6. Stakeholder Consultation

It is best to initiate the stakeholder consultation process at an early stage in a project cycle. This ensures that feedback from communities and other stakeholders directly or indirectly affected by the project can be used to adjust and improve the project's design, planning, and implementation, and help structure the project to be both environmentally and socially sound.

For this purpose two separate rounds of public consultations were held as part of this ESIA. The initial round, involving socioeconomic data gathering, was undertaken from June 1 to 4, 2010. The second round of consultations was made between June 19 and June 24, 2010. The third and final round of talks and consultations was held from August 26 to August 30, 2010. Apart from the local community, consultations with relevant government and non-government organizations and associations, as well as women in nearby settlements, were also held. A female sociologist was brought in to conduct these consultations. An introductory leaflet providing basic information about the project and its environmental and social impacts in Urdu was prepared and distributed amongst the participants of stakeholders' consultations (see **Appendix E**).

6.1 Objectives of Stakeholder Consultations

- The overall objectives of the public consultation process are as follows:
- To inform primary as well as secondary stakeholders about Project activities
- To gather feedback from primary and secondary stakeholders on Project activities
- To identify relevant potential issues, including the socioeconomic impact of the Project, and corresponding mitigation measures.

6.2 Identification of Stakeholders

Stakeholders are people, groups, or institutions that may be affected by, can significantly influence, or are important to the achievement of the stated purpose of a proposed intervention. Primary and secondary stakeholders are to be identified based on definitions provided in the ADB's Handbook on Poverty and Social Analysis:

1. *Primary Stakeholders:* People, groups or institutions affected positively (beneficiaries) or negatively (e.g., involuntary resettlers) by the project
2. *Secondary Stakeholders*: People, groups, or institutions that are important intermediaries in the project delivery process (e.g., the ADB, government line agencies, or NGOs)

For this Project, primary stakeholders are limited to local landowners and members of resident communities. Secondary stakeholders are mainly relevant government departments, NGOs, and welfare associations.

The government organization that was consulted is the Sindh Irrigation and Drainage Authority (SIDA), Ghotki.

Other organizations working in the Study Area that were consulted are the SRSO (Sindh Rural Support Organization) and NCHD (National Commission for Human Development).

A list of individuals and organizations consulted during the course of this study is given in **Exhibit 6.1**.

6.3 Primary Stakeholders Consultation

6.3.1 Topics for Discussion

Given below is a list of the topics that were covered during the meetings:

- Water
- Employment
- Pollution
- Community development
- Traffic
- Non-local workforce
- Gender issues.

The proposed site is located on an agricultural field and has no human settlement, while there are no major settlements in the vicinity of the site either, and therefore the issues of relocation and compensation are not relevant and hence not discussed.

Consultation Process

The consultants held meetings with primary stakeholders. To assess any potential gender issues that could be triggered by Project activities, separate consultations were held with the females of nearby villages. The survey team visited almost all the major settlements and villages in the Study Area that could be affected by the proposed Project activities. As a result, stakeholder consultations were conducted in 21 villages in the final round of consultations. **Exhibits 6.2** and **6.3** show photographs of theses consultation sessions.

During these consultations a simple, non-technical description of the Project was given in Urdu language in the form of an information leaflet, along with an overview of the project's likely human and environmental impact. Following the project description, a discussion was held so that the participants could voice their questions, concerns, and opinions. These concerns and suggestions were recorded in the field notes.

6.3.2 Outcomes of Consultations

Exhibit 6.4 summarizes the issues and concerns raised by the community.

Community Safety

The participants of the public consultations expressed concern over the safety hazard that could result from the increase in the road traffic, particularly during the construction

phase of the project. They suggested that the single unpaved road leading to the project site from the national highway should be widened and compacted and, if necessary, should be sprinkled with water to avoid any dust emissions resulting from heavy vehicular movement on the access track. People also suggested that speed limits should be imposed and unnecessary blowing of horns should be avoided to the extent possible.

It was also demanded by the local communities that the road should be rebuilt and maintained as it was recently damaged by the heavy traffic of another power project near the proposed plant site which also used the same access track for the transport of materials and equipments to and from the plant site.

Employment

The participants of the public consultation meetings emphasized the need to employ locals in all non-technical and support services through a transparent process. They also insisted that all salary payments should be made directly to them and that the employment should be given on permanent basis, not on short-term contract.

Project Benefits

Local communities expressed a deep belief that potential Project benefits should be focused on the development of local infrastructure, health and education facilities for the poor and needy people of the Project Area.

They also demanded that water filtration plants should be installed for the people living in the vicinity of the power plant as the groundwater in the study area is saline and is declared unfit for drinking by the people of the study area.

Community Health

The more educated locals expressed the concern that emissions from the power plant during operational phase would affect the ambient air quality in the area. Also, community members living near the plant site were afraid that effluents from the plant would contaminate their groundwater.

Cooperation with the Community

The participants expressed the view that Project proponents should adopt and maintain a cooperative attitude towards the community.

6.3.3 Outcomes of Consultations with the Women of the Project Area

Consultations with the females of the study area were taken simultaneously but separately to get both the male and female perspective, and to assure the community that both genders were being consulted equally. Some of the additional points highlighted during the consultations with female community members are discussed below.

Employment

Employment for the locals and women of the area was a major concern. They also complained that most previous development projects in the area had ignored the local communities, especially the women.

Community Health

Women and child care was another area of concern for the females in the study area and they demanded proper medical facilities, as fatalities and complications during childbirth are very common in the area.

6.4 Meetings with Secondary Stakeholders

Heads of relevant secondary stakeholders were met at their respective offices during the consultation process.

6.4.1 Consultations with Government and Semi-government Departments

Consultations with relevant government officials and departments is an essential part of the environmental assessment process. For this purpose, meetings were held with different officials of the government and semi-government agencies working in the Study Area as described below.

Sindh Irrigation and Drainage Authority (SIDA)

A meeting was held with the Mr Abdur Rashid Khosa, Director, SIDA, in his office at Ghotki. He expressed his appreciation for the Project and assured his department's full cooperation to help meet the country's dire need for more power and for the people of the area to also benefit from such development activities. He was of the opinion that such consultations would help improve cooperation between government departments and the project, and smoothen the operation of the Project.

Sindh Rural Support Organization (SRSO)

A meeting was held with the taluka officer (station incharge) at his office. He expressed no real concerns over the proposed Project and stated that industrial activities in the area already support social welfare programs already initiated, and hoped that the Project proponents would do likewise and not ignore their social responsibility towards the people of the Project Area.

6.4.2 Consultations with Private Firms

Engro Fertilizers Limited (EFERT)

Engro Fertilizers Limited (EFERT) was consulted during the consultation process. Mir Kaiser Yakub, Senior Advisor P & IR spoke at the meeting about the potential damage that may be caused to the access track leading from N-5 to the proposed plant site. It was revealed in the meeting that there was a planned development for the access track and that in which case the Project Proponent should inform EFERT prior to commencement of the construction activities.

Exhibit 6.1: List of Participants of Public Consultation

Location	*Taluka*	*Date*	*Participants*
Local Communities			
Bashir Ahmad Soomro	Daharki	August 28, 2010	Qutaibdin Abid Abdullah
Shahbazi Khan Dahar	Daharki	August 28, 2010	Sahib Dino Naeem Akhtar Ali Hasan
Bahadur Laghari	Daharki	August 28, 2010	Wali Muhammad Abdul Rashid
Goth Juma Khan	Daharki	August 27, 2010	Nazir Krishna
Rind Khan Shar	Daharki	August 27, 2010	Rind Khan Shar
Gul Muhammad Pitafi	Daharki	August 28, 2010	Ghulam Rasool Bux Nadim
Goth Sher Muhammad Malik	Daharki	August 27, 2010	Pir Bux Allah Ju wayo Shehzad
Goth Banho Malik		August 27, 2010	Allah Dino Noor Muhammad Pehlwan
Goth Mitho Lakhan		August 27, 2010	Mujahid Hussain M. Ayub M.Qasim
Goth Gul Muhammad Laghari		August 27, 2010	Rafiq Ahmad M Ayub Amir Bux
Bhago Bhutto		August 28, 2010	Ghulam Muhammad Habibur Rehman Haji Abdul Ghafoor M. Farooq
Goth Kalo Bulro	Daharki	August 28, 2010	Abdul Qayyum Abdul Fateh Raza Muhammad

Location	*Taluka*	*Date*	*Participants*
Goth Habibullah Laghari	Daharki	August 29, 2010	Abdul Waheed Mazhar Hussain
Jung	Daharki	August 29, 2010	Ghulam Hussain Iqbal Ali
Dad Laghari	Daharki	August 29, 2010	Bilal Aftab
Kotlo Mirza	Raharki	August 28, 2010	Ahmad Ali Shehzad Amin Bhutto Fazal Ahmad Bhutto
Goth Syed Noor Hassan Shah	Mirpur Mathelo	August 27, 2010	Syed Asad Ali Syed Ijaz Shah Syed Sudheer Hussain Shah
Chnadnrh Sharif	Daharki	August 29, 2010	Allah Bahaya Karim Bux Murad Ali
Jhando Bhuggio	Daharki	August 29, 2010	Mir Muhammad Umid Ali Abdullah Ameer Din
Goth Sultan Lashari	Daharki	August 29, 2010	Afzal Allah Bux Azam
Consultations with Women			
Fateh Pur	Daharki	August 27, 2010	Mariyam Mai Rashida Sehrish Wajid
Banho Malik	Daharki	August 27, 2010	Bhaul Mai Mai Siyam Sahabzadi Mai Haseena
Bhago Bhutto	Daharki	August 28, 2010	Naghma Rukhsana Aziza Waheeda Razq Dini Husan Bano
Dad Laghari	Daharki	August 29, 2010	Naseema Asiya Shahid Waheed Zahid

Location	*Taluka*	*Date*	*Participants*
Government Department and Associations			
Sindh Irrigation and Drainage Authority Ghotki (SIDA)	Ghotki	June 24, 2010	Director: Abdur Rashid Khosa Office: 0723 684 568
Sindh Rural Support Organization (SRSO)	Daharki	June 24, 2010	Taluka Officer Dr. Gulzar Ali Office: 0723 644 489
National Commission for Human Development (NCHD)	Daharki	June 24, 2010	Markaz Coordinator: Pervaiz Akhtar Mob: 0321-3535727
Private Firms			
Engro Fertilizers Limited (EFERT)	Daharki	August 29, 2010	Senior Advisor P & IR, Maj. (Retd.) Mir Kaiser Yakub Office: 0723 641001-10

Exhibit 6.2: Consultation in Study Area

Exhibit 6.3: View of Female Consultation

Exhibit 6.4: Concerns Raised by Stakeholders

Area of Concern	*Observation of the Community/Concern Expressed*	*Expressed By*	*Environmental Assessment Section where the Concern/ Suggestion is Addressed*
Community Safety	Local traffic may be disturbed Local community may become exposed to the safety hazards associated with project traffic and movement of construction equipments along the access track	Bhago Bhutto Kotlo Mirza Kalo Buriro Gul Muhammad Laghari Goth Sher Muhammad Malikl Goth Banho Malik	**Section 7.3.1**
Employment	All non-technical jobs should be the right of the local communities Technical jobs for which local labor can compete may not be given to people from outside the Study Area	Fateh Pur Dad Laghari Kalo Bulro Bhago Bhutto Jung Goth Syed Noor Hassan Shah	**Section 7.5.1** **Section 7.5.2**
Project Benefits	It was demanded that project related benefits should focus on development of infrastructure and health facilities.	Jhando Bhuggo Goth Sultan Lashari Dad Laghari Habibullah Laghari Chandanrh Sharif	
Community Nuisance	Traffic and construction related noise will disturb the local communities	Fateh Pur Kalo Bulro Kotlo Mirza Jhando Bhuggio	**Section 7.4.1**
Community Health	Emissions from the power plant during operational phase, may affect the ambient air quality in the area.	SRSO, NCHD Bhago Bhutto Banho Malik Goth Sher Muhammad Malik	**Section 7.4.3**

Exhibit 6.5: Consultation with Director Irrigation and Drainage Authority Ghotki

7. Project Impacts and Mitigation

This section discusses the potential environmental and social impacts of proposed Project activities, predicts the magnitude of the impacts, assesses their significance, identifies mitigation measures to minimize adverse impacts, and evaluates the residual impacts, if any, of the Project.

Some of the potential impacts and proposed mitigation measures of the Project are discussed in detail in light of the field visits. The discussion starts with a description of the methodology used for the impact assessment (see **Section 7.1**).

7.1 Impact Assessment Methodology

The potential environmental and social impact of a development activity is identified on the basis of concerns raised by stakeholders, technical guidelines, and professional opinion of the project team.

Once potential impacts have been identified, the assessment of each impact follows these steps:

1. Definition of the criteria for determining significance

   The consequence of the proposed activity is evaluated by comparing it against recognized 'significance criteria'. The criteria are of the following types:

   a. Institutional recognition—laws, standards, government policies, or plans
   b. Technical recognition—guidelines, scientific or technical knowledge, or judgment of recognized resource persons
   c. Public recognition—social or cultural values or opinion of a segment of the public, especially the community directly affected by the Project
   d. Professional interpretation of the evaluator.

