farafra Blocks and the second concession area is located at Ras Budran on the coast of Gulf of Suez in Sinai Peninsula.

1.2 Identification of project sponsors, operators and contractors

A Production Sharing Agreement has been agreed between the Egyptian General Petroleum Corporation (EGPC) and Apache Egypt Companies for Concession Areas "Siwa, Sallum, West Ghazalat, Farafra, and East Ras Budran". The agreement designates Apache Egypt as the operator for operations in the Concession Areas. This report presents the Environmental Impact Assessment (EIA) for a proposed seismic and exploratory drilling program to be undertaken by Apache Egypt within the main two concession areas which in Western Desert includes "Siwa, Sallum, West Ghazalat, Farafra", and East Ras Budran" on the Sinai Peninsula along the Gulf Suez.

Apache Overall Operations

In Egypt's Western Desert, Apache's 18.9 million gross acres encompass a sizable resource and outstanding exploration potential. The Qasr gas and condensate field, discovered in 2003, is the largest ever found by Apache with ultimate recoverable reserves of an estimated 2.25 Tcf of gas and 80 MMbbls of associated liquids. Our historical growth in Egypt has been driven by drilling and Apache is the most active driller in Egypt.

In Egypt, our operations are conducted pursuant to production sharing contracts under which the contractor partner (Apache) pays all operating and capital expenditure costs for exploration and development. A percentage of the production, usually up to 40 percent, is available to the contractor partners to recover operating and capital expenditure costs. In general, the balance of the production is allocated between the contractor partners and Egyptian General Petroleum Corporation (EGPC). Apache is the largest acreage holder and the most active driller in Egypt. Egypt holds our largest acreage position with approximately 18.9 million gross acres in 23 separate concessions (19 producing concessions) as of December 31, 2007. Development leases within concessions generally have a 25-year life with extensions possible for additional commercial discoveries, or on a negotiated basis. Apache is the largest producer of liquid hydrocarbons and natural gas in the Western Desert and third largest in all of Egypt. Egypt contributed 20 percent of Apache's production revenues and 18 percent of total production in 2007 and approximately 12 percent of total estimated proved reserves.

In 2007, Apache had an active drilling program in Egypt, completing 161 of 192 wells, an 84 percent success rate, and conducted 450 workovers and recompletions. In 2006 we received approval to expand our Western Desert gas processing capacity and infrastructure to process an additional 200 MMcf/d primarily from the Qasr field discovery. Work commenced in 2007 and we expect incremental production from the expansion to begin late in the fourth quarter of 2008.

Our gas production is sold to EGPC under an industry pricing formula. Oil from the Khalda Concession, the Qarun Concession and other nearby Western Desert blocks is either sold directly to EGPC or other third-parties. Oil sales are made either directly into the Egyptian oil pipeline grid, exported via one of two terminals on the north coast of Egypt, or sold to third parties (non-governmental) through the MIDOR refinery located in northern Egypt. We exported 32 cargoes (approximately 9.8 million barrels) of Western Desert crude oil from the El Hamra and Sidi Kerir terminals located on the northern coast of Egypt.

We doubled our acreage position with a 50 percent interest in four new concessions, adding 10.5 million gross acres of exploration potential. Progress is being made on our Salam gas plant expansion, which should be completed by the end of 2008. We

also continued expansion of several waterflood projects with further drilling and increased water injection capacity. Daily production averaged 60,735 b/d.

Summary of Apache Concession-specific Operations

Seismic Surveys

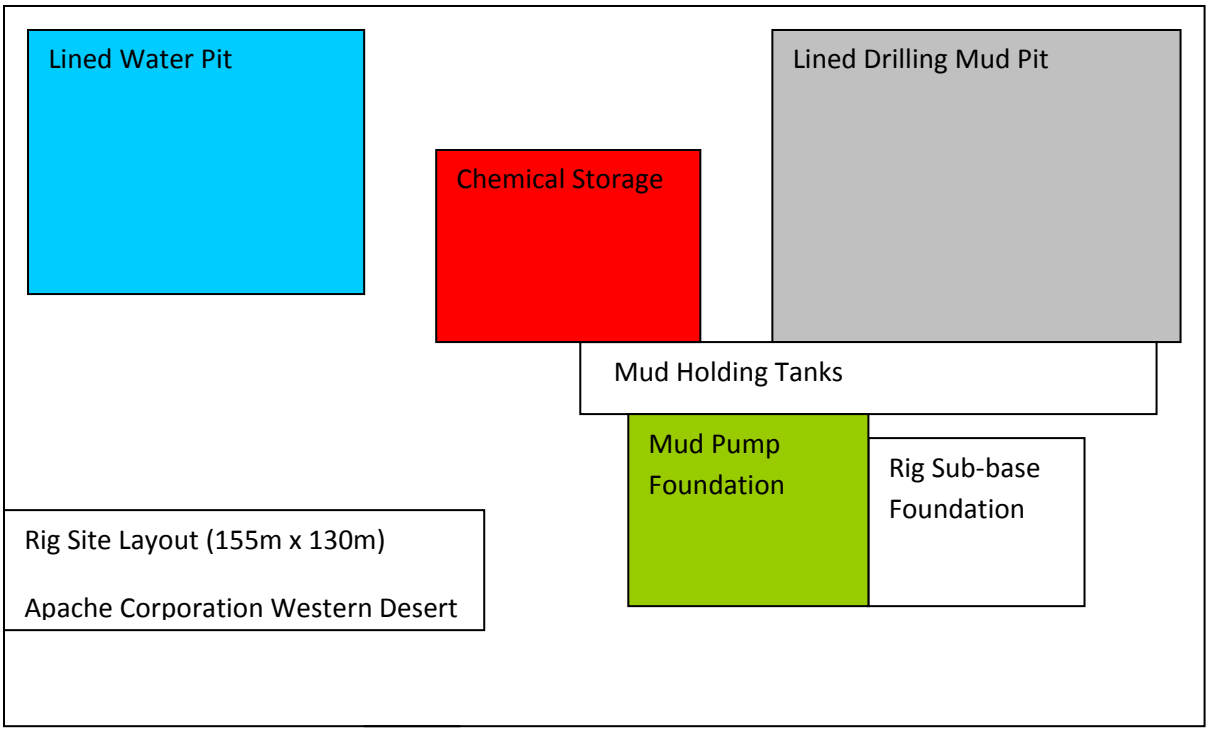
Apache has recently conducted seismic surveys in the Siwa, Sallum and West Ghazalat blocks and may conduct additional seismic acquisition operations in the future including surveys in the East Ras Budran (ERB) and Farafra blocks. A description of a typical seismic survey operation is included as Appendix A. Apache stipulates in our seismic contract that the seismic contractor will conduct operations in a safe and environmentally conscientious manner, adhering to Apache's EH&S Management System for International Operations and in full compliance with local and federal regulations as they apply.

Apache monitors the seismic operation using employees that are based in the operations camp during seismic activities. Wastes handling and disposal is conducted according to the Apache Waste Disposal Matrix (see Appendix B). Seismic contractors are required to prepare and implement an Emergency Response Plan.

Well Drilling

Apache has drilled wells in the ERB block and has plans to drill additional wells in the Tharwa concessions. Three wells were drilled but only one was completed for production. All produced fluids from the ERB-A-1X are transported via flowline to the SUCO plant for processing.

Apache stipulates in the drilling contract that the contractor will conduct operations in a compliant manner, adhering to Apache's EH&S Management System for International Operations and local and federal regulations as they apply. Apache employs contract observers to monitor the drilling activities to ensure safe and environmentally compliant drilling operations. Reserve pits that have been lined with an impermeable barrier are utilized for temporary storage of drilling fluids (see typical layout below). All waste generated during the drilling operation will be disposed of according to the aforementioned Waste Disposal Matrix.



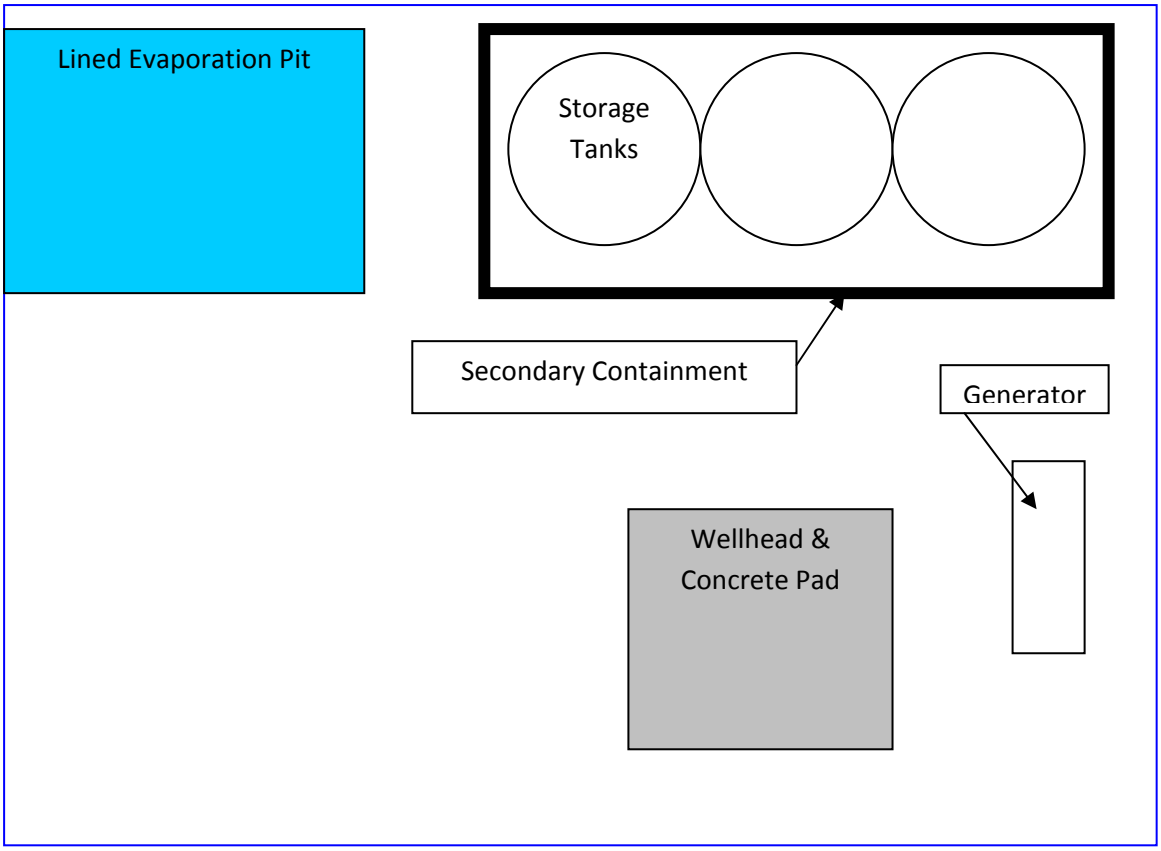
Hydrocarbon Production

Currently, only exploration wells are slated to be drilled. Fluids produced by the wells will be stored onsite in 1000bbl tank(s). Tank retention time will be used for basic gravity separation of the crude oil and water. Produced water will be decanted from the tanks into lined pits for disposal by evaporation. The crude oil will be trucked to nearby existing Apache facilities on other concessions for further treatment.

The produced fluids in this concession have very little associated gas. Venting of gases emitted during storage will take place onsite because the volumes are too small and intermittent to support any beneficial reuse or flaring. The emissions from venting and truck-loading operations have been taken into consideration in the greenhouse gas emission calculations as described in Section 4.1 of this report.

The East Ras Budran wellsite differs from the typical layout in that a three phase separator and flare have been installed. The well is expected to produce between 250-450 bopd while flaring 40 mscf/d. The GHG emissions from this site have been taken into consideration in the GHG calculations discussed in section 4.1 of this report.

See the following diagram for a typical production well pad layout.



Wells that are deemed uneconomical to produce will be plugged and abandoned according to applicable Egyptian regulations.

1.3 Baseline environmental conditions

This EIA study report, which considers the seismic, drilling and exploratory wells in the concession areas, builds on the results of an environmental and socio-economic baseline study (ESBS) which was collected and completed for this study

The purpose of the EIA is to examine and assess potential impacts on the environment from the planned project activities. An EIA is a process for the efficient and systematic identification, investigation and evaluation of potential environmental impacts that may result from a proposed project. It is a process carried out to ensure that the likely significant environmental effects are identified and assessed before a decision is taken on whether a proposed project should be approved.

The EIA forecasts changes (which may be viewed as positive or negative) that may occur as a direct or indirect result of key project activities, and necessitates a baseline understanding of the natural conditions at the proposed project location. The early identification of impacts that may occur in the area of influence of the proposed project reduces the likelihood of long-term adverse environmental effects, and permits the implementation of mitigation measures to avoid, reduce or remedy significant adverse effects.

1.4 Applicable environmental standards

This EIA is prepared to fully satisfy the requirements of the EEAA, including Law No. 4 of 1994 for nature conservation, and Law No. 102 for protected areas. The EIA is also compliant with Apache policies, OPIC guidelines, international conventions, World Bank, industry good practice and international standards.

1.5 Proposed mitigation measures

The scope of work and approach to the EIA may be to review details of the proposed seismic and drilling program activities and identify the key project components that may cause environmental or/and social impacts.

The implementation of the mitigation measures plans will prevent or minimize the impact of the project operation activities including seismic, drilling, exploration and production activities on the biotic and abiotic natural resources including flora, fauna, geological structure, archaeological site and local community.

1.6 Net environmental impacts

The minimum requirement of the residual impacts is to evaluate opportunities to address project residual environmental impacts. Projects can respond to this residual impact by supporting non-operational initiatives or activities which are focused on environmental research and education, and conservation. Any action in response to our residual impact should take into consideration the scale and type of all other additional activity that Apache Egypt is supporting, both at a corporate, country and project level. Such activities will be linked with the project's management of its social programs. In such cases programs will be evaluated in close collaboration with internal experts, national/local governments, and international and/or national development agencies and NGOs.

EIA aims to identify key resources and habitats based on available information, which may include physical and chemical parameters, biotic/biodiversity parameters, socio-economic and cultural parameters, and health parameters, and assess the potential impact on each key resource and habitat from each identified project component.

2 Policy, Legal and Administrative Framework

The main objective of the EIA is to meet or surpass the relevant environmental legislative requirements and guidelines, including but not limited to:

- Egyptian legislation: Egyptian Environmental Affairs Agency (EEAA) Law 4 of 1994 for environmental affairs and its Executive Regulations (ER) issued via Decree No.338 of 1995 and amended via Decree No.1741 of 2005; and Law 102 for protected areas.

- The requirements of EEAA publication “Environmental Impact Assessment (EIA) guidelines for Oil and Gas sector” (October 2001/January 2005);
- Apache Environmental Requirements for New Projects (including the Environmental Impact Management Process (EIMP) and Environmental Performance Requirements (EPR)
- International Finance Corporation (IFC) Environmental, Health and Safety Guidelines for Oil and Gas Development; and
- World Bank standards.
- Regional and International conventions

2.1 Applicable host country environmental and occupational safety and health laws and regulations

- The Egyptian Environmental Affairs Agency (EEAA) is the competent authority responsible for environmental protection in Egypt. It is responsible for setting standards, formulating environmental policies, implementing Law 4/1994 and inspecting compliance. Moreover, the EEAA sets criteria and procedures for mandatory EIAs of projects, approves EIAs and monitoring programs, and inspects the environmental registers during project operation. The EEAA has the authority to take action against violators of these criteria and conditions.
- Ministry of Petroleum and mineral resources, The Egyptian General Petroleum Corporation (EGPC), the body for handling oil activities including exploration, drilling, production and exportation.
- The Egyptian Natural Gas Holding Company (EGAS) was established in 2001 by the Ministry of Petroleum as the main body for handling the natural gas chain of activities in Egypt. It is the authority responsible for all gas-related operations, including exploration, implementation of gas projects and transportation, evaluation and approval of all upgrading plans for gas handling facilities, management, supervision and follow up of operations and maintenance activities of all gas pipelines and the national gas network, and revision of all natural gas agreements and contracts.

National Legislation

Law 4/1994

- Law No. 4, passed in 1994, is the main Law in Egypt concerning the environment. This law established the EEAA as the competent authority. The Executive Regulation of the law was set out in 1995. Various decrees have also been passed dealing with drainage of liquid wastes, and protection of the River Nile and other waterways from pollution.
- Law 4 dictates that the licensing authority, the EEAA, must assess the environmental impacts of the proposed development. The assessment shall include a statement of all elements of the project’s self-monitoring system,

and the expected contaminant levels. The Egyptian Environmental Affairs Agency shall verify the foregoing whenever necessary (Article 10, Decree 338 of 1995, amended by Decree 1741 of 2005). The license application must include comprehensive data about the project, to fulfill the requirements of the form structured by the EEAA and the Competent Administrative Authority (CAA) (A12/D338, amended by D1741).

- A register shall be maintained to record the impact of the project on the environment (A17/D338, amended by D1741), according to Annex 31 of the Executive Regulation and such register shall include the following information:
    - Emissions emanating or draining from the project and the limits thereof;
    - The efficiency of treatment processes and specification of any residual material from the treatment process;
    - Details of environmental safety and environmental self-monitoring procedures applied in the project (onshore and offshore activities); and
    - The name of the officer in charge of maintaining the register.
- The EEAA must be notified by registered letter of any deviation from the established criteria. The letter must also outline the procedures taken to correct the problem (A17/D338, amended by D1741). The EEAA shall be responsible to follow up the data included in the project's register, to ensure conformity with the actual conditions, the project's commitment to the self-monitoring plan and the efficiency of equipment and personnel responsible for the monitoring. The EEAA has the authority to visit the project to ensure conformity. If a violation occurs and the establishment fails to comply within 60 days, the violating activity could be suspended, and/or court action taken (A18/D338, amended by D1741).
- The EEAA must be notified of any expansions, modifications or renewals to the existing project (onshore and offshore activities) or any work that might result in an adverse impact on the environment or workers. Such expansions/modifications/renewals are subject to Articles 19, 20, 21, and 22 of Law 4 (A19/D338, amended by D1741).
- It is prohibited to construct any establishment within 200 meters of the Egyptian coast lines without the permission of the Shore Protection Agency (SPA) in coordination with the EEAA. The executive regulations of this law shall lay down the procedures and conditions to be followed (A73/Law 4). Also, Law 4 prohibits any measures to be taken that may affect the natural coast line or alter its configuration either inwards or outwards, without the approval of the SPA in coordination with EEAA. The executive regulations of this law shall regulate the procedures and conditions to be followed (A74).

Use of Hazardous Materials and Wastes

The production and displacement of hazardous materials and wastes is prohibited without a license. The license is issued for a fixed time interval. The permit

[1] All Executive Regulation annexes were amended by Decree 1741 of the year 2005.

requirements are summarized in A26/D338, amended by D1741. Management of hazardous wastes is subject to rules and procedures, which are set out in A28/D338, amended by D1741.

Hazardous substances are defined by Law 4 as “substances having dangerous properties which are hazardous to human health, or which adversely affect the environment, such as contagious, toxic, explosive or flammable substances or those with ionizing radiation.”

A hazardous waste is defined by Law 4 as the “waste of activities and processes or its ashes which retain the properties of hazardous substances and have no subsequent original or alternative uses, such as clinical waste from medical treatments or the waste resulting from the manufacture of any pharmaceutical products, drugs, organic solvents, printing fluid, dyes and painting materials”.

Relevant Articles for Marine Protection

None of the five concessions that are discussed in this EIA are offshore. The following marine protection articles are discussed due to the close proximity to coastal areas of two of the concessions.

The project is licensed to discharge effluents containing degradable substances into the marine environment after treatment that complies with the limits presented in Annex 1 of the Executive Regulations of Law 4. “Industrial establishments shall also be prohibited to drain the non-degradable substances, as prescribed in Annex No. 10 to these Regulations, into the water environment” (Article No. 58 of the Executive Regulations D338, amended by Decree 1741). Annex 1 of the Executive Regulations also sets specifications and criteria (permissible limits) for draining and disposing liquid wastes into the marine environment. Annex 10 of the Executive Regulation presents the non-degradable polluting substances which industrial establishments are prohibited from discharging into the marine environment. Non-degradable polluting substances are defined as substances that are found in the environment for a long period, depending basically on the quantities disposed of. Some of these substances are decomposed after long periods, ranging from months to several years, based on the composition of such substances and their concentrations in the environment.

First, Non-organic Substances

It is forbidden to discharge the compounds and salts of the following non-organic substances into the marine environment, except within the concentrations mentioned in Annex 1: Mercury, Lead, Cadmium, Cobalt, Nickel, Zinc, Iron, Manganese, Silver, Barium, Chromium, Arsenic, Copper, Vanadium, and Selenium.

Second, Organic Substances

It is completely forbidden to discharge the following organic substances:

- Organophosphorus pesticides, which degrade rapidly:
  - Dimethoate
  - Malathion
- Halogenated organic pesticides, which are not decomposed easily and leave traces that are persistent for several years:
  - Organochlorine Pesticides:
    - Aldrin
    - Dieldrin
    - DDT
    - Chlordane
    - Endrin
- Also, non-degradable chlorinated compounds, which are considered to be highly toxic even in very low concentration:
  - Polychlorinated Biphenyls (PCBs) (Aroclor):
  - Tetrachlorobiphenyl
  - Trichlorobiphenyl
- Polycyclic aromatic compounds that require years to fully degrade:
  - Polynuclear Aromatic Hydrocarbons (PAH)
    - Benzo (a) Pyrene
    - Naphthalene

Third, Solid Materials

It is forbidden to discharge solid materials such as plastic, fishing nets, ropes, containers, and domestic garbage in general. It is also forbidden to discharge other persistent organic pollutants (for example, toxaphene, mirex, heptachlor, and hexachlorobenzene) and other toxic substances specified by the international conventions to which Egypt is a signatory.

Air/Odour Emissions

The project must demonstrate that it will meet air/odour emission standards taking into account (A34 - 36/D338). The cumulative contaminant levels due to incremental effects when combined with discharges from all industries in the area should not

exceed the limits in Annex 5 of the Executive Regulation (A34/D338, amended by D1741).

Reference is also made in D1741/2005 to “guidelines for specific limits”, which shall be published by the EEAA in coordination with the authorities involved. However, the latter guidelines have not been published yet.

Gas releases, noxious and harmful smoke, fumes resulting from burning fuel, precautions and permissible limits as well as specifications of chimneys are regulated by Articles 36, 37, and 42/D338, amended by D1741, and Annex 6 of the Executive Regulation. Table 2-1 presents maximum limits for certain gaseous emissions from industrial establishments' stacks (extracted from Table 2, Annex 6 of the Executive Regulations of Law 4/1994).

Table 2-1 Ambient Air Quality Criteria (µg.m-3) (Annex 5 of the Executive Regulations of Law 4/1994)

Pollutant	**Average Period**	**Egyptian Standards**
Sulphur dioxide (SO_2)	1 hour	350
	24 hours	150
	1 year	60
Carbon monoxide	1 hour	30 000
	8 hours	10 000
Nitrogen dioxide (NO_2)	1 hour	400
	24 hours	150
Ozone	1 hour	200
	8 hours	120
Suspended Particles measured as black smoke	24 hrs	150
	1 year	60
Total Suspended Particles	24 hrs	230
	1 year	90
Lead	24 hour average over 1 year in urban areas	0.5
	24 hour average over 6 months in industrial zones	1.5
Thoracic particles	24 hrs	150

Pollutant	Average Period	Egyptian Standards
(PM 10)	1 year	70

Table 2-2 Maximum Limits for Gaseous and Vapour Emissions from Industrial Establishments' Stacks (extracted from Table 2, Annex 6 of the Executive Regulations of Law 4)

Pollutant	Limit Concentration ($mg.m^{-3}$ of exhaust)
Aldehydes (measured as Formaldehyde)	20
Antimony	20
Carbon monoxide	500 for existing facilities 250 for facilities to be constructed after the amended executive regulations are issued
Sulphur Dioxide	
• Burning coke and petroleum	2 500 for existing facilities 4 000 for facilities to be constructed after the executive regulations are issued
• Non-ferrous industries	3 000
• Sulphuric acid Industry & other sources	1 500
Sulphur trioxide in addition to sulphuric acid	150
Nitric acid resulting from nitric acid Industry	2 000
Hydrochloric acid (hydrogen chloride)	100
Hydrofluoric acid (hydrogen fluoride)	15
Lead	2
Mercury	3
Arsenic	20
Heavy elements (total)	25

Pollutant	**Limit Concentration (mg.m^{-3} of exhaust)**
Silicon Fluoride	10
Fluorine	20
Tar • Graphite Electrodes Industry	50
Cadmium	10
Hydrogen Sulphide	10
Chlorine	20
Carbon	
Garbage burning	50
Electrodes industry	250
Organic Compounds	
• Burning of organic liquids	50
	0.04% of crude (oil refining)
Copper	20
Nickel	20
Nitrogen oxides	
• Nitric acid industry	3 000 for existing facilities 400 for facilities to be constructed after the amended executive regulations are issued
• Other sources	300

Conditions in the Workplace

The project must operate such that any possible leakage or emission of air pollutants inside the workplace will not affect worker's health and safety (A45/D338). Annex 8 of the Executive Regulation provides the maximum limits for air pollutants inside the workplace. Suitable Personal Protective Equipment (PPE) is to be provided as required for workers in different areas of the project (A46/D338).

The project must meet noise standards specific to the workplace and standards for noise outside the facility and for the area as a whole (A44/D338). Permissible noise levels inside the workplace are also regulated in Annex 7 of the Executive Regulation. Table 2-3 presents the permissible noise levels in different areas. And Table 2-4 presents the noise limits in the workplace.

Table 2-3 Maximum Permissible Limits for Noise Intensity in dBA (Annex 7 of the Executive Regulations of Law 4/1994)

Type of Zone	Day	Evening	Night
Rural dwelling zones, Hospitals and Gardens	45	40	35
Dwelling suburbs together with an existing weak movement	50	45	40
Dwelling zones in the city	55	50	45
Dwelling zone including some workshops or commercial business or on a public road	60	55	50
Commercial, administrative and downtown areas	65	60	55
Industrial zones (heavy industries)	70	65	60

Table 2-4 Permissible Limits for Noise Limits in the Workplace

Type of Place and Activity	Limit (dBA)
Work place with up to 8 hour shifts and aiming to limit noise hazards on sense of hearing	90
Work rooms for computers, typewriters or similar equipment	70
Work rooms for the follow up, measurement and adjustment of high performance operations	65

Additional Laws and Regulations

a) Fishing, aquatic life, and fish farms are mainly regulated by Law 124 of the year 1983. The Law designates the General Authority for Fish Resources Development (GAFRD) as the Competent Administrative Authority. The GAFRD was established by Presidential Decree 190 of year 1983, under the Ministry of Agriculture. Section 2 of this Law concerns water pollution and fishing obstructions. Presidential Decree 465 of year 1983 has designated coastal areas to be developed and monitored by the GAFRD. The project will require approval of the GAFRD for the near shore activities.

b) Law 102 of year 1983 regulates natural protectorates in Egypt. The Law defines a natural protectorate as "any area of land, coastal or inland water, characterised by flora, fauna, and natural features having cultural, scientific, touristic or aesthetics value, which is designated by a Decree from the Prime Minister, based on a recommendation from the Egyptian Environmental Affairs Agency" (Article 1/Law 102). Decree 1067 of year 1983, concerning the implementation of some provisions of Law 102/1983, has designated the EEAA as the Competent Administrative Authority responsible for the implementation of Law 102/1983 and the decrees related to this law for the protection of natural protectorates (A1/D1067).

c) The Egyptian drinking water quality standards, adopted by the Ministry of Health (Decree 108/1995).

d) Law 59 of year 1960 regulates radioactive substance usage and is executed by the Ministry of Health. The law defines the people who are allowed to work in this field and the authority responsible for inspection and granted licenses. In consequence the ministerial decree 265 of year 1989 and its annexes regulate protection from radioactive used in industries. The decree describes the system of work at a site including training and equipment requirements for protection, emergency planning, dose reports for each employee at the site, and transportation to / from the site.

e) Law 53 of year 1966 protects agricultural land, and law 116 of year 1983 prohibits the fallowing of agriculture land, or its use in building and construction.

f) Law 38 of year 1967 regulates the collection and disposal of solid waste.

g) Law 12/2003 "Labour Law", has sections concerning "Vocational Safety and Health and Ensuring Labour Environment Security".

National Policies

- In 2002, the National Environmental Action Plan (NEAP) was published. NEAP represents Egypt's agenda for environmental action for the fifteen years from 2002 to 2017. The following strategies and programmes have been set:
    - national program of managing marine coastal zones, the main objectives of which include establishing a dynamic process for national comprehensive coastal zoning (land and sea), and achieving sustainable use of marine and coastal resources;
    - national strategy for air quality management, which include executable plans such as programs for cleaner production techniques and energy conservation;
    - plans for sustainable land uses that encourage planning on a scale large enough to maintain the health of regional ecosystems;
    - EEAA have formulated a policy for the proper management of waste in Egypt, which includes the national municipal solid waste program over a period of 10 years from 2000. The strategy is intended to develop the capabilities of governorates in the field of solid waste management and to ensure integrated system of implementation; and

- Under bio-safety there is a program for regulating the handling and unintentional release of biological material. It also includes a program for regulating intentional release of genetically modified organisms (GMOs) to the environment.