2. Prediction of the magnitude of potential impacts

   This step refers to the description, quantitatively (where possible) or qualitatively, of the anticipated impacts of the proposed Project. This may be achieved through the use of models or comparison with other similar activities.

3. Identification of mitigation measures

   If it is determined that the predicted impact is significant when compared to the criteria for determining significance, suitable mitigation measures are identified. There is a range of mitigation measures that can be applied to reduce impacts. Broadly, these measures can be classified into following categories:

   a. Avoiding the impact altogether by not taking a certain proposed activity or parts of an activity; for example, using CFC-free equipment to avoid impact on the ozone layer.

b. Minimizing impacts by limiting the degree or magnitude of the activity, for example, minimizing dust emissions by reducing vehicular traffic

c. Rectifying the impact by repairing, rehabilitating, or restoring the affected environment

d. Compensating for the impact by replacing or providing substitute resources or environments.

4. Evaluation of the residual impact

   Incorporation of the suggested mitigation measures reduces the adverse impact of the Project and brings it within acceptable limits. This step refers to the identification of the anticipated remaining impacts after mitigation measures have been applied, i.e., the residual impacts.

5. Identification of monitoring requirements

   The last step in the assessment process is the identification of minimum monitoring requirements. The scope and frequency of the monitoring required depends on the residual impacts identified. The purpose of monitoring is to confirm that the impact is within the predicted limits and to provide timely information if unacceptable impact is taking place.

The overall assessment process followed for the study is shown in **Exhibit 7.1**.

7.2 Noise

The following is a brief description of terminology used in this assessment:

- *Sound*: A vibratory disturbance created by a vibrating object, which, when transmitted by pressure waves through a medium such as air, is capable of being detected by a receiving mechanism, such as the human ear or a microphone
- *Noise*: Sound that is loud, unpleasant, unexpected, or otherwise undesirable
- *Decibel (dB)*: A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micro-pascals
- *A-Weighted Decibel* (dB(A)): An overall frequency-weighted sound level in decibels, which approximates the frequency response of the human ear. The typical human ear is not equally sensitive to all frequencies of the audible sound spectrum. As a consequence, when assessing potential noise impacts on people, an electronic filter is used that de-emphasizes certain frequencies in a manner corresponding to the human ear's decreased sensitivity to low and extremely high frequencies. All of the noise levels reported in this section are A-weighted
- *Equivalent Sound Level (L_{eq})*: The equivalent steady-state sound or vibration level, which in a stated period of time, typically one hour, would contain the same acoustical or vibration energy.
- In general, human sound perception is such that a change in sound level of 3 dB is just noticeable, a change of 5 dB is clearly noticeable, and a change of 10 dB is perceived as a doubling or halving of sound level.

7.2.1 Potential Impacts

N01 Construction Noise	*Phase*
The disturbance to communities in surrounding areas of the proposed plant site due to construction machinery operation on the plant site.	Design
	Construction
	Operation

N02 Plant Noise	*Phase*
Unacceptable increase in noise levels in the communities	Design
	Construction
	Operation

7.2.2 Existing Conditions

The major continuous sources in the Study Area include Engro Fertilizers Plant and TNB Liberty Power Plant. The nearest source is the Engro Fertilizers plant, which is less than 3 km from the proposed site. Existing intermittent sources of noise in the Study Area include road and train traffic and farm equipment. Noise levels have been measured in the Study Area under different conditions. The results (**Exhibit 5.14**) show that under normal conditions, the noise levels are around 50 dB(A). However, as a result of road traffic near N-5 and the road intersection one kilometer south of Engro, the noise level may increase to 55-60 dB(A). Night measurement of noise levels was not possible due to security reasons. Based on the data, and assessment of noise sources in the Study Area, it is concluded that:

- Day- and nighttime noise levels in the Study Area, away from the road and railway track, are typically 50 dB(A).
- Noise levels in the area close to the road during the day increase to about 55 dB(A) in the presence of traffic. As the traffic volume is relatively low—on average one vehicle after every 2.5 minutes (**Exhibit 5.15**)—it is estimated that the L_{eq} for daytime in areas close to the road is less than 50 dB(A).
- Areas within 200 m of the rail track are exposed to noise levels in excess of 60 dB(A) when trains pass by. Total traffic on the railway track is estimated at 50 trains per day.

7.2.3 Criteria for Determining Significance

The NEQS for noise (**Appendix A**) and World Bank guidelines for noise (**Appendix B**) require that the sound level in residential areas should not exceed 55 dB(A) during the day and 45 dB(A) during the night.[1]

[1] World Bank, UNIDO and UNEP. 1999. *Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production*. Environment Department, The World Bank; UNIDO; UNEP.

7.2.4 Impact Analysis

Plant Constriction

Potential sources of significant noise during the Project's construction period include construction machinery, generators at camps, and construction-related traffic. Precise prediction of noise due to construction activity at given location and time requires a listing of all equipment that is operational at the time and the following information regarding each piece of equipment:

- The maximum and minimum noise levels, measured at a reference distance from the equipment, during a work cycle
- The fraction of time it operates at maximum level during a work cycle
- The usage factor, i.e., the number of hours during the day when the equipment is operational
- The distance of the equipment from the receptor
- Potential noise barriers and other topographic features that attenuate the sound
- Atmospheric conditions—wind speed and direction, humidity and barometric pressure—also affect the propagation of sound; however, for short distances, the effect of these atmospheric conditions is insignificant compared to other variables.

The analysis presented in this section is based on the approach recommended by the Federal Highway Administration of the US Department of Transportation for the assessment of construction noise.[2]

It is expected that construction noise levels at the nearest receptor in the nearby village, located approximately at 200 m from the plant boundary, would fluctuate depending on the type, number, distance from receptor, and duration of use of various pieces of construction equipment at the Project site. In this analysis, first the noise level due to each piece of equipment which is likely to be used in the construction of the plant is calculated. Peak noise levels of all main construction equipment are shown in **Exhibit 7.2**. The list includes all equipment except vehicles and some minor equipment. Using these data, the expected noise level, $L_{eq(8\text{-}hr)}$, is calculated and the predicted noise levels shown in **Exhibit 7.3**. The exhibit shows that the highest equivalent noise level for an 8-hour shift due to a single piece of equipment at a receptor 250 m from the source[3] will be about 52 dB(A). This is under 'no-mitigation' conditions and assuming no attenuation due to ground features.

When more than one piece of equipment are operating simultaneously, the noise level at the receptor will increase. Predicted noise levels, assuming no attenuation or mitigation, under three different scenarios, are shown in **Exhibit 7.4**. Thus, the resultant noise levels

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[2] Reagan, J. A. and C. A. Grant. *Highway Construction Noise: Measurement, Prediction, and Mitigation. Special Report.* US Department of Transportation, Federal Highway Administration. Available from <http://www.fhwa.dot.gov/environment/noise/highway/index.htm>.

[3] As the equipment will not be located at the boundary but anywhere on the site, a conservative figure of 250 m has been used.

at the receptor when the construction work is carried out at a distance of 250 m from the receptor could be in the range 45-50 dB(A). In this scenario, the noise level in surrounding communities due to construction activities will meet the target standards for daytime noise levels at all times. Furthermore, if the same equipment is operated during the night, the resulting noise at the same receptor is likely to exceed the guideline limit. However, the calculation does not assume any attenuation. In reality, attenuation due to topographic factors could be between 3 and 5 dB(A). Similarly, about 3 to 5 dB(A) of further reduction could be achieved by installing noise-reducing devices on noise sources. Thus, at nighttime the noise levels are likely to barely meet applicable standards.

Plant Operation

Noise emitted during the power plant operation can potentially be a nuisance for the nearby community as it can cause disturbance, particularly during the night. The precise noise emission data for the selected plant equipment is currently not available. However, representative data for a 470 MW combined cycle power plant[4] indicate the following noise levels:

Gas Turbines	112 dB(A)
Generators	113-115 dB(A)
Steam Turbines	104 dB(A)
HRSG	107.5 dB(A)
Gas Turbine air intakes	106 dB(A)
Cooling towers	110 dB(A)
Generator air coolers	98 dB(A)

The assessment predicted that without mitigation, the noise levels at 200 m from the source will be 65 dB(A). With mitigation, it was predicted that the noise level will be reduced by about 5 dB(A). For the proposed plant, the nearest community will be 250-300 m from the source. Further, the capacity of the proposed power plant is less than one-third of the plant for which data is provided above. It is therefore likely that the noise level at the nearest receptor will be less than 55 dB(A).

7.2.5 Mitigation

Given the predicted levels, the strategy to restrict noise impact on the community and Project staff to within acceptable limits will be based on the following:

- Reduce equipment noise at source
- Before the start of operations, conduct a noise survey of the equipment and prepare a noise control plan
- Minimize vehicular noise

[4] ESIA of Liberty Power Project, Foster Wheeler, 1996. The ESIA was based on a 470 MW power plant to be consutructed in two phases of 235 MW each. Presntly, only Phase I is constructed.

- Train all staff members in the use of PPE (Personal Protection Equipment) near high-noise areas.
- Select low noise equipment for the power plant.

The proposed strategy will be implemented through the following specific measures:

- Noise survey.

  A noise survey of all Project construction equipment will be conducted prior to their deployment. For this purpose, each piece will be tagged and the following data will be recorded:

  - Survey date, surveyor, and noise meter ID
  - Equipment ID, type, and make
  - Noise levels at reference distance(s) in idling conditions, in all four directions for stationary sources
  - Noise levels at reference distance(s) in full-throttle conditions, in all four directions
  - Noise levels at reference distance(s) for moving equipment and vehicles in full-throttle conditions, in any direction

  The survey will be repeated periodically.

- Reduce equipment noise at source

  Based on the above survey, equipment emitting excessive noise in comparison with other similar equipment will not be allowed to operate. Equipment under use will be properly maintained, tuned, and provided with mufflers to minimize noise output for high-noise producing equipment. Equipment in poor state of maintenance, particularly without effective noise controls, will be checked to determine if it can be improved, and replaced with less noisy equipment as soon as practicable.

- Traffic noise
  - Construction-related traffic will enter the plant site from the construction gate and thereafter use the road inside the plant to reach the construction site.
  - Blowing of horns will be prohibited on the access road to the plant site and inside the site, unless necessary.
- Other measures
  - Construction work during the night will be minimized and use of high-noise equipment will be avoided
  - Plant boundary will be constructed early during the construction phase, before any substantial civil work on the site is initiated to help attenuate noise levels outside.
  - Construction equipment, such as mixing and batching plant, will be placed at least 300 m away from any local community.

- Power Plant noise reduction
  - While selecting the equipment for the power plant, low noise equipment will be preferred
  - In particular, fans for cooling tower will be of low noise type
  - Silencers will be used on vents and ventilators
  - Undertaking of detailed noise modeling to demonstrate that the nighttime noise levels are met at the community.

Close liaison with the communities and regular monitoring of noise levels within the communities are key to successful implementation of the mitigation measures listed above. Specifically:

- The communities will be informed of all construction activities at least two weeks in advance. In particular, the noise control plan will be discussed.
- During the Project, active consultation will be maintained with the communities through informal and formal meetings.
- A complaint registering, tracking, and redressal mechanism will be implemented.
- Noise levels will be monitored regularly within the communities in order to take timely corrective measures, if needed.

7.2.6 Residual Impacts

No irreversible noise impact is expected from construction activities at the plant site. It is possible that occasionally the noise level will exceed the significance criteria during construction. This may happen if, for example, some construction machinery is deployed close to a nearby community. This will cause a nuisance to the community, although it is likely to last for only a short period.

Noise from the power plant operation is likely to meet the target standards. However, performance noise survey will be required to meet the desired standard.

7.2.7 Monitoring Requirements

Given the residual impacts, a noise monitoring plan will be developed that will include regular monitoring of noise at source, at the plant boundary, and within the communities on a regular basis and impart the necessary staff training.

7.3 Emissions

Plant emission may include construction dust, combustion exhaust from vehicles, and combustion exhaust from power plant.

Dust—or the equivalent technical term ‘particulate matter’—is generally defined as any airborne, finely divided solid or liquid material (except water) up to the size of about 100 microns (micrometers or one-millionth of a meter). A health hazard is mainly posed by particles smaller than 10 microns (designated as PM_{10}) as they are respirable. Larger particles, in addition, tend to settle rapidly and often do not reach receptors. In cases

where they reach the receptors, the dust is considered a nuisance as it may hinder soil property, cause health problems, deteriorate building materials, and affect visibility.

Sulfur dioxides are mainly emitted if the fuel contains sulfur. Combustion of diesel is a typical source of sulfur dioxide.

Nitrogen oxides are produced mainly by oxidation of atmospheric nitrogen in the combustion chamber of the power plant.

Green House Gases i.e., carbon dioxide and water vapor will be produced by the ignition of fuel in the combustion chamber of the power plant.

7.3.1 Potential Impact

E01 Dust Emission	*Phase*
The nuisance to surrounding communities of the proposed plant due to emission of dust during construction on the plant site.	Design
	Construction
	Operation

E02 Vehicle and Equipment Exhaust	*Phase*
Combustion exhaust from vehicles and construction can affect the ambient air quality of the Study Area.	Design
	Construction
	Operation

E03 Emission	*Phase*
The emission of SO_x and NO_x along with GHG from the plant can potentially affect the ambient air quality.	Design
	Construction
	Operation

7.3.2 Existing Conditions

Existing air quality is described in **Section 5.1.5**. The dust level in the Study Area is higher than target standards. The primary reason for this is likely to be existing agricultural activities in the surrounding areas or dust emissions from nearby open spaces, particularly given the desert environment. Traffic on the roads that are broken in most places and have narrow width with dusty shoulders is also likely to be a source of particulate matter in the air. Other major sources include EFERT plant, TNB Liberty power plant and trains of Pakistan Railways.

7.3.3 Criteria for Determining Significance

Regarding construction activity at the plant site, a significant effect on the environment will be interpreted if there is an increase in visible dust beyond the boundaries of the

plant site due to activities undertaken onsite, or the dust affects local property or results in any complaints from nearby communities.

For vehicles and equipment exhaust, a significant impact on ambient air quality will be interpreted if a) the vehicles or equipment emit significant smoke, or there are persistent complaints from the community; b) the vehicles are not in compliance with the NEQS and for vehicles.

7.3.4 Impact Analysis

Analysis of emission impacts are discussed separately as follows.

Dust During Construction

Potential sources of particulate matter during construction activities include earthworks (dirt or debris shoveling and grading), exposed surfaces, exposed storage piles, truck dumping, hauling, vehicle movement on unpaved roads, combustion of liquid fuel in equipment and vehicles, land excavation, and concrete mixing and batching.

The quantity of dust that will be generated on a particular day will depend on the magnitude and nature of activity and the atmospheric conditions prevailing on the day. Due to the uncertainty in values of these parameters, it is not possible to calculate the quantity from a 'bottom up' approach, that is, from adding PM emissions from every activity on the construction site separately. Typical and worst-case PM emissions from the construction sites have been estimated[5] as 0.27 megagram per hectare per month of activity (Mg/ha-month) and 1.04 Mg/ha-month, respectively.

The impact on ambient air quality due to PM emissions is assessed using the USEPA's SCREEN3 dispersion model (**Exhibit 7.5**). The construction site is considered an 'area source' of emissions. If no controls are imposed, the possible increase in concentration of PM in the surrounding communities could be 402 $\mu g/m^3$ and may even be as high as 1,531 $\mu g/m^3$. Typically, PM_{10} is 40% of total dust. Consequently, the construction activity can add about 160 $\mu g/m^3$ of PM_{10} in the ambient air.

A wide variety of options exist to control emissions from construction sites. The most effective means of reducing dust emissions is wet suppression. Watering exposed surfaces and soil regularly to keep the soil moist at all times can reduce total dust emissions from the Project by as much as 75%.[6] This measure alone can bring down airborne dust levels to less than 40 $\mu g/m^3$. Specific measures that can be employed for the proposed construction are discussed in the following section.

Vehicular and Equipment Emission

Combustion processes in generators and other construction equipment result in exhaust gases that can affect the ambient air quality locally. However, this environmental issue can be minimized by using properly maintained equipment.

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[5] Gaffney, G. and Shimp, D. 1997. *Improving PM_{10} Fugitive Dust Emission Inventories*. Sacramento, CA. California Air Resource Board. <www.arb.ca.gov/emisinv/pubs/pm10tmp.pdf>.

[6] El Dorado County Air Pollution Control District. 2002. Guide to Air Quality Assessment: Determining Significance of Air Quality Impacts Under the California Environmental Quality Act. First Edition. <http://co.el-dorado.ca.us/emd/apcd>.

Plant Emission

Comparison of plant emission with the applicable emission standards is presented in **Exhibits 7.6** and **7.7**. The emissions will meet all applicable standards for natural gas, the main plant fuel. The stack emission of particulate matter may exceed IFC's Thermal Power Plants Emission Guideline Limits when the plant is operating on HSD. However, this is not a major concern and should be acceptable because a) plant will operate on HSD for short duration during which the total increment of particulate matter in the ambient air will be minimal; b) the estimate assumes 1% S in HSD. HSD with lower concentration of HSD is now generally available. If HSD with 0.5% S is used, which is now possible, the particulate matter emission will also reduce correspondingly.

Air dispersion modeling was undertaken using the USEPA SCREEN3 model to assess the potential impact to air quality during power plant operation. The parameters for which the dispersion modeling was carried out were SO_2, NO_X, CO, and PM_{10}. The modeling is done for both the primary and back up fuels. The input parameters of the air dispersion modeling are provided in **Exhibit 7.8** and the results in **Exhibit 7.9**.

The interpretation of the air dispersion modeling is as follows:

- It is expected that the concentration of sulfur dioxide, nitrogen oxides, and carbon monoxide in the ambient air after the plant becomes operational will meet the target limits (NEQS and IFC Guidelines) under all conditions, i.e., whether operating on natural gas or high speed diesel.
- The respirable particulate matter (PM_{10}) concentration in ambient air exceeds the target limit. However, no increase in concentration of PM_{10} due to natural gas combustion, the main fuel of the power plant, is expected. The combustion of diesel may result in about a 2.5% increase from background PM_{10} levels at project related receptors. However, HSD will be used for short periods only, primarily for start up and shut down. These periods are typically less than 10 minutes of firing time per cycle assuming one startup/shutdown per day. The time period when the plant will operate on HSD will be less than 7/10 of 1% of run-time per day. Further, the ambient concentration of PM_{10} will meet the corresponding NEQS. As explained in **Section 5**, due to dry conditions the concentration of particulate matter in ambient air in Pakistan is naturally high. This is reflected in the higher national standards set for it.

7.3.5 Mitigation

The following mitigation measures will be implemented at the power plant site during construction and operations to control emissions of particulate matter:

- During the detailed designing of the power plant, to the extent possible, plant facilities will be located away from the community thereby minimizing construction activities in areas close to local residents.
- Water will be sprinkled daily or when there is an obvious dust problem on all exposed surfaces to suppress emission of dust. Frequency of sprinkling will be kept such that the dust remains under control, particularly when the wind is blowing towards the community.

- Dust emission from soil piles and aggregate storage stockpiles will be reduced by appropriate measures. These may include:
  - Keeping the material moist by sprinkling of water at appropriate frequency
  - Erecting windshield walls on three sides of the piles such that the walls project 0.5 m above the pile, or
  - Covering the pile, for example with tarpaulin or thick plastic sheets, to prevent emission.
- All roads within the plant site that are to be paved or appropriately sealed will be paved as early as possible after the commencement of construction work. Until the roads are paved, they will be sprinkled regularly to prevent dust emission. Other temporary tracks within the site boundary will be compacted and sprinkled with water during the construction work.
- Project traffic will respect a maximum speed limit of 20 km/h on all unsealed roads within the proposed plant site and on community roads. Fugitive dust control measures will be developed for unsealed roads if any, with heavy project related traffic.
- Construction materials that are susceptible to dust formation will be transported only in securely covered trucks to prevent dust emission during transportation.
- Aggregate material will be delivered to the batching plant in a damp condition, and water sprays will be applied, if needed, to reduce dust emissions.
- A minimum distance of 250 m will be maintained between potential sources of dust, such as material stockpiles and batching plant, and the community.
- The following mitigation measures will be incorporated to prevent any adverse impact on ambient air quality:
- All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants

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- Proper maintenance record of all vehicles, generators, and other equipment will be maintained.
- The stack height of the generators used during construction will be at least 3 m above the ground.

7.3.6 Residual Impacts

Dust emission during construction activities may affect the ambient air quality. However, with the adoption of the mitigation measures, the additional dust contributions will be minimal.

7.3.7 Monitoring Requirements

In view of the residual impacts, the following monitoring measures will be undertaken:

- Dust emission from the construction activity will be visually monitored, particularly when activity is undertaken close to a nearby community, to prevent visible dust beyond the power plant property lines.
- Community members in the residential areas will be actively consulted. Their feedback will form a key means of monitoring the impact of dust emission.
- To ensure compliance, regular inspection of equipment and vehicles will be undertaken. Annual testing of all vehicles and generators will be undertaken to ensure their compliance with NEQS.

For the power plant emission, an emission monitoring plan will be developed. The key requirements are:

- PM_{10} will be monitored using low-volume samplers at two sites (one day per site per week) on a monthly basis
- Sulfur dioxide and nitrogen oxides will be monitored using diffusion tubes at four sites on a weekly basis.

7.4 Soil and Water Contamination

7.4.1 Potential Impact

C01 Soil Contamination	*Phase*
Spills during refueling, discharges during vehicle and equipment maintenance, traffic accidents, handling of chemicals and leakages from equipment and vehicles often result in contamination of soil at the construction site.	Design
	Construction
	Operation

C02 Drainage and Storm water Runoff	*Phase*
Runoff after a storm from the plant site or the construction site may contain oil that may pollute the surrounding lands. Earthwork may also	Design
	Construction

alter the drainage pattern and affect the stormwater flow and result in possible flooding of sections of surrounding land.	Operation

C03 Camp Effluent	*Phase*
Improper disposal of domestic effluent from the camp may result in contamination of soil and water and become a health hazard.	Design
	Construction
	Operation

C04 Hazardous and Non-Hazardous Waste Management	*Phase*
Various types of wastes such as packing waste; metal scrap, and excess materials, uprooted vegetation, and excess soil will be generated during the construction phase. Besides being an eyesore, the waste can be a health hazard and pollute waterways, if disposed improperly.	Design
	Construction
	Operation

C05 Wastewater	*Phase*
The untreated discharge of sanitary wastewater effluent from the power plant can potentially affect the water resources of the Study Area.	Design
	Construction
	Operation

C05 Liquid waste	*Phase*
The direct discharge of liquid waste effluent from the power plant can potentially affect the water resources of the Study Area.	Design
	Construction
	Operation

C05 Thermal Discharge	*Phase*
The direct discharge of heated water from the power plant to the water resources of the Study Area.	Design
	Construction
	Operation

C06 Hazardous Material	*Phase*
The operations phase will require use of process chemicals some of which are hazardous. These chemicals have a potential to harm human health and contaminate soil and groundwater if not handled correctly.	Design
	Construction
	Operation

7.4.2 Existing Conditions

There are no visible signs of soil contamination in the Study Area in general and the Project site in particular.

The plant site is surrounded by agricultural fields on all sides.

No wastewater treatment facilities exist in the surrounding communities where all untreated wastewater is normally discharged into irrigation channels, ponds, and surrounding fields.

7.4.3 Criteria for Determining Significance

A significant impact on soil will be interpreted if visible amounts of hydrocarbons are observed in the soil.

A significant impact will be interpreted if:

- Visible quantity of liquid waste (oil and grease etc) is present in the runoff from the site
- The runoff regularly contains silt above the NEQS limits
- The runoff flows towards the community.
- A significant impact on the environment will be interpreted if the thermal discharge or sanitary wastewater discharged to the environment is not in compliance with the NEQS and IFC guidelines.

As no regulations for waste handling and disposal exists, an adverse impact on the environment will be interpreted if,

- Any person is exposed to potentially hazardous waste generated by the Project
- The Project generates waste that can be avoided through practicable means (waste minimization)
- Reusable waste generated by the Project is discarded
- Recyclable waste instead of separation at the source is dumped at the trash bins
- Any waste generated by the Project is scattered at any place outside the designated bins, or
- Non-recyclable and non-reusable waste ends up at any place other than the designated disposal site.

A significant impact will be interpreted if hazardous material is handled in manner other than that prescribed in the Material Safety Data Sheets (MSDS), without a valid justification.

7.4.4 Impact Analysis

Soil Contamination

During a typical construction project, spillage of fuel, lubricants, and chemicals takes place:

- during transfer from one container to another or during refueling,
- during maintenance of equipment and vehicles,
- due to leakages from equipment and containers, or
- as a result of traffic accidents.

Depending on the nature of the material, location and quantity of spill, the soil can get contaminated.

Drainage and Storm Water Run-off

The storm water runoff from construction sites can carry oil and grease if the soil is contaminated or the potentially contaminated areas (oil and grease storage areas, maintenance areas and workshops) are in hydrological contact with the surrounding areas. Any risk may be eliminated by taking measures to avoid spills and taking immediate remedial measures in case of accidental spillage of oil (see previous section).

The area of the plant site is only a small fraction of other areas in the surroundings at the same elevation. It is unlikely that the construction work at the plant will measurably affect the drainage pattern of the area. Although no major community is located with 1 km of the proposed site, there are scattered houses that could be possibly at risk.