- The Mediterranean Action Plan (MAP) was formulated to protect the environment and to foster development in the Mediterranean basin. The major activities of the MAP are pollution assessment and control, and the coastal areas management programme (CAMP).
- Horizon 2020 is an initiative to deal with the top sources of Mediterranean pollution by the year 2020. The European Commission is building a partnership of south and eastern Mediterranean countries, including Egypt, to implement the initiative. One of the activities of the Horizon 2020 timetable is a set of projects to reduce the most significant sources of pollution, initially focusing on industrial emissions, solid waste and waste water, which are responsible for up to 80% of Mediterranean Sea pollution.
- The environmental disaster management plan addresses the steps to be taken to plan for, and react to, environmental disasters.

Environmental Impact Assessment

The purpose of EIA is to ensure the protection and conservation of the environment and natural resources, including human health aspects, against uncontrolled development. The long-term objective is to ensure sustainable economic development that meets present needs without compromising future generations' ability to meet their own needs. EIA is an important tool in the integrated environmental management approach.

EIA must be performed for all new establishments or projects and for expansions or renovations of existing establishments according to the Law for the Environment (Law No. 4 of 1994).

The Executive Regulations relating to Law No. 4 identify establishments or projects which must be subjected to an EIA based upon the following main principles:

- Type of activity performed by the establishment;
- Extent of natural resources exploitation;
- location of the establishment; and
- Type of energy used to operate the establishment.
- A flexible system for the management of EIA projects has been developed in order to use limited economic and technical resources in the best possible way; projects are classified into three groups or classes reflecting different levels of environmental impact assessment according to severity of possible environmental impacts as follows:
- White list projects for establishments/projects with minor environmental impact;

- Grey list projects for establishments/projects which may result in substantial environmental impact; and
- Black list projects for establishments/projects which require complete EIA due to their potential impacts.

2.2 Relevant international agreements

Since 1936, Egypt has been party to many regional and international conventions, treaties and agreements addressing environmental protection, the conservation of nature in general and biodiversity in particular. Relevant international and national legislation and guidelines include but not limited to:

1) Convention Relative to the Preservation of Fauna and Flora in their Natural State (London, 1933).
2) Agreement for the Establishment of a General Fisheries Council for the Mediterranean (Rome, 1949).
3) International Convention for the Protection of Wetlands (Ramsar) (Iran, 1971).
4) International Convention for the Prevention of Pollution from Ships (MARPOL 1973/1978).
5) Convention for the Protection of the Mediterranean Sea against Pollution (Barcelona, 1976).
6) Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (Barcelona, 1976).
7) Convention for the Conservation of Migratory Species of Wild Animals (CMS) (Bonn, 1979).
8) United Nations Convention on the Law of the Sea (UNCLOS) (1982).
9) Protocol Concerning Mediterranean Specially Protected Areas (Geneva, 1982).
10) Protocol on Substances that Deplete the Ozone Layer (Montreal, 1987).
11) Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989).
12) International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC) (London, 1990).
13) Convention on Biological Diversity (CBD) (Rio de Janeiro, 1992).
14) United Nations Framework Convention on Climate Change (Kyoto, 1997). Kyoto Protocol (2005).
15) The International Maritime Dangerous Goods (IMDG) Code (2006 Edition).
16) IAITA Regulations for the Transportation of Hazardous Goods by Air (48th Edition).

3 Baseline Conditions in Area Potentially Affected by Project (“Project Areas”)

The Environmental profile includes an inventory of the biotic and abiotic components of the environment and their interaction. The presented data will include physical, biological and ecological features of the potential project concession areas.

An environmental profile is very useful for identifying main environmental effects, adverse and beneficial, likely to result from mentioned activities. Mitigation measures are applied in order to avoid environmental damage, and depletion of available natural resources that may result from the projects negative environmental impacts.

In this section, we will summarize the main features of the different environments that prevail in the Apache concession areas in both of Western Desert and Sinai Peninsula concession area.

3.1 Designation of project area perimeters

The project will take place in five different concession areas; four of them are located in the western desert of Egypt, while the fifth concession area is located on the eastern coast of the Sinai Peninsula. These areas contain different habitats like Mediterranean coasts (Sallum area), lakes and oasis (Siwa), sandy dunes and desert. In addition, archeological sites, geological structures and biological resources (fauna and flora) were evaluated in the analysis.

3.1.1 Tharwa (Western Desert) Concession Areas

Two thirds of Egypt is covered by the Western Desert. This is part of the Great Sahara that stretches across North Africa all the way from the Atlantic coast to the Nile Valley. There are a few mountains in this desert, with Jebel Uweinat in the far southwest being the highest point at 7,000 feet above sea level. Also located in this region are great depressions that can drop several hundred feet below sea level. The largest is the Qattara Depression, which covers 7,000 square miles. Qattara starts just south of the Mediterranean coast and, at 440 feet below sea level, is the lowest point on the African continent.

For the most part, the Western Desert is a flat sandy plateau. Close to the Libyan border is an area known as the "Great Sea of Sand.". The shape and movement of the dunes of sand is controlled by the wind. Some dunes may move a few hundred feet a year, while others are almost stationary. Few spots in the world are as inhospitable as the heart of this great desert, where temperatures can rise as high as 50°C. Moreover, at night, there is no cloud cover to retain the heat, which allows temperatures to drop to freezing during certain times of the year.

There are seven major depressions in the Western Desert, of which the most northerly and by far the largest is the Qattara Depression, encompasses *sabkhas* (salt flats), lakes and salt marshes which cover area of 5,800km². This vast depression is very sparsely inhabited and due to the inaccessibility of much of its area, is refuge for otherwise rare species such as the Cheetah, *Acinonyx jubatus*, and the Dorcas Gazelle, *Gazella dorcas*.

There are some communities located within or adjacent to the potential project area as listed here below: -

- **Sallum or As Sallum:**

Sallum Is located on the Mediterranean Sea, east of the border with Libya.

- **Siwa**

The Siwa Oasis or Siwah is an oasis in Egypt, located between the Qattara Depression and the Egyptian Sand Sea, nearly 50 km (30 mi) east of the Libyan border, and 560 km (348mil) from Cairo.

- **Farafra**

The Farafra Oasis is the smallest oasis located in Western Egypt, near latitude 27.06° North and longitude 27.97° east. It is located in the western desert, approximately mid-way between Dakhla and Bahariya.

3.1.2 Sinai Peninsula Concession area

The Sinai is a barren desert peninsula. Geographically, it is really more part of Asia than Africa. It is bordered by three seas: the Gulf of Aqaba to the east, the Gulf of Suez to the west, and the Mediterranean to the north. Since the building of the Suez Canal, the Sinai has been physically cut off from the rest of the country.

In ancient times, the Sinai was a wild and inhospitable desert area that formed a formidable barrier between Egypt and her Middle Eastern neighbors. The ancient Egyptians did little in the region except send the occasional mining expedition in search of turquoise or other minerals.

In the north, the Sinai is a flat and sandy desert area. The south is far more mountainous, and Jebel Katherina is the highest point in Egypt at 8,652 feet above sea level. Jebel Musa, or Mount Sinai, another peak located in the south, rises to 7,497 feet above sea level.

The nearest communities (cities) to the potential project area in Sinai concession are

- **Abo Zneema**

Is located on the Suez gulf about 145 km from Ahmed Hamdy Tunnel in the south of Ras-sedr, the total area is 3078 km^2.

- **Abo Rdees**

Abu Rdees, Is located on Suez gulf about 165 km far from Ahmed Hamdy tunnel. Its area is 3063 km^2. It is an oil city.

3.2 Physical geography (climate, geology, topography)

3.2.1 Air and Climate

Climatic Zone

According to the Food and Agriculture Organization (FAO), the climate of Egypt is governed mainly by its location in the north-eastern part of Africa, on the margin of the Sahara, the largest desert in the world. The latitudinal position, between 22° and 32° N, lies in the sub-tropical dry belt, although conditions on the northern coast are ameliorated by the presence of the Mediterranean Sea. Throughout most of the year the hot, dry tropical continental air masses dominate, but during the winter period air masses of both tropical maritime and polar maritime origin make brief incursions into Egypt from the north, and frequently bring rain.

Despite the fact that the coast of Egypt is semi-arid, its climate can be considered Mediterranean. The weather is highly seasonal in nature and is strongly related to high-pressure systems that extend towards the North Atlantic, Eurasia and Africa (Birot and Dretschk, 1956; Wigley and Farmer, 1982; Bucht and El Badry, 1986). Local and regional climatic conditions have a significant impact on the dispersion of pollutants in the atmosphere.

The climate within the project area can be summarized as follows:

- Winter (November to March): a semi-permanent low-pressure area known as the Cyprus low is usually located over the eastern Mediterranean. It will influence the project area and generate rainstorms. These months are the windiest, with prevailing winds from the north-west and less frequently from the north and north-east.
- Spring (April to May): there is a gradual weakening of the Cyprus low which coincides with the development of a high-pressure ridge over the Mediterranean and a low-pressure zone over the Arabian Peninsula and north-central Sahara. These weaker depressions result in a decrease in the average wind speeds over the Mediterranean. When the depressions are counteracted by strong blasts of polar air, the south-westerly and southerly hot and dry winds (known as Khamasin) become violent, raise air temperature, lower the relative humidity, and transport sand and dust.

- Summer (May to August): the area is not generally affected by atmospheric depressions, and therefore, rainfall is minimal. Meteorological conditions are relatively stable and prevailing winds are from the northwest and are relatively hot.
- Autumn (September to November): season of the year between summer and winter during which temperatures gradually decrease, rainfall is minimal

Air Temperature

According to the FAO, the mean annual temperatures in Egypt are high and register between 20 and 25°C. Major variations occur between summer and winter temperatures, as well as between coastal and interior locations. Along the coast and project area mean maximum temperatures vary from 18°C to 19°C in January and from 30°C to 31°C in July and August. For monitoring stations at Alexandria, Cairo, Port Said, Minya, Kharga, and Aswan, the mean minimum temperatures show variations from 9°C to 11°C in January and from 21°C to 25°C in July and August (FAO).

Table 2-4 indicates the average, average maximum and average minimum temperature data in Sallum measured over a period of 14 years. It also indicates the lowest and highest recorded temperature. Analysis of the data from Sallum indicates that the average air temperatures on the near the project area can range from 14°C to 27°C.

Table 3-1 Table (1) indicates the average, average maximum and average minimum temperature (°C) data in Sallum measured over a period of 14 years.

Months	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average Temperature	14	15	16	19	21	25	27	27	26	23	20	16
Average high Tem.	17	17	20	23	25	29	30	30	28	27	23	18
Average low Tem.	11	11	13	15	18	21	23	23	22	20	16	12

Figure 3-2 Illustrate the average, average maximum and average minimum temperature (°C). Data in Sallum measured over a period of 14 years.

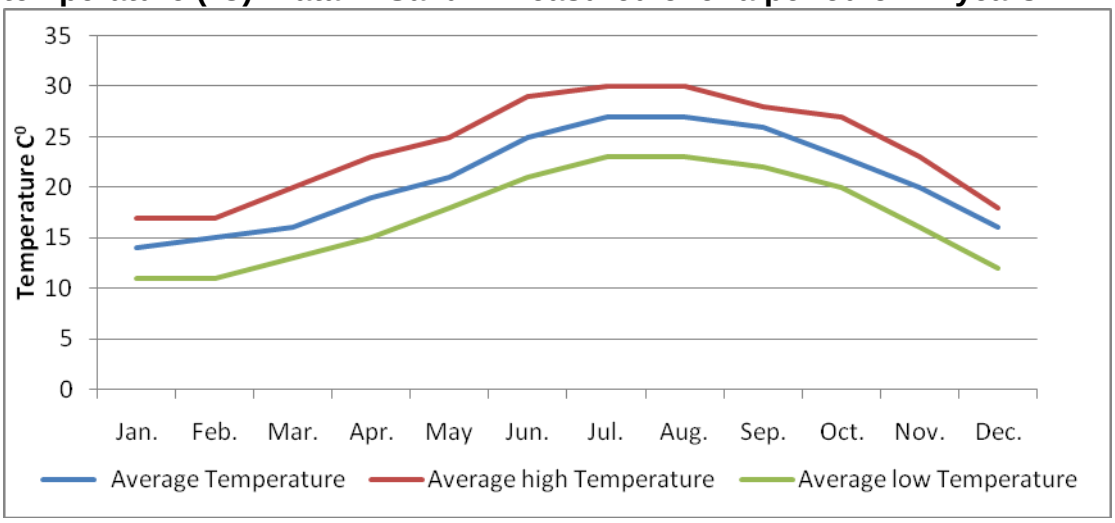


Figure 3-2 indicates the average, average maximum and average minimum temperature data in Sallum measured over a period of 30 years. It also indicates the lowest and highest recorded temperature. Analysis of the data from Siwa indicates that the average air temperatures on the near the project area can range from 14°C to 27°C.

Table 3-3 Indicates the average, average maximum and average minimum temperature (°C). Data in Siwa measured over a period of 14 years.

Months	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average Temperature	11	13	16	20	25	27	29	28	26	23	18	13
Average high Tem.	19	21	25	30	34	37	38	37	35	32	26	21
Average low Tem.	3	5	7	11	16	18	20	20	17	14	10	5

Figure 3-1 Illustrate the average, average maximum and average minimum temperature (°C). Data in Siwa measured over a period of 30 years.

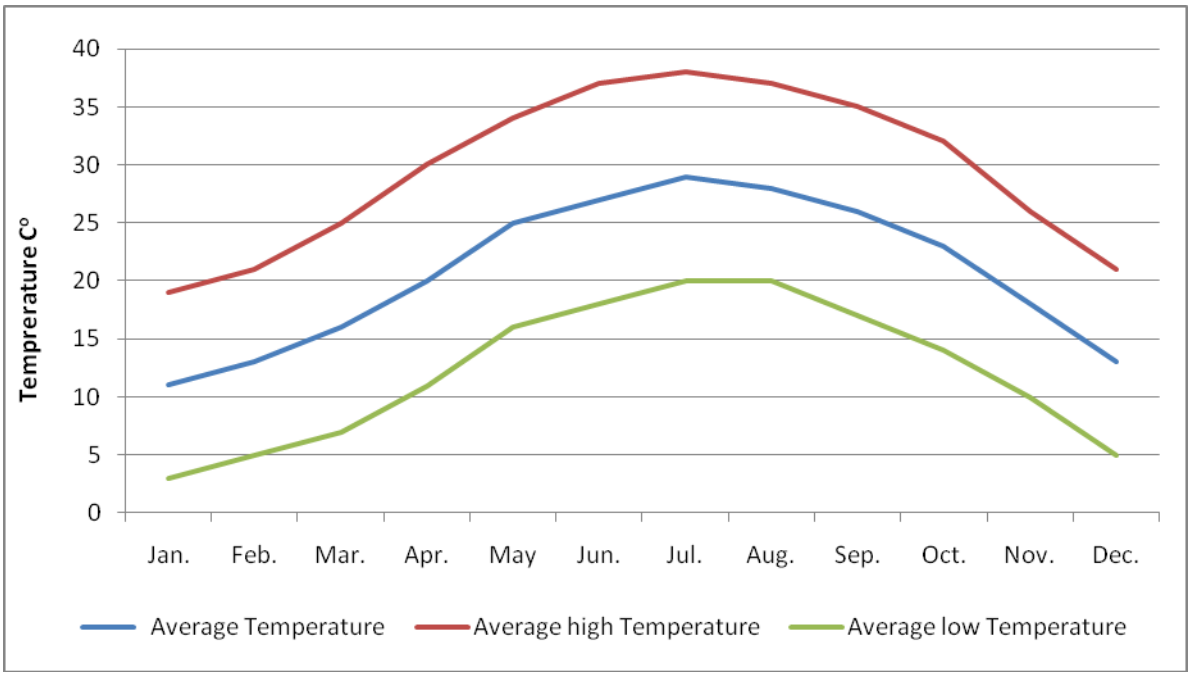
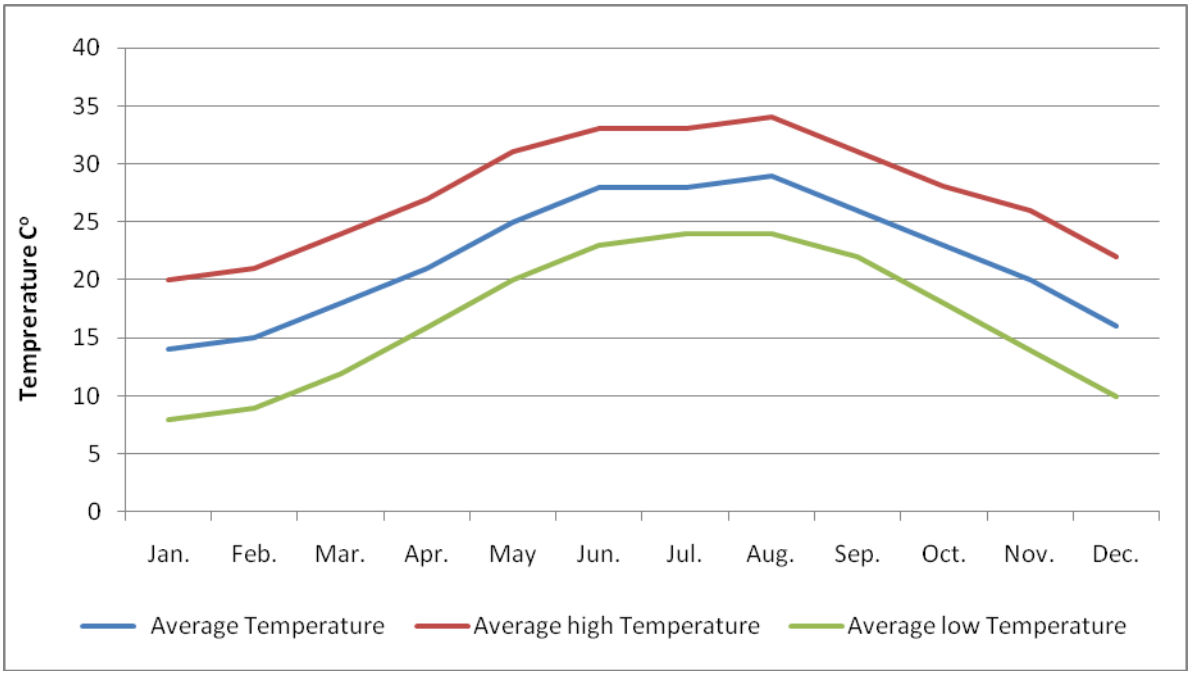


Table 3-4 indicates the average, average maximum and average minimum temperature data in Siwa measured over a period of 30 years. It also indicates the lowest and highest recorded temperature. Analysis of the data from Siwa indicates that the average air temperatures on the near the project area can range from 14°C to 29°C.

Table 3-4 Table (1) indicates the average, average maximum and average minimum temperature (°C).

Months	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Average Temperature	14	15	18	21	25	28	28	29	26	23	20	16
Average high Tem.	20	21	24	27	31	33	33	34	31	28	26	22
Average low Tem.	8	9	12	16	20	23	24	24	22	18	14	10

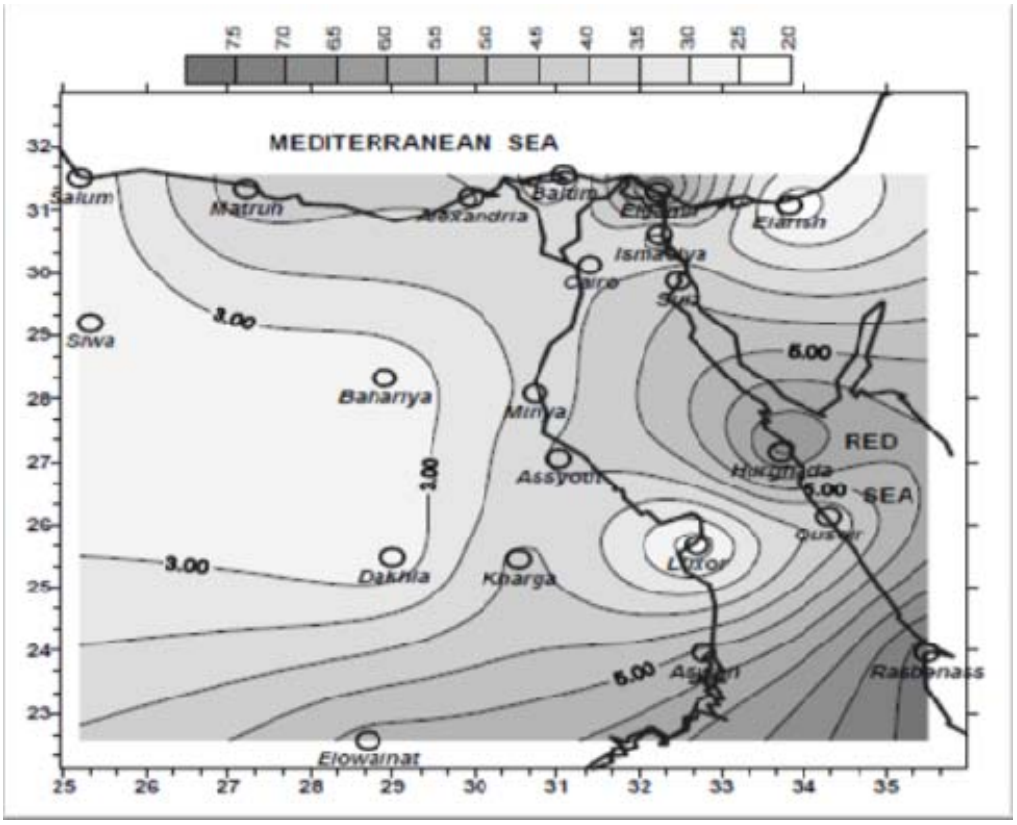
Table 3-5 Illustrate the average, average maximum and average minimum temperature data in Sues measured over a period of 30 years.



Wind

The wind regime is highly uniform throughout the coastal zone of Egypt and is dominated by north-westerly and northerly winds for most of the year. For only a few days during spring, transient changes in this rather stable wind pattern occur, with hot desert wind blowing from the south, southeast or southwest. This wind (Khamasin) often blows as sand storms of hot desert wind covering vast areas of the Egyptian desert, including the Mediterranean coastal area.

Figure 3-2 Wind resource map of Egypt: mean wind speed determined by mesoscale modeling.



Source: Wind Atlas for Egypt, 2006.

Source: A. M. El-Asrag et al. / ICEHM2000, Cairo University, Egypt, September, 2000, page 124- 133 http://virtualacademia.com/pdf/clea124_133.pdf

Rainfall

According to FAO, the rainy season is the winter period from October to May when the depressions follow their southern tracks over the Mediterranean region. Most of the precipitation is associated with the warm and cold fronts of these systems. Many of the fronts are weak by the time they reach Egypt and rainfall is light and showery. Rainy periods usually last for one to four days.

Annual rainfall, which varies considerably at a local level, falls mainly between early October and March. Significant precipitation is limited to the coastal belt, especially in the north-west; Alexandria receives 150 to 200 mm of rain per year. From Alexandria eastwards, annual totals decline to about 80 mm at Port Said and 70 mm at El-Arish, near Egypt's eastern border. Rainfall decreases rapidly south of the coast. Inland, there is a very sharp precipitation gradient with only 50 mm falling annually in the middle of the Nile Delta and just 22 mm in Cairo. Further inland, it

continues to decline until at Aswan a value of 1 mm is recorded. The erratic distribution of rainfall and its scarcity are worsened by high insulation and evaporation.

Over most of the interior of Egypt it is not unusual for a year to pass without any precipitation at all being recorded. Throughout Egypt rainfall reveals considerable variability over time and space. Figure 3-3 and Figure 3-4 present the mean annual precipitation in Egypt ($mm.y^{-1}$) as well as the annual number of precipitation days.

Figure 3-3 Mean Annual Precipitation in Egypt

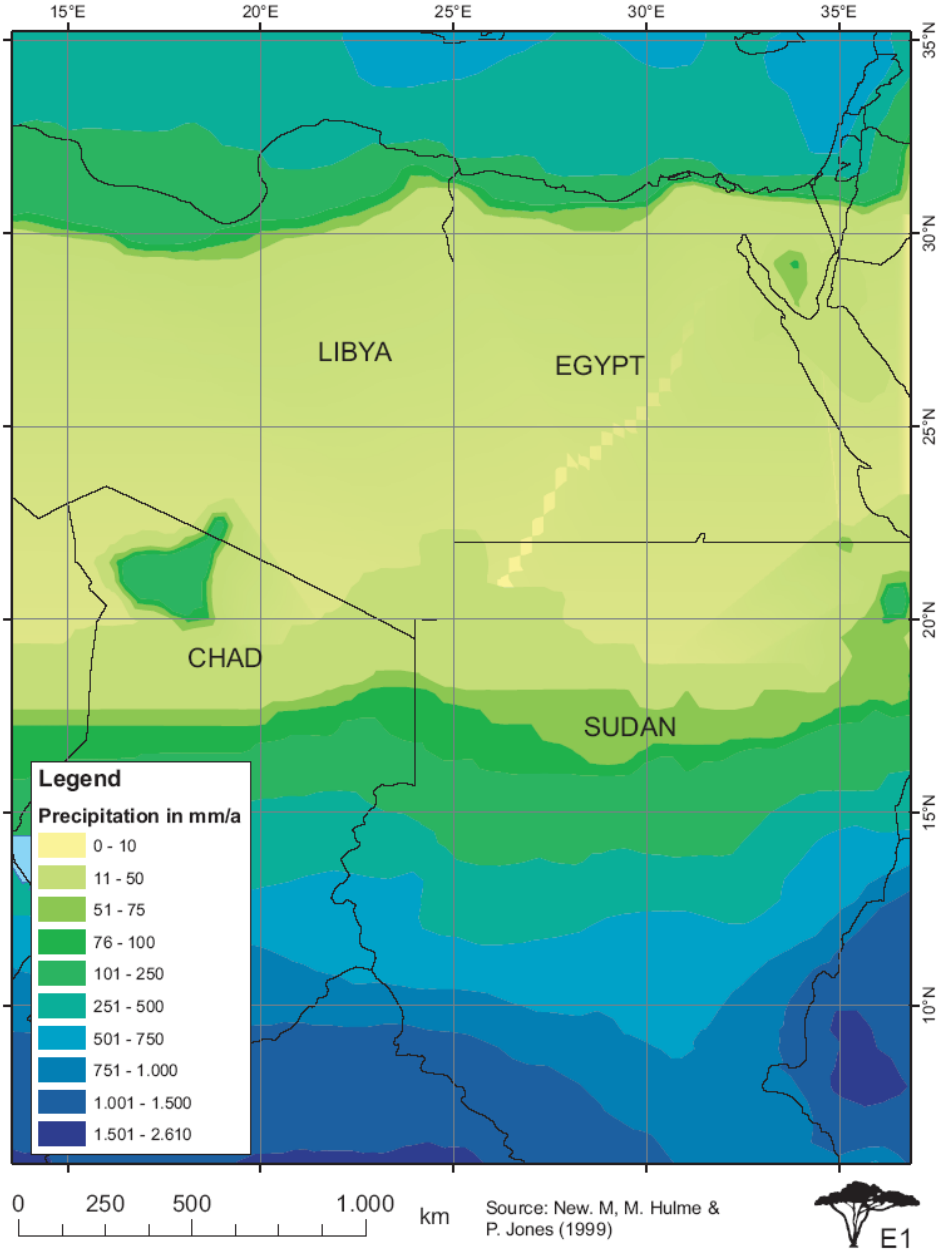
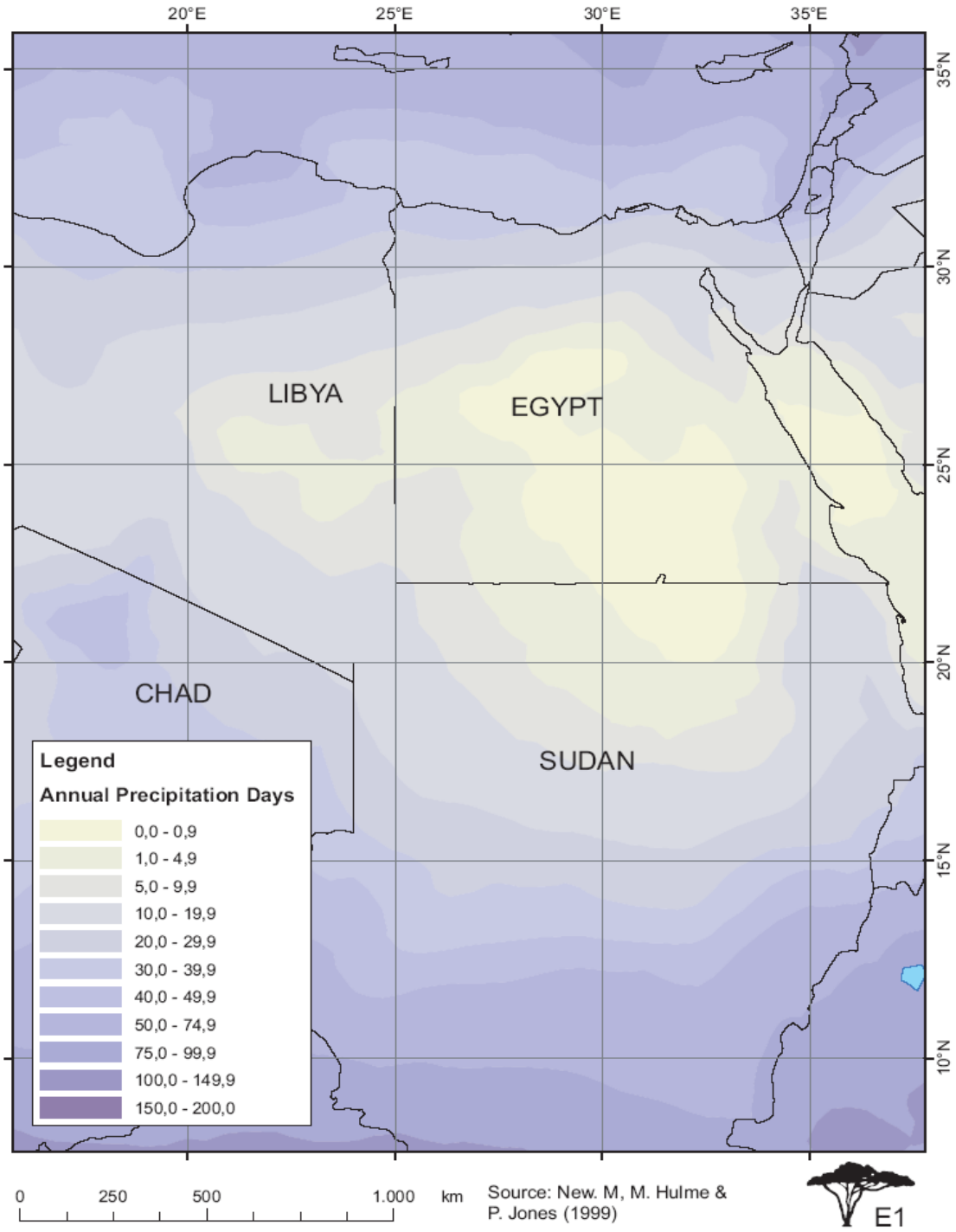


Figure 3-4 Annual Precipitation Days in Egypt



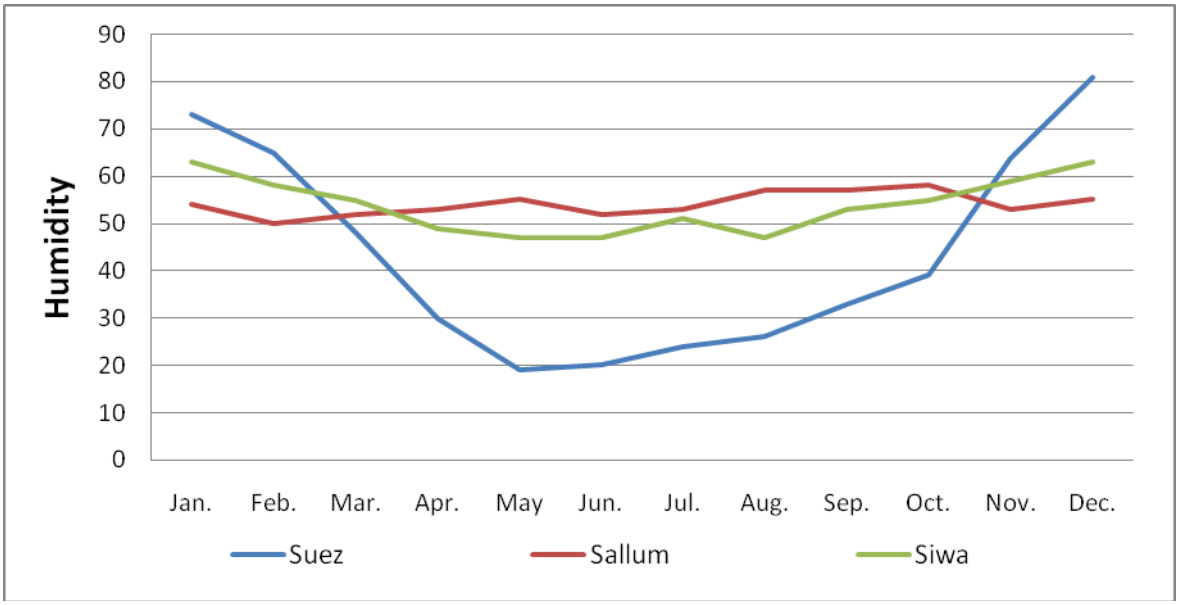
Relative Humidity

The average monthly relative humidity measured at Sallum and Siwa in the Western Desert and Suez city which is located on the other side of Suez Gulf in Sinai and Gulf of Suez concession area over a period of 9 years as shown in Table 3-6 and Figure 3-5.