Camp Effluent

The staff and labor camps for the construction and operation of the power plant will be a source of wastewater generated from the toilets, washrooms, and the kitchen. The untreated wastewater will not meet the national environmental standards and will therefore need treatment prior to disposal.

Hazardous and Non-Hazardous Waste Management

In the absence of national or domestic regulations and an effective waste management system in the Study Area, waste disposal can potentially become a serious environmental issue. To avoid any potential issue, the project proponent will have to impose adequate internal controls. The proposed controls are discussed in the following section.

According to the IFC PS 4 guidelines, the client will prevent or minimize the potential for community exposure to hazardous materials that may be released by the project and in addition, the client will exercise commercially reasonable efforts to control the safety of deliveries of raw materials and of transportation and disposal of wastes.

7.4.5 Mitigation

The following control measures are proposed to mitigate the impact on soil resources to meet the requirements of the IFC PS 3 Pollution Prevention and Abatement and PS 4 Community Health, Safety and Security:

- Spill prevention trays will be provided and used at refueling locations
- During on-site maintenance of construction vehicles and equipment, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil

- Regular inspections will be carried out to detect leakages from construction vehicles and equipment
- Vehicles and/or equipment with leakage will not be used until repaired
- Fuels, lubricants, and chemicals will be stored in covered bunded areas, underlain with impervious lining
- Appropriate spill control arrangements, including shovels, plastic bags and absorbent materials, will be available near fuel and oil storage areas
- Measures will be taken to minimize soil contamination. Contaminated soil will be immediately collected to minimize the volume of contaminated soil. Heavily contaminated soil will be segregated from the rest of the soil. Various final disposal options for contaminated soil are available. These include incineration at facilities in Karachi, disposal through licensed hazardous waste contractors, encapsulation at site, and bioremediation at site or off-site location. Appropriate disposal method will be employed, however, until an acceptable method is found the contaminated soil will be stored at the site in secure containers.

The following measures will be undertaken to prevent any adverse impact due to storm water runoff:

- Through contouring and installation of embankments, where necessary, it will be ensured that storm water from the surrounding areas does not enter the construction site
- All unpaved exposed areas of the plant will be compacted to minimize water erosion
- All areas containing potentially hazardous materials will be hydrologically isolated from the remaining site.
- Spoil banks from ditching operations will not be placed where they might impair natural drainage
- Channel runoff will be provided, where necessary, to avoid flooding of the surrounding fields
- To eliminate risk, the drainage system of the plant site will be designed in a manner that the runoff is discharged via existing irrigation drains.
- The following mitigation measures will be taken:
- No untreated effluents will be released to the environment

Liquid waste will be collected and treated in an on-site neutralization tank to bring the pH range within limits (6-9), as specified in the NEQS and the IFC guidelines for thermal power plants before releasing to the environment

- Heated water as thermal discharge will be stored first and then released to the environment or may be used for arboriculture and plantation in and around the plant site.

- A closed sewage treatment system will treat the sanitary wastewater, which will then be disposed off in a soak pit or will be used for irrigating plantation after meeting the NEQS and IFC guidelines values

A waste management plan will be developed before the start of the construction. Key elements of the waste management system will be the following:

- On-site handling
  - Recyclable material will be separated at source. Separate bins will be placed at the construction site for different type of materials—plastic, paper, metal, glass, wood, and cotton. The recyclable waste will be sold to waste contractors.
  - Waste bins for the construction waste will be constructed inside the proposed plant boundary. No waste will be dumped at any location outside the boundary.
  - All hazardous waste will be segregated from other wastes.
  - An on-site storage facility to segregate and temporarily store hazardous waste will be developed.
- Audits
  - Periodic on-site audits of the waste management will be undertaken.
  - Audits of the waste disposal contractors and waste disposal facilities will be undertaken on a regular basis to check that procedures are being followed.
- Records
  - Records of all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register.
- Disposal
  - All non-hazardous waste material that cannot be recycled or reused will be disposed of through local waste contractors.
  - Hazardous waste for which disposal facilities exist (mainly for oily waste) will be disposed of by hazardous waste contractors licensed by SEPA.
  - Hazardous waste that cannot be disposed of through acceptable means will be stored in an on-site hazardous waste holding facility until an approved off-site hazardous waste disposal facility is developed.
  - The possibility of returning the packaging to the manufacturers for reuse will be explored.
  - Recyclable waste will be disposed of via approved waste contractors
  - Chemical containers (including partially full containers) will be returned to vendors

- Other management measures
  - An emergency response plan will be developed for the hazardous waste.
  - Training will be provided to personnel for identification, segregation, and management of waste
  - All containers of hazardous waste will be appropriately labeled.
  - Equipment and material containing asbestos, poly-chlorinated biphenyls (PCBs), and ozone depleting substances (ODSs) will not be used.

A Hazardous Materials Management Plan will be prepared that contains the following management and mitigation measures:

- Storage and handling of hazardous materials will be in accordance with international standards and appropriate to their hazard characteristics. Storage and liquid impoundment areas for fuels and hazardous process chemicals will be designed with secondary containment to prevent spills and contamination of soil and groundwater. The secondary containment will be impervious with a capacity of at least 110% of the largest single container.
- Labels will be placed on all storage vessels as appropriate to national and international standards. The labeling will clearly identify the stored materials.
- Supporting information such as MSDS will be available for all hazardous materials.
- A Hazardous Materials Register will be in place that covers:
  - Hazardous Material name
  - HAZCHEM/United Nations Code
  - MSDS
  - Summary of maximum inventory
  - Storage requirements and precautions
  - Location, physical properties of the materials where they are used
  - Approved disposal methods

7.4.6 Residual Impacts

Implementation of the proposed mitigation measures is not likely to leave any long-term residual impact on the soil. However, insignificant amounts of hydrocarbons may be left in the soil due to minor spills, where remedial measures are not possible.

The treated water discharged will contain contaminants. However, their concentration will be below the NEQS limits.

Even after implementation of the control measures, it is possible that some littering may take place. Periodic monitoring and clean up will be undertaken to minimize the residual impact.

7.4.7 Monitoring Requirements

To ensure compliance:

- Regular inspection of soil in the area where project activities will take place will be undertaken.
- Incident record of all moderate and major spills will be maintained. The record will include the location of spill; estimated quantity; spill material; restoration measures; photographs; description of any damage to vegetation, water resource, or community asset; and corrective measures taken.

The monitoring measures will include:

- Records of all waste generated during the construction period will be maintained. Quantities of waste disposed, recycled, or reused will be logged on a Waste Tracking Register.
- On-site audits of the waste management will be undertaken on a regular basis.
- Audits of the waste disposal contractors and waste disposal facilities will be undertaken on a regular basis to check that procedures are being followed.
- The areas around the construction camps and the construction site will be periodically inspected to verify that no project related waste is scattered in these area.

Periodic monitoring will include:

- Discharge rate of wastewater
- Chemical analysis of the wastewater
- Complete record of purchase, storage, use, and disposal of hazardous material will be maintained.

7.5 Hazards related to HSD and Natural Gas Handling

7.5.1 Potential Impact

H01 HSD	*Phase*
HSD spills may cause soil water and water contamination and/ or may start fire if exposed to naked flame nearby.	Design
	Construction
	Operation

H02 Natural Gas	*Phase*
Accidental release of natural gas may be injurious to the persons directly exposed to large quantities of natural gas and as of HSD can be cause of starting a fire	Design
	Construction
	Operation

7.5.2 Existing Conditions

Currently the proposed plant site is agricultural land and there are no HSD or natural gas pipelines and storage areas nearby.

7.5.3 Criteria for Determining Significance

It will be considered a significant impact if:

- The HSD spill causes large scale water or soil contamination
- The exposed personnel inhale the natural gas which may cause them to faint or in the worst case loss of life.
- Release of HSD or natural gas starts a fire.

7.5.4 Impact Analysis

HSD and natural gas are both high energy hydrocarbons. Their accidental or uncontrolled release can potentially be a threat to both the humans and wildlife but also to the other natural resources such as soil and water. HSD can potentially contaminate both surface and groundwater if released in large quantities. Natural gas is a potential threat if any humans or wildlife are exposed to high volumes of natural gas eventually resulting in their death or nausea. Being flammable substances can start a fire if naked flame is in the vicinity which may have severe impacts on the health and safety of the humans, biodiversity and infrastructure.

7.5.5 Mitigation

The following mitigation measures are proposed:

- Spill prevention and control measures should be implemented
- HSD should be stored in a fenced area with impermeable floor
- HSD containers should be of high quality leak resistant material
- Emergency shut off valves should be installed at suitable intervals so that in case of emergency release can be stopped at once
- Fire detection and alarm systems should be in place near the HSD storage tanks and the supply pipelines of HSD and natural gas
- Emergency response and firefighting back up plan should be in place

7.5.6 Residual Impacts

No long-term residual impact is envisaged.

7.5.7 Monitoring Requirements

The following monitoring will be undertaken:

- Gas and HSD supply pipelines should be regularly monitored for leakages
- Record of all major and minor spills should be maintained and reported

- All firefighting equipment and detection systems should be checked daily to minimize the risks

7.6 Biodiversity Conservation

As described in Section 5, the Study Area does not have any significant floral or faunal species. However, the deserts to the west and south of the Study Area contain various fauna, particularly birds, which have conservation value.

7.6.1 Potential Impact

B01 Vegetation Loss	*Phase*
The preparation of the site will result in removal of vegetation from the plant site.	Design
	Construction
	Operation

B02 Wildlife	*Phase*
The Project staff may indulge in hunting and trading in animals or their products found in the adjacent deserts.	Design
	Construction
	Operation

7.6.2 Existing Conditions

Existing conditions are discussed in details in **Section 5** of the report.

At present, the proposed plant site is covered by agricultural fields and no major species of concern were observed or recorded at the plant site during the field visit conducted for this Project. There are no trees on the proposed plant site.

7.6.3 Criteria for Determining Significance

It will be considered a significant impact if:

- Vegetation cover is substantially reduced, or
- Any person present in the Study Area as a result of the Project activities indulges in any activity, directly or indirectly, that results in the killing, harming or capturing of any wild animal found in the Study Area or outside it under the IFC PS 6 Biodiversity Conservation and Sustainable Natural Resource Management.

7.6.4 Impact Analysis

About 40% of the proposed plant site will be covered with buildings or roads. Vegetation from this area will be permanently removed. However, the remaining exposed area will be covered with lawns, trees and ornamental plants. The total number of trees that will

be planted may exceed 200. Therefore, compared to pre-Project conditions, the site is likely to have more vegetation and, unlike crops, the vegetation will be permanent.

According to the IFC PS 6 Biodiversity Conservation and Sustainable Natural Resource Management in order to avoid or minimize adverse impacts to biodiversity in the project's area of influence and assess the significance of project impacts on all levels of biodiversity as an integral part of the Social and Environmental Assessment process.

Given the status of the habitat in the Study Area, it is unlikely that the activities associated with the proposed Project will have any direct impact on the wildlife resources of the region. No endangered or vulnerable species are found in the proposed Study Area. However, previous experience of projects in similar areas indicate that project staff who come from other parts of the country and have interest in hunting make use of the opportunity and indulge in hunting in the desert area. Similarly, some members of the staff are who offered live animals, their meat, skin or other parts by the local poachers, unintentionally encourage such activities by trading, purchasing the animals or the products. These activities eventually affect the biodiversity of the desert habitat.

7.6.5 Mitigation

The following mitigation measures are proposed:

- A tree plantation plan will be developed for the plant site.
- Plantation will be initiated as early as possible during the construction phase of the Project.
- To prevent adverse impacts on the vegetation and ecology of the Study Area, it will be ensured that the trees planted are all native species or introduced species that have been found to be compatible with the local ecology.
- No tree will be cut for the construction camp, as it will be located within the proposed plant boundary.

The measures listed below will minimize damage to wildlife during the construction and operation phases of the proposed Project.

- A no hunting and no trapping policy will be adopted, ie the Project staff will be prohibited to hunt or trap any animal.
- Through written material and other means, the Project staff will be made aware of the zero tolerance policy of the company with respect to the harming of wildlife.
- Fishing in Study Area water bodies will be strictly prohibited.

7.6.6 Residual Impacts

No long-term residual impact is envisaged.

7.6.7 Monitoring Requirements

The following monitoring will be undertaken:

- Inventory of trees removed, including their sizes and species
- Record of number of trees planted and their survival rates.

Incident record of all damage or harm to the wildlife will be maintained. The record will include the identification of species; location of incident; harm; person(s) responsible; explanation of violation; measures taken to prevent reoccurrence of the event; photographs, if available.

7.7 Water Resources

Groundwater is used extensively by means of hand pumps and boreholes, for domestic and to certain extent for agricultural use, by the community in the Study Area. Every village in the vicinity has hand pumps in almost every household.

7.7.1 Potential Impact

W01 Water Resources	*Phase*
The extraction of water for the power plant construction activities can affect the groundwater availability for the Study Area communities.	Design
	Construction
	Operation

7.7.2 Existing Conditions

The existing conditions are discussed in detail in **Section 5**. Availability of irrigation water from canals has gradually raised the water table in the Study Area. Presently the water table is reported to be between 10 and 15 m.

7.7.3 Criteria for Determining Significance

An adverse impact on the water resources will be interpreted if it is established that the water consumed by the Project has directly affected the ability of the community to meet their water needs.

7.7.4 Impact Analysis

A survey was conducted in the Study Area to assess the current water use and groundwater condition. The results are shown in **Exhibit 5.5**. The summary is as follows:

Number of boreholes (BH) surveyed within 3 km	4
Number of hand pumps (HP) surveyed within 3 km	8
Average BH abstraction as reported	1,631 m^3/year (1,180 gal/day)
Average HP abstraction as reported	1,281 m^3/year (956 gal/day)
Total BH within 3 km	5
Total HP within 3 km	1,356

Total estimated extraction within 3 km[7]	1.05 million m^3
Estimated extraction per square kilometer	37,038 m^3/year
Total area of basin	90 km^2
Estimated extraction from basin	3.33 million m^3/year

The seepage from the canals of the Study Area basin is calculated in **Exhibit 7.10**. The total estimated seepage from the canals is 110,750 m^3/d. Assuming the canal operates for 300 days annually, the total estimated seepage of water in the Study Area basin is 33.22 million m^3.

Based on the plant water requirement of 270 m^3/hr, it is estimated that the plant will abstract about 6% of the seeped water in the basin. In comparison, the community is abstracting about 10% of the seeped water.

7.7.5 Mitigation

Based on the discussion above, the following measures are proposed:

- The quantity of water used during construction activity will be kept to the minimum required by taking prudent water conservation measures on site.
- SPGL management will bore tube wells designated for its requirements along the banks of perennial canal Dahar Wah Lower and Dahar Wah Upper.
- Newly installed tube well(s) will be located at least 100 m from the existing local wells.
- Installation of tubetube wells within the canal safety zone, 300 m either side of a major canal and 200 m either side of a minor and/or distributor, requires approval of SIDA, even if the well is on private land. Prior approval from SIDA will be obtained if the wells are to be located in the safety zone.
- A water conservation program will be initiated.

Residual Impacts

It should be possible to meet the entire demand for the plant construction through the plant well(s) without adversely impacting the supplies of the community.

Monitoring Requirements

The depth of the water table in all wells within 500 m of the well from which water is to be extracted will be monitored weekly.

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[7] The flow rate was measured. The community was asked as to the number of hours that the wells operate. The total reported duration is the time for which the well is in use. The duration for which it is actually extracting water at full capacity is less. It is estimated based on observation of the wells that the duration for which the wells are in operation is not more than 50-60%. Therefore a conservative value of 60% is assumed.

7.8 Socioeconomic Impacts

7.8.1 Community Safety

Potential Impact

S01 Community Safety	*Phase*
The proposed construction activity can potentially be a safety hazard for the community. In particular, the increase in construction related traffic on the proposed Project access road.	Design
	Construction
	Operation

Existing Conditions

There is no major construction or any other development Project currently active in the Study Area, and therefore no significant traffic on the access road to the plant site.

Criteria for Determining Significance

A significant community hazard will also be considered, if a condition is created during the construction activity that would be considered a safety hazard under widely acceptable occupational and safety health criteria such as that of the Occupational Safety and Health Administration (OSHA) of the USA.

According to The IFC PS 4 the developer will have to evaluate the risks and impacts to the health and safety of the affected community during the design, construction, operation, and decommissioning of the project and will establish preventive measures to address them in a manner commensurate with the identified risks and impacts. These measures will favor the prevention or avoidance of risks and impacts over minimization and reduction.

Impact Analysis

Project related traffic particularly on the section of the access road that is passing through settlements will be the major source of concern for the community.

There are no major settlements near the proposed plant site therefore no major construction related hazards are predicted for the construction phase of the Project.

Mitigation

The following are mitigations measures:

- Planning and management
  - A public safety plan will be developed and shared with the community according to the IFC Performance Standard (PS) 4 and associated guidelines.
  - Community complaint register and other means will be adopted for the community to complain about non-adherence of Project traffic to speed limits, safe driving and other safety-related concerns
  - The fence surrounding the site will be put in during the early phase of construction to prevent access to the construction site.

- ▷ All entry points into the construction area will be staffed 24 hours a day. People who are not related to the Project will not be allowed inside, unless accompanied by Project personnel.

- Traffic
  - ▷ Community will be briefed on traffic safety, especially women who are main care providers to children.
  - ▷ Flagmen and traffic controllers employed by Star Power will be put at the plant site to direct the Project related traffic to and from the plant site
  - ▷ Speed limit of 20 km/h will be maintained on the section of the access road that passes near the settlements
  - ▷ Nighttime driving of Project vehicles will be limited where possible.
  - ▷ Road signage relevant to the Project traffic will be posted, where necessary.
- Machinery
  - ▷ Work areas outside the proposed plant site, especially where machinery is involved, will be roped off and will be constantly monitored to ensure that local people, especially children, stay away.
  - ▷ No machinery will be left unattended, particularly while running.

Residual Impacts

With implementation of the mitigation measures proposed above, the residual impact on the community safety due to the construction of the power plant will be insignificant.

Monitoring Requirements

Specific monitoring requirements will be part of the Community Safety Plan and may include inspection for road signage, safety markers, fencing, and observance of other measures.

7.8.2 Land Acquisition, Resettlement, and Compensation

Potential Impact

C11 Land Acquisition, Resettlement, and Compensation	*Phase*
As per the requirements of the IFC PS 5 Land Acquisition and Involuntary Resettlement fair and timely payments for acquisition of land and compensation for loss of assets are the main issues that arise during the land acquisition process. If the payments are unfair or are perceived unfair, are delayed, are given to a person who is not the actual affected person, or does not cover all the damages, then it may result in material loss to the community. It also affects the relationship between the Project proponents and the community.	Design Construction Operation

Analysis

Land for the proposed power plant has already been acquired. There are no settlements on the land, therefore no relocation is required. Further, there is enough land available on the purchased land for the construction camp, therefore no resettlement is envisaged.

Mitigation

As land has already been acquired for the proposed power plant, however if any additional land that may be temporarily leased for project purposes, the following mitigation measures will be implemented:

- In accordance with the IFC PS 4 requirements to safeguard the local community from the negative impacts with regards to project design, the site will be at least 300 m from any settlement
- All agreements will be in writing
- Compensation will be paid on market rate
- All compensation will be settled in advance before the land is occupied.

7.8.3 Employment Conflicts

Potential Impact

C12 Employment Conflicts	*Phase*
The potential employment related issue includes dissatisfaction among local communities over the number of jobs offered to them, disagreement on definition of 'local' and also on distribution of jobs within the local community.	Design
	Construction
	Operation

Existing Conditions

The existing conditions have been discussed in **Section 4.**

Criteria for Determining Significance

A significant impact will be interpreted if the proportion of available unskilled jobs offered to the locals in the immediate area is less than around 50%.

Impact Analysis

The proposed Project is not likely to create significant local job opportunities. Unskilled and semi-skilled employment opportunities that are likely to be created will primarily be for a short period. As persons with relevant skills are not easily available locally, people from outside the Study Area are likely to fill a significant number of the semi-skilled and skilled jobs.

The key issue relates to provisions of jobs. This issue could become particularly problematic if it is perceived by the local communities that a significant number of construction-related jobs opportunities are not given to people from the local community. This could result in friction between local residents and construction workers.

A second related issue often seen in construction projects is the definition of 'local' for the purpose of award of jobs unless this process is transparent and in consultation with the local communities, to the extent possible.

Mitigation

The following mitigation measures will be implemented:

- Maximum number of unskilled and semi-skilled jobs will be provided to the local communities
- A local labor selection criterion will be developed in consultation with the community.

Residual Impacts

Due to its economic implications, it is possible that employment may remain a contentious issue throughout the Project.

Monitoring Requirements

The following data will be recorded and maintained on the employment:

- Total number of unskilled, semi-skilled, and skilled jobs offered during construction
- Name and place of residence of the employed staff

7.9 Occupational Health and Safety Hazards

Potential Impact

S01 Occupational Health and Safety Hazards	*Phase*
Construction and related activities of such large scale projects like power plants presents occupational health and safety challenges for both the workers and the management especially while handling hazardous chemicals, working at heights and in confined spaces etc.	Design
	Construction
	Operation

Existing Conditions

At present there is no construction or developmental activity going on at the Project site.

Criteria for Determining Significance

A significant Occupational Health and Safety hazard will also be considered, if a condition is created during the construction activity and/or operations phase that would be considered a safety hazard under widely acceptable occupational and safety health criteria such as that of the Occupational Safety and Health Administration (OSHA) of the USA.

Impact Analysis

During the construction phase of the project the potential risks may include potential injuries due to working at heights, exposure to heat and hazardous chemicals, injuries from falling objects and sharp edged equipment etc.

Mitigation

All the suggested mitigation measures are in light of the IFC PS 2 about occupational health and safety hazards and PS 4:

- Implement project-specific health and safety-related plans, which would include appropriate training and supervision of employees and enforcement of workplace safety policies.
- All processes and equipment would be designed and constructed for safe operation.
- Develop and implement a process safety management program to identify hazards associated with each applicable chemical.
- All project related staff would be provided the required personal protection equipment (PPE) and shall be trained to make sure that they are aware of the usefulness and correct use.
- Working at heights and in confined spaces should be done after obtaining approvals from the safety supervisors and should regularly be monitored.
- Emergency escape routes should be identified and all the workers should be made aware of them.
- Use of correct signage for better understanding of all the health safety instructions and precautions for the workers.

Residual Impacts

With implementation of the mitigation measures proposed above, the residual impact on the occupational health and safety issues due to the construction of the power plant will be insignificant.

Monitoring Requirements

- Depending upon the nature of activity and associated risk there will be periodical monitoring.
- All major and minor onsite incidents shall be reported and recorded. Also the data will be analyzed to improve the health and safety standards and performance.

7.9.1 Archaeological Resources

Potential Impact

C13 Archaeological Resources	*Phase*
Potential damage to archaeological resources during excavation.	Design
	Construction
	Operation

Existing Conditions

There are no documented sites of archaeological, historical, or cultural significance at the proposed plant site and in its vicinity.

Criteria for Determining Significance

A significant impact will be interpreted if any archaeological artifact is damaged.

Impact Analysis

Given the long-standing agricultural practices in the Study Area, it is unlikely that any archaeological sites or artifacts will be encountered during the construction activities of the proposed Project.

Mitigation

If evidence of archaeological remains is found during construction activities, the following actions will be undertaken:

- All contractors hired for construction work will be instructed to notify the Star Power plant management immediately if any object of archaeological or cultural value is found
- Excavation work in the vicinity of the find will be immediately stopped
- Assistance will be sought from the nearest office of the Department of Museum and Archaeology to identify the remains.
- If the museum decides to salvage the find, the plant management will provide assistance.

Residual Impacts

No residual impact on archaeological resources is envisaged.

Monitoring Requirements

Record of all finds with photographs.