Table 3-6 Average Monthly Relative Humidity (%) at Sallum, Siwa And Suez.

Average Humidity	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Suez	73	65	48	30	19	20	24	26	33	39	64	81
Sallum	54	50	52	53	55	52	53	57	57	58	53	55
Siwa	63	58	55	49	47	47	51	47	53	55	59	63

Figure 3-5 Shows the Average Relative Humidity at Sallum, Siwa And Suez



Source: http://www.weatherbase.com (sampling period of 9 years).

Thunderstorms, Fog, Smoke/Haze, Vision Obstruction, and Dew Point

Thunderstorms occasionally affect the Egyptian coastal area, accompanied by sustained winds of 43 to 60 knots for short periods and instantaneous wind gusts in the range of 70 to 90 knots. These thunderstorms occur particularly between October and May and are less frequent in the summer and early autumn. Table 3-7 shows the expected thunderstorms for the potential project areas.

Table 3-7 Expected Thunderstorms for the Potential Project Areas

Local Thunderstorms Name	Expected Date	Probable Duration (days)
1. Nawat El-Salib	End of September	3
2. Nawat El-Salib	Mid-End of October	3
3. Nawat El-Maknasa	End of November	3
4. Nawat Kasim	Beginning of December	3

Local Thunderstorms Name	Expected Date	Probable Duration (days)
5. Nawat El-Feida	End of December	2
6. Nawat El-Ghotas	Beginning of January	3
7. Nawat El-Feida El-Kubra	Mid January	5
8. Nawat El-Karam	End of January	2
9. Nawat El-Shams	Beginning of February	5
10. Nawat El-Hosoum	Beginning of March	8
11. Nawat El-Shams El-Koubra	Mid-End of March	2
12. Nawat Aowa	End of March	6
13. Nawat El-Khamasin	April	Variable
14. Nawat El-Nokta	Mid July	Variable

3.2.2 Geology

Western Desert

The Western Desert covers about 700,000 square kilometers (equivalent in size to Texas) and accounts for about two-thirds of Egypt's land area. This immense desert to the west of the Nile spans the area from the Mediterranean Sea south to the Sudanese border. The desert's Jilf al Kabir Plateau has an altitude of about 1,000 meters, an exception to the uninterrupted territory of basement rocks covered by layers of horizontally bedded sediments forming a massive plain or low plateau. The Great Sand Sea lies within the desert's plain and extends from the Siwah Oasis to Jilf al Kabir. Scarps (ridges) and deep depressions (basins) exist in several parts of the Western Desert, and no rivers or streams drain into or out of the area.

The northern part of Western desert forms an almost featureless plain which, with the exception of the small folded and faulted Abu Roash complex to the north of Giza pyramids, offer few prominent topographical or geological features that would reflect its intricate geological history. Most of the surface is covered with gentle dips and large amplitude. Topographically the monotony of the plains is cut by occasional low quests, the great Qattara Depression, Siwa oasis and Wadi Natrun hollows.

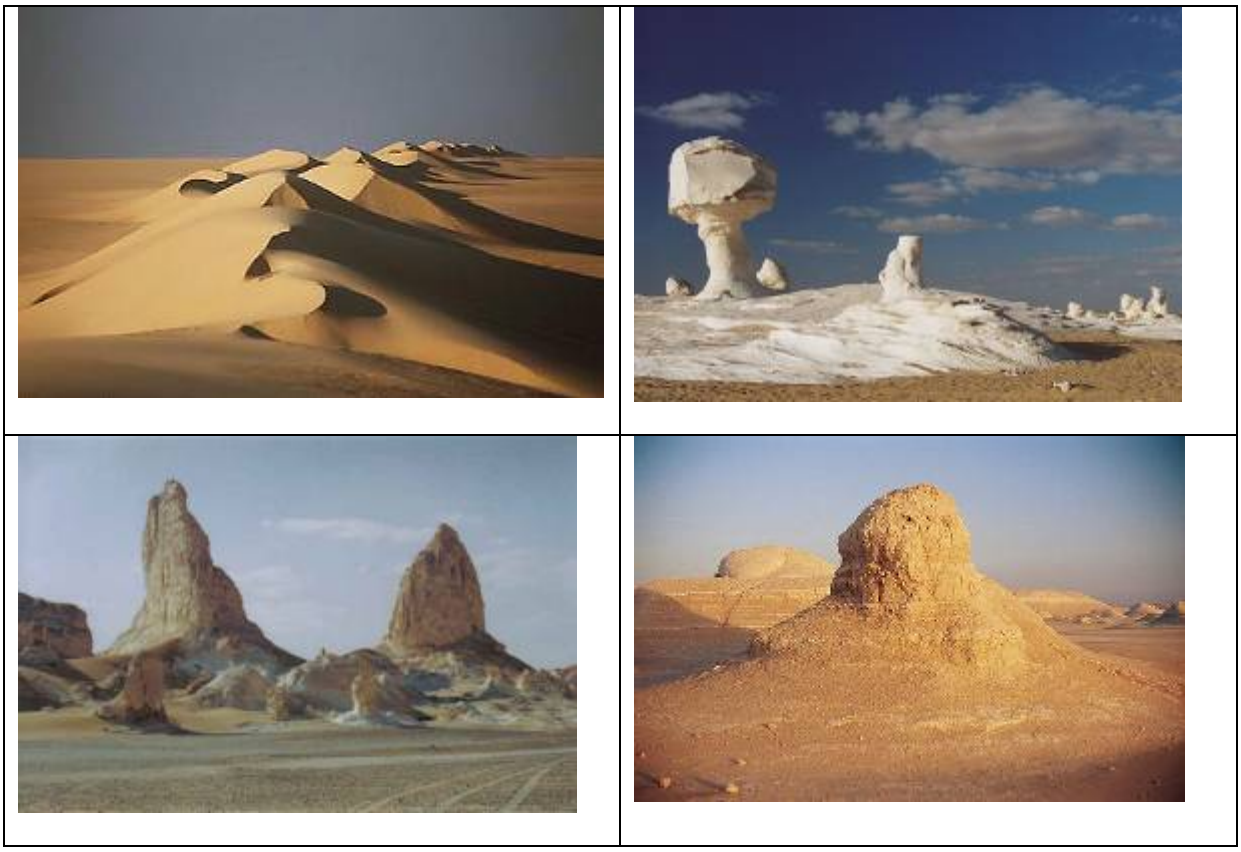
Deep drilling in this desert, however, has shown that this apparently geologically simple structure made by thin cover of later sediments conceals beneath it an intricate geological structure made up of a large number of swells and basins. The sedimentary column is thick, in the Abu Gharadig basin it reaches between 8 and 9

km, while to the north it may reach 3 to 6 km. the complicate structure and the great thickness of the sedimentary column, when compared with areas to the south, justifies the use of the terms stable and unstable Shelves which were introduced by Said (1962) for the areas north and south of Abu Gharadig basin.

Several tectonic events affected the north Western Desert. The early Paleozoic (Caledonian) and the late Paleozoic (Hyrcenian) event were mild and are presented by regional uplift of moderate magnitude producing disconformities within the Paleozoic and between the Paleozoic and the Jurassic. The presence of widely-spread continental Jurassic indicates that the late Paleozoic event could have produced major structural or topographic irregularities. During the Jurassic, which was accompanied by major plate movements including the separation of the Apulian microplate, many of the emergent lands of north Egypt became submerged by the newly formed Neotetheys. The end of the Jurassic witnessed a major organic movement which results in the emergence of the land.

The most important tectonic event occurred during the late Cretaceous and early Tertiary and was probably related to the movement of the North African plate toward Europe. It resulted in the elevation and folding of major portions of the north Western Desert along an east-northeast west-southwest trend (Syrian arcing system) and in the development of faults of considerable displacements.

Figure 3-6 Shows Photos for Some Geological and Topographical Features (Western Desert)



Sinai Peninsula

Sinai is shaped like a triangle with its base at the Mediterranean in the North and its tip in the South at Ras Mohammed, the Gulf of Aqaba to the East and the Gulf of Suez and Suez Canal to the west. It is topographically divided into three main sections:

- The Southern section: is an extremely tough terrain. It is composed of high rise Granite Mountains. Mount Catherine rises about 2640 meters above sea level, which makes it the highest mountain top in Egypt.
- The Central Section: is bounded by the Mediterranean to the North and the At-Teeh plateau to the south. It is a plain area with abundant water resources derived from rain water that flows from southern heights to the central plateau.

Figure 3-7 Shows Photos for Some Geological and Topographical Features (Sinai)

3.3 Natural events history (earthquakes, floods, fires, storms, volcanic eruptions, etc.)

According to CIA;'s World Fact Book, periodic droughts, frequent earthquakes, flash floods, landslides, and hot driving windstorms called khamsin that occur in spring, occur in the area. Dust storms, sandstorms, the movement of the sandy dune in western desert, tsunami on the Mediterranean coast and flood risk at Sinai and Gulf

of Suez are the considered potential natural risks. Regular flash floods still sweep through the Wadis, causing damage to roads and infrastructure.

NORM

In the exploration and extraction processes of oil and gas, the natural radionuclides 238U, 235U and 232Th, as well as the radium-radionuclides (223Ra, 224Ra, 226Ra and 228Ra) and 210Pb,.etc., are brought to the slurry surfaces and may contain levels of radioactivity above the surface background.
As these materials are handled, their radioactive constituents may be separated, resulting in TE-NORM waste. The petroleum waste (scale or sludge) have been produced by two mechanisms: either incorporation or precipitation onto the production equipment such as pipelines, tank storage, pumps, etc. The waste generated in oil and gas equipment is due to the precipitation of alkaline earth metals as sulfate, carbonates and/or silicates. Nuclear spectroscopic analysis showed that the main radionuclides present in TE-NORM waste associated with petroleum industries are 238U, 235U and 232Th series. The mineralogical analysis by X-ray techniques (XRF and XRD) indicated the incorporation and co-precipitation of these radionuclides with the alkaline earth metals (e.g. Mg, Ca, Sr, Ba) and some quantities of lead sulfate, carbonate and/or silicate.

Based on the different spectroscopic investigations carried out on the TE-NORM waste samples associated with oil and gas production in Abu Rudeis region, it is concluded that: (a) XRF and XRD showed that the silicate is the major form of the waste with Ca, Sr, Ba, Al and Fe. (b) Radionuclides of 226Ra (of 238U-series) and 228Ra (of 232Th-series) are the main radiological constituents in the waste. (c) After the fractionation, 226Ra and 228Ra are redistributed and enriched in certain particle sizes (0.3–2.5 mm). This represented an 1.48 and 1.82-fold enrichment of 226Ra and 228Ra, respectively, in fraction F8 (2.0–2.5 mm) as compared to the bulk waste samples. (d) The activity concentrations of the 226Ra in the TE-NORM waste produced from Abu Rudeis region was comparable with some local oilfields and other countries (Table 4). (e) Parent/daughter ratio showed disequilibrium in U-series while approximate radioactive equilibrium is found in Th-series. (f)

Radiologically, all the radiation indices evaluated (222Rn EC, Ra-eq, and Dgr) are higher than the recommended acceptable levels. It must be taken into consideration that the wastes with granular characteristics associated with oil and gas fields are more hazardous on the staff operators as compared to the wastes with small grain size.

The AEA designed and supervised the construction of two NORM storage vaults for Apache at existing Apache facilities. NORM waste is segregated in a secure fenced area prior to being placed in the vault. The AEA conducts NORM surveys on Apache’s equipment at least twice per year. The frequency of the surveys is dictated by the classification of the site to be surveyed. The rules that govern the

classification also stipulate the level of employee training and certification required when handling NORM contaminated materials.

Equipment in the new concessions will be surveyed and classified by the AEA. Any NORM waste produced in the new concessions will be handled according to classification and placed in the existing vaults for storage. Additional vaults will be constructed as needed.

Mines

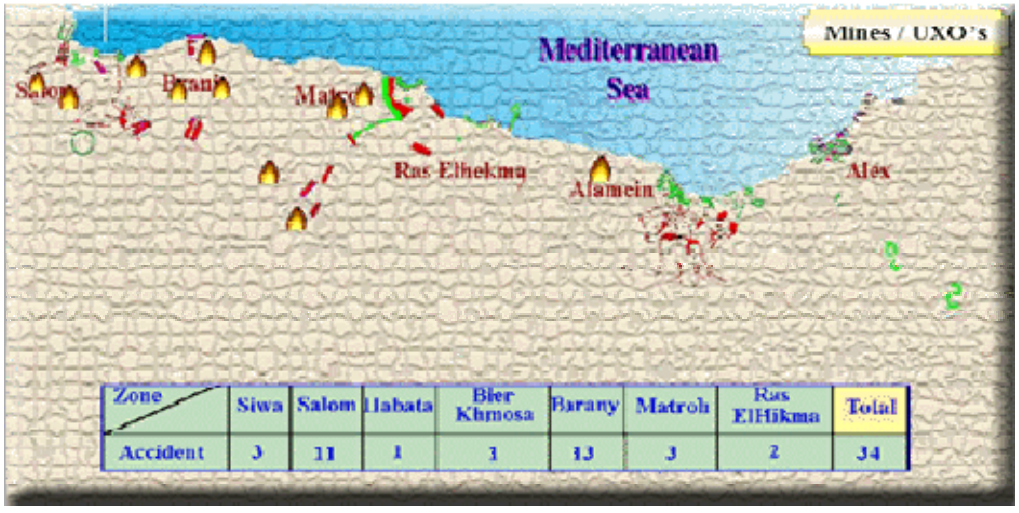
Egypt is considered one of the most affected countries by mines. There are 22 million mines in Egypt, out of 102 million mines, laid in 65 countries. This is 21% of the total number of mines laid around the world.

The vast areas of infested land, number of mines laid, the high sensitivity of mines due to their existence for almost 50 years underground, the lack of maps and sketches of mine field positions, and the disappearance of land marks are very sophisticated obstacles facing the clearing efforts.

The existence of mines in such a random manner in the western desert makes it very hard to know the exact number and types.

Despite the great efforts spent by the Egyptian government in mine clearance activities, the mine problem impedes development projects in the western desert which was considered the main wheat farm in ancient Egypt.

Figure 3-8 Illustrate the Number of accident by Mines in the Western Desert.



3.4 Biological environment

Biodiversity is the variety of plant and animal life together genetic diversity and assemblages of organisms. However, biodiversity is much more than numbers of plants and animals; it is what underpins human life and well-being.

Egypt lies at the northeast corner of Africa at the junction of four bio-geographical

regions, Irano-Turanian, Mediterranean, Saharo-Sindian and Afro tropical. At the same time it is at the center of the great Saharo-sindian desert belt that runs from Morocco on the northwest corner of Africa to the high, cold deserts of central Asia. This unique position is enhanced by the circumstance that it is divided by the Nile, the longest river in the world. Most of Egypt is either arid or hyper arid, however, due to its very varied eco-zones, the country is home to a diversity of terrestrial habitats and a fauna and flora, which although low in species numbers and with few endemic species, is extremely varied in composition.

Egypt is bounded on its north and east by two largely enclosed seas, the Mediterranean Sea and Red Sea. The Red Sea is species rich and nurtures reef systems that are among the richest in the world as will as stands of mangroves that play a vital role in the health of the sea. The reefs and the mangroves of the red sea are arguably among the most important vehicles of biodiversity in the world. However, the fauna and flora of the Red Sea is essentially a modified version of threat of the Indo-Pacific and it also has relatively few endemic species. Ecosystems and habitats must be maintained to safeguard species. Species must be protected in order to conserve ecosystems and habitats. In Egypt, the lack of species abundance and the relatively large number of eco-zones and habitats makes the preservation of both especially important.

Diversity of Species

The numbers provided in table Table 3-8 are estimates which are likely to be lower than the real number of species in Egypt. This is due to the fact that many species are not yet documented.

Table 3-8 Number of Species of Fauna and flora in Egypt

Taxa	No. of species
Flora	
Viruses	44
Bacteria	238
Fungi	1260
Algae	1148
Non-flowering vascular plants	337
Flowering plants	2094
Fauna	
Insects	10000
Other invertebrates	4701
Fresh water fishes	85
Marine fishes	669
Amphibians	8
Terrestrial reptiles	99
Marine reptiles	5
Resident and breeding birds	150

Migratory and wintering birds	320
Terrestrial mammals	73
Marine mammals	13
Bats	22

According to the Red Data Book (IUCN, 2000)

3.4.1 Biological Environment of Western Desert

Fauna

The waterless expanse of this desert is home to an assemblage of animals that are well adapted to living without water and gain their moisture from their food. Many animals have evolved behavioral or morphological features that enable them to survive the extremely hot climate or for locomotion on soft sand. The Lesser Sand Viper, *Cerastes vipera*, which can easily be confused with hornless specimens of the Horned Viper, *Cerastes cerastes*, is only found in sandy habitats. Another denizen of the sands is the Sandfish, *Scincus scincus*, so named because of its habit of "swimming" through the sand.

A number of birds inhabit the sands especially the Hoopoe Lark, *Alaemon alaudipes*, which is easily distinguished from other larks by the long, slightly curved bill that gives it its name and also by its remarkable display flight.

Mammals of the region include the now extremely rare Slender-horned Gazelle, *Gazella leptoceros*. This animal lives largely on such plants as *Nitraria retusa*, *Cornulaca monacantha* and *Calligonum comosum*. An immensely appealing animal of the sands is the tiny Fennec Fox, *Vulpes zerda*, which may be one of the most well adapted desert carnivores in the world. They dig rather deep burrows so that exposure to heat during the day is reduced to a minimum and appear to be the only desert carnivores that can live entirely without water.

- ***Arachnida (spiders & scorpions)***

Arachnids are represented by only two species in the Libyan desert. Contrary to popular belief, they are seen very rarely, during ten years of observation only two individuals of foth species were noted. This is attributable to their nocturnal activity, in daylight they remain hidden under rocks.

Leirus quinquestriatus

Sparassus dufouri

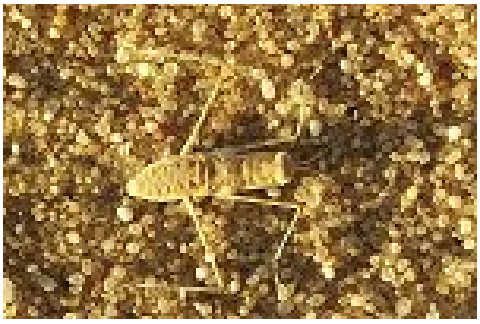
- ***Insecta (insects)***

Insects are the most abundant species, appearing even in those areas of the desert where no other life forms exist.

Anax parthenope

Cataglyphis bicolor

Cataglyphis fortis



Eremiaphila species

Eumeninae species

Gryllus bimaculatus

Schistocerca gregaria

Julodis fimbriata

- ***Vertebrata (vertebrates)***

Reptilia (reptiles)

Reptiles are relatively scarce, only four species were noted. Their range is wide, some have been noted in areas with no vegetation.

Acanthodactylus scutellatus

Agama mutabilis

Cerastes cerastes

Psammophis schokari

Aves (birds)

Birds are commonly seen throughout the Libyan Desert, however only a few species are resident, the majority migratory, as attested by the numerous mummified remains.

Ardea cinerea

Bucantes githagineus

Buteo rufinus

Ciconia ciconia

Motacilla alba

Motacilla flava

Mammalia (mammals)

Mammals are very scarce, and represented by a handful of species. The range of the large herbivores is restricted to the large massifs of the central Libyan Desert, which support permanent vegetation, and their population is under extreme pressure from indiscriminate hunting.

Ammotragus lervia

Gazella dorcas

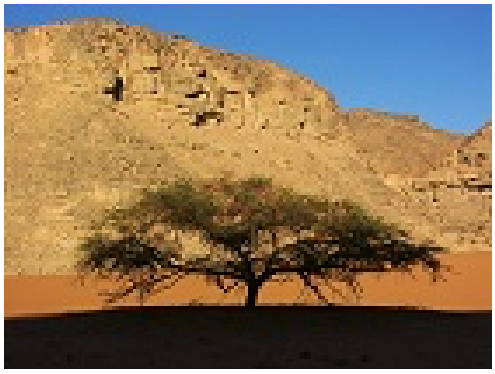
Gerbillus gerbillus

Vulpes rueppeli

Flora

Western desert is a harsh environment for plant growth. The hot summer (sometimes above 50°C) and the extreme daily temperature fluctuations in winter (from above 30°C in the day to below zero at night) contribute to this. Of course, rainwater is extremely rare item there. Heavier downpour may occur only once in decades. Nevertheless, when it does occur, the rainwater quickly penetrates the permeable sand to a depth beyond the root zone. The seeds of only few plants succeed in germinating under such conditions.

In large tectonic depressions, oases where formed where artesian water reach the surface. Over a long history of human settlement, the local biota was severely affected by humans. Land was transformed into cultivated fields and orchards. As the result, it is difficult to ascertain what natural vegetation had been there before human interference. After reaching the surface and irrigating agricultural land, the water drains to lowest level of the oasis floor, where it forms pools or lakes. Because of high evaporation, this water becomes highly saline. Wetlands and salt marches that form around pools and lakes are rich in vegetation and, together with cultivated fields and often stabilized sand dunes, are the main features of inhabited oasis.

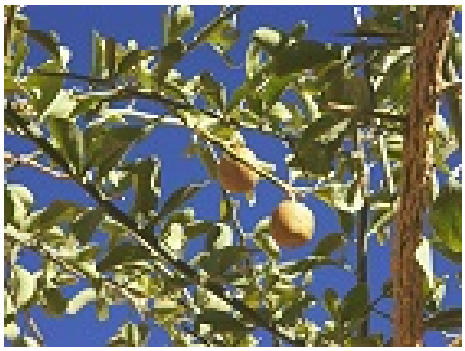


Acacia raddiana

Acacia tortilis

Anastatica hierochuntica

Aristida mutabilis



Balanites aegyptiaca

Atractylis aristata

Boerhavia coccinea

Barleria triacantha

Citrullus colocynthis

Cleome droserifolia

Indigofera disjuncta

Heliotropium bacciferum

3.4.2 Biological Environment of South Sinai and Gulf of Suez:

Most of the flora and fauna species of the Western Desert are recorded in Sinai Peninsula, but the richness of the biodiversity and abundance of species is more

obvious. Rainfall, geomorphology and availability of the groundwater, play an important rule in richness of species.

Flora

Around 1000 plant species, representing almost 40% of Egypt's total flora are found in this region. These include many endemic species. Half of the 33 known Sinai endemics are found in St. Catherine area. Many of these are rare and endangered. Small orchards are scattered in wadis particularly at higher elevations.

Fauna

The White-crowned Black wheatear is very characteristic of the area. There are 46 reptile species, where 15 of which are found nowhere else in Egypt. e.g. Endemic Sinai Banded Snake and the Innes Cobra which is considered to be very vulnerable to extinction. Other fauna include Geckos, Agamids, Skinks, Rodents, Hedgehogs, Hares, Red fox, Wild cat, Sinai Leopard, Rock hyrax, the Nubian ibex, Dorcas gazelle. The Panther pardus jarvisi is endangered and the endemic sub-species as well. A rich diversity of insects also exists.

3.4.3 Proximity to national parks and other protected areas

There are two protected areas adjacent to the potential project area in the western Deseret; Siwa and white desert protectorates

Nearest protected areas to Western Desert project area:

Siwa protectorate:

Siwa Oasis is one of the areas rich with distinguished tourists attractions including monuments tourism, therapeutic tourism, safari tourism and desert tourism, due to its distinctive monuments area such as Amoun temple as well as the scriptures and paintings of kings offering sacrifice to Gods. The hall of crowning Alexander the Great, the Dead Mountain in Aldakrour area, which has some ancient mummeries and tombs from the Roman age, having a group of coins and old jewelry. There is also Deheba area which includes tombs engraved in the rocks from the Greek Roman era, and also Khamisa area including a group of tombs dating back to the Greek age. The biological variety of Siwa is characterized by the existence of more than 40 species of wild plants including medical, pastoral and other plants that help stabilize sand. Some of them have significant genetic origins, besides mimosa and Athl trees. Moreover, there are around 28 species of wild mammals, some of them are threatened with extinction like hyena, Egyptian deer, white deer, red fox and, in addition 32 reptiles and around 164 species of birds besides numerous invertebrates and insects.

White Desert protectorate:

The importance of the white desert area is attributed to the fact that it is a unique model of the Karst phenomenon. It is an open museum for studying desert environments, geographical phenomena, fossils and wild life. It has relics and tombs that date back to prehistory and include a group of rare tombs and caves remains of ancient mummies and carvings. The area is distinguished with the beauty of the sand dunes. Geological formations of bright white limestone rocks and distinctive fossils. The white desert area has aground of white chalk where the geological formations are spread in the shape of snowy white chalk columns formed by the act of wind and sloppy hills , a matter which gives the area a unique nature and geological position . Al-Farafra fall crosses the white chalk layer which is a part of an obviously spread rocky unit known as the chalk unit.

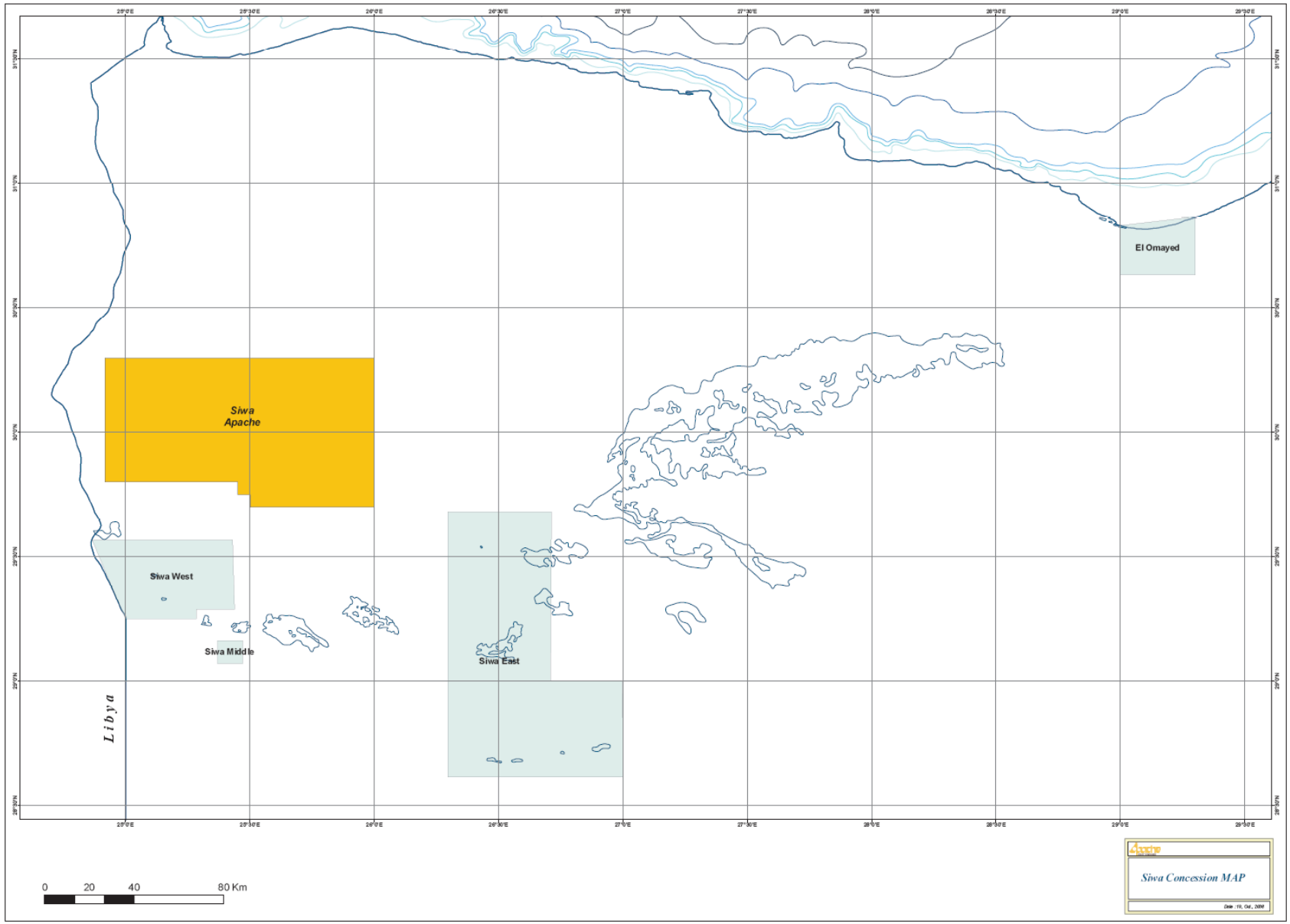
Nearest protected areas to Sinai and Gulf of Suez project area

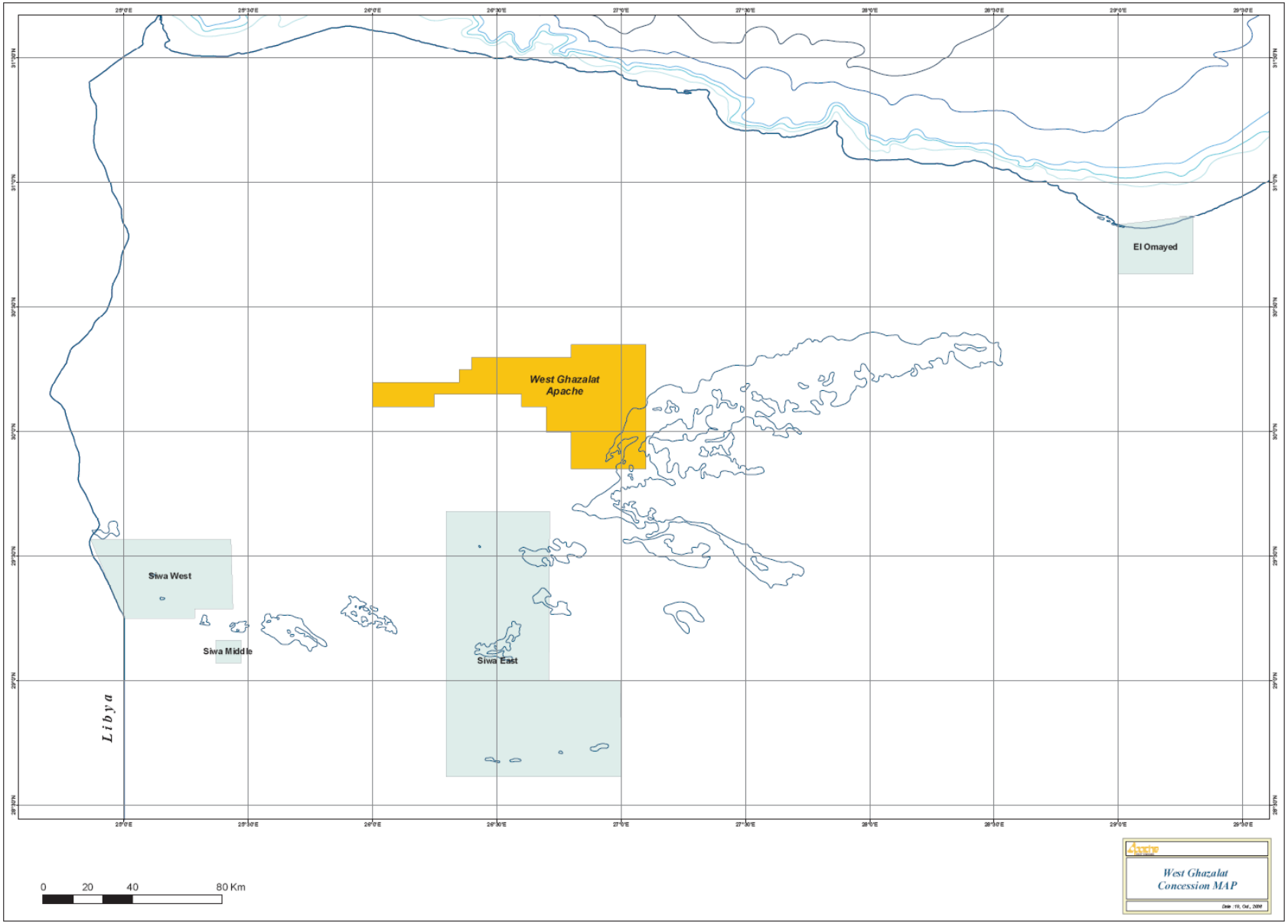
There are five protectorates in South Sinai governorate which are; Ras Mohammed National Park, Nabq, AbuGalum, Taba and Saint Kathrin protectorates. The Saint Kathrin protected area is adjacent to the potential concession area.

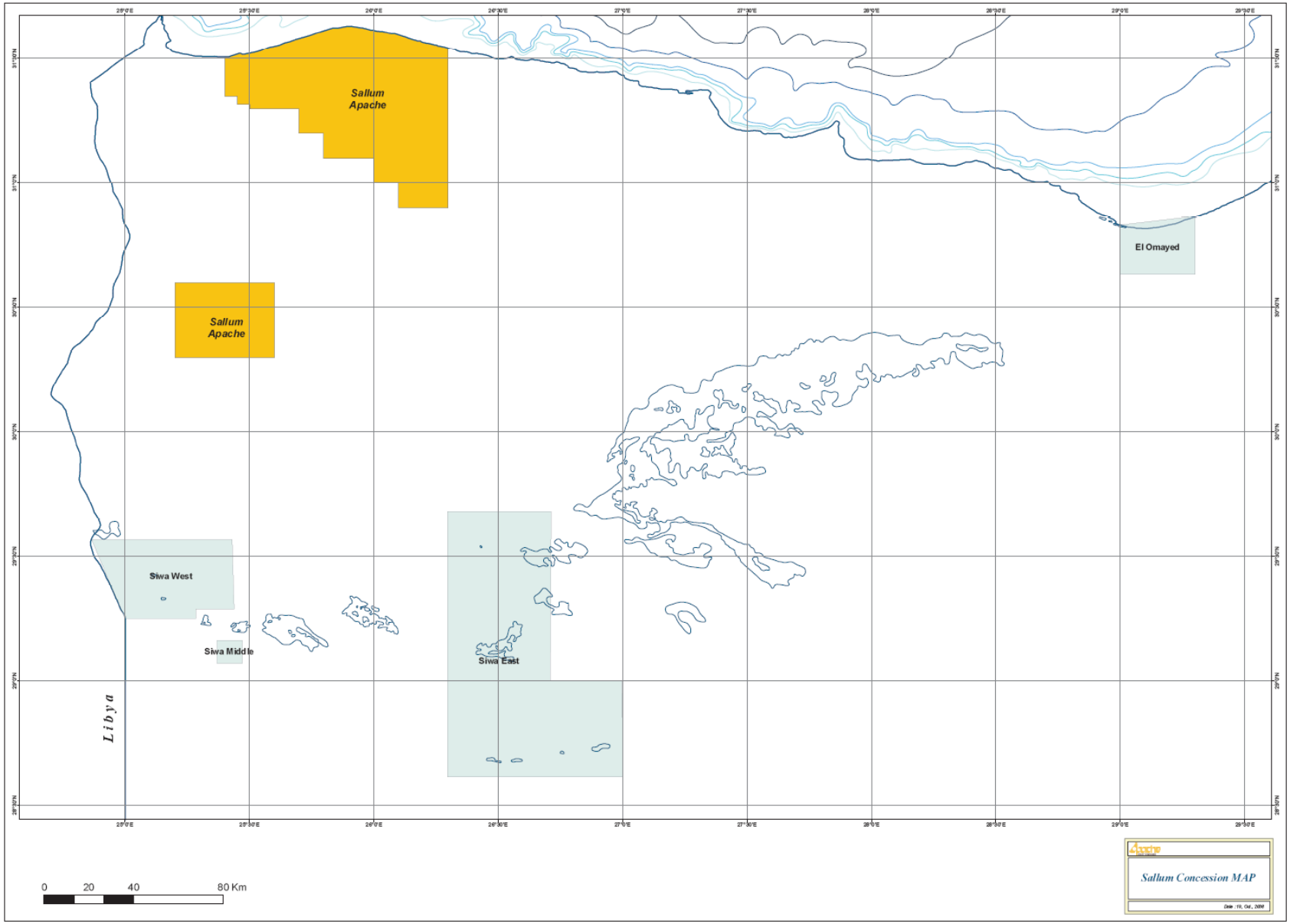
Saint Kathrine

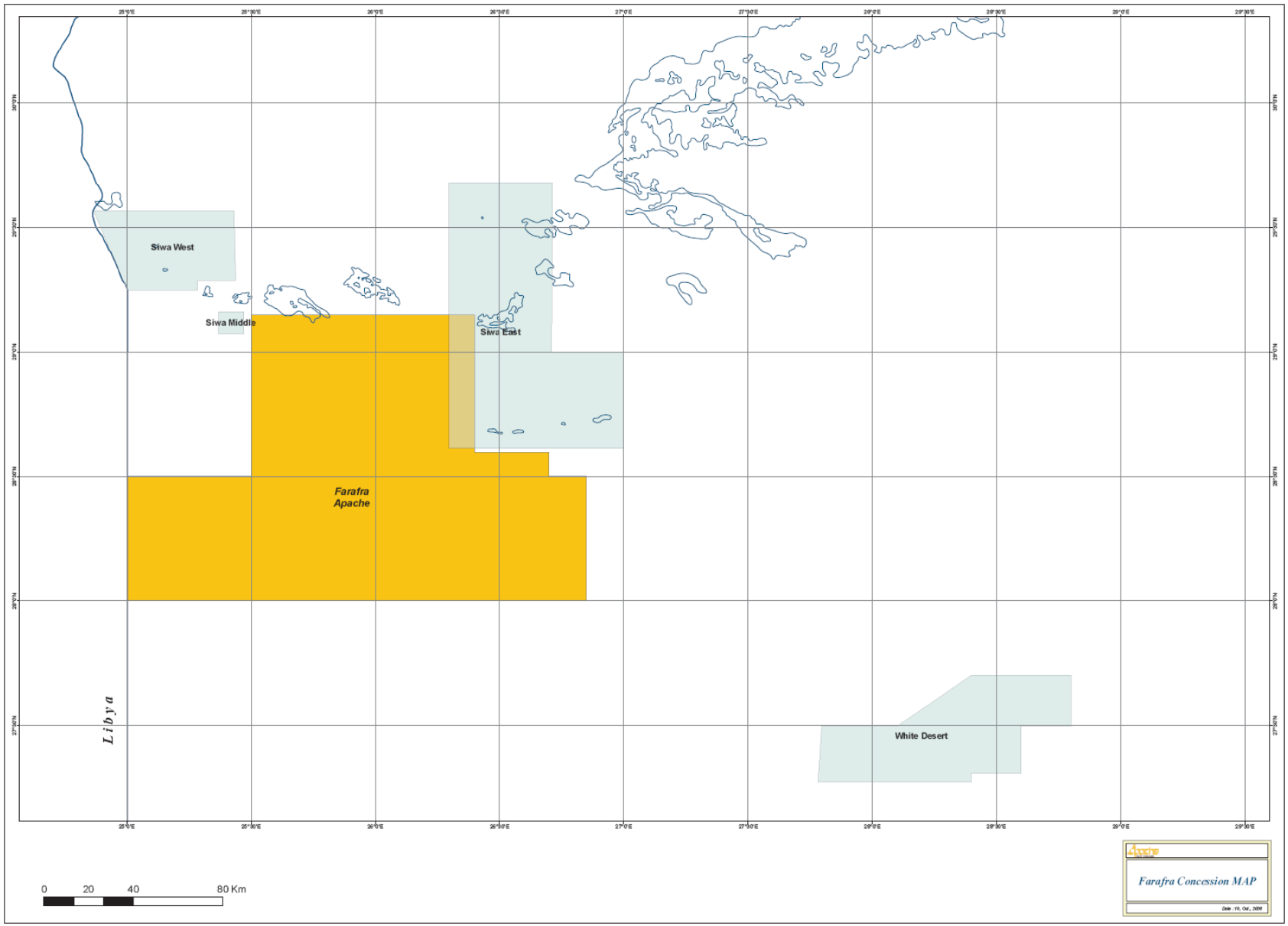
The St. Katherine National Park is an area of great biological interest and includes the highest mountains in Egypt. This high altitude ecosystem supports a surprising diversity of wild species; some found nowhere else in the world. The mountains are relic outposts for the Sinai rose finch from Asia, the ibex and wolf from Europe, and the striped hyena and Tristram's grackle which came from Africa. Several species are unique to the National Park including two species of snakes and about twenty plant species, such as a beautiful native primrose.

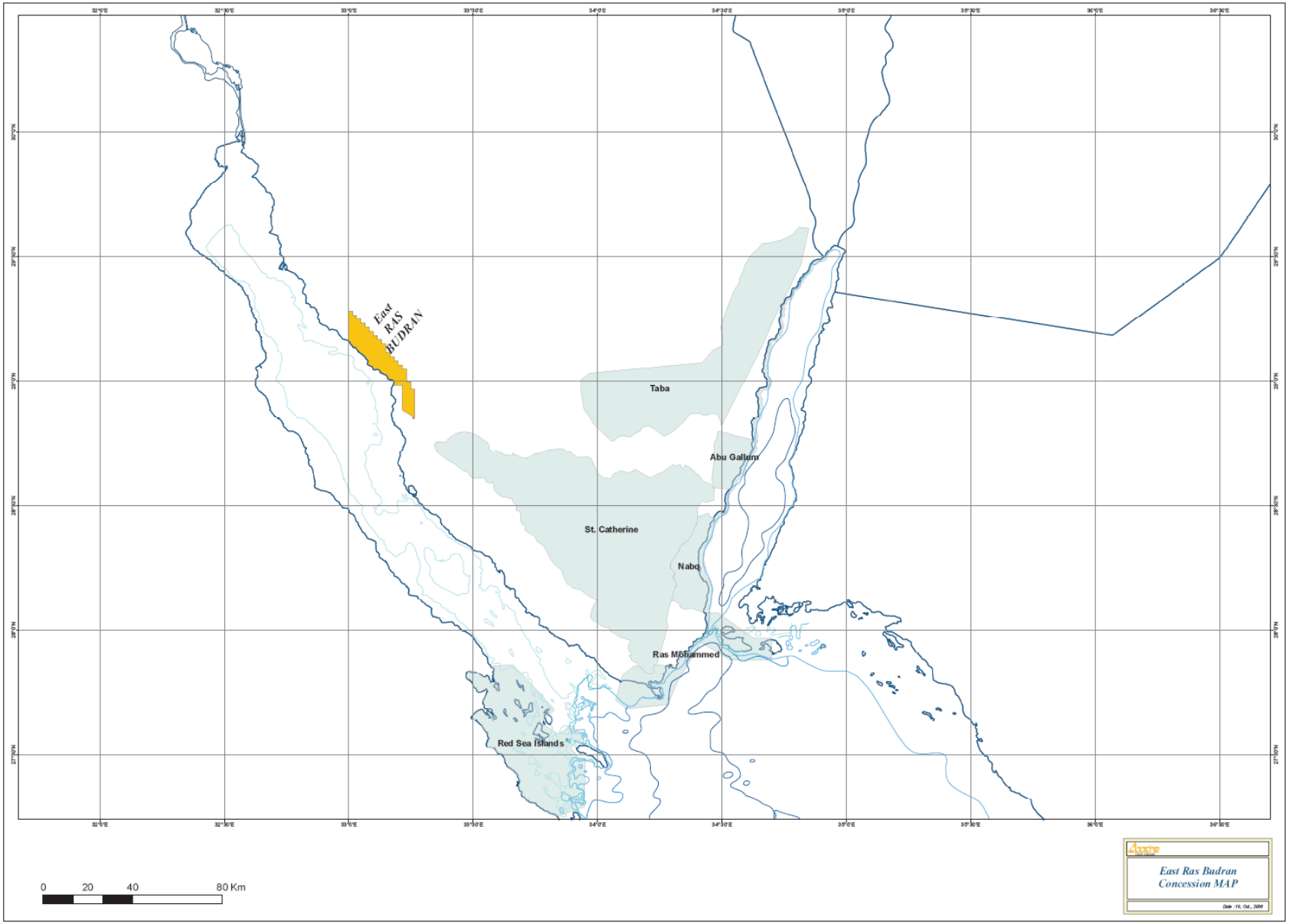
The following maps illustrate the location of protected areas in relation to the concessions.


El Omayed
Siwa
Apache
Siwa West
Siwa Middle
Siwa East
Libya
0 20 40 80 Km
Siwa Concession MAP


El Omayed
West Ghazalat
Apache
Siwa West
Siwa Middle
Siwa East
L i b y a
0 20 40 80 Km
West Ghazalat
Concession MAP


Sallum
Apache
Sallum
Apache
El Omayed
Siwa West
Siwa Middle
Siwa East
Libya
0 20 40 80 Km
Sallum Concession MAP


Siwa West
Siwa Middle
Siwa East
Farafra
Apache
White Desert
Libya
0 20 40 80 Km
Farafra Concession MAP


East
RAS
BUDRAN
Taba
Abu Gallum
St. Catherine
Nabq
Ras Mohammed
Red Sea Islands
0
20
40
80 Km
East Ras Budran
Concession MAP

3.4.4 2. Identification of unique or sensitive natural habitats of internationally or locally recognized rare, threatened or endangered species

Egypt's Importance for Birds

Birds are one of the most prominent and visible components of Egypt's biodiversity. The country is blessed with a wide range of habitats each with its own unique bird life. As the only land bridge between Eurasia and Africa, Egypt represents one of the most important migration routes in the world, with hundreds of millions of birds passing through the country every spring and autumn. Many birds over winter in Egyptian wetlands, making them internationally important wintering grounds for water birds. A total of 16 globally threatened species occur in the country, seven of which Egypt has particular importance. Egypt has benefited from its bird life since ancient times .The country is vital for many species of birds and shares a global responsibility to conserve them

The Directory of IBAs in Egypt identifies 34 sites as IBAs in the country. Egypt's IBAs comprise wide range of habitats critical for birds, including: wetlands, high altitude mountains, desert wadis, coastal plains and marine islands. Fifteen of Egypt's IBAs are in existing Protected Areas. Five further IBAs have been proposed for protection.

However, not all IBAs can become Protected Areas .Bird conservation needs at sites such as Suez and Ain Sukhna can only be addressed through conscientious planning and management.

The Directory of IBAs in Egypt Provides decision makers and planners with a practical tool that can aid in setting conservation priorities and environmental management.

Figure 3-9 Illustrate the IBAs in Egypt

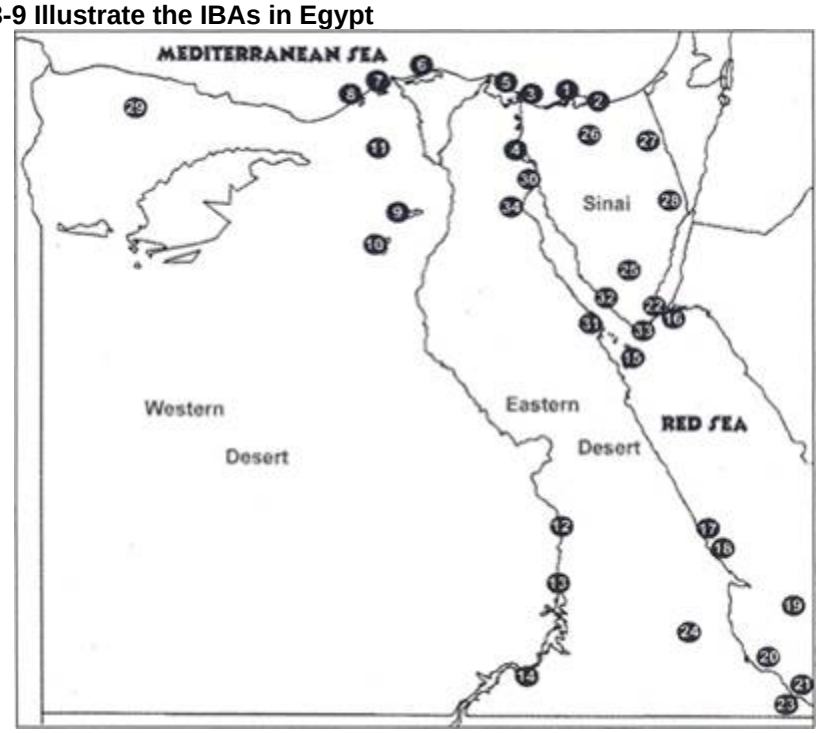


Table 3-9 List of IBAs in Egypt

1. Lake Bardawil	18. Qulan Island
2. Zaranik	19. Zabargad Island
3. El Malaha	20. Siyal Islands
4. Bitter Lakes	21. Rawabel Islands
5. Lake Manzalla	22. Nabaq
6. Lake Burullus	23. Gabel Elba
7. Lake Idku	24. The Abraq Area
8. Lake Maryut	25. St. Katherine
9. Lake Qarun	26. Gabel Maghara
10. Wadi El Rayan	27. Quseima
11. Wadi El Naturn	28. Wadi Gerafi
12. Upper Nile	29. El Qasr Desert
13. Aswan Reservoir	30. Suez
14. Lake Nasser	31. Gabel El Zeit
15. Hurghada Archipelago	32. El Qa Plain
16. Tiran Island	33. Ras Mohammed
17. Wadi Gimal Island	34. Ain Sukhna

According to Red List (IUCN); In Egypt, there are several endangered species; these are wild animals and plants whose populations are decreasing in number due to various factors. Animals including birds are mainly threatened by habitat destruction and hunting. Habitat destruction also affects plants which further suffer from overgrazing and over harvesting. Table 3-10 has been put together by the International Union for Conservation of Nature (IUCN) and includes the plant and animal species which are considered to be in danger of extinction, some of which have already disappeared from the country.

3-10 Shows the listed threatened, endemic Species recorded in Egypt

#	Scientific Name	Family	Phylum	Common Name(s)
1	*Hippopotamus amphibius*	HIPPOPOTAMIDAE	CHORDATA	COMMON HIPPOPOTAMUS (Eng) HIPPOPOTAMUS (Eng)
2	*Grus virgo*	GRUIDAE	CHORDATA	DEMOISELLE CRANE (Eng)
3	*Phalaropus lobatus*	SCOLOPACIDAE	CHORDATA	RED-NECKED PHALAROPE (Eng)
4	*Phalaropus fulicarius*	SCOLOPACIDAE	CHORDATA	GREY PHALAROPE (Eng)
5	*Larus canus*	LARIDAE	CHORDATA	MEW GULL (Eng)
6	*Larus armenicus*	LARIDAE	CHORDATA	ARMENIAN GULL (Eng)
7	*Larus ridibundus*	LARIDAE	CHORDATA	COMMON BLACK-HEADED GULL (Eng)
8	*Larus genei*	LARIDAE	CHORDATA	SLENDER-BILLED GULL (Eng)
9	*Larus melanocephalus*	LARIDAE	CHORDATA	MEDITERRANEAN GULL (Eng)
10	*Larus minutus*	LARIDAE	CHORDATA	LITTLE GULL (Eng)
11	*Sterna nilotica*	LARIDAE	CHORDATA	GULL-BILLED TERN (Eng)
12	*Sterna caspia*	LARIDAE	CHORDATA	CASPIAN TERN (Eng)
13	*Sterna albifrons*	LARIDAE	CHORDATA	LITTLE TERN (Eng)
14	*Chlidonias niger*	LARIDAE	CHORDATA	BLACK TERN (Eng)
15	*Pandion haliaetus*	ACCIPITRIDAE	CHORDATA	OSPREY (Eng)

16	*Phalacrocorax aristotelis*	PHALACROCORACIDAE	CHORDATA	EUROPEAN SHAG (Eng)
17	*Phoenicopterus roseus*	PHOENICOPTERIDAE	CHORDATA	GREATER FLAMINGO (Eng)
18	*Pelecanus onocrotalus*	PELECANIDAE	CHORDATA	GREAT WHITE PELICAN (Eng)

The vegetation of this zone includes nine plants that are endemic to Egypt. Of these four are found only along this stretch of coastline. Among them are an endemic variety, *Zygophyllum album* var. *album* and a full species of the same genus, *Z. aegyptium*. Also along this coastal desert is an endemic globe thistle, *Echinops taeckholmianus*, named for a famous botanist of Egypt, the late Dr. Vivi Täckholm.

3.4.5 Renewable and non-renewable natural resources

Natural resources such as coal, oil and natural gas take millions of years to form naturally and cannot be replaced as fast as they are consumed. Eventually natural resources will become too costly to harvest and humanity will need to find other sources of energy. At present, the main energy sources used by humans are non-renewable.

Groundwater resources are never strictly non-renewable. But in certain cases the period needed for replenishment (100s or 1000s of years) is very long in relation to the normal time-frame of human activity in general and of water resources planning in particular. In such cases it makes practical good sense to talk in terms of ‘non-renewable groundwater resources.

Some natural resources, called renewable resources, are replaced by natural processes given a reasonable amount of time. Soil, water, forests, plants, and animals are all renewable resources as long as they are properly conserved. Solar, wind, wave, and geothermal energies are based on renewable resources. Renewable resources such as the movement of water (hydropower, including tidal power; ocean surface waves used for wave power), wind (used for wind power), geothermal heat (used for geothermal power); and radiant energy (used for solar power) are practically infinite and cannot be depleted.

3.5 Human environment

3.5.1 Human Development and Poverty Index

Human Development Index

Since 1990 the United Nations Development Programme Human Development Report (UNDP-HDR) has published each year the human development index (HDI)

that looks beyond Gross Domestic Product (GDP) to a broader definition of well-being. The HDI provides a composite measure of three dimensions of human development: living a long and healthy life (measured by life expectancy), being educated (measured by adult literacy and enrolment at the primary, secondary and tertiary level) and having a decent standard of living (measured by purchasing power parity, PPP, income) (UNDP 2006-1). According to UNDP- HDR for 2006, the HDI for Egypt is 0.702, which gives Egypt a rank of 111th out of 177 countries with available data. More information about Egypt's HDI is provided in Table 3-11.

Table 3-11 Egypt's Human Development Index

HDI value	**Life expectancy at birth (years)**	**Combined primary, secondary and tertiary gross enrolment ratio (%)**	**GDP per capita (PPP US$)[2]**
1.Norway (0.965)	1. Japan (82.2)	1. Australia (113.2)	1. Luxembourg (69 961)
109. Viet Nam (0.709)	92. Peru (70.2)	68. Qatar (76.3)	104. Guatemala (4 313)
110. Kyrgyzstan (0.705)	93. Bahamas (70.2)	69. Saint Lucia (76.0)	105. Morocco (4 309)
111. Egypt (0.702)	**94. Egypt (70.2)**	**70. Egypt (75.5)**	**106. Egypt (4 211)**
112. Nicaragua (0.698)	95. Morocco (70.0)	71. Georgia (75.5)	107. Jamaica (4 163)
113. Uzbekistan (0.696)	96. Nicaragua (70.0)	72. Tunisia (75.4)	108. Azerbaijan (4 153)
177. Niger (0.311)	177. Swaziland (31.3)	172. Niger (21.5)	172. Sierra Leone (561)

Source: (UNDP 2006-2)

Human Poverty Index

The HDI measures the average progress of a country in human development. The Human Poverty Index for developing countries (HPI-1) focuses on the proportion of people below a threshold level in the same dimensions of human development as the human development index, living a long and healthy life, having access to education and a decent standard of living. By looking beyond income deprivation, the HPI-1 represents a multi-dimensional alternative to the $1 a day (PPP US$) poverty measure.