Exhibit 7.1: Assessment Process

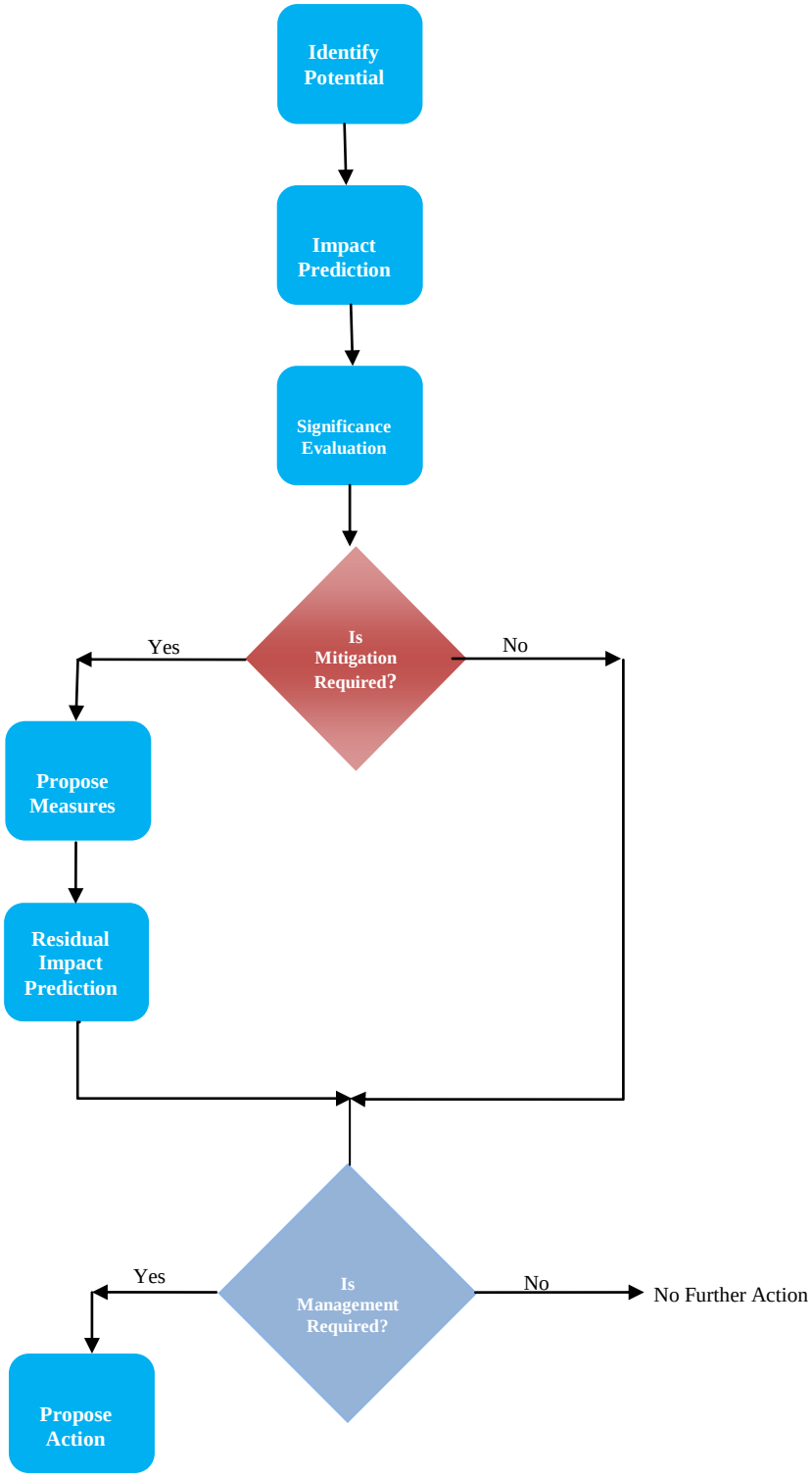


Exhibit 7.2: Construction Equipment Noise Ranges (dB(A))

Equipment	*Peak Noise Range at 15.2 m*	*Typical Peak Sound Level in a Work Cycle*[a]	*Typical 'Quieted Equipment' Sound Level*[b]	*Construction Phase*		
				Earthworks	*Structures*	*Installation*
Batching plant	82-86	84	81		Y	
Concrete mixers	76-86	85	82		Y	
Cranes	70-94	83	80		Y	Y
Excavators	74-92	85	82	Y		
Tractors and trolleys	77-94	88	85	Y	Y	Y
Water bowsers	85-93	88	85	Y	Y	Y
Graders	72-92	85	82	Y		
Bulldozers	65-95	80	75	Y		
Paver	87-89	88	80	Y		
Pumps	68-72	76	75	Y	Y	Y
Diesel generators	72-82	78	75	Y	Y	Y
Vibrators	68-82	76	75	Y	Y	
Drilling machines	82-98	90	87		Y	Y
Compressors	74-84	81	71		Y	
Dumpers	77-96	88	83	Y	Y	Y
Road rollers	73-77	75	72	Y		

Sources: Bolt, Beranek, and Newman, Noise from Construction Equipment and Operations, Building Equipment, and Home Appliances. USEPA, 1971;
http://www.waterrights.ca.gov/EIRD/text/Ch11-Noise.pdf;
http://www.lacsd.org/LWRP%202020%20Facilities%20Plan%20DEIR/4_6_Noise.pdf;
http://newyorkbiz.com/DSEIS/CH18Construction.pdf

Notes:

[a] Where typical value is not cited in literature, mean of the peak noise range is assumed

[b] Quieted equipment can be designed with enclosures, mufflers, or other noise-reducing features. Where data is not available, a 3 dB reduction is assumed

Exhibit 7.3: Predicted Noise Level for Construction Equipment (dB(A)

Equipment	*Equivalent Noise Level in an 8-hr Shift at Receptor 250 m from Source*
Batching plant	59
Concrete mixers	59
Cranes	54
Excavators	54
Tractors and trolleys	49
Water bowsers	49
Graders	44
Bulldozers	44
Paver	44
Pumps	39
Diesel generators	39
Vibrators	39
Drilling machines	39
Compressors	39
Dumpers	39
Road rollers	39

Exhibit 7.4: Noise Levels at Receptor under Various Activity Levels

Equipment	*Number of Equipment Employed*		
	Earthworks	*Structural*	*Installation*
Batching plant		1	
Concrete mixers		1	
Cranes		1	1
Excavators	2		
Tractors and trolleys	2	1	1
Water bowsers	1	1	1
Graders	1		
Bulldozers	2		
Paver	1		
Pumps	1	1	1
Diesel generators	1	1	1
Compressors		1	
Dumpers	2	1	1
Road rollers	2		
Additional Sound Pressure Level at Receptor (dB(A))	**48**	**49**	**47**
Total Noise Level Including Background (dB(A))	**48.6**	**49.5**	**47.8**

Exhibit 7.5: SCREEN3 Input Parameters and Results for PM_{10} Emission during Construction

Input			
Source type		Area	
Emission rate	Worst Case	4.00×10^{-5}	g/m^2-s
	Typical	1.05×10^{-5}	g/m^2-s
Source height		0.5	m
Length of Larger side		520	m
Length of smaller side		405	m
Receptor height		1.6	m
Urban/Rural option		Rural	
Output			
Maximum 1-hour concentration	Worst Case	3,828	$\mu g/m^3$
	Typical	1,005	$\mu g/m^3$
Distance to the maximum from center of site		331	m
24-hour average	Worst Case	1,531	$\mu g/m^3$
	Typical	402	$\mu g/m^3$

Exhibit 7.6: Comparison with NEQS Emission Standards[8]

Parameter	*Target Emission Standard*	*Estimated Plant Emission*
Natural gas		
Sulfur dioxide	1,700 mg/Nm^3	2.87 mg/Nm^3
Nitrogen oxides	400 mg/Nm^3	29.4 mg/Nm^3
Carbon Monoxide	800 mg/Nm^3	15.5 mg/Nm^3
Particulate Matter	300 mg/Nm^3	0 mg/Nm^3
High Speed Diesel (HSD)		
Sulfur dioxide	500 tons per day	8.95 tons per day
Nitrogen oxides	130 ng/J	106 ng/J
Carbon Monoxide	800 mg/Nm^3	6.36 mg/Nm^3
Particulate matter	300 mg/Nm^3	88.8 mg/Nm^3

Exhibit 7.7: Comparison with IFC's Thermal Power Plants Limits[9]

Parameter	*Target Emission Standard*	*Estimated Plant Emission*
Natural gas		
Sulfur dioxide	NA	2.87 mg/Nm^3
Nitrogen oxides	51 mg/Nm^3	29.4 mg/Nm^3
Carbon Monoxide	NA	15.5 mg/Nm^3
Particulate Matter	NA	0 mg/Nm^3
High Speed Diesel (HSD)		
Sulfur dioxide	Use 1% or less S fuel	Use of 1% S fuel
Nitrogen oxides	152 mg/Nm^3	97.3 mg/Nm^3
Carbon Monoxide	NA	6.36 mg/Nm^3
Particulate matter	50	88.8 mg/Nm^3

[8] The plant emissions stated in this table are for actual Oxygen concentration

[9] The plant emissions stated in this table are for 15% Oxygen

Exhibit 7.8: Inputs for Air Dispersion Modeling

Number of stacks	2	
Stack height	30	m
Stack internal diameter	2.5	m
Receptor height	1.6	m
Urban/Rural option	Rural	
Ambient temperature	27	°C
Natural Gas		
Gas flow rate (at stack temperature)	342.2	m^3/s
Stack Temperature	117	°C
	390	K
Mass emission rate		
Sulfur dioxide	0.34	g/s
Nitrogen oxides	3.53	g/s
Particulate matter	0	g/s
Carbon monoxide	1.86	g/s
High Speed Diesel		
Gas flow rate (at stack temperature)	379.1	m^3/s
Stack Temperature	137	°C
	410	K
Mass emission rate		
Sulfur dioxide	103.6	g/s
Nitrogen oxides	12.28	g/s
Particulate matter	11.2	g/s
Carbon monoxide	0.80	g/s

Exhibit 7.9: Results of Dispersion Model

All values in µg/m³

Fuel	*Pollutant*	*Averaging Period*	*Increase Due to Project*	*Background Concentration* [a]	*Predicted Post-Project Concentration*	*Percent Increase*	*NEQS*	*IFC Guidelines*	*Target Limit* [b]
Natural Gas	SO_2	24 hour	0.14	84.1	84.2	0.2%	120	125	120
	SO_2	Annual	0.03	34.1	34.1	0.1%	80		80
	NO_X	1 hour	3.549	172.5[c]	176.0	2.1%		200	200
	NO_X	24 hour	1.420	57.5	58.9	2.5%	80		80
	NO_X	Annual	0.284	34.7	35.0	0.8%	40	40	40
	PM_{10}	24 hour	0.000	329	329	0%	250	150	150
	PM_{10}	Annual	0.000	138	138	0%	200	70	70
	CO	1 hour	1.876	7,004[d]	7,005	0.0%	10,000		10,000
	CO	8 hours	1.313	3,402[d]	3,403	0.0%	5,000		5,000
High Speed Diesel	SO_2	24 hour	31.96	84.1	116.1	38.0%	120	125	120
	SO_2 [e]	Annual	6.39	34.1	40.5	18.7%	80		80
	NO_X	1 hour	9.472	104.1[c]	113.6	9.1%		200	200
	NO_X	24 hour	3.789	34.7[f]	38.5	10.9%	80		80
	NO_X [e]	Annual	0.758	34.7	35.5	2.2%	40	40	40
	PM_{10}	24 hour	3.455	138[f]	141	2.5%	250	150	150
	PM_{10} [e]	Annual	0.691	138	139	0.5%	200	70	70
	CO	1 hour	0.617	7,004[d]	7,004	0.0%	10,000		10,000
	CO	8 hours	0.432	3,402[d]	3,402	0.0%	5,000		5,000

a. For 24-hour reading the daily maximum as shown in **Exhibit 5.17** has been used.
b. The more stringent of NEQS and IFC Guidelines (Note: Blank cell indicates there is no corresponding standard).
c. NO_X for 1-hr has been calculated by multiplying the 24-hr average by 3. The multiplying factor has been obtained from typical hourly monitoring data.
d. CO for 1-hr and 8-hr were calculated by multiplying the 24-hr average by 1.7 and 3.5, respectively. The multiplying factors are based on typical hourly monitoring data.
e. Annual concentration pollution due to HSD combustion is shown for comparison only. HSD will be used for start-up and shut-down only and hence is not likely to impact the annual concentration of the pollutants.
f. As HSD will be used for short-term, for likely impact on the 24-hour concentration the annual average 24-hour pollutant concentration is used instead of maximum 24-hour.

Exhibit 7.10: Seepage from Canals in Study Area Basin

	Design Inflow Cusecs	*Net Design Extraction*	*Actual Estimated Extraction a (m^3/d)*	*Total Length of Canal (km)*	*Extraction per unit Length (m^3/d/km)*	*Length in the Study Area Basin (km)*	*Extraction in the Study Area Basin (m^3/d)*	*Estimated Seepage b (m^3/d)*
Narli Minor	397	971,290	777,032	37	21,001	8	84,004[c]	16,801
Dahar Wah Lower	663	1,622,080	1,622,080	60	21,628	10.6	229,254	45,851
Kandar Distributory	252	616,537	616,537	25	19,729	6	59,188[c]	11,838
Dahar Wah Upper	200	489,315	489,315	19	20,603	8.8	181,304	36,261
Total								110,750

[a] Estimate based on actual flow being 80% of the design flow

[b] Estimated at 20% of flow

[c] Only 50% of the extraction is included since only one bank of the canal is in the basin

8. Social and Environmental Management System

This section describes the framework for the social and environmental management system ('SEMS')[1] for the Project. The framework has been developed with consideration of the requirements of the Project description (Section 3) and Project environment (**Section 5**) in accordance with Pakistan's legislation and guidelines, the International Finance Corporation's (IFC's) Performance Standard 1 and the main principles in the International Standards Organization (ISO) 14001 Standard (ISO 14001:2004).

The IFC Performance Standards state the objectives of an SEMS are to:

- identify and assess social and environmental impacts, both adverse and beneficial;
- avoid, or where avoidance is not possible, minimize, mitigate or compensate for adverse impacts on workers, affected communities, and the environment;
- ensure that affected communities are engaged on issues that could potentially affect them; and
- promote improved social and environmental performance of companies through the effective use of management systems.

IFC Performance Standard 1 describes key features of a good SEMS. These features are:

Dynamic	it should be a dynamic, continuous process
Communication	it should be initiated by management and involve communication between the Project owner, its workers, and the local communities directly affected by the Project
Plan-do-check-act	it should be based on this widely accepted business management process
Impact and risk	it should take into account a thorough assessment of potential environmental and social impacts and risks from the early stages of project development
Consistency	it should provides order and consistency for mitigating and managing environmental and social impacts and risks on an ongoing basis throughout the life of the project.