According to UNDP-HDR the HPI-1 value for Egypt, 20.0, ranks 44th among 102 developing countries for which the index has been calculated. The HPI-1 measures severe deprivation in health by the proportion of people who are not expected to survive beyond the age of 40 and education is measured by the adult illiteracy rate. A decent standard of living is measured by the un-weighted average of people without access to an improved water source and the proportion of children under age

[2] GDP per capita (PPP US$) is the gross domestic product (in purchasing power parity terms in US dollars) divided by midyear population.

5 who are underweight for their age. Table 3-12 shows the values for these variables for Egypt and compares them to other countries (UNDP 2006-1). More information about Human Poverty in Egypt is provided in Table 3-12.

Table 3-12 Human Poverty in Egypt

Human Poverty Index (HPI-1) 2004	**Probability of not surviving past age 40 (%) 2004**	**Adult illiteracy rate (%ages 15 and older) 2004**	**People without access to an improved water source (%) 2004**	**Children underweight for age (% ages 0 - 5) 2004**
1. Uruguay (3.3)	1. Hong Kong, China (SAR) (1.5)	1. Cuba (0.2)	1. Bulgaria (1)	1. Chile (1)
42. Mongolia (18.5)	77. Cape Verde (7.6)	83. Kenya (26.4)	5. Thailand (1)	44. China (8)
43. Cape Verde (18.7)	78. Belarus (7.6)	84. Cambodia (26.4)	6. Saint Lucia (2)	45. Fiji (8)
44. Egypt (20.0)	**79. Egypt (7.8)**	**85. Egypt (28.6)**	**7. Egypt (2)**	**46. Egypt (9)**
45. Fiji (21.3)	80. Algeria (7.8)	86. Madagascar (29.3)	8. Mexico (3)	47. Bahrain (9)
46. Algeria (21.5)	81. Georgia (7.9)	87. Algeria (30.1)	9. Jordan (3)	48. Morocco (9)
102. Mali (60.2)	172. Swaziland (74.3)	117. Mali (81.0)	125. Ethiopia (78)	134. Nepal (48)

Source: (UNDP 2006-2)

Population Profile

According to government statistics, Egypt's population has grown by more than 20% in the past decade and has doubled in the last 30 years. The population, including those living abroad, reached 76.5 Million in 2006 and one Egyptian baby was born every 23 seconds during the year 2006. Cairo's population rose to more than 18 million, although figures suggest large-scale rural migration has ended.

Although nearly one-third of the population was under 15 last year, the average family size is falling from 4.65 people in 1996 to 4.18 in 2006 which reflects both the government success in moderating high birth rates over the past four decades and parents' awareness and preference to reduce their new births to give their other children a better standard of living (BBC, 2007). Further information about the demographic trends in Egypt is detailed in Table 3-13.

Table 3-13 Demographic Trends in Egypt

Demographic Trends	Value
Total population (millions) 2004	72.6
Total population (millions) 2015	88.2
Annual population growth rate (%) 1975 - 2004	2.1
Annual population growth rate (%) 2004 - 2015	1.8
Urban population (% of total) 2004	42.7
Urban population (% of total) 2015	45.4
Population under age 15 (% of total) 2004	33.9
Population under age 15 (% of total) 2015	31.4
Population ages 65 and older (% of total) 2004	4.7
Population ages 65 and older (% of total) 2015	5.5
Total fertility rate (births per woman) 1970-75	5.7
Total fertility rate (births per woman) 2000-05	3.3

Source: (UNDP 2006-2)

3.5.2 Social Services Profile

Health

The Egyptian government has adopted a Health Sector Reform Program (HSRP) to improve the health status for all Egyptians. However, the performance of the health sector in Egypt is still lagging behind the targeted level due to population pressure. During the HSRP, a noticeable improvement was found in public health, while other major health sector problems included deterioration in quality of services provided and quality assurances in addition to nursing problems and shortage of funds (Sakr 2006). Table 3-14 provides further information about health indicators in Egypt.

In the nearest communities to the potential project areas as in most remote cities and villages in Egypt; Health services are provided by both the public and the private sectors, and considered to be insufficient to serve the population in those areas.

Table 3-14 Health Indicators in Egypt

Commitment to Health: Resources Access and Services	Value
Public health expenditure (% of GDP) 2003	2.5
Private health expenditure (% of GDP) 2003	3.3
Health expenditure per capita (PPP US$) 2003	235
One-year-olds fully immunized against tuberculosis (%) 2004	98

Commitment to Health: Resources Access and Services	Value
One-year-olds fully immunized against measles 2004 (%)	97
Physicians (per 100 000 people) 1990 – 2004	54

Source: (UNDP 2006-2)

Education

In 1966, illiteracy in Egypt was estimated at more than 70%; in 1995, it dropped to 48.6% (males, 36.4%; females, 61.2%). For the year 2000, projected adult illiteracy rates stood at 44.7%. The Education Act of 1953 provided free and compulsory education for all children between the ages of 6 and 12. The curriculum was updated in 1995 and included a greater emphasis on vocational training, as well as physics and foreign languages. A decree of 23 July 19 62 provided free tuition at all Egyptian universities. The traditional centre for religious education in the Muslim world is Al-Azhar in Cairo, which in 1983 celebrated 1,000 years of teaching as the oldest continuously operating school in the world. There are a total of 13 universities, and numerous institutes of higher learning in addition to the American University in Cairo and some other privet and international universities (Nations Encyclopaedia, 2006-1). More information about education indicators in Egypt is provided in Table 3-15.

Table 3-15 Education Indicators in Egypt

Literacy and enrolment	Value
Adult literacy rate (% ages 15 and older), 2004	71.4
Youth literacy rate (% ages 15 - 24), 2004	84.9
Net primary enrolment ratio (%), 2004	95
Net secondary enrolment ratio (%), 2004	79
Children reaching grade 5 (% of grade 1 students), 2003	99
Public expenditure on education (as % of GDP), 1991	3.9

Source: (UNDP 2006-2)

Housing

According to the 1996 local census, there were about 9.6 million apartments and 4.5 million rural homes throughout the country. Approximately 2.6 million units were built between the years of 1981 and 1999, and yet housing shortages were an issue. There were nearly 400 slum/squatter areas, housing over seven million people. In order to deal with the housing shortage problem, the government encouraged rural

housing activities on non-fertile soil and efforts have been made to provide low-rent housing in towns. Despite these efforts, Egypt's housing shortage remains acute, with about one million units required in urban areas. Housing construction was a major priority of development plans in the 1980s, but it was considered likely that it would take many years for Egypt's housing deficit to be met. Currently the greatest shortage is in low-cost housing (Nations Encyclopaedia 2006-2). Further information about the housing supply in Egypt is available in Table 3-16, which represents some figures concerning housing in the study area.

Their is no housing shortage problem in the potential project areas, however the utilities and some infrastructure services are considered to be limited in Siwa, Farafra and west Ghazalat. Some areas have no service or utilities, especially in rural areas. The accessibility of the housing in the area is owing to the Bedouins culture where the whole family can live in the same house or tent.

Table 3-16 Housing supply

Housing Type 2003/2004	Number	%
Urban Economy Level	131 000	50.4%
Urban Medium Level	35 000	13.5%
Urban Above Medium Level	10 000	3.8%
Economy Housing at Rural and Land Reclamation	84 000	32.3%
Total	260 000	100.0

Source (OPIC 2005)

Gender

- **Gender in Education**

The adult literacy rate is the percentage of people ages 15 and older who can, with understanding, both read and write a short, simple statement related to their everyday life. Youth literacy rates reflect the same concept as for 15–24 years old. At the national level, and according to UNDP-HDR 2006, the female adult literacy rate (female rate as % of male rate) was estimated at 71% and the youth literacy rate was estimated at 88% in 2004.

- **Gender in Economic Activity**

The female economic activity rate is the share of the female population aged 15 and older who supply, or are available to supply, labour for the production of goods and services. According to UNDP-HDR 2006, this rate was estimated at 20.1%. Female employment in agriculture for the period 1995 – 2003 was estimated at 39%, in industry 7% and in services 54% for the same period.

The division of work between men and women is socially constructed and, therefore, an obvious gender inequality in economic activities exists. Some professions are still dominated by men and others by women, for instance the majority of doctors in the study Area are male.

- **Women's Political Participation**

In Egypt, women were given the right to vote and stand for election in 1956 and the first woman was elected to the parliament in 1957.

- **Gender Empowerment**

The Gender Empowerment Measure (GEM) is a composite index measuring gender inequality in basic dimensions of: empowerment, economic participation and decision-making, political participation, and decision-making and power over economic resources. According to UNDP-HDR 2006, the GEM for Egypt was 73 (best performer in the world was Norway, GEM = 1. The percentage of seats in Parliament held by women is 3.8 %, percentage of female legislators, senior officials and managers is 9 %, the percentage of female professional and technical workers is 30 % and the ratio of estimated female to male earned income is 0.23.

Economic Services Profile

Egypt's economy primarily relies on five sources of income: tourism, remittances from Egyptians working abroad and foreign aid, revenues from the Suez Canal, agriculture and oil. World Bank data suggests that almost 50% of Egypt's GDP in 2000 was generated by the service sector. Since the 1990s the shift to a free market economy and the adoption of economic reforms and structural adjustment has produced mixed results.

Reviewing the economic performance of Egypt should always take into account its fastly growing population, which according to some estimates may exceed 100 million people by 2020; this continues to place a burden on its limited resources, increasing unemployment and poverty. According to official estimates, unemployment measured 11% in 2004 compared to 9.2% in 1991/1992. To control unemployment, Egypt will need to achieve a sustained real GDP growth rate of at least 6% per year. The economy has to generate between 600 000 and 800 000 new jobs each year in order to absorb new entrants onto the labour force (CIA 2007). Additional information about economic performance indicators is provided in Table 3-17.

Table 3-17 Egypt Economic Performance

Economic performance	Value
GDP (PPP US$ billions), 2004	305.9
GDP per capita (PPP US$), 2004	4 211
GDP per capita annual growth rate (%), 1990 - 2004	2.5

Economic performance	Value
GDP per capita, year of highest value	2004

Source: (UNDP 2006-2)

- **Agriculture**

Agriculture accounts for 20 % of GDP and 36 % of total employment. After the Government's agriculture reform, the production increased steadily in recent years. According to official figures, the value of agricultural production increased by 74 % over the five year period 1988 – 1994, from US$ 7 billion in 1988 to US$ 12.2 billion in 1994 and value added in agriculture reached US$ 9.6 billion in 1994. Cultivation is concentrated in the Nile and Delta regions, and less than 3% of total land area is cultivated. The yields of Egyptian farmlands are now among the highest in the world. Egypt is the world's most important producer of long-staple cotton. Other leading crops include rice, tomatoes and wheat. Also produced are sugarcane, watermelons, millet, barley, onions, vegetables, citrus fruits, mangos, dates, figs and grapes (IPR, 2002). According to the CIA country fact report, agriculture contributed to 14.7 % of the country's GDP in 2006.

Agriculture is the most common onshore economic activity in the study area, involving more than 50% of the population. Although agriculture's share to GDP is limited, it has a significant role in poverty alleviation.

- **Tourism**

The tourism industry is one of the most important sectors in the economy in terms of high employment and incoming foreign currency. Egypt offers tremendous cultural heritage and natural beauty. Since 1992 some terrorist actions have affected this sector negatively; recent government efforts to crack down on terrorism have sought to counter this trend.

Tourism officially became the country's second largest foreign currency provider in 1996, with revenues of US$ 3 billion; the increase was due largely to development along the Red Sea coast. Foreign companies including German, French and Italian are investing in the country (IPR, 2002).

- **Fishing and Fish Industry**

Egypt has a long coastline, extending for about 2,500 km, together with a continuous continental shelf of about 53,000 km^2 bordering the country on the north along the Mediterranean Sea coast and to the east along the Red Sea, with the Suez and Aqaba Gulfs. Egypt also has various inland resources. These include: the Nile River with many irrigation canals; five northern coastal lagoons opening to the Mediterranean Sea; two opening to the Suez Canal; two closed lakes; and the great reservoir behind the Aswan High Dam. Fish is a traditional and important component of the Egyptian diet and is the main source of inexpensive animal protein

for a growing population. Most of the catch is consumed fresh through domestic markets with only small quantities exported (2000 tons/year) (FAO).
The Egyptian fishing industry fleet is modernizing, with the fleets in the private sector being well developed and using advanced navigation equipment. Fish production has expanded rapidly in the last ten years and has been marked by a gradual increase in unit effort, i.e., increase in engine power and the size of the gear used by the individual vessels. The fishing industry has a relatively minor direct role in the economy of Egypt, but nevertheless, domestic fish production makes a valuable contribution to the national food supply and to the traditional way of life, in which fish eating plays an important part. In addition, it is a significant source of food for the tourist industry. The fishing industry is also important for the livelihood of over 65 000 fishermen and other people employed full time in related activities (estimated at some 300 000 men) (FAO, 2004).

- **Oil and Gas**

Egypt is a significant non-OPEC energy producer. The Suez Canal and the Sumed Pipeline are two routes for Arabian Gulf oil, making Egypt's geographic location a strategic focal point in world energy markets (CSME, 2001). There are four major Oil and Gas ports in Egypt; Sidi Kerir, Ras Shukheir, Suez, and Ain Sukhna. In 2006 the proven oil reserve was estimated at 2.6 bbl and natural gas reserve was estimated at 1.657 trillion m^3. Oil production in 2005 was 700,000 bbl/day; oil consumption in 2004 was 590 000 bbl/day and oil export in 2004 was 134 000. Natural gas production in 2004 was 32.56 billion m^3; 31.46 were consumed locally and 1.1 billion m^3 were exported (CIA, 2007).

- **Oil and Gas Companies in Egypt**
    - State Oil Company: Egyptian General Petroleum Corporation (EGPC).
    - State Pipeline Companies: Sumed - Arab Petroleum Pipeline Company (APP), Domestic pipelines – Petroleum Pipelines Company (PPC), Export gas pipelines-Egypt Trans-Gas Company (EGTC).
    - Major Foreign Oil Company Involvement: Apache, Amoco, Arco, BG, BP, Deminex, Elf Aquitane, ENI-Agip, Exxon, Marathon, Norsk Hydro, Phillips, Repsol, Royal Dutch Shell, Texaco, Total.
- **Major Oil and Gas Fields in the Area**
    - Gas Fields: Abu Madi, Abu Qir/North Abu Qir.
    - Pipelines (capacity): Sumed pipeline.
    - Oil Refineries (crude oil capacity): Cairo Petroleum Refining Company, El-Nasr – Petroleum Company, El-Mex Alexandria Petroleum Company, Suez Oil Processing Company. (CSME 2001).

3.5.3 Distribution of residential and occupational population in project area

The project will take place in five different concession areas. Four of them are located in the western desert of Egypt, while the fifth concession area is located on the western coast of the Sinai Peninsula, The profile of the western desert contains different habitats like Mediterranean coasts (Sallum area), lakes and oasis (Siwa), sandy dunes and desert in addition to archeological sites, geological structures and biological resources (fauna and flora).

Western Desert Concession Areas

Sallum or As Sallum

Sallum is a city in Egypt, near the Mediterranean Sea, east of the border with Libya. Sallum is mainly a Bedouin community, it has little if any tourist activity or organized historical curiosities. Sallum is not considered a tourist area, and it is certainly not a town familiar with western travelers.

Sallum was the ancient Roman port of Baranis, and there are some Roman wells still remaining in the area. It is also a Bedouin trading center. It rests on the Egyptian North Coast along the border with Libya.

Table 3-18 Summarize the Social Information of Sallum

Population		Total Population	Area km^2	Water sources	Village councils	Types of crops		
Females	Males					Olive	Wheat	Tin
5681	5989	11675	425	Rainfall & desalination	2	2824 Acres	33576 Acres	7725 Acres
Tourist villages		Healthy Units	Public hotels	No. of families	Ambulance units	Hospitals	Electricity sources	Power
Existed	Under construction							
0	0	1	5	157	2	1	Unified network	12.41 MW
Schools								
KG	One Class	Elementary	Primary	Secondary				Total Schools
				General	Technical	Commercial	Agriculture	
1	2	5	1	**1**	**0**	**1**	**0**	11

Source: (http://www.matrouh.gov.eg/matrouhsite/ELSALOM.htm)

Siwa

The Siwa Oasis or Siwah is an oasis In Egypt, located between the Qattara Depression and the Egyptian Sand Sea, nearly 50 km (30 mi) east of the Libyan border, and 560 km (348mil) from Cairo. About 80 km (50 miles) in length and 20 km (12 mi) wide, Siwa Oasis is one of Egypt's isolated settlements, with 23,000 people, mostly ethnic Berbers who speak a distinct language of the Berber family known as tasiwit. Agriculture is the main activity, mostly dates and olives, supplemented by handicrafts (like basketry). Figure 3-10 shows the date palm trees in Siwa Oasis. Tourism has in recent decades become a vital source of income. Much attention has been given to creating hotels that use local materials and play on local styles.

Figure 3-10 Shows the Date Palm Trees in Siwa

The original settlement of Siwa, Aghurmi, was superseded by Shali, founded in 1203. Built of salt-impregnated mud, the fortress-like community expanded upwards rather than outwards. Set amongst thick palm groves, walled gardens and olive orchards, with hundreds of freshwater springs and salt lakes, modern Siwa clusters beneath the remains of ancient Shali.

Siwans have largely retained their own culture, speaking in a Berber tongue - Wiwi - rather than the Arabic spoken in the rest of the country.

Table 3-19 Summarize the Social Information of Siwa

Population		Total Population	Area km^2	Water sources	Village councils	Palm date factories	Types of crops	
Females	Males						Palm date	Olive
8056	8659	161715	1358	4 companies – 50 oasis's	5	6	5000 Acres	7646 Acres
Tourist villages		Healthy Units	Public hotels	No. of beds	Ambulance units	Hospitals	Electricity sources	Power
Existed	Under construction							
3	1	3	13	178	4	1	Generators	7.7 MW
Schools								
KG	One Class	Elementary	Primary	Secondary				Total Schools
				General	Technical	Commercial	Agriculture	
3	7	14	6	**1**	**1**	**1**	**0**	33

Source: (http://www.matrouh.gov.eg/matrouhsite/SIWAMAP.htm)

Farafra#

The Farafra Oasis is the smallest oasis located in Western Egypt, near latitude 27.06° North and longitude 27.97° east. It is located in the western desert, approximately mid-way between Dakhla and Bahariya.

White Desert Farafra has an estimated 5,000 inhabitants (2002) living within its single village and is mostly inhabited by the local Bedouins. Parts of the village have complete quarters of traditional architecture, simple, smooth, unadorned, all in mud color. Local pride has also secured endeavors to secure local culture. Also located near Farafra are the hot springs at Bir Setta and the El-Mufid lake.

A main geographic attraction of Farafra is its White Desert shown in Figure 3-11 (known as Sahara el Beyda, with the word sahara meaning a desert).

Figure 3-11 Shows the White Desert

The White Desert of Egypt is located 45 km (30 miles) north of Farafra. The desert has a white, cream color and has massive chalk rock formations that have been created as a result of occasional sandstorms in the area. The Farafra desert is a typical place visited by some schools in Egypt, as a location for camping trips.

Sinai Peninsula and Gulf of Suez Concession area

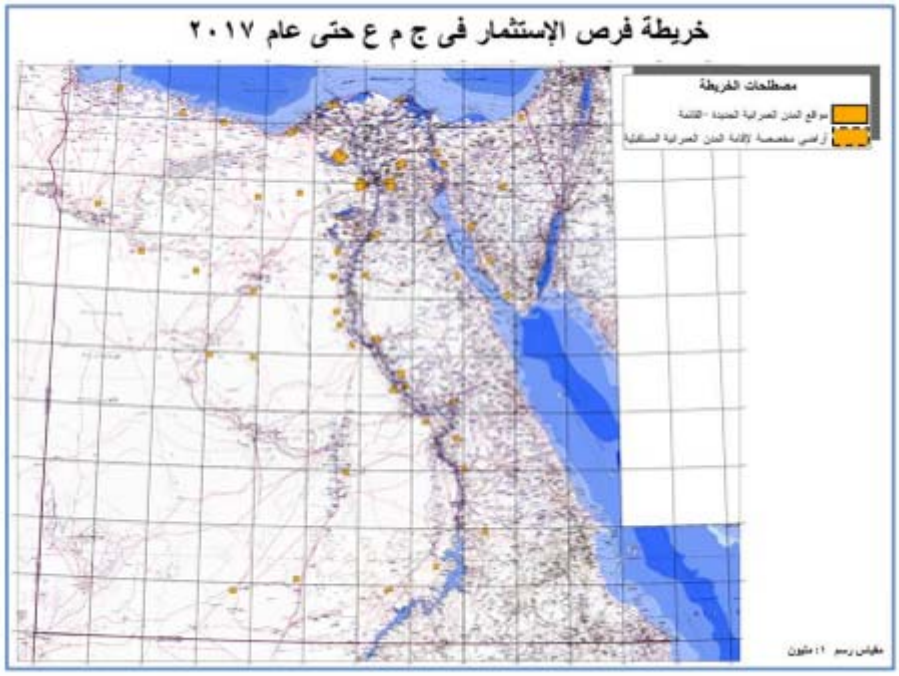
The Bedouin people have always lived in the Sinai, traditionally as nomads, moving from oasis to oasis. In ancient times they were fierce warriors and the Egyptians only entered this area under military protection. Today, many of them have abandoned the nomadic way of life, and instead make their living from a combination of date farming and raising livestock

Abo Zneema

Is located on the Suez gulf about 145 km from Ahmed Hamdy Tunnel in the south of Ras-sedr , The total area is 3078 km^2 . Abu Zneema city is famous for Feromangneez factory and Gypsum factory and the Pharo path. The city includes Grandal village and inhabited areas and it includes the largest industrial area in south Sinai governorate as well as an exporting port.

Abo Rdees

Abu Rdees, Is located on Suez gulf about 165 km far from Ahmed Hamdy tunnel. Its area is 3063 km^2. It is an oil city, and the most important oil companies in it are Blaeem Oil Company. About one third of the total oil production of Egypt is from this area.



3.5.4 Description of previous, current and planned land use activities in or near project area

The land use map, which was produced by the national center for estate land use with cooperation with all ministries and authorities, presents the investment opportunities in Egypt until 2017.

Figure 3-12 Illustrate the Investment Opportunities in Egypt Until 2017

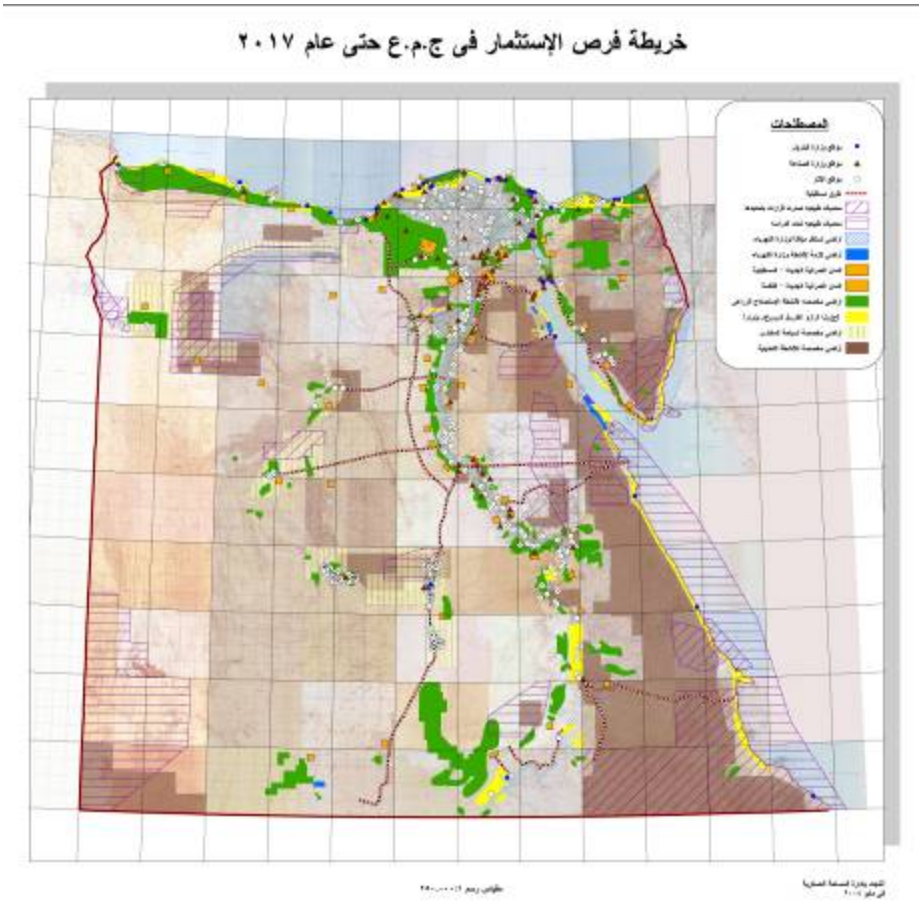
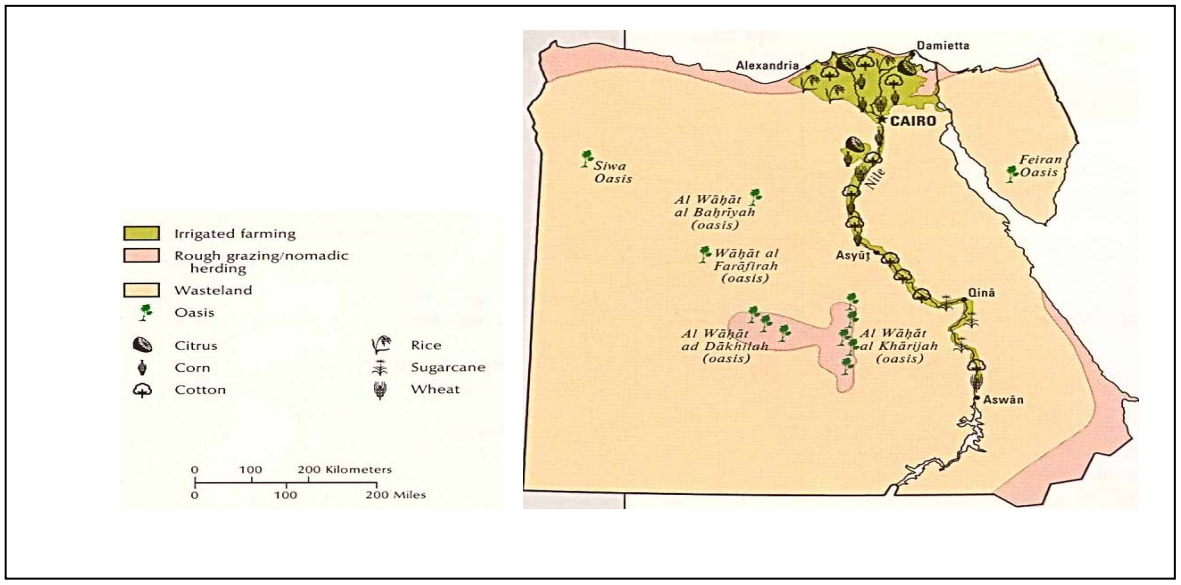


Figure 3-13 Illustrate the Land Use Map of Egypt



3.5.5 Habitation or use of project area by indigenous peoples

There are only scattered settlements within and adjacent to the potential project areas in the Western Desert. Agriculture is the main activity in the area. Date palm trees and Olive are the main crops.

There is no settlement within the Sinai concession.

3.5.6 Environmental quality of project area

There are no industrial activities in the potential project area; that means that there are no pollutants affecting the environmental quality (soil, air and surface and ground water).

3.5.6.1 Ambient air conditions (including seasonal variations)

With no industry operating in the concession areas, the air quality is currently very good. Although emissions are certain to occur as a result of the proposed activities, the direct effects from routine operations will be of small magnitude, limited duration and experienced only on a local scale.

3.5.6.2 Water supply, quality and end use (human consumption, agriculture, plant and animal habitat)

With a very limited industry operating in the all concession areas, the water quality is currently very good. Surface and ground water are used for domestic and irrigation purposes.

3.5.6.3 Noise levels

As mentioned before there is no industrial activities within the potential project area. The noise levels are less than the national and international levels.

3.5.6.4 Soil conditions including contamination from previous or current activities

As mentioned before there is no industrial activities within the potential project area. Impacts from oil and gas production operations do not exist.

3.5.6.5 Archeological, historical or cultural resources

There are several archaeological sites in the oasis; the most distinct ones are Alexander the Great temple at Aghormi hill and the Gebel El Mota tomb excavations. They have suffered due to deterioration and cracks of different kinds and some parts are getting worse as rock falls occur.

Alexander the Great temple was built over the northern edge of Aghormi hill, which consists of two distinct beds-an upper limestone bed and a lower shale one.

Temple of the Oracle, Built during the 26th dynasty, the temple and its Oracle flourished well into the Greek and Roman periods.

Figure 3-14 Shows the Temple of the Oracle, in Siwa Oasis

At Gabal El Mota tomb excavations, it was noticed that when compaing tombs with the same size opening that those that were excavated on shale beds had cracked much more than those that were excavated in limestone. This may be attributed to the low bearing capacity of excavated shale walls. The remedial measures suggested to overcome the stability problems on these archaeological sites are grouting or construction of retaining walls.

Figure 3-15 Photos of Gabal El Mota

Every inch of the lower platform of the mountain has been used for family graves.

Entrance to one of the richest graves.

The lower part of the mountain has countless mounds with small passageways to the tombs.

Most of the tombs belonged to families, and are arranged according to the same patterns as graves all around Egypt. The larger ones had ceremonial chambers, while the smaller ones had ceremonies performed outside the grave.

The mountain holds a couple of truly great graves, full of wall-paintings equally beautiful to the noble tombs of Luxor or Aswan.

Figure 3-16 Photo of Full of Wall-Painting of the Tombs

This is the tomb with the second nicest wall-paintings. It has one more "attraction", two mummies in the original place.

The Supreme Council of Antiquities archeological mission operating in Siwa revealed the footprints of the prehistoric man, which likely dates back to 2 million years," SCA Secretary General Zahi Hawass said, noting that samples of the fossilized plants in rocks are being analyzed to identify their date. Figure 3-17 shows the photo of the footprint of the prehistoric man in Siwa Oasis.

"If it is proven that these footprints date one million years back, they will be the oldest archaeological site on earth, which shows that man in Egypt preceded in any other parts of the world," Hawass said, explaining that the footprints of the prehistoric man were etched on a layer of sandy mud that dried with the passage of time.

Figure 3-17 Shows the recent discovery of the footprints of the prehistoric man

4 Potential (Unmitigated) Environmental, Health and Safety Impacts

4.1 Sources and volumes of untreated airborne, liquid, and solid waste and potential impacts of unmitigated discharge on the environment

Air Quality

Air quality will be reduced by the following events during the proposed seismic and drilling program:

- Exhaust gases and particulates, as well as CO_2, will be produced from the use of diesel fuelled engines and generators throughout the all project phases, including at the rig and camp sites and as a result of vehicle use during mobilisation, demobilisation and for supply of equipment and services to the rig and camp sites, in addition to seismic vibrators engines and dust generation by vibrators movement.
- Gas venting and flaring during well testing;
- Volatile organic compound (VOC) emissions from fuels or chemicals;
- Dust generation by vehicle movements and construction equipment particularly during access road construction and maintenance and site preparation works; and
- Smoke generation from waste burning (incinerator) or accidental fires or blowouts.

Carbon dioxide and methane are ‘greenhouse gases’, widely accepted to be associated with global warming. Carbon monoxide and some volatile organic compounds are toxic. Nitrogen oxides and sulphur dioxide are acidic and components of ‘acid rain’.

Greenhouse Gas (GHG) Emissions

Well development and production operations within the new concessions will generate carbon dioxide, methane and nitrous oxide emissions, commonly referred to as greenhouse gas or GHG emissions. In order to estimate the GHG emissions from these activities, a number of assumptions are made regarding the number of wells drilled; the estimated production rates for oil and associated natural gas; the production operations methodology; and transport modes used to bring the products to processing and markets.

For the purposes of this EIA, it was assumed that twenty (20) wells would be drilled on the new concessions and that all wells would be successfully completed and brought on production. Apache anticipates that the wells will be crude oil producers and will include some associated natural gas production. It is assumed that each of the wells in the concession would produce 1,400 barrels of crude oil per day and 35 standard cubic feet/barrel (35scf/bbl) of associated gas. As each well is brought on line, it is expected that the crude oil would flow to its own storage tank battery where any produced water would separate out by gravity and any entrained gas would evolve. Two electric transfer pumps would transfer the oil from the tanks to trucks, which would haul the oil to a nearby Khalda facility for processing. Any produced water would be drained from the storage tank battery to lined ponds for evaporation.

In order to provide a conservative estimate of GHG emissions from the operations, it was assumed that all wells would produce at their maximum rates for 365 days per year. The gas-oil ratio for these wells would be similar to that of the Qarun field production (approximately 35 scf/bbl.) These low gas volumes are problematic for several reasons: they are insufficient to utilize as fuel gas for power generation; there are no natural gas pipelines in the area to provide an opportunity for sales; and the operation of a flare system would not be dependable as gas flow rates are inconsistent over time. As a result of these technical difficulties, the associated gas must be vented in order to maintain reliable production operations. Once the production aspects of this field are better understood, any decisions on venting, flaring, capture or other control technologies for associated gas can be assessed based on actual production data.

GHG Emissions Estimates

The GHG emissions estimate for the new concessions consist of several sources. The first is combustion emissions, calculated from the diesel fuel usage required for electrical power generation at each well site. The diesel-fired generators consume approximately 18 gallons per hour of fuel each and operate continuously, providing power for the transfer pumps, lights, well controls and production pumping systems. The calculated CO_2e value for combustion emissions for the projected well count is 35,367 short tons per year.

Another source of GHG emissions are those associated with crude oil storage and transport operations. This includes breathing losses from the storage tank batteries and emissions from truck loading operations. The estimated emissions from this segment of the project are 4,894 short tons per year of CO_2e. Some associated natural gas from the crude oil production operations is released from the oil as flash gas as the crude oil enters the storage tanks. This low volume of natural gas will be vented to the atmosphere and result in emissions of 10,780 short tons per year of CO2e. Fugitive emissions are those released from valve and line leaks, packing and seal leaks on rotating and reciprocating equipment, and other non-routine gas releases associated with oil and gas production. Estimated fugitive emissions from the anticipated operations totals 55,299 short tons of CO_2e.

The emissions from the venting of associated gas production (which does not include flash gas) totals 150,403 short tons of CO_2e. As stated previously, in order to provide a conservative estimate of GHG emissions from the operations, it was assumed that these low gas volumes would be problematic and that operation of a produced gas flare system would not be dependable, thus the need to vent the gas. Once the production aspects of this field are better understood, any future decisions on venting, flaring, capture or other control technologies for associated gas can be assessed based on actual production data.

The total for all GHG emissions values is 256,743 short tons of CO_2e during the highest emissions year for the project. This value was rounded-up to 260,000 short tons for ease of reporting. Rather than report the individual components of the greenhouse gas emissions, mainly carbon dioxide, methane and nitrous oxide, the three components were combined into a CO_2 equivalent, or CO2e value for reporting.

Estimate Methodology

The GHG emissions were calculated based upon the previously discussed assumptions and utilizing information supplied in the American Petroleum Institute (API) 2004 Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry, which promotes the use of consistent, standardized methodologies for estimating GHG emissions from petroleum industry operations. The Compendium presents the use of preferred calculation approaches for CO_2 and CH_4 emissions for all common petroleum industry emissions sources, including combustion, flashing, product handling, storage, venting and fugitives. The production information was input into the SANGEA Emissions Estimation System, as provided by API, to calculate the GHG emissions resulting from the operating assumptions.

4.2 Potential impacts on natural and biological resources

4.2.1 Landscape

Seismic and drilling sites

The proposed project will require some civil works including creating seismic line and access roads, leveling, laying and compaction to prepare the rig and camp sites.

Proposed project is located at different areas with different landscape, only very limited geomorphologic changes will be required during the seismic, rig and camp sites construction.

One potential direct impact to landscape arising from these activities would be the destabilization of the landforms leading to increased erosion.

While the project is in progress there will be visual landscape impacts due to the presence of the seismic lines, access roads, camps and the drilling rig and its associated infrastructure, including water and mud pits.

Seismic lines and access roads

As part of site preparation and seismic survey, access roads will be created to enable the mobilization and demobilization of heavy equipment at the start and end of the project, and the supply of services and equipment during the project duration, and seismic lines will be created to cover the whole concession areas to enable the vibrator to survey the whole areas. These access roads and seismic lines will pass through a variety of environments, including desert pavement with mesas and localized rock outcrops; desert pavement in dune areas.

The activities associated with the improvement, creation or maintenance of access routes on desert pavement are the main activities that can potentially be responsible for geomorphologic damage or disturbance. Desert pavement provides a natural barrier that slows erosion processes at the ground surface. Destabilizing the soil structure during access road preparation (or even by simply driving off-track) will expose the finer grained materials that are present beneath the surface gravel layer, leading to scarring and increased erosion. Due to the highly fragile nature of the desert pavement, the effects will be essentially permanent in duration.

4.2.2 Groundwater

Potential impacts to groundwater may be manifested in terms of quantity (depletion of water supply) and quality (potential for contamination). Groundwater is used for drinking and agricultural purposes in the region. Regardless, groundwater represents an important resource at the local and regional scale.

Groundwater resources

Water for the exploratory drilling activities will be supplied from a water well at the rig site and will originate from fossil groundwater.

Siwa concession contains the largest aquifer in western desert. This groundwater is a fossil resource (i.e. no recharge is occurring), and continued pumping at a rate which exceeds the lateral inflow rate from southern recharge areas will cause a change in aquifer storage, manifested by eventual declining water levels.

Groundwater Quality

During drilling, the main risk of impact to groundwater quality is from drilling fluid losses due to inadequate sealing or casing, or leakage from the cuttings pit. However, the drilling mud to be used is water-based and of low inherent toxicity (Ray, et al. 1989).

During well testing, produced water may contain oil and gas products that could potentially contaminate groundwater resources if not properly controlled using adequate waste management techniques.

The risk to groundwater in the event of a spill or release of potentially contaminative material is partly dependent on the depth to groundwater and the permeability of the intervening materials (except in the case of a release at or below the water table, which may occur during drilling). There is little data on groundwater depth at the proposed seismic and drilling sites.

In the event of a blow-out there could be a considerable threat to groundwater quality due to the infiltration of potentially large volume of liquid hydrocarbons. In the event of a fire or explosion, some of the hydrocarbon materials may be burnt off, but some may be released onto the desert surface allowing infiltration.

4.2.3 Surface Water

There is no surface water in the immediate areas of interest. The nearest surface water body is Siwa oasis at Siwa concession. In theory this could be at risk via groundwater contamination, although this would only apply in the case of a major spill of contaminants.

4.2.4 Seawater

Sea water might be affected during drilling, well testing, produced water may contain oil and gas products that could potentially contaminate seawater, domestic waste water (also known as grey water) will be produced from catering, accommodation and vehicle washing areas and also could potentially contaminate seawater.

4.2.5 Flora

Flora may be affected during the all project phases including seismic, drilling, exploration, production and Oil/Gas transferring activities.

Non-routine events such as leaks and spills, fires, explosions and blowouts are only likely to occur on the camp site, drilling pad and access routes.

4.2.6 Fauna

The food web in the desert is finely balanced and so a small impact on one of the elements of the web can have large consequences on the system as a whole.

Fauna may be affected directly by injury or death from vehicle movements, and indirectly by disruption or destruction of the food supply (flora or other fauna) or shelter and habitat (flora, rock outcrops, and burrows).

The project component that has the largest potential to impact on faunal habitat is seismic survey, site preparation activities including the construction of the drilling and camp sites and the creation of access routes. This is an indirect impact mainly related to changes in the landscape and the potential disturbances to nests or dens.

Another potential direct impact to fauna is from hunting. The creation of access routes potentially allows easier access to areas that are usually hard to reach. The scarcity of potential hunted species in the region supports the conclusion that an increase in hunting activity.

Animal communities can also be affected by noise, vibration and movement of seismic vibrators, extraneous light, and dust. The effects can be manifested by changes in an animal community's habitat, foraging, breeding and migration habits. In general, animals shy away from human activity, or the opposite case can occur, particularly where animals may be attracted to the water pit, or by inappropriately disposed of, or uncovered, food waste at the rig and camp sites.

Wildlife contact with waste or hazardous material could result in disease or even death depending on the type of waste or material. There is also the potential for animals to become a disease vector. These impacts may also result from site restoration procedures that are not adequate or not properly implemented.

As with flora, non-routine events such as leaks and spills, fires and explosions and blowouts are unlikely to affect fauna as their effects would largely be limited to the area of the camp site and drilling pad.

4.2.7 Liquid Effluents

Wastewater

Industrial Wastewater

Wastewater generated due drilling operations can be highly contaminated with oil. It is an exploratory drilling, and thus no produced water is expected to be generated. Other wastewater generated includes:

- Spent and surplus water based mud (WBM) fluids;
- Associated WBM and low toxicity oil based drilling mud (LTOBM) fluids retained on the cuttings;
- Clean area run-off water from rig; and
- Water maker reject

Domestic Wastewater (Sewage)

If the generated sewage is disposed to the ground, surface water or/and sea water without treatments could be considered as contamination source.

Solid Wastes

Solid wastes generated due to seismic activities and drilling operations are classified as non-hazardous wastes, hazardous wastes, mud cuttings and medical wastes.

Non-Hazardous Solid Wastes

Solid non-hazardous waste includes domestic waste, paper, plastic and metals, which is mainly generated due to staff accommodation. .

Hazardous Solid Wastes

Generated hazardous solid wastes include absorbents used for spill clean-up, oily rags, batteries, used oil filters of engines, fluorescent light bulbs, paint materials generated from any painting or coating activities, and empty drums with chemical/oil residue.

Mud Cuttings#

Mud cuttings generated as a result of the drilling operations which is affect on all natural resources in the dumping area.

Medical Wastes

Small amounts of medical waste are expected to be generated which may include bandages, syringes, sterilizing agents and blood contaminated material.

4.3 Potential human impacts:

4.3.1 Communities

People living in the near villages or/and cities may be subject to various impacts, potentially both positive and negative. The impacts will mainly be related to peripheral activities associated with the project, including transport of the workforce and equipment from drilling locations, and procurement of supplies. The main negative impact to communities may be associated with traffic increase due to the transport of heavy loads on the main access roads to interest locations during the mobilization and demobilization phases.

Workforce employment is recognized as a positive socio-economic impact. Due to the technical nature of drilling activities and consequent requirement for a largely skilled workforce, most staff will travel from outside the area. However, there will be opportunity for local employment, particularly relating to security issues and supply of the base camp. The opportunities will be comparatively short-term, but there is an added advantage that staff having this experience and potentially undergoing training in new skills may more easily find employment subsequently.

4.3.2 Tourism

It is likely that the access roads to the drilling sites will follow some sections of the existing route used by locals to reach lakes, oases, and archeological sites for touristic purposes. The only impacts expected from the project would be positive, associated with the improvement of the road conditions.

4.3.3 Existing Infrastructure

The movement of heavy loads during mobilization and demobilization phases could damage the existing roads which play an important role in the regional economy.

4.3.4 Archaeological / cultural sites

Cultural artifacts and sites including archaeological artifacts, grave sites and camel caravan tracks were observed frequently in Siwa area. Those activities that require any bulldozing to level the ground or for ground clearance could lead to damage to cultural sites or archaeological remains.

Summary of Impact Assessment

Table 4-1provides a summary of the impact assessment undertaken for the proposed drilling program in the concession areas.

Table 4-1. Summary of Impact Significance

Category	Key Resource / Habitat	Importance	Summary of Impact Significance
Air and Climate	Air quality	Link to human, floral and faunal health.	Exhaust gas emissions from the continuous use of generators at the site, smoke from waste burning, and flaring or venting during well testing, and dust generation during site preparation and seismic survey works will cause a reduction in air quality. Secondary receptors (human environment and fauna) are scarce in the area. The overall potential impact is considered to be of minor significance.
Land	Landscape	The landscape is generally fragile, particularly the desert pavement areas which will not readily regain their natural character after disturbance. Rock outcrops provide shelter for fauna	The construction of access roads using bulldozers will cause visual impact, particularly in the area characterized by desert pavement landscapes where scarring will be essentially permanent. However, the area is scarcely populated and already impacted by scarring from vehicle tracks; therefore the predicted impacts are considered to be of only minor significance.

Category	Key Resource / Habitat	Importance	Summary of Impact Significance
Water	Groundwater	Groundwater is used locally for drinking and irrigation purposes and represents a potential national resource	The draw on the groundwater reserve from the project will be very small compared to current and planned use of groundwater resources in the area. Therefore the impact from the planned use of groundwater is anticipated to be minor. Groundwater quality could be impacted during drilling activities by drilling fluid loss due to inadequate sealing or casing, leakage of liquid hydrocarbon products from the cuttings or flaring pits, inappropriate waste management practices, poor material handling and accidental spills. The significance of these potential impacts is regarded as minor since only relatively small quantities of contaminant are likely to be involved, and there are no users of the groundwater in the immediate project area.
	Surface water	Lakes are represents an important tourist amenity as well as a habitat for relatively diverse flora and fauna.	Operations are not planned near any surface water resource (oasis) and therefore the potential for impact is not considered to be significant.

Category	Key Resource / Habitat	Importance	Summary of Impact Significance
Ecology and Biodiversity	Flora	A scarce and fragile community, providing sustenance, shelter and habitat for fauna	A whole ecosystem is sustained by limited vegetation. Any loss of the fragile flora community would be regarded as an impact of major significance. However, the scarcity of the flora means that it should be easily avoided.
	Fauna	A scarce, fragile community	Fauna are sparse in the areas of interest and therefore any damage or loss would be regarded as significant. Disruption to faunal behavior due to attraction to water and food or repulsion by noise, light and general human presence is possible throughout the project. The potential significance of impact is considered moderate, but will be temporary. Wildlife contact with waste or hazardous material could result in disease or death. These impacts would be viewed as being of major significance.

Category	Key Resource / Habitat	Importance	Summary of Impact Significance
Human Environment	Communities	There are no communities within concession areas are located nearby and could be affected by project activities	The potential for disruption to residents of nearest cities from increased traffic and risk of accident due to the transport of the workforce, equipment and supplies is considered to be of minor significance. Positive impacts due to the temporary increase in trade, employment and training opportunities for locals are anticipated to be of moderate significance.
	Tourism	Tourism is a potential enhancement to the local economy	Impacts to tourism may be related to the use of the oases, lake, archeological sites and recreational areas route. Impacts would most likely be positive due to the improvement of the road.
	Existing infrastructure	infrastructure may be important features of the local and/or national economy	Existing infrastructure is not widespread, and is easily visible; the potential for impact is therefore deemed to be insignificant.
	Archaeological / cultural sites	All archeological sites etc have a national and cultural significance and are protected by law	The creation of access routes could permanently damage archaeological remains of national importance. The potential impact significance is therefore judged to be major.

The preceding consideration of potential impacts arising from the proposed seismic and drilling activities suggests that negative impacts should generally be minor, as a

consequence of the relatively low sensitivity of the project areas, which contains no communities and have only minor floral and faunal populations. Although the overall sensitivity of the area may be perceived as low, sensitive components are present. These include desert pavement, Wadis, groundwater resources, the minor floral and faunal populations, and cultural and archaeological sites. Disruption or damage to any of these could be regarded as impacts of significance.

4.3.5 Positive: employment, services, economic opportunities

Positive impacts due to the temporary increase in trade, employment and training opportunities for locals are anticipated to be of moderate significance.

Food, water, fuel and possibly spare parts may largely be sourced from nearest cities. This will produce a positive effect in terms of the local economy and prosperity of traders, although the effect will be short-term.

4.3.6 Negative: resettlement and economic displacement

Due to the technical nature of seismic and drilling activities and consequent requirement for a largely skilled workforce, most staff will travel from outside the area. The workforce will include workers form different areas with different traditions, moreover, the skilled workforce will include foreign employees, which can be considered as a negative impact in terms of traditional and culture aspects.

4.4 Potential occupational health and safety hazards

Working in the extreme climate of the desert places extra strain on staff that may affect the environmental and social integrity of the project. Environmental parameters such as maximum temperatures, wind strengths, and sandstorm activity, potentially presence of radio active materials are considered to be the main occupational health and safety hazards.

Waste Handling

The health and safety of all personnel is priority. Thus, personnel dealing with waste, whether hazardous or non hazardous are subjected to affected by direct or indirect contact with waste materials.

4.5 Potential for major safety and health hazards beyond the workplace

Non-routine events such as leaks and spills, fires, explosions and blowouts are only likely to occur on the camp site, drilling pad and access routes associated with generated hazardous solid wastes include absorbents used for spill clean-up, oily rags, batteries, used oil filters of engines, fluorescent light bulbs, paint materials generated from any painting or coating activities, and empty drums with chemical/oil residue; are expected to be the major safety and healthy hazards.

5 Proposed Environmental Prevention and Mitigation Measures (including a thorough discussion of alternatives and justifications for measures selected)

Introduction

This section describes procedures to be implemented by Apache Egypt and its contractors to minimize the potential negative impacts associated with the proposed project. Apache Egypt have built significant mitigation measures into the project design; company policies and their commitment to adhere to industry good practice are such that preventative measures against detrimental impacts will be in place before the project starts.

The mitigations described in this section apply to planned project operations, responses to emergency situations, such as fire or hazardous liquid spill.

5.1 Waste minimization measures

The principles of good waste management are firstly to avoid or minimize the generation of waste and, secondly, to discharge or dispose of any unavoidable waste in an environmentally responsible manner. The order of preference for waste management is as follows:

- Wherever possible avoid generating waste;
- Where waste is generated, attempt to minimise it;
- Where waste is generated, reuse, recycle or recover to the maximum extent possible;
- Treatment should only be considered after the recovery and recycling options have been exhausted; and

5.2 Waste treatment and disposal measures

Disposal, as the last option, should be confined to a designated and managed area. The following general principles of waste management will be applied throughout the project:

- The types and quantities of waste that will be generated from operations must be specified in the waste management plan. The plan should address the handling, collection, storage, and transportation procedures together with the ultimate disposal option for each waste type;
- Waste will be segregated for efficient treatment and disposal;
- All waste will be securely stored and covered to avoid attracting animals;
- Hazardous waste will be handled by appropriately trained personnel:

- Adequate and appropriate PPE must be worn while handling hazardous materials as specified in the waste management plan;
- Solid hazardous waste will be placed in appropriate, clearly labelled containers, in accordance with manufacturer's / supplier's instructions and industry good practice;
- Oily rags will be placed in a metal container provided at each workspace and subsequently incinerated when practical. Oily rags must not be mixed with other combustible materials or stored in direct sunlight;
- Used oil filters will be drained into a waste oil container and placed in a dedicated collection bin;
- Oily filter containers must not be stored in direct sunlight as this could lead to over-heating and combustion;
- Waste non-chlorinated solvents, cleaners and thinners will be properly contained and labelled, segregated and stored until disposal. The proposed means of disposal must be specified by the drilling contractor;
- Any waste aerosol containers will be stored separately from other waste products. Aerosols must not be disposed of through incineration. Aerosol containers should be de-pressurised before being placed in waste containers for scrap metal;
- Used batteries (both wet and dry) will be stored in camp, for transport to an appropriate disposal facility;
- Wet cell batteries will be drained prior to storage and transportation, and cell fluids will be neutralised;

- Open waste burning will not be undertaken. A closed, mobile waste incinerator will be used for suitable materials;
- A bioactive treatment unit will be used for all black and grey water;
- Waste treatment and disposal will not take place near surface water;

All waste disposal pits (including the cuttings and water pits) will be properly abandoned and the ground surface reinstated including covering with at least 1m of clean material.

5.3 Natural resource management (e.g. sustainable management of biological resources and protection of endangered species and their habitats)

5.3.1 Flora

Vegetation is very sparse in the areas of interest. However, this scarcity and the fragile nature of the floral species make the resource valuable. The nature conservation value is increased as the flora also provides sustenance and shelter and habitat for fauna. Local flora could potentially be affected by reduction in air quality (air pollutant emissions and dust), and particularly by physical damage or removal during seismic survey operation, site and road preparation, which would be regarded as a significant impact.

The scarce nature of vegetation in the areas of interest means that it should be relatively easy to avoid during preparation and execution of the project.

Non-routine events such as leaks and spills, fires, explosions and blowouts are only likely to occur on the camp site, drilling pad and access routes, which will be devoid of vegetation. It is not anticipated, therefore, that there will be any additional adverse impacts to flora associated with these non-routine events.

5.3.2 Fauna

The food web in the desert is finely balanced and so a small impact on one of the elements of the web can have large consequences on the system as a whole.

Fauna may be affected directly by injury or death from vehicle movements, and indirectly by disruption or destruction of the food supply (flora or other fauna) or shelter and habitat (flora, rock outcrops, and burrows).

The project component that has the largest potential to impact on faunal habitat is seismic survey operations, site preparation activities including the construction of the drilling and camp sites and the creation of access routes. This is an indirect impact mainly related to changes in the landscape and the potential disturbances to nests or dens.

The risk of direct impact should not be great since most animals tend to avoid vehicles. The risk may be increased at night since many desert animals are nocturnal. It is, however, the policy of Apache Egypt not to undertake driving at night, except in emergency.

Another potential direct impact to fauna is from hunting. The creation of access routes potentially allows easier access to areas that are usually hard to reach. The scarcity of potential hunted species in the region supports the conclusion that an increase in hunting activity is not likely to be a consequence of the project.

Animal communities can also be affected by noise, extraneous light, and dust. The effects can be manifested by changes in an animal community's habitat, foraging, breeding and migration habits. In general, animals shy away from human activity and therefore the risk of impact may be considered as low. However, the opposite case can occur, particularly where animals may be attracted to the water pit, or by inappropriately disposed of, or uncovered, food waste at the rig and camp sites.

Wildlife contact with waste or hazardous material could result in disease or even death depending on the type of waste or material. There is also the potential for animals to become a disease vector. These impacts may also result from site restoration procedures that are not adequate or not properly implemented.

As with flora, non-routine events such as leaks and spills, fires and explosions and blowouts are unlikely to affect fauna as their effects would largely be limited to the area of the camp site and drilling pad.

5.4 Mitigation of human impacts: compensation, training, etc.

The most important mitigation measure for potential negative impacts to local communities is to ensure the communities are aware of the project. This will be achieved in consultation with appropriate local authorities in nearest cities/villages. Appropriate authorities will be consulted with regard to access creation, seismic and drilling sites, and the presence of any known sensitivities in the area. In addition, restoration plans will be discussed, particularly with regard to potential future use of access routes created during the project.

5.5 Occupational safety and health measures

Apache Egypt will ensure that all wastes generated are correctly identified, and stored pending collection/transfer for re-use, recovery, recycling, treatment and/or disposal in an environmentally sound manner. All reasonable steps are to be taken to minimize both quantities and hazards of waste generated. In addition, proper waste segregation will be maintained at all times. Generated waste will be identified, classified and documented.

Drilling activities are the main sources of waste generation associated with drilling operations. A variety of hazardous and non-hazardous industrial and wastes are generated as a result of drilling activities in the rig area.

Waste generated is segregated according to type (paper, plastic, solid, hazardous, medical waste, food, etc.). Waste is then loaded onto specially designed skips. The skips are transferred by trucks and transported to the appropriate managing facilities.

Waste Handling

When handling waste it is essential that proper safety measures are taken. The health and safety of all personnel is priority. Thus, personnel dealing with waste, whether hazardous or non hazardous, must be fully equipped with the appropriate personal protective equipment (PPE).

Final Disposal

Integral to waste management is the assurance that approved waste management facilities exist that can accommodate the predicted waste output. The waste management facilities must be in compliance with local regulations. HSE audits will be performed prior to utilizing any facility; and periodic audits will be conducted.

Communications

A satellite communication unit including voice, fax and data communications, email, Internet will be in place. A Thuraya mobile phone will be used as a back up.

FM hand held radios for diverse field purposes will also be available.

Safety Equipment

Complete sets of PPE, including hard hats, gloves, protective clothing, safety glasses, masks, and boots shall be provided.

First aid kits, chemical eye wash stations and fire extinguishers shall be appropriately provided and used in accordance with normal operating standards.

Policy for Environmental Protection

Apache Egypt in accordance to its HSE policy is dedicated to conducting business in a manner that protects communities. The health and safety of employees, their families, neighbors and the communities in which they operate are the highest priorities for the company. Safety and environmental responsibility are an integral part of Apache Egypt projects worldwide, and these characteristics result in improved quality in every aspect of operations. Apache Egypt adheres to a policy and philosophy set out by the corporation. Apache Egypt will review its operations on a random or as-needed basis, and will take the necessary measures to ensure the public, Land, air and water in neighboring cities/villages are protected from adverse impacts.

5.6 Major hazard prevention and emergency response

5.6.1 Air Quality

Local reductions in air quality will result from a potential project activities including the use of diesel powered equipment, dust generation during civil works, flaring or venting during well testing activities and potential vapour emissions during fuel transfer or maintenance activities or from hazardous material handling and storage. Due to the localized nature of the impacts, the receptors most at risk will be workforce personnel in the immediate area. Any significant risk to the health of personnel resulting from the use of such equipment and vehicles will be covered by the HSE plan for the project.

The project's cumulative impact in terms of global warming will be very small. Nevertheless, industry good practice requires that the significance of cumulative impacts be acknowledged by all projects and activities. This may be achieved by demonstrating that measures are being implemented to eliminate or reduce emissions. The following measures are recommended:

- In general, plan the project so that equipment and vehicle use is minimised (e.g. in terms of staff movements and delivery of supplies);
- Give regard to fuel efficiency when selecting equipment and vehicles;
- Carry out regular maintenance to all equipment and vehicles according to manufacturer's recommendations;

- Switch off generators and engines whenever equipment or vehicles are not in use;
- Avoid running engines at excessive speed;
- Avoid off-track driving;
- Minimise dust generating activities when conditions could exacerbate the impacts (e.g. during high winds);
- Avoid or minimise gas emission and flaring activities during well testing;
- Consider using solar power wherever possible;
- Do not locate the camp downwind of flares or the waste incinerator;
- Adopt appropriate material handling and HSE procedures; and
- Encourage all staff to understand their responsibility to reduce energy use.