8.1 Basic Elements of SEMS

There are 16 basic elements of SEMS relating to the four steps–plan, do, check, and act. In **Exhibit 8.1**, the Plan-Do-Check-Act Model is presented showing the relationship of each step with the 16 elements. Brief explanation of the each of the element is provided below and are discussed in details in the following sections.

[1] Several other terms are also used such as Environmental and Social Management System and Environmental Management System. SEMS is the term used by IFC.

Step I: Plan Elements

1. **Policy:** Produce and communicate a statement of corporate commitment to environmental and social management
2. **Legal requirements**: Identify and provide access to legal requirements
3. **Aspect identification and impact assessment**: Identify aspects ("mechanisms" by which project activities impact on the environment) and assess associated impacts arising throughout the Project life. The environmental assessment falls under this element of the SEMS
4. **Objectives, targets and plans for management**: Define objectives, targets, criteria and actions for the management of potential impacts. The Environmental and Social Management Program (ESMP) falls under this element

Step II: Do Elements

5. **Roles and responsibility**: Provide sufficient management sponsorship of human and financial resources; establish roles and responsibilities for implementation
6. **Training**: Ensure that employees are aware of and able to meet that their responsibilities
7. **Communication**: Communicate internally and externally on the implementation of environmental and social management
8. **Operational controls**: Implement operational controls to maintain environmental performance and compliance and to manage impacts and risks
9. **Documentation and record keeping**: Maintain and control documentation on the different elements of the SEMS

Step III: Check Elements

10. **Monitoring and evaluation**: Monitor and measure the effectiveness of the ESMP and performance of the SEMS
11. **Corrective and preventive actions**: Identify and correct problems and prevent re-occurrences
12. **Reporting**: Report on the effectiveness of the ESMP and SEMS to senior management, regulatory authorities and affected communities

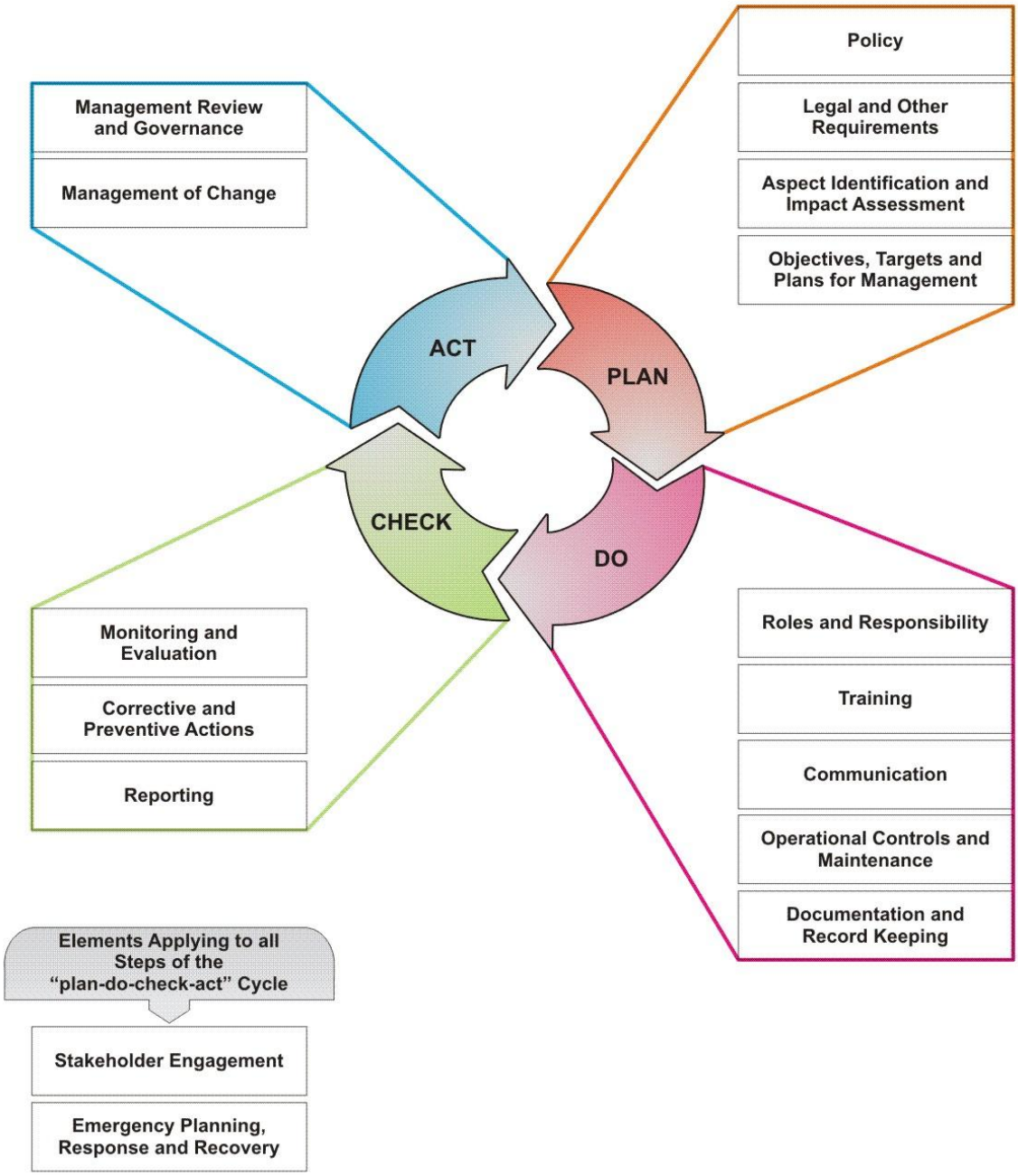
Step IV: Act Elements

13. **Management review and governance**: Review and refine the ESMP and SEMS with the aim of continuous improvement
14. **Management of change**: Modify the SEMS in response to changes in the Project and to changes in the organization, personnel, operations and processes

Elements Applying to All Steps

15. **Stakeholder engagement**: An ongoing process, throughout the life of the project. Serves to build and maintain a constructive relationship with communities affected by the project

Exhibit 8.1: Elements of the SEMS



16. **Emergency planning, response and recovery**: Maintain emergency response preparedness through the identification of potential environmental emergencies, development of response plans and allocation of response and recovery resources.

8.2 Planning Elements

8.2.1 Policy

SPGL is developing its corporate policy for environment. The policy will be based on the guidelines provided in ISO 14001 Environmental Management Standard. SPGL will periodically review the scope and effectiveness of its policy. The policy will be documented, maintained, implemented and communicated to SPGL employees, contractors, suppliers and the public.

8.2.2 Legal Requirements and other Obligations

The SEMS needs to consider both legal and other obligations imposed on the Project. The types of obligations that may influence the SEMS may include:

1. **Legal:** Statutory requirements (Act, Ordinances, Regulations and Rules), Conditions of environmental approval
2. **Financing agreement conditions:** IFC performance standards and guidelines
3. **Voluntary:** Corporate policies and standards, industry codes
4. **Commitments to Stakeholders**

An obligations register will be compiled and maintained for the Project. This register will include identified legal and other requirements pertaining to environmental and social management for the Project.

SPGL will also:

- manage recurring legal and other obligations (such as inspections, sampling, analysis and reporting);
- track developing legislation and regulations that may apply to operations and activities to anticipate and prepare for compliance;
- inform employees and others working on behalf of the company of existing and emerging obligations that apply to their job responsibilities; and
- consider the register in the review of objectives, targets and plans for management of impacts.

8.2.3 Aspect Identification and Impact Assessment

A key element of SEMS is identification of aspects and assessment impacts. The EA documented in this report falls under this element of the SEMS.

Procedures will be set up for identification of significant environmental aspects and undertaking of impact and risk assessments on an ongoing basis through the Project life. These will address:

- aspects not covered by this EA; and

- any changes in the Project or new developments arising subsequent to the completion of this EA.

8.2.4 Objectives, Targets and Plans for Management

This element of the SEMS pertains to the setting of objectives and targets for environmental and social management, and plans for the achievement of these objectives and targets at corporate and Project/ site levels.

The primary purpose of the ESMP is to guide environmental and social management throughout the life of the Project. The core of the ESMP is a statement of environmental and social management objectives and associated management measures. The ESMP will be supported by other documentation such as the original Project description (described in Section 3) and specific management plans and operating procedures. The ESMP and its supporting documents serve the same function as the 'Environmental Management Plan'(**Appendix F**)referred to in the Pakistan regulations and the 'Action Plan' used in the Equator Principles and the IFC Performance Standards.

8.2.5 ESMP Supporting Documentation

Management plans and other forms of supporting documentation will be developed, where needed, to provide further detail on how key actions identified in the ESMP will be executed. The need for supporting management plans or other supporting documents has been determined initially during the EA, based on the risk posed by or complexity of the impact/s or area requiring management.

A benefit of separating the ESMP and supporting documentation is increased flexibility in meeting the stated ESMP objectives. Modifications can be made to ESMP supporting documentation and additional detail provided, in line with changing priorities and external and internal circumstances, without necessarily needing to renegotiate regulatory conditions of approval (which may make the ESMP legally enforceable).

ESMP supporting documentation that may be developed includes:

- stakeholder engagement plan;
- recruitment plan,
- training and skills development plan;
- emergency preparedness, response and recovery plan;
- energy management plan;
- water management plan;
- waste management plan;
- hazardous materials management plan;
- spill prevention and mitigation plan.

8.3 Implementation (do) Elements

Effective implementation and functioning of the ESMP depends on adequate human and financial resources, clearly defined responsibilities for environmental and social management, appropriate training and good communication. An outline of how these features will be managed for the Project is presented below.

8.3.1 Roles and Responsibility

SPGL will define, document and communicate the environmental and social management roles and responsibilities of Project personnel, including contractors and others working on behalf of the company. Personnel with specific roles and responsibilities will have the authority, and be held accountable for, carrying out these.

The basic roles required to implement the ESMP, and establish and maintain the SEMS, are shown in **Exhibit 8.2**. These roles need to be reviewed and incorporated into the organizational structures for the construction and operational phases of the Project.

8.3.2 Contractors, Suppliers and Vendors

Environmental and social performance, programs and risk management will be considered in the selection and management of contractors, suppliers and vendors. Contracts will address potential environmental and social liabilities and responsibilities including:

- use of competent, trained staff, including subcontractors;
- consequences for failing to meet obligations;
- monitoring of performance;
- required job-specific, site-specific training;
- compliance with SPGL policies and site standards and applicable legal requirements;
- responsibility for chemicals brought on-site and wastes generated on-site, including closure activities where appropriate; and
- identification of a lead responsible person for both SPGL and the contractor.

Contractors, including their employees and associated subcontractors, will be made aware of the environmental risks, associated controls, procedures and standards relevant to their work on-site. The activities and performance of contractors will be monitored against the terms of the contracts.

Exhibit 8.2: Roles and Responsibilities for Environmental and Social Management

Roles	Relevant Responsibilities
SPGL chief executive officer	▶ Endorse the environmental and social management policy and require it to be communicated to the public ▶ Allocate adequate human and financial resources to enable effective functioning and continual improvement of the SEMS ▶ Establish and maintain a governance system
Project site management and SPGL senior management	**Policy** ▶ Develop, review and update policy (or policies) on environmental and social management ▶ Incorporate principles of these policies in business decisions **Compliance** ▶ Confirm necessary authorizations have been obtained for the Project ▶ Confirm compliance with legal requirements and other obligations pertaining to environmental and social management ▶ Commit contractors and suppliers to meeting relevant environmental and social obligations by means of specific conditions in the contracts of appointment **Roles and responsibility** ▶ Define, document and communicate environmental management roles, responsibilities and authorities ▶ Provide sufficient appropriately trained human resources and adequate financial resources to enable effective functioning and continual improvement of the SEMS ▶ Hold personnel responsible for meeting their assigned responsibilities ▶ Select SEMS Committee **Communication and reporting** ▶ Confirm there is adequate ongoing stakeholder engagement ▶ Confirm obligations for reporting to regulatory authorities, development financiers and affected communities are met ▶ Management review ▶ Provide leadership in the pursuit of environmental and social management ▶ Examine and review the SEMS periodically to determine its suitability, adequacy and effectiveness ▶ Support action to enhance the SEMS and make improvements in environmental and social management performance

Roles	Relevant Responsibilities
Environmental management	**SEMS** ▶ Establish the SEMS, with assistance from the senior management, division managers and community relations managers ▶ Liaise with division managers regarding environmental management roles, responsibilities and authorities throughout operational divisions ▶ Coordinate monitoring and evaluation activities and confirm corrective actions (an action taken to address a non-conformance) are taken to address incidents and non-conformances (a failure to comply with the Project's SEMS) ▶ Report progress in implementation and functioning of the SEMS to senior management, development financiers, regulatory authorities and stakeholders **ESMP** ▶ Keep the ESMP up to date and confirm it addresses all relevant environmental and social obligations ▶ Present the ESMP in an appropriate format for communication with regulatory authorities and other stakeholders ▶ Present the ESMP in an appropriate format for communication with parties responsible for Project execution ▶ Compile ESMP compliance reports ▶ "Sign-off" actions in the ESMP and non-conformances once they have been completed
Community relations management	▶ Assist the Environmental Management team with ongoing reporting to stakeholders on ESMP and supporting management plans, and progress with implementation of management measures ▶ Assist Environmental Manager and division managers with stakeholder communication where awareness and/ or co-operation of stakeholders are required to implement management measures ▶ Manage the grievance mechanism
Line management	▶ Confirm the SEMS and ESMP are established, communicated, implemented and maintained in their respective areas ▶ Provide leadership in the pursuit of environmental and social management ▶ Identify ways to improve environmental and social performance through daily monitoring of their activities and evaluating implementation ▶ Review monitoring results, incidents and corrective actions taken ▶ Evaluate adequacy and effectiveness of awareness and skills training programs pertinent to environmental and social management ▶ Maintain internal communication of environmental and social matters between the Environmental Manager and other personnel, and promote environmental and social awareness.
All personnel and contractors	▶ Comply with SPGL policies, site standards and applicable legal requirements ▶ Work in accordance with the ESMP and supporting documents ▶ Report problems or deviations from the SEMS or ESMP to division managers and/or environmental managers, as instructed.