5.6.2 Landscape

The impacts to the landscape during the project are unlikely to be highly significant. The following measures should help to minimize potential adverse impacts on geomorphology and landscape:

General mitigation measures

- Use existing routes and already disturbed areas whenever possible when considering the creation of access routes;
- Consider the fate of the routes after project completion: if it is considered that a route may encourage wider access and lead to further degradation of the landscape, then consideration should be given to removing or blocking the route. If, on the other hand, the establishment of a route serves to reduce travel on a number of alternative routes then its continued use may be encouraged;
- Where disturbance is necessary, clear only the minimum to facilitate safe access and working;
- Avoid wadis and natural drainage features when defining the access route. If avoidance is not possible, minimise the disturbance and design site reclamation procedures to return the land to its initial conditions;
- Use vehicles appropriate for the terrain and designed to cause minimum impact;
- Adhere to a ‘single track’ policy except in areas where this would cause more significant impact than running parallel tracks;
- Control vehicle movements and plan to minimise journeys;
- Minimise the use of bulldozers;
- Ensure workforce is aware of environmental sensitivities;

- Make photographic records of areas to be disturbed before development, to assist in after-use site restoration;
- Practice progressive site clean-up through the life of the project; and
- After project completion, restore camp and drilling locations to original condition as far as is practicable.

Groundwater

Water to be supplied for the project will be sourced from fossil reserves that are not being recharged. The total quantity of water to be used during the project is a negligible fraction of the total resource. Nevertheless, Apache Egypt will promote water conservation practices at all stages of the project. Water conservation will notably be achieved by:

- Optimising the separation of cuttings from the drilling mud and its recycling;
- Ensuring sealing and casing procedures are adequate and conducted in a timely manner to minimise drilling fluid loss;
- Monitor water volume extracted from the water well.
- Ensure the water pit is not leaking.
- Reuse of standing water in the cutting pit where possible;
- Promoting employee awareness via training on how to minimise water use; and
- Applying water conservation measures at the camps.

The risk of contamination of groundwater reserves from project activities will be minimized by the adoption of appropriate operating procedures as follows:

- Appropriate completion of the water well to ensure it does not creates a conduit for contaminant migration in the event of a fuel spill or well blow-out
- Appropriate lining of the cutting and flaring pits;
- Adoption of best industry practice for well casing design and implementation to ensure groundwater resources are adequately sealed off;
- Adoption of best industry practice for the management of potentially contaminating liquids, such as fuel, oil and chemicals (storage, handling, disposal, treatment), in particular a waste management plan will specify procedures for controlling potential risks of leakage from any liquid waste wastewater;
- Spill response equipment and procedures will be in place in all areas where the potential for spills exists;

- Employees will be appropriately trained to apply those procedures in an efficient and timely manner;
- The wells will be appropriately completed and plugged at the end of the project; and
- Site reclamation procedures will be implemented to ensure that no potential source of contaminants remains at the site following project completion. In particular, the water-well should be appropriately abandoned and sealed.

Surface Water

Project activities will not be undertaken in close proximity to surface water bodies. The mitigation listed for the protection of groundwater will also minimize risks of contamination to surface water.

Sea Water

Project activities will not be undertaken in close coastal areas (Sallum concession on the Mediterranean Sea and Ras Budran on the Gulf of Suez). The mitigation listed for the protection of groundwater will also minimize risks of contamination to seawater.

Flora

Vegetation is very sparse in the areas of interest. However, this scarcity and the fragile nature of the floral species make the resource valuable. The nature conservation value is increased as the flora also provides sustenance and shelter and habitat for fauna. Local flora could potentially be affected by reduction in air quality (air pollutant emissions and dust), and particularly by physical damage or removal during site and road preparation, which would be regarded as a significant impact.

The scarce nature of vegetation in the areas of interest means that it should be relatively easy to avoid during preparation and execution of the project.

The following recommendations should be adopted to reduce the impact:

- As a general principle, avoid disturbance or damage to any vegetation. Existing access routes and cleared areas should be used where at all possible and new access routes should remain at a safe distance from any plants;
- Avoid excavating making access routes in wadis or locations that may have been natural drainage features in the past. Rainfall in these areas may activate seeds that lie dormant at the surface or shallow depth and may give rise to significant floral communities;
- Ensure that earthmoving activities do not alter existing drainage patterns;
- Driving off the established access routes must be prohibited;
- A suitable person (e.g. HSE representative) should be responsible for ensuring

that no damage to vegetation is caused throughout the project cycle; and

- Training should be undertaken prior to beginning work to ensure that all personnel are aware of the importance of protecting vegetation in the area and the requirement to avoid its disturbance.

Fauna

Desert fauna is at direct risk from access road construction and site clearance activities, and at indirect risk due to habitat loss. Adherence to the above recommendations for mitigation of potential impacts to flora will also mitigate some impacts to fauna. The following additional recommendations should be adopted to further reduce the impact:

- As a general principle, avoid disturbance or harm to all fauna;
- Define the final access route away from potential animal habitats (burrows, vegetated areas, rock faces, sabkha);
- A strict no hunting policy should be enforced;
- Apply industry best-practices for waste management procedures and ensure that animals are not attracted to campsites by odours from food or waste. Ensure that animals cannot gain access to the water pit, waste storage, and treated wastewater disposal areas;
- While working at night, use lights with the minimum intensity required for safe working, and orientate them towards the specific work areas to minimise fauna attraction; and
- The risk of injury to fauna from vehicle movements will be minimised by the adoption of safe speed limits and a ban on night driving, except in emergency situations.

Communities

There are no human communities in the areas of interest. The most important mitigation measure for potential negative impacts to local communities is to ensure the communities are aware of the project. This will be achieved in consultation with appropriate local authorities in nearest cities to the project areas. Appropriate authorities will be consulted with regard to access creation, seismic and drilling areas, and the presence of any known sensitivities in the area. In addition, restoration plans will be discussed, particularly with regard to potential future use of access routes created during the project.

The increase in vehicle traffic in the project areas will leads to the potential increase in vehicle-related incidents and accidents. The health and safety of the local population should be a primary concern throughout the project. Mitigation measures designed to minimize the risks include the following:

- The adoption of driving regulations to be adhered to by all personnel including subcontractors;

- Strict enforcement of speed limits;
- Deliveries and trips between communities and base camp to be minimised;
- Good driving behaviour to be encouraged to ensure the utmost courtesy is given to the local population; and
- No driving to be undertaken at night except in emergency.

Positive impacts to communities can be maximised by promoting the procurement of services and labour locally from surrounding cities.

Existing Infrastructure

Due regard will be given to existing infrastructure relevant to the project, namely a power transmission line and routes that may be in use by the local population. Buffer zones will be formed around the pylons of the power transmission line using a nominal distance of 50m.

To minimize damages to existing roads, speed limits will be set in accordance with the vehicle loads, and preference will be given to non-sealed roads which are less likely to be damaged by heavy loads.

Archaeological / cultural sites

Archaeological or culturally sensitive sites such as graves may be affected by the creation of access roads. Apache Egypt will consult with the Department of Antiquities to clarify the need for additional surveying prior to starting the preparation of access roads. It is recommended that the Department of Antiquities is invited to participate in the final scouting of the access routes. All project staff will be made aware of the potential sensitivity of archaeological or cultural sites.

Mitigation Summary and Residual Impacts

Table 5-1 presents a summary of mitigation measures to be implemented during the seismic and exploratory drilling program. Note that these mitigation measures apply to routine project activities, and not unplanned events or emergencies such as fires, spills or well blow-out, which are addressed by the emergency response measures provided that the mitigation measures described in this Section are implemented and enforced, it is considered that impacts from the proposed project program in the concession areas will be minimal.

Table 5-1. Summary of Mitigation Measures

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
Air and Climate	Air quality	Local reduction in quality due to exhaust and vapour emissions, and dust generation	• Creation of access routes • Seismic operations • Site preparation • Drilling and camp operations • Well testing • Site reclamation and abandonment	• Civil works and dust generating activities will not take place in windy conditions where excessive wind-blown sand could be generated • Engine and equipment use will be minimised • Preference will be given to fuel-efficient generators and vehicles • Regular maintenance will be undertaken • Speed limits will be enforced • Solar energy will be used if possible • Appropriate procedure for fuel transfer

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
		Local reduction in air quality due to smoke	• Well evaluation • Waste management	• If flaring is the chosen option, the quantities to be flared will be minimised. • Use of a confined incinerator unit to burn waste
Land	Landscape	Scarring Increased erosion Modification of natural drainage pattern Open access into the desert	• Creation of access routes • Seismic lines • Camp and drilling pad construction • Site reclamation	• Existing access routes and disturbed areas will be used whenever possible • The workforce will undergo training in landscape sensitivity awareness • A ‘single track’ policy will be adhered to unless conditions dictate otherwise • Journeys will be planned, controlled and minimised • Bulldozer use will be minimised and steps taken to minimise impact where their use is necessary • Off-road driving

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
				will be prohibited • Reinstatement of disturbed areas will be planned and conducted progressively through the project life • Care will be taken not to cause modification of natural drainage patterns • A photographic record will be made before disturbing an area (e.g. the rig site, unavoidable wadi crossing) – this may be useful for later restoration • The post-project fate of a new access route will be planned prior to its creation

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
Water resources	Groundwater	Increased demand on groundwater resources	• Site preparation including access road construction • Camp operations • Drilling operations	• Minimise the demand for water by reusing and recycling, setting strict water conservation targets and by monitoring water consumption • Optimise drilling mud recycling • Employee awareness and training

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
		Contamination of groundwater	• Equipment use • Waste management • Drilling operations • Well testing • Site reclamation	• Good practice for containment and handling of potentially contaminating liquids will be strictly enforced • Best-practice for wastewater management will be implemented • Spill response equipment and procedures will be in place • Employee awareness and training • Only water-based mud will be used • Appropriate casing and cementing program to seal off valuable groundwater resources • Cutting pits and flare pits will be appropriately lined • Groundwater may be sampled to establish baseline quality prior to drilling • Boreholes will be properly completed and the drilling site restored appropriately

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
Ecology and Biodiversity	Flora	Destruction of flora Destruction of faunal habitats	• Site preparation including access road construction • Transport • Waste management	• Disturbance of vegetation will be avoided during all activities and in particular during access road construction • Driving off the established access routes will be prohibited • Field staff will undergo training to ensure that personnel are aware of environmental sensitivities and know how negative impacts can be minimized • Avoid excavation and construction works in natural drainage areas (wadis, depressions)
	Fauna	Disturbance or destruction of fauna	• Site preparation including access road construction • Transport and equipment use • Waste management • Drilling operations	• Disturbance of vegetation will be avoided during access road construction • A strict no-hunting policy will be enforced • Field staff will undergo training to ensure that personnel are aware of

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
				environmental sensitivities • Food storage and waste management procedures will be designed such that animals will not be attracted to camps • Areas which may attract fauna will be fenced off • Lights will be oriented towards specific work areas • Night driving will not be undertaken except in emergency
Human Environment	Communities	Nuisance due to increased personnel / vehicle movements	• Project in general	• Community engagement will take place via local authorities to ensure that local people are aware of the project • Traffic disturbance during mobilisation and demobilisation will be minimised

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
		Accidents due to increased vehicle movements `	• Site preparation • Site reclamation • Procurement of equipment and supplies	• Deliveries and trips between communities and base camp will be minimised • Speed limits will be strictly enforced • Night driving will not be undertaken except in emergency • All drivers will undergo appropriate training
		Increased trade	• Procurement of supplies and equipment	• Local trade will be encouraged
		Increased employment opportunity	• Staffing • Procurement of supplies and equipment	• Local employment will be encouraged
		Skills / technology transfer	• Staffing	• Local employment and training will be encouraged
	Tourism	Disruption	• Access roads construction	• Local tourism will benefit from the use of improved access routes to reach Bazimah

Category	Key Resource/ Habitat	Impact	Project Component	Mitigation
	Infrastructure	Damage to local economy	• Procurement of equipment and supplies	• The workforce will be made aware of local infrastructure • Buffer zones will be established around infrastructure where appropriate
	Archaeological / cultural sites	Disturbance	• Access roads preparation	• Archaeological and cultural sites will not be disturbed • The Department of Antiquities will be consulted to validate the choice of access route and of caliche extraction sites • The workforce will be trained in awareness relating to archaeological or cultural sites

6 Projected Net Environmental Impacts (post-mitigation)

If mitigation recommendations are followed, it is likely that minimal residual impacts will result; the minimum requirement of the residual impacts is to evaluate opportunities to address project residual environmental impacts. Projects can respond to this residual impact by supporting non-operational initiatives or activities which are focused on environmental research and education, and conservation. Any action in response to our residual impact should take into consideration the scale and type of all other additional activity that Apache Egypt is supporting, both at a corporate, country and project level. Such activities will be linked with the project's management of its social programmes. In such cases programs will be evaluated in close collaboration with internal experts, national/local governments, and international and/or national development agencies and NGOs.

In addition, Category A projects shall conduct opportunity reviews in early appraise and select stages to identify and support environmental, socio-economic and trans-project opportunities including potential opportunities for Apache's Education and Environment Program for sensitive areas. Possible opportunities should be characterised as:

- Opportunities for the project – mainly engineering solutions for delivering local benefits, such as energy provision and water treatment, which may be either directly or indirectly environmental;
- Opportunities for Community Investment Program; and
- Opportunities for Apache's Education and Environment Programs.

6.1 Physical impacts (e.g. topography, ground and surface water supply, soil conservation)

6.1.1 Topography

Residual impacts will be restricted to landscape disruption due to access route creation and disturbed areas at the well locations, which are inherent consequences of drilling activities in the desert landscape. However, given the lack of communities and amenities in the footprint areas of the project, However, the sand dune environment is continuously in flux due to wind action, and tends to regain a state of equilibrium comparatively quickly following disturbance (for example in comparison to desert pavement areas). Since effects will be localized and secondary receptors including communities and faunal habitats (including flora) are scarce, potential impacts are not considered to be significant.

6.1.2 Surface, Ground and sea water

The risk of contamination of surface water, groundwater and sea water reserves from project activities will be minimized by the adoption of appropriate operating procedures; the residual impacts can considered as insignificant.

6.2 Biological impacts (flora, fauna and related habitat with particular attention to threatened and endangered species; natural resources. e.g. primary forests, coral reefs, mangroves, etc.)

6.2.1 Flora

The scarce nature of vegetation in the areas of interest means that it should be relatively easy to avoid during preparation and execution of the project.

It is not anticipated that there will be any additional adverse impacts to flora associated with these non-routine events, such as leaks and spills, fires, explosions and blowouts are only likely to occur on the camp site, drilling pad and access routes, which will be devoid of vegetation.

Fauna

The risk of direct impact should not be great since most animals tend to avoid vehicles. The risk may be increased at night since many desert animals are nocturnal. It is, however, the policy of Apache Egypt not to undertake driving at night, except in emergency.

Another potential direct impact to fauna is from hunting. The creation of access routes potentially allows easier access to areas that are usually hard to reach. The scarcity of potential hunted species in the region supports the conclusion that an increase in hunting activity is not likely to be a consequence of the project.

6.3 Net discharges of airborne, liquid and solid wastes and resulting ambient impacts as compared to applicable host country, World Bank and other relevant regulatory standards and guidelines

6.3.1 Airborne

The project's cumulative impact in terms of global warming will be very small. Nevertheless, industry good practice requires that the significance of cumulative impacts be acknowledged by all projects and activities. This may be achieved by demonstrating that measures are being implemented to eliminate or reduce emissions.

6.3.2 Liquid and solid waste

If the mitigation measures procedures implemented, the residual impacts of the liquid and solid wastes can be considered insignificant impacts

6.4 Net exposures by workers to safety and health hazards

Non-routine events such as exposures by workers to safety and health hazards by leaks and spills, fires, explosions and blowouts are only likely to occur on the camp site, drilling pad and access routes.

The EMP will include a detailed Emergency Response Plan (ERP) to deal with non-routine incidents that may occur during the field program (See Appendix C). Given the nature of the project and environment, the four priority emergency response considerations outlined in this plan are likely to be:

- Emergency medical evacuation;
- Fire response;
- Spill response; and,
- Blowout Prevention Plan

ERP procedures will be routinely practiced by appropriate personnel before and during operations. Records will be maintained and analyzed, and weak points assessed and corrected allowing continuous improvement of the ERP.

6.5 Net potential for major hazards

Non-routine events such as leaks and spills, fires, explosions and blowouts are only likely to occur on the camp site, drilling pad and access routes, which could be considered the major net potential hazards to the all environmental features including local communities and workers. It is not anticipated, therefore, that there will be any additional adverse impacts to the environment with these non-routine events.

6.6 Consistency with applicable international agreements

As mentioned in chapter 2 (Policy, Legal and Administrative Framework); the main objective of the EIA is to meet or surpass the relevant national and international environmental legislative requirements and guidelines, including regional and international agreements and conventions.

7 Appendices

7.1 Permits issued and pending from environmental authorities

وزارة الدفاع
هيئة عمليات القوات المسلحة
الرقم: [illegible]
التاريخ: [illegible]

موافقة رقم (١٦٨٤) لسنة ٢٠٠٧

إلى السيد / رئيس الإدارة المركزية لأمن قطاع البترول والثروة المعدنية

العنوان / (١) شارع أحمد الزمر – المنطقة الثامنة – مدينة نصر – فاكس ٢٦٧٠٦٤٢٩٧

تحيـة طيبـة ... وبعـد ،،،

إيماء لكتابكم رقم ٤٢ بتاريخ ٢٠٠٧/٧/٢ بشأن طلب الموافقة لشركة أيباتشي نائلة كوربوريشن على القيام بإجراء مسح سيزمي بحري ثلاثي الأبعاد وذلك بمنطقة إلتزامها بسيوة (مسرب القبوية) وبإستخدام طريقة الذبذبات وبدون إستخدام المفرقعات .

نفيدكم بالموافقة على تنفيذ العمل المشار إليه بعاليه في المدة من ٢٠٠٧/٧/١٥ إلى ٢٠٠٧/١٠/١٤ مع الإلتزام بالشروط الآتية :

١ – الإلتزام بتنفيذ العمل في المنطقة المحددة بالإحداثيات والملونة باللون الأحمر على الخريطة المعتمدة المرفقة .

٢ – الإلتزام بالقرار الوزاري رقم ١٤٦ لسنة ٢٠٠٢ .

٣ – الإلتزام بقانون البيئة رقم ٩٤/٤ ولائحته التنفيذية .

٤ – الإلتزام بتنفيذ تعليمات التأمين والحراسة لقوات حرس الحدود بمنطقة العمل .

٥ – الإلتزام بعدم استخدام المتفجرات في أعمال المسح عالية .

٦ – الإلتزام بشروط المسح السيزمي البري الآتية :-

أ – عدم المساس أو الإقتراب من الطرق والمدقات والكوابل العسكرية بمنطقة العمل .

ب – الإلتزام بمراعاة حساب قوة الموجات الزلزالية الصادرة بواسطة الأجهزة المستخدمة وبما لا يؤثر على سلامة المنشآت المطمورة أو التي تحت سطح الأرض أو شبكات الطرق الداخلية بالمعسكرات في منطقة البحث .

ج – التنسيق قبل وأثناء العمل مع قيادة المنطقة الغربية العسكرية – إدارة الإشارة للقوات المسلحة – إدارة المناطق بشأن الآتي :

(١) تحديد منطقة العمل على الطبيعة واتخاذ إجراءات التأمين اللازم اتباعها .

(٢) الإحداثيات الجغرافية لمنطقة العمل .

(٣) تحديد المناطق الغير مسموح العمل بها (وحدات عسكرية / قواعد جوية / مهابط / مناطق ممنوعة) .

(٤) تأمين الكوابل وخطوط المياه العسكرية بمنطقة العمل .

د – الإلتزام بعدم إقامة أي منشآت ثابتة بمنطقة العمل وأن تكون خشبية وسهلة الإزالة .

هـ – تتحمل وزارة البترول تكاليف إعادة الشيء لأصله بعد أعمال البحث داخل أراضي أنشطة القوات المسلحة .

٧ – الإلتزام بدفع التعويضات التي تحددها القوات المسلحة في حالة إتلاف أو تحويل لمسارات الكابلات الإشارية أو الكهربية البرية أو البحرية أو خطوط المياه العسكرية أو أحدث أي خسائر بالمنشآت والوحدات العسكرية وذلك بشيك مقبول الدفع برسم مدير عام جهاز مشروعات أراضي القوات المسلحة .

٨ – التنسيق قبل بدء العمل مع رئاسة مكاتب مخابرات وأمن حرس الحدود ومكتب مخابرات (مطروح) بشأن إستخراج تصاريح العمل اللازمة .

٩ – التنسيق بمعرفة وزارة البترول مع إدارة المخابرات الحربية والإستطلاع لإستصدار التصاريح الخاصة بدخول الأجانب المناطق المحظورة .

١٠ – لا تضمن خلو منطقة العمل من مخلفات الحروب السابقة ويلزم التنسيق مع جهاز مشروعات الخدمة الوطنية في هذا الشأن مع عدم مسئولية القوات المسلحة عن حدوث أية أخطار نتيجة حدوث أي انفجار .

١١ – الإلتزام بعدم خروج أي عينات أو تبادل أو نشر نتائج أبحاث خارج جمهورية مصر العربية إلا بعد الحصول على موافقة الجهات المختصة .

١٢ – تحتفظ القوات المسلحة بحقها في إيقاف العمل عند مخالفة الشروط أو عند الضرورة التي تراها .

١٣ – الرأي عاليه وجهة نظر القوات المسلحة فقط ويلزم الحصول على موافقة الوزارات والهيئات المعنية قبل التنفيذ .

وتفضلوا بقبول فائق الإحترام ...

تعتبر الموافقة لاغية في حالة عدم الإلتزام بالتعليمات المشار إليها بعاليه

التوقيع/
لواء أ.ح / محـمد نبيـل الخميسـي
نائب رئيس هيئة عمليات القـوات المسلحـة

صورة إلى : –

– وزارة الدولة لشئون البيئة – ٣٠ طريق مصر / حلوان الزراعي .

وزارة الدفاع
هيئة عمليات القوات المسلحة
القيد ٤ | ٧٣٠٨ | ١٩٩٦
التاريخ ٢٠٠٧/٨/١٨

١٨٤٢٤/

الموافقة رقم (٤٣٤٣ | ٢٠٠٧)

إلى السيد / رئيس الإدارة المركزية لأمن قطاع البترول والثروة المعدنية
العنوان / ٧ شارع أحمد الزمر – المنطقة الثامنة – مدينة نصر – فاكس ٢٧٠٦٤٢٧

تحية طيبة ... وبعد ،،،

إشارة لكتابكم رقم ٦٠ بتاريخ ٢٠٠٧/٨/١٤ بشأن طلب الموافقة لشركة أناشي خالدة كروبوريشن ل سي دى على قيام شركة وسترن جيكو المقاولة لحاجرات مسح سيزمي برى ثلاثي الأبعاد وذلك بمنطقة العزيزها بالسموم وباستخدام طريقة الأبابات وبدون إستخدام المفرقعات ،

نفيد كم بالموافقة على تنفيذ العمل المشار إليه بعالية في المدة من ٢٠٠٧/٨/٢٥ إلى ٢٠٠٧/١١/٢٤ مع الإلتزام بالشروط الآتية

١ – الإلتزام بتنفيذ العمل في المنطقة المحددة والملونة باللون الأخضر على الخرائط المعتمدة المرفقة .
٢ – الإلتزام بالقرار الوزاري رقم ١٤٦ لسنة ٢٠٠٢ .
٣ – الإلتزام بتنفيذ تعليمات التأمين وحراسة القوات حرس الحدود بمنطقة العمل .
٤ – الإلتزام بقانون البيئة رقم ٤/٩٤ ولائحته التنفيذية .
٥ – الإلتزام بعدم استخدام المفجرات في أعمال المسح عامة .
٦ – الإلتزام بشروط المسح السيزمي الواردة الآتية :-
أ – عدم اقتراب أو الإقتراب من المرافق والمنشآت والكوابل العسكرية بمنطقة العمل
ب – الإلتزام بإزالة حساب قوة الموجات الزلزالية المستخدمة بواسطة الأجهزة المستخدمة وبما لا يؤثر على سلامة المنشآت السطحية أو التي تحت سطح الأرض أو شبكات الطرق المتاخمة بالمعسكرات في منطقة البحث .
ج – التنسيق قبل وأثناء العمل مع إدارة الإشارة وإدارة الدفاع للقوات المسلحة بشأن كوابل الإشارة وخطوط المياه الخاصة بالقوات المسلحة .
د – التنسيق قبل وأثناء العمل مع قيادة المنطقة الغربية العسكرية – إدارة الإشارة للقوات المسلحة وبشأن الآتي :-
(١) تحديد منطقة العمل على الطبيعة وإعداد إجراءات التأمين اللازم اتباعها .
(٢) الإحداثيات الجغرافية لمنطقة العمل .
(٣) تحديد المناطق الغير مسموح العمل بها (وحدات عسكرية / قواعد جوية / مهابط / ميادين رماية) .
(٤) تأمين الكوابل العسكرية بمنطقة العمل .
هـ – الإلتزام بعدم إقامة أي منشآت ثابتة بمنطقة العمل وأن تكون جميعها وسيلة الإزالة .
و – تتحمل وزارة البترول تكاليف إعادة الشيء لأصله بعد اعمال البحث داخل أراضي المنطقة القوات المسلحة .
٧ – الإلتزام بدفع التعويضات التي تحددها القوات المسلحة في حالة إتلاف أو تعويل لمسببات الكهربائية الإشارية أو الكهربية الجوية أو خطوط المياه العسكرية أو أحداث أي خسائر بالمنشآت والوحدات العسكرية وذلك بشيك مقبول الدفع برسم مدير عام جهاز مشروعات أراضي القوات المسلحة
٨ – التنسيق قبل بدء العمل مع رئاسة مكاتب تجارات وأمن حرس الحدود ومكتب عامات (مطروح) بشأن إستخراج تصاريح العمل اللازمة .
٩ – التنسيق بمعرفة وزارة البترول مسبع إدارة المحاجر الجوية والإستطلاع لإستصدار التصاريح الخاصة بدخول الأجسام الطائرة المشرعة .
١٠ – لا يضمن خط منطقة العمل من مخلفات الحروب السابقة ويلزم التنسيق مع جهاز مشروعات الخالد الوطنية في حالة الإشتباه مع عدم مسئولية القوات المسلحة عن حدوث أية أخطار نتيجة حدوث أي انفجار .
١١ – الإخطار بعدم خروج أي بيانات أو نماذج أو مشر خامات خارج جمهورية مصر العربية إلا بعد الحصول على موافقة الجهات المختصة .
١٢ – تحفظ القوات المسلحة بحقها في إيقاف العمل عند مخالفة الشروط أو عند الضرورة التي تراها .
١٣ – الرأي عالية وجهة نظر القوات المسلحة فقط ويلزم الحصول على موافقة الوزارات والهيئات المعنية قبل التنفيذ .

وتفضلوا بقبول فائق الإحترام ،،،

تعتبر الموافقة لاغية في حالة عدم الإلتزام بالتنسيقات المشار إليها بعاليه .

التوقيع /
لواء أ ح / نجيب شبل الجمسي
نائب رئيس هيئة عمليات القوات المسلحة

صورة إلى :-
– وزارة الدولة لشئون البيئة – ٣٠ طريق مصر/حلوان الزراعي .

وزارة الدفاع
هيئة عمليات القوات المسلحة
[illegible]

موافقة رقم (١٧٦٢)

إلى السيد / رئيس الإدارة المركزية لأمن قطاع البترول والثروة المعدنية

العنوان / [illegible] شارع أحمد الزمر – المنطقة الثامنة – مدينة نصر – فاكس [illegible]

تحية طيبة ... وبعد ...،

إيماء لكتابكم رقم ٤٠ بتاريخ ٢٠٠٧/٧/٢ بشأن طلب الموافقة لشركة [illegible] عاملة كوريوشن على القيام بإجراء مسح سيزمي [illegible] الأبعاد وذلك بمنطقة التزامها بالسلوم وباستخدام طريقة الهزازات وبدون استخدام المفرقعات .

نفيدكم بالموافقة على تنفيذ العمل المشار إليه بعاليه في المدة من ٢٠٠٧/٧/٢٠ إلى ٢٠٠٧/١٠/١٩ مع الالتزام بالشروط الآتية :

١- الالتزام بتنفيذ العمل في المنطقة المحددة بالإحداثيات والملونة باللون الأحمر على الخريطة المعتمدة المرفقة .
٢- الالتزام بالقرار الوزاري رقم ١٤٦ لسنة ٢٠٠٢ .
٣- الالتزام بقانون البيئة رقم ٤ لسنة ١٩٩٤ ولائحته التنفيذية .
٤- الالتزام بتنفيذ تعليمات التأمين والحراسة لقوات حرس الحدود بمنطقة العمل .
٥- الالتزام بعدم استخدام المتفجرات في أعمال المسح عاليه .
٦- الالتزام بشروط المسح السيزمي البري الآتية :-
أ- عدم المساس أو الاقتراب من الطرق والمنشآت والكوابل العسكرية بمنطقة العمل .
ب- الالتزام بمراعاة حساب قوة الموجات الزلزالية المنبعثة بواسطة الأجهزة المستخدمة وبما لا يؤثر على سلامة المنشآت العسكرية أو التي تحت سطح الأرض أو شبكات الطرق الداخلية بالمعسكرات في منطقة البحث .
ج- التنسيق قبل وأثناء العمل مع قيادة المنطقة الغربية العسكرية / إدارة الإشارة للقوات المسلحة / إدارة المياه بشأن الآتي :
(١) تحديد منطقة العمل على الطبيعة واتخاذ إجراءات التأمين اللازم لها .
(٢) الإحداثيات الجغرافية لمنطقة العمل .
(٣) تحديد المناطق الغير مسموح العمل بها (وحدات عسكرية / قواعد جوية / مهابط / ميادين رماية) .
(٤) تأمين الكوابل وخطوط المياه العسكرية بمنطقة العمل .
د- الالتزام بعدم إقامة أي منشآت ثابتة بمنطقة العمل وأن تكون خشبية وسهلة الإزالة .
هـ- تتحمل وزارة البترول تكاليف إعادة الشيء لأصله بعد أعمال البحث داخل أراضي أنشطة القوات المسلحة .
٧- الالتزام بدفع التعويضات التي تحددها القوات المسلحة في حالة إتلاف أو تحويل لمسارات الكابلات الإشارية أو الكهربية البرية أو البحرية أو خطوط المياه العسكرية أو أحداث أي عثر بالمنشآت والوحدات العسكرية وذلك طبقاً لجدول [illegible] عام جهاز مشروعات أراضي القوات المسلحة .
٨- التنسيق قبل بدء العمل مع رئاسة مكاتب مخابرات وأمن حرس الحدود ومكتب مخابرات (السلوم) بشأن استخراج تصاريح العمل اللازمة .
٩- التنسيق بمعرفة وزارة البترول مع إدارة المخابرات الحربية والاستطلاع لاستصدار التصاريح الخاصة بدخول الأجانب للمناطق الممنوعة .
١٠- لا نضمن خلو منطقة العمل من مخلفات الحروب السابقة ويلزم التنسيق مع جهاز مشروعات الخدمة الوطنية في هذا الشأن مع عدم مسئولية القوات المسلحة عن حدوث أية أخطار نتيجة حدوث أي انفجار .
١١- الالتزام بعدم خروج أي عينات أو بيانات أو نشر نتائج أبحاث خارج جمهورية مصر العربية إلا بعد الحصول على موافقة الجهات المختصة .
١٢- تحتفظ القوات المسلحة بحقها في إيقاف العمل عند مخالفة الشروط أو عند الضرورة التي تراها .
١٣- الرأي عاليه وجهة نظر القوات المسلحة فقط ويلزم الحصول على موافقة الوزارات والجهات المعنية قبل التنفيذ .

وتفضلوا بقبول فائق الاحترام ...

تعتبر الموافقة لاغية في حالة عدم الالتزام بالتعليمات المشار إليها بعاليه

التوقيع /
لواء أ.ح / [illegible]
نائب رئيس هيئة عمليات القوات المسلحة

صورة إلى :-
- وزارة الدولة لشئون البيئة – ٣٠ طريق مصر / حلوان الزراعي .

وزارة الدفـــــــاع
هيئة عمليات القوات المسلحة
الفهـــد : ٥/١/٣٠٨/٢٨٢٥
التاريخ : ٢٠٠٦/١٢/٢٨

لحضرة السيد العميد/ محروس الكيرش

فاكس رقم ٠٢٢٤٢١

٠٢٣١٩٧٩

موافقة رقم (٢٥٨١) (٢٠٠٦)

إلى السيد / رئيس الإدارة المركزية لأمن قطاع البترول والثروة المعدنية

العنوان / ١١ شارع أحمد الزمر – المنطقة الثامنة – مدينة نصر – فاكس ٢٧٠٦٩٤٢٧

تحيـــة طيبـــة ... وبعـــد ،،،

إلحاقا لكتابكم رقم ٤١٥ بتاريخ ٢٠٠٦/٥/٢٠ والمتضمن الموافقة لشركة ريجل إيجيبت ليمتد على قيام شركة وسترن جيكو المقاولة بإجراء مسح سيزمى برى ثلاثى الأبعاد بمنطقة إلتزامها بشرق رأس بشران بجنوب سيناء وباستخدام طريقة الهزازات وبدون إستخدام المفرقعات ؟

ونيابة عن تكنايكو رقم ٤٢ بتاريخ ٢٠٠٦/١٢/١٤ بشأن طلب إمتداد الموافقة على العمل المشار إليه بعاليه ،

نفيد كم بالموافقة على إمتداد العمل المشار إليه بعاليه فى المدة من ٢٠٠٦/١٢/٢٥ إلى ٢٠٠٧/٣/٢٤ مع الإلتزام بالشروط الآتية

١ – الإلتزام بتنفيذ العمل فى المنطقة المحددة والموثقة بالمونتاج الأخضر على الخريطة المعتمدة المرفقة .
٢ – الإلتزام بالقرار الوزارى رقم ١٤٦ لسنة ٢٠٠٢ .
٣ – الإلتزام بقانون البيئة رقم ٩٤/٤ ولائحته التنفيذية .
٤ – الإلتزام بشروط المسح السيزمى البرى الآتية :–
أ – عدم المساس أو الاقتراب من الطرق والمدقات والكوابل العسكرية بمنطقة العمل .
ب – الإلتزام بمراعاة حساب قوة الموجات الزلزالية المستخدمة بواسطة الأجهزة المستخدمة وبما لا يؤثر على سلامة المنشآت المسطحة أو التى تحت سطح الأرض أو شبكات الطرق الداخلية بالمعسكرات فى منطقة البحث وعدم إستخدام المفرقعات فى أعمال المسح .
ج – التنسيق قبل وأثناء العمل مع إدارة الاشارة وإدارة المياه للقوات المسلحة بشأن كوابل الإشارة وخطوط المياه الخاصة بالقوات المسلحة .
د – التنسيق قبل والبدء بالعمل مع (قيادة الجيش الثالث الميدانى) بشأن مواقعها بالاتى :–
(١) بإحداثيات منطقة العمل على الطبيعة وإتخاذ إجراءات التأمين اللازم إتباعها .
(٢) تحديد المناطق الغير مسموح العمل بها (وحدات عسكرية / قواعد جوية / مهابط / ميادين رماية) .
هـ – الإلتزام بعدم إقامة أى منشآت ثابتة بمنطقة العمل وأن تكون خشبية وسهلة الإزالة .
و – تتحمل وزارة البترول تكاليف إعادة الشىء لأصله بعد أعمال البحث داخل أراضى أنشطة القوات المسلحة .
٥ – الإلتزام بدفع التعويضات التى تحددها القوات المسلحة فى حالة إتلاف أو تعويل لمسارات الكابلات الإشارية أو الكهربية البرية أو البحرية أو خطوط المياه العسكرية أو أحداث أى خسائر بالمنشآت والوحدات العسكرية وذلك بشيك مقبول الدفع برسم مدير عام جهاز مشروعات أراضى القوات المسلحة
٦ – التنسيق قبل بدء العمل مع رئاسة مكاتب مخابرات وأمن حرس الحدود ومكتب مخابرات (السويس) بشأن إستخراج تصاريح العمل اللازمة .
٧ – عدم تحميل القوات المسلحة أى مسئولية قانونية عن حدوث أى خسائر بالأفراد / المعدات نتيجة وقوع منطقة البحث المشار اليها بعاليه داخل ميادين الرماية .
٨ – التنسيق بمعرفة وزارة البترول مع إدارة المخابرات الحربية والإستطلاع لإستصدار التصريح الخاص بدخول الأجانب المناطق الممنوعة .
٩ – لايتضمن حق منطقة العمل من مخلفات الحروب السابقة ويلزم التنسيق مع جهاز مشروعات الخدمة الوطنية فى هذا الشأن مع عدم مسئولية القوات المسلحة عن حدوث أية أخطار نتيجة حدوث أى انفجار .
١٠ – الإلتزام بعدم خروج أى عينات أو نماذج أو نشر نتائج أبحاث خارج جمهورية مصر العربية إلا بعد الحصول على موافقة الجهات المختصة .
١١ – تحتفظ القوات المسلحة بحقها فى إيقاف العمل عند مخالفة الشروط أو عند الضرورة التى تراها .
١٢ – الرأى عالية وجهة نظر القوات المسلحة فقط ويلزم الحصول على موافقة الوزارات والجهات المعنية قبل التنفيذ .

وتفضلوا بقبول فائق الإحترام ...

التوقيع /
لواء أ ح / نجيب شبل الجمسى
نائب رئيس هيئة عمليات القوات المسلحة

تعتبر الموافقة لاغية فى حالة عدم الإلتزام بالتنسيقات المشار إليها بعاليه .

مع تحيـــات
الإدارة المركزية لأمن وزارة البترول

صورة إلى : –
– وزارة الدولة لشئون البيئة – ٣٠ طريق مصر / حلوان الزراعى .

وزارة الدفـــــــــاع
هيئة عمليات القوات المسلحة
القيـــــد (١٢٣٠٨ / ١٢٢٠) ٣٨-٢٠٠٧
التاريخ ٢٩ / ١٢ / ٢٠٠٧

موافقة رقم (٢٠٠٧ / ١١٠)

إلى السيد / رئيس الإدارة المركزية لأمن قطاع البترول والثروة المعدنية
العنوان / ١٧ شارع أحمد الزمر – المنطقة الخامسة – مدينة نصر – فاكس ٢٧٠٠٦٤٢٧

تحيـــة طيبـــة ... وبعـــد ...

إحاقا لكتابنا رقم ١٩٦٩٤ بتاريخ ٢٠٠٧/٩/٤ و بخصوص الموافقة بشركة إيسادنى حالة كوربوريشن على قيام شركة ويسترن جيكو القابضة فى بإجراء مسح سيزمى برى ثلاثى الأبعاد وذلك بمنطقة إنتزعها بغرب غرداقة وباستخدام طريقة النبضات .
وإفادة لكتابكم رقم ٧٤ بتاريخ ٢٠٠٧/١٠/٢٣ بشأن طلب إعتماد الموافقة على العمل المشار إليه بعالية .
نفيد كم بالموافقة على إعتماد العمل المشار إليه بعالية فى المدة من ٢٠٠٧/١٢/٨ إلى ٢٠٠٨/٦/٧ مع الإلتزام بالشروط الآتية .

١- الإلتزام بتقيد العمل فى المنطقة المحددة والمبينة باللون الأخضر على الخريطة المعتمدة المرفقة .
٢- الإلتزام بالقرار الوزارى رقم ١٤٦ لسنة ٢٠٠٣ .
٣- الالتزام بقانون البيئة رقم ٤ لسنة ١٩٩٤ لائحته التنفيذية .
٤- الالتزام بتنفيذ تعليمات التأمين وإحراسة لقوات حرس الحدود بمنطقة العمل .
٥- الإلتزام بعدم استخدام المتفجرات فى أعمال المسح عالية .
٦- الإلتزام بشروط المسح السيزمى البرى الآتية :-
أ – عدم المساس أو الإقتراب من الطرق والمدقات و لكوابل العسكرية بمنطقة العمل .
ب –الإلتزام بإعادة حساب قوة الموجات الزلزالية المصنعة بواسطة الأجهزة المستخدمة وبما لا يؤثر على سلامة المنشآت العسكرية أو التى تحت سطح الأرض أو شبكات الطرق الداخلية بالمعسكرات فى منطقة البحث .
ج – التنسيق قبل وأثناء العمل مع إدارة الأشغال وإدارة المياه لقوات المسلحة بشأن كوابل الإشارة وخطوط المياه الخاصة بالقوات المسلحة .
د – التنسيق قبل وأثناء العمل مع (قيادة المنطقة الغربية العسكرية – إدارة الإشارة للقوات المسلحة) بشأن الآتى :
(١) مراجعة منطقة العمل على الطبيعة وأخذ إجراءات التأمين اللازم اتباعها .
(٢) الإحداثيات الجغرافية لمنطقة العمل .
(٣) تحديد المناطق الغير مسموح العمل بها (وحدات عسكرية / قواعد جوية / مطارات / مساكن وغابة) .
(٤) تأمين الكوابل وخطوط المياه العسكرية بمنطقة العمل .
هـ – الإلتزام بعدم إقامة أى منشآت دائمة بمنطقة العمل وأن تكون خفيفة وسهلة الإزالة .
و – تحمل وزارة البترول تكاليف إعادة الشئ لأصله بعد أعمال البحث داخل أو على أنشطة القوات المسلحة .
٧ – الإلتزام بدفع التعويضات التى تحددها القوات المسلحة فى حالة إتلاف أو تخريل لمنشآت الكابلات الإشارة أو الكهربية أو خطوط المياه العسكرية أو أحداث أى خسائر بالمنشآت والوحدات العسكرية وذلك بشيك مقبول الدفع بوسم تاجر خام جهاز مشروعات أراضى القوات المسلحة .
٨ – التنسيق قبل بدء العمل مع رئاسة مكاتب محاورات ومكتب محاورات (مطروح) بشأن إستخراج تصاريح العمل اللازمة .
٩ - التنسيق بمعرفة وزارة البترول مع إدارة المحاورات الحربية والاستطلاع لإستخدام التصاريح الخاصة بالخبراء الأجانب المناطق الممنوعة .
١٠ - لايعمل خلو منطقة العمل من مخلفات الحروب السابقة ويلزم التنسيق مع جهاز مشروعات الخدمة لوعليه فى هذا الشأن مع عدم مسئولية القوات المسلحة عن حدوث أية أخطار نتيجة حدوث أى انفجار .
١١ - الإلتزام بعدم خروج أى عينات أو تبادل أو نشر نتائج أبحاث خرج جمهورية مصر العربية إلا بعد الحصول على موافقة الجهات المختصة .
١٢- تحتفظ القوات المسلحة بحقها فى إيقاف العمل عند مخالفة الشروط أو عند الضرورة التى تراها .
١٣ - نرى عالية وجهة نظر القوات المسلحة فقط ويلزم الحصول على موافقة الوزارات والهيئات المعنية قبل التنفيذ .

وتقبلوا بقبول فائق الإحترام ...

تعتبر الموافقة لاغية فى حالة عدم الإلتزام بالتنسيقات المشار إليها بعالية

التوقيع /
لواء أ ح / نجيب بلال الجمسى
نائب رئيس هيئة عمليات القوات المسلحة

صورة إلى :-
- وزارة الدولة لشئون البيئة – ٣٠ شارع مصر / حلوان الزراعى .

7.2 Author information

7.2.1 Names, affiliations and qualifications of project team

Name	Position	Qualifications
Waleed Mahmoud	Chairman, EPSCO	Over ten years & more than 200 EIA Studies closely involved with the following Environmental & Safety aspects within petroleum sector. - Environmental Studies, - EMS application, - Hazardous waste management, - Environmental monitoring, - Oil spill combating, - Environmental audits and Compliance action plans, - Oil Base Mud Cuttings Treatment Techniques, - HAZAN studies, - Inspection visits, and - HAZOP studies.
Nabil Helmy Ahmed	Head of Environmental Department, EPSCO	- Seven years experience in the fields of "Biodiversity Conservation and Management" & "Coastal zone Management". - Three years experience in the fields of "Hazardous waste Management", "Environmental inspection" & "Pollution prevention and abatement". - Six years experience in "Environmental Impact Assessment (EIA) of different development activities (Petroleum, industrial & touristic).
Mohamad Ali	Environmental Director, EPSCO	- Environmental impact assessment in the energy and infrastructure sectors - Hazardous waste management: site assessment, data analysis, modeling, and remediation - Marine pollution abatement and oil spill contingency planning - Air force site innovative remediation studies - Water and waste water engineering - Water resources assessment, planning, and management - Air quality management
Ahmed Mostafa	Environmental Director, EPSCO	More than twenty Years of experience in Human resources consultation and training, along with strategic planning, reorganization, and change strategies. The experience includes also market surveys, marketing consultations and training.
Mahmoud Nour Eldeen	Senior Environmental Specialist.	Total 9 years experience in the field of environment (with a masters degree in Environment from Ain Shams University 2007). Expertise includes environmental auditing, environmental management, air quality and stack emission monitoring, air quality modeling, and environmental impact assessment. Experience as a senior environmental specialist for various types

		of industry including Environmental reviews/compliance audits against Egyptian environmental law Environmental monitoring, Air quality and stack emission monitoring, environmental impact assessment. Senior environmental specialist in the Egyptian Environmental Affairs Agency (EEAA), senior environmental specialist in EPSCO.
Ehsan El Hady	Environmental Specialist.	- Environmental & Social Impact Assessments (ESIA); - Terrestrial and Marine Assessments; - Environmental Audits; - Marine, terrestrial and wetland natural resources/protectorates management; - Coastal zone management; and - Marine and Terrestrial surveys and monitoring

7.2.2 Relationship of authors to project sponsors

Mr. Waleed Mahmoud Chairman of EPSCO served Apache Egypt Companies with the following Services:

List of the QC Seismic projects

1. Qarun Petroleum Company, QC on 3D seismic acquisition operations in Beni Suef concession for CGG acquisition (Running from August 2008).

2. Apache Egypt Company, QC on 3D seismic acquisition operations in Ghazalat concession for western Geco acquisition (Completed in March 2008).

3. Apache Egypt Company, QC on 3D seismic acquisition operations in Siwa concession for Western Geco acquisition (Completed in December 2007).

4. Apache Egypt Company, QC on 3D seismic acquisition operations in Siwa concession for CGG HPVA acquisition (Completed in November 2007).

5. Apache Egypt Company, QC on 3D seismic acquisition operations in Sallum concession for CGG HPVA acquisition (Completed in October 2007).

6. Apache Egypt Company, QC on 3D seismic acquisition operations in Sallum Concession for WesternGeco Q- Land acquisition (Completed in September 2007).

7. Apache Egypt Company, QC on 3D seismic acquisition operations in West Kanayes for CGG HPVA acquisition (Completed in July 2007).

8. Apache Egypt Company, QC on 3D seismic acquisition operations in East Bahariya South Extension for CGG HPVA acquisition (Completed in May 2007).

9. Apache Egypt Company, QC on 2D/3D seismic acquisition operations in East Ras Budran GOS for WesternGeco acquisition (completed in March 2007).

10. Apache Egypt Company, QC on 2D/3D seismic acquisition operations in East Beni Suef for CGG HPVA acquisition (Completed in March 2007).

11. Apache Egypt Company, QC on seismic acquisition operation in El Diyur West for 3C Multi-Component acquisition (completed in October 2006).

12. Apache Egypt Company, QC on seismic acquisition operation in El Diyur East for CGG HPVA acquisition (completed in August 2006).

13. Apache Egypt Company, QC on seismic acquisition operation in East Bahariya for CGG HPVA acquisition (completed in November 2006).

14. Apache Egypt Company, QC on seismic acquisition operation in West Kalabsha for WesternGeco Q-Land acquisition (completed in April 2006).

List of the EIA projects

1. Apache Egypt Companies, Environmental Impact Assessment study for Akik well early production facilities in west Mediterranean - March 2001

2. Apache Egypt Companies, Environmental Impact Assessment study for ASALA - 1 well in East Baharya area – July 2001

3. Apache Egypt Companies, Environmental Impact Assessment study for Abu Sir-1x Exploratory well in west Mediterranean Deepwater Concession – October 2001

4. Apache Egypt Companies, Environmental Impact Assessment study for Karama SE-1 exploratory well in East Baharya area – November 2001

5. Apache Egypt Companies, Environmental Impact Assessment study for Abu Sir-2x exploratory well in west Mediterranean Deepwater Concession – April 2002

1. Apache Egypt Companies, Environmental Impact Assessment study for Al Bahig- 1x, Offshore exploratory well in west Mediterranean Deepwater – May 2002

2. Apache Egypt Companies, Environmental Impact Assessment study for Misaada-1x onshore exploratory well in East Bahariya Concession – May 2002

3. Apache Egypt Companies, Environmental Impact Assessment study for Zomorod-1x onshore exploratory well in East Bahariya Concession – May 2002

4. Apache Egypt Companies, Environmental Impact Assessment study for MAS-1x onshore exploratory well in East Bahariya Concession – May 2002

5. Apache Egypt Companies, Environmental Impact Assessment study for Solitair-1x onshore exploratory well in East Bahariya Concession – May 2002

6. Apache Egypt Companies, Environmental Impact Assessment study for Amana- 1x Onshore exploratory well in East Bahariya Concession – June 2002

7. Apache Egypt Companies, Environmental Impact Assessment study for Rabowa- 1x Onshore exploratory well in East Bahariya Concession – June 2002

8. Apache Egypt Companies, Environmental Impact Assessment study for Karama SE -2x Onshore exploratory well in East Bahariya Concession – July 2002

9. Apache Egypt Companies, Environmental Impact Assessment study for Karama SW-2X Onshore exploratory well in East Bahariya Concession – July 2002

10. Apache Egypt Companies, Environmental Impact Assessment study for El King -1x offshore exploratory well in West Mediterranean Deepwater Concession – August 2002

11. Apache Egypt Companies, Environmental Impact Assessment study for El Max – 1x offshore exploratory well in West Mediterranean Deepwater Concession – August 2002

12. Apache Egypt Companies, Environmental Impact Assessment study for El Vis -1x Offshore exploratory well in West Mediterranean Deepwater Concession – November 2002

13. Apache Egypt Companies, Environmental Impact Assessment study for El Agami – 1x Offshore exploratory well in West Mediterranean Deepwater Concession – November 2002

14. Apache Egypt Companies, Environmental Impact Assessment study for Abu Sir – 3x offshore exploratory well in West Mediterranean Deepwater Concession – January 2003

15. Apache Egypt Companies, Environmental Impact Assessment study for El king – 2X offshore exploratory well in West Mediterranean Deepwater Concession – January 2003

16. Apache Egypt Companies, Environmental Impact Assessment study for Yamama -1x offshore exploratory well in West Mediterranean Deepwater Concession – January 2003

17. Apache Egypt Companies, Environmental Impact Assessment study for Farash – 1x offshore exploratory well in West Mediterranean Deepwater Concession – January 2003

18. Apache Egypt Companies, Environmental Impact Assessment study for El Tan Jan -1x offshore exploratory well in West Mediterranean Deepwater Concession, April 2003

19. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya - 11 onshore exploratory well in East Bahariya Concession – April 2003

20. Apache Egypt Companies, Environmental Impact Assessment study for El Max -2x offshore exploratory well in West Mediterranean Deepwater Concession – June 2003

21. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-15x onshore exploratory well in East Bahariya Concession – September 2003

22. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-17x onshore exploratory well in East Bahariya Concession – September 2003

23. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-19x onshore exploratory well in East Bahariya Concession – September 2003

24. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-21x onshore exploratory well in East Bahariya Concession – September 2003

25. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-23x onshore exploratory well in East Bahariya Concession – September 2003

26. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-25x onshore exploratory well in East Bahariya Concession – September 2003

27. Apache Egypt Companies, Environmental Impact Assessment study for 3D Seismic onshore Survey in East Bahariya Concession – Western Desert October 2003

28. Apache Egypt Companies, Environmental Impact Assessment study for 3D Seismic onshore Survey in Wadi El Rayan Concession – October 2003

29. Apache Egypt Companies, Environmental Impact Assessment study for 3D Seismic onshore Survey in Beni Suef Concession – October 2003

30. Apache Egypt Companies, Environmental Impact Assessment study for West Med. Development facilities (8 wells+ 75 Km Pipelines + Gas plant) in West Mediterranean Deepwater Concession according to OPIC and World Bank Guidelines – October 2003

31. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Survey) in North East Bahariya Concession – December 2003

32. Apache Egypt Companies, Environmental Impact Assessment study for Apache Egypt Companies all Onshore activities and all Apache Concessions according to OPIC and World Bank Guidelines. – February 2004.

33. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya – 34 exploratory well in East Bahariya Concession - September 2004

34. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya – 35 exploratory well in East Bahariya Concession - October 2004

35. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya – 32 exploratory well in East Bahariya Concession - December 2004

36. Apache Egypt Companies, Environmental Impact Assessment study for El Diyur – 2 exploratory well in El Dayir Concession – January 2005

37. Apache Egypt Companies, Environmental Impact Assessment study for El Diyur -3 exploratory well in El Dayir Concession – February 2005

38. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya – 37 exploratory well in East Bahariya Concession - March 2005

39. Apache Egypt Companies, Environmental Impact Assessment study for El Diyur -4 exploratory well in El Dayir Concession – April 2005

40. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Survey) in Shushan Concession – Western Desert, May 2005

41. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Survey) in West Kalabsha Concession – Western Desert, May 2005

42. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Survey) in North Tarek Concession – Western Desert, May 2005

43. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Survey) in West Kanayis Concession – Western Desert, May 2005

44. Apache Egypt Companies, Environmental Impact Assessment study for North El Diyur -1 exploratory well in El Dayir Concession – August 2005

45. Apache Egypt Companies, Environmental Impact Assessment study for El Diyur -7 exploratory well in El Dayir Concession – September 2005

46. Apache Egypt Companies, Environmental Impact Assessment study for El Diyur -9 exploratory well in El Dayir Concession – September 2005

47. Apache Egypt Companies, Environmental Impact Assessment study for North El Diyur -2 exploratory well in El Dayir Concession – September 2005

48. Apache Egypt Companies, Environmental Impact Assessment study for El Faghour -1 Exploratory Well in West Kalabsha Concession – January 2006

49. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Onshore Survey) in East Bahariya Concession – Western Desert, February 2006

50. Apache Egypt Companies, Environmental Impact Assessment study for North Dayir –4x Exploratory Well in EL Dayir Concession – Western Desert, April 2006

51. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya –38 Exploratory Well in the new extension of East Bahariya Concession – Western Desert, April 2006

52. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya –39 Exploratory Well in the new extension of East Bahariya Concession – Western Desert, May 2006

53. Apache Egypt Companies, Environmental Impact Assessment study for North Dayir –3x Exploratory Well in EL Dayir Concession – Western Desert, June 2006

54. Apache Egypt Companies, Environmental Impact Assessment study for North Dayir –5x Exploratory Well in EL Dayir Concession – Western Desert, July 2006

55. Apache Egypt Companies, Environmental Impact Assessment study for WKAN-B Exploratory Well in West Kanayis Concession – Western Desert, September 2006

56. Apache Egypt Companies, Environmental Impact Assessment study for WKAN-C Exploratory Well in West Kanayis Concession – Western Desert, September 2006

57. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic offshore Survey) in Ras Budran Concession – Gulf of Suez, November 2006

58. Apache Egypt Companies, Environmental Impact Assessment study for N. TAREK-A-1x Exploratory Well in North Tarek Concession – Western Desert, January 2007

59. Apache Egypt Companies, Environmental Impact Assessment study for East Ras Budran- 1 Exploratory Well in Ras Budran Concession – Gulf of Suez, February 2007

60. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Onshore Survey) in East Bahariya Concession – Western Desert, March 2007

61. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Onshore Survey) in West Kanayes Concession – Western Desert, March 2007

62. Apache Egypt Companies, Environmental Impact Assessment study for N. TAREK-B-1x Exploratory Well in North Tarek Concession – Western Desert, April 2007

63. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Onshore Survey) in Siwa North Concession – Western Desert, May 2007

64. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Onshore Survey) in Sallum Concession – Western Desert, May 2007

65. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-A-1x onshore exploratory well in East Bahariya Concession – June 2007

66. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-B-1x onshore exploratory well in East Bahariya Concession – July 2007

67. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-C-1x onshore exploratory well in East Bahariya Concession – July 2007

68. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-D-1x onshore exploratory well in East Bahariya Concession – July 2007

69. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-E-1x onshore exploratory well in East Bahariya Concession – July 2007

70. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-F-1x onshore exploratory well in East Bahariya Concession – July 2007

71. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Onshore Survey) in Siwa South Concession – Western Desert, July 2007

72. Apache Egypt Companies, Environmental Impact Assessment study (3D Seismic Onshore Survey) in West Ghzalaat Concession – Western Desert, July 2007

73. Apache Egypt Companies, Environmental Impact Assessment study for West Kalabsha- A -1x onshore exploratory well in West Kalabsha Concession – October 2007

74. Apache Egypt Companies, Environmental Impact Assessment study for East Ras Budran-B-1x onshore exploratory well in Ras Budran Concession – October 2007

75. Apache Egypt Companies, Environmental Impact Assessment study for East Ras Budran-B-2x onshore exploratory well in Ras Budran Concession – December 2007

76. Apache Egypt Companies, Environmental Impact Assessment study for North Tarek-C-1x onshore exploratory well in North Tarek Concession – December 2007

77. Apache Egypt Companies, Environmental Impact Assessment study for SIWA-A-1x onshore exploratory well in Siwa Concession – January 2008

78. Apache Egypt Companies, Environmental Impact Assessment study for SIWA-C-1x onshore exploratory well in Siwa Concession – May 2008

79. Apache Egypt Companies, Environmental Impact Assessment study for East Bahariya-K-1x onshore exploratory well in East Baharyia Concession – May 2008

80. Apache Egypt Companies, Environmental Impact Assessment study for SALL- A - 1x Exploratory Well onshore exploratory well in Sallum Concession – September 2008

81. Apache Egypt Companies, Environmental Impact Assessment study for WGHAZ- A - 1x Exploratory Well onshore exploratory well in West Ghazalat Concession – September 2008

82. Apache Egypt Companies, Environmental Impact Assessment study for SALL- D - 1x Exploratory Well onshore exploratory well in Sallum Concession – September 2008

83. Apache Egypt Companies, Environmental Impact Assessment study for SALL- B - 1x Exploratory Well onshore exploratory well in Sallum Concession – September 2008

List of the Integrated Permits projects

1. Apache Egypt Companies, compensation to land owners and farmers (3D Seismic Survey) in beni suef Concession – Western Desert, May 2004

List of camping and catering projects

1. Apache Egypt Companies, fly camp for 3D Seismic Survey of El dayir Concession, June 2006

List of our training for Apache

1. 3D Seismic Design Course.
2. Seismic Data Processing.

Our Relation with OPIC

1. Apache Egypt Companies, Environmental Impact Assessment study for West Med. Development facilities (8 wells+ 75 Km Pipelines + Gas plant) in West Mediterranean Deepwater Concession according to OPIC and World Bank Guidelines – October 2003

2. Apache Egypt Companies, Environmental Impact Assessment study for Apache Egypt Companies all Onshore activities and all Apache Concessions according to OPIC and World Bank Guidelines. – February 2004.