8.3.3 Training

Personnel, including contractors' personnel, working for or on behalf of the Project will be informed of potential significant environmental and social impacts and risks associated with the Project by means of awareness training. Visitors to Project sites will also receive awareness training as part of site induction training.

Personnel, including contractors' personnel, will be made aware of their specific environmental and social management responsibilities. Training needs analyses will be undertaken and personnel will be given adequate training to meet these responsibilities.

The training program comprises the following elements:

- identification of training needs for all employees specific to their varying responsibilities;
- development of a training plan and schedule to address defined needs;
- verification of training programs to confirm consistency with organizational requirements;
- training of employees and documentation of training received;
- evaluation of training effectiveness; and
- review and modification of training programs, as required.

Personnel with direct responsibility for implementation of the ESMP and functioning of the SEMS will have additional training to:

- provide them with the knowledge and skills necessary to perform their work;
- maintain their knowledge of relevant environmental and social obligations; and
- enable them to implement specific measures required under the ESMP in a competent and efficient manner.

8.3.4 Internal Communication

To effectively implement environmental and social management, the relevant managers will maintain lines of internal communication and provide information regarding the ESMP, SEMS and environmental and social management performance to personnel electronically, on notice boards and/or in newsletters. Such communication will be used to inform the personnel of their individual responsibilities with respect to the SEMS and to raise awareness on specific matters.

A grievance mechanism will be established and will provide a means for Project personnel, including contractors' personnel, to anonymously raise environmental and social concerns.

8.3.5 Operational Controls

Operational controls will be implemented to maintain performance and compliance, and to manage impacts and risks. Operational controls may include:

- administrative controls such as performance standards;

- standard operating procedures and work instructions; and
- engineered controls such as pollution control equipment.

Written operational controls are required where their absence could lead to deviation from environmental obligations or objectives and targets. The adequacy, suitability, and effectiveness of operational controls will be reviewed regularly. Documentation on the design basis and operating criteria and limits for equipment having the potential to impact environmental performance will be maintained.

Operating equipment, as well as environmental monitoring and measurement devices, will be maintained consistent with manufacturers' specifications and best management practice to reduce the potential for environmental incidents and adverse environmental impacts.

8.3.6 Documentation and Recordkeeping

Elements of the SEMS will be documented and controlled in accordance with a document control system. Records demonstrating compliance with legal requirements and conformance with the SEMS will also be maintained. SPGL will establish, implement and maintain procedures:

- for SEMS document control detailing how the creation, review and updating of various types of documents will be managed and who will be responsible; and
- for record identification, storage, protection, retrieval, retention and disposal.

Documentation and record keeping controls will include:

- measures to enable relevant documents (including those of external origin deemed necessary for planning and operation of the SEMS) and records to be readily available and identifiable (labeled, dated and properly filed), legible and protected from damage;
- review, revision and approval of documents for adequacy by authorized personnel at least once a year;
- establishment of the electronic document control version as the 'authorized version';
- making current versions of relevant documents available at locations where operations essential to the effective functioning of the SEMS are performed;
- suitably identifying obsolete documents retained for legal and knowledge preservation purposes; and
- identification and segregation of confidential and privileged information.

8.4 Check Elements

Monitoring is required to confirm the existence of an effective SEMS and conformance with the ESMP. Linked to this is the need for identified non-conformances to be remedied and for progress with both compliance and non-conformances to be reported. These three components are discussed below.

8.4.1 Monitoring and Evaluation

A monitoring program will be established. This will be an integral component of the SEMS and have clear links to the ESMP. The aim of the monitoring program will be:

- provide measurements of environmental and social impacts of the Project;
- ascertain and demonstrate compliance with conditions of approval and other legislation;
- provide sufficient evidence to address any claims made against the Project in respect of environmental and social matters;
- track performance of the SEMS and progress in the implementation of the ESMP;
- track and measure key indicators and other performance measures over time to improve the Project's performance and reduce the likelihood of environmental incidents; and
- inform decision processes for determining management actions.

The monitoring program comprises data collection and interpretation, site inspections and formal audits as discussed further below. The monitoring program proposed for the Project is presented in the following section.

Data Collection and Interpretation

The monitoring program covers the physical, biological and social components of the operation and is integrally linked with the assessment criteria stated in the ESMP. Where appropriate and possible, the sampling parameters and locations used in the EA baseline studies have been retained to provide data continuity.

The monitoring program identifies monitoring parameters, sampling locations, sampling frequency and duration and detection limits (where appropriate). It includes control sites, where relevant. The focus and extent of monitoring is commensurate with the risk of impacts occurring, the sensitivity of the surrounding areas and the affected communities' perceptions of risks to their health and environment. For some types of monitoring, thresholds or targets are available (and included in the environmental or social management programs), for example the emission and ambient limits included in the Project's Environmental Design Criteria (**Section 3**). In other cases, the monitoring results will be compared to the baseline data set gathered as part of this EA. Lastly, where neither thresholds nor baseline data are available, the initial data collection may go on to form the baseline for future data collection.

The monitoring program will be coupled with a series of supporting procedures, yet to be developed, covering:

- sample or data collection;
- sample handling, sample storage and preservation;
- sample or data documentation;
- quality control;

- data reliability (calibration of instruments, test equipment, and software and hardware sampling);
- data storage and backup, and data protection;
- interpretation and reporting of results; and
- verification of monitoring information by qualified and experienced external experts.

Data will be documented and interpreted. Temporal and spatial trends in the data will be discerned and compliance with relevant thresholds will be evaluated. Monitoring reports will be produced to meet internal and external reporting requirements. If monitoring results indicate non-conformance with stipulated thresholds or if a significant deteriorating trend is observed, it will be recorded as a non-conformance and handled by the non-conformance and incident procedure.

Site Inspections

Site inspections will be undertaken regularly in relevant areas of the Project. The inspections will focus on compliance with the ESMP and conformance with the SEMS. The inspections will play an important role in increasing awareness of ESMP and SEMS requirements.

Minor non-conformances will be discussed during the inspection and recorded as a finding in the inspection report. Major non-conformances will be reported as incidents. Inspection results will be disclosed at management meetings.

Formal Audits

Formal audits will be undertaken at planned intervals. Procedures for audits will be established, implemented and maintained. These will cover the audit criteria, scope, frequency and methods, and will address the responsibilities and requirements for planning and conducting audits, reporting results and retaining associated records.

Any negative findings arising from an audit will be treated an incident and dealt with in accordance with the non-conformance and incident procedure. Results from audits and evaluations of compliance with legal requirements will be reported to site and senior management and subject to management reviews.

8.4.2 Non-conformances and Incident Reporting

Non-conformances include the following:

- exceedances of relevant thresholds as identified during routine monitoring;
- non-conformances with the requirements of the ESMP or supporting documentation identified during an internal inspection;
- non-conformances identified during an audit or by regulatory authorities;
- events, such as spills, resulting in potential or actual environmental harm;
- events that did or could result in injury to staff, visitors to site or surrounding communities; and

- significant complaints or grievances received from any source.

A process will be established for the identification, investigation and tracking of non-conformances, including:

- prioritizing and classifying non-conformances based on the type and severity of the non-conformance;
- recording of non-conformances and the results of corrective and/or preventive actions, including the actions necessary to mitigate or remedy any associated impacts;
- defining results expected from the corrective and/or preventative actions;
- confirming the corrective and/or preventive actions taken to eliminate the causes of the non-conformance are appropriate to the magnitude of problem and commensurate with the impacts encountered;
- reviewing the effectiveness of the corrective and/or preventive actions taken; and
- implementing and recording required changes in the ESMP or monitoring program resulting from corrective and preventive action.

Serious non-conformances will be classified as incidents. Incidents will be promptly reported to appropriate management. A guideline will be prepared on:

- the types of incidents reportable to internal management at the site, Project and corporate levels, as well as to regulatory authorities and other external stakeholders; and
- standards to be observed when reporting incidents.

The investigation of incidents and evaluation of effectiveness of existing controls and response actions will be undertaken at a level commensurate with the severity of the incident.

8.4.3 ESMP and SEMS Reporting

Progress on compliance with the ESMP and functioning of the SEMS will be reported to:

- Plant site and SPGL senior management;
- development financiers, if required in terms of the loan agreement;
- regulatory authorities, if required in terms of legislation and conditions of approval; and
- affected communities and other interested stakeholders.

In addition, the formal audit reports on compliance with the ESMP and the functioning of the SEMS will be made available to site and corporate management.

8.5 Act elements

8.5.1 Governance and Management Review

Plant site management and SPGL senior management will review the ESMP and SEMS on a periodic basis to determine its suitability, adequacy and effectiveness. Each management review will initiate a new plan-do-check-act cycle with enhancement of the SEMS and continuous improvements in environmental and social management performance. The management review will cover:

- progress and closure of actions from previous management reviews;
- monitoring programs findings/ the extent to which objectives and targets have been met;
- findings of audits;
- incidents and the status of corrective and/or preventative actions;
- impact and risks assessments;
- changing circumstances, including changes to operations, Pakistan legislation or guidelines, ownership, socio-political circumstances;
- legal compliance and compliance with other obligations;
- stakeholder concerns, requests or complaints;
- adequacy of policies, ESMP and SEMS to meet operational and corporate requirements; and
- recommendations for improvement.

8.5.2 Management of Change

Changes to the Project can be expected throughout the life of the Project. These can range from changes to operations and infrastructure, new developments (such as an expansion), changes to personnel and the Company, changes in legislation and changes the environment of the Project (such as a new settlement established near Project infrastructure). These changes could result in changes to the significance of environmental and social impacts and risks. This may necessitate updates to existing authorizations/ permits, changes to the ESMP, which may have to be approved by regulatory authorities, and general changes to the SEMS framework.

A procedure for the management of change will be established and maintained. This will:

- observe the corporate requirements for the management of change;
- identify proposed changes that could alter environmental or social impacts and risks and/ or require new authorizations/ permits or changes to existing authorizations/ permits; and
- define the impact and risk assessments appropriate to different types of changes, which need to be undertaken by competent personnel.

Changes will not be made without the required authorizations and permits in place. The measures identified as necessary to mitigate impacts and risks will be implemented. The various elements of the SEMS will be modified as required in response to the change,

A procedure specifically for changes to the ESMP and supporting documentation will be established. This will detail:

- how the changes are to be recorded;
- who has responsibility for overseeing changes and checking they do not conflict with any planning conditions or other obligations;
- the process of review and sign off in response to changes; and
- how changes to the ESMP should be communicated internally and externally.

8.6 Stakeholder Engagement

Stakeholder engagement provides stakeholders with opportunities to express their views on project risks, impacts and impact mitigation measures and involves appropriate consideration of the views and responses by project management. The stakeholder engagement applies to each of the steps of SEMS "plan-do-check-act" cycle and is an integral part of several SEMS elements. The relationship between stakeholder engagement and these elements is as follows:

- **Environmental Assessment**: During the EA, the focus of stakeholder engagement has been the involvement of stakeholders in project-planning and project-approval decision-making processes. It facilitated identification of stakeholder's concerns so they could be addressed in the Project design and/or ESMP. It forms the basis for stakeholder engagement throughout the life of the Project.
- **ESMP**: Stakeholders will be involved in the regulatory process of review and approval of the first version of the ESMP. Throughout the life of the Project, there should be ongoing reporting to stakeholders on progress in the implementation of the ESMP and supporting management plans that are of interest to them. The ESMP and supporting management plans may need to be revised in response to stakeholders' concerns.
- **Communication:** Communication with stakeholders will be required to implement some management actions. The communication will be required to raise awareness and cooperation of potentially affected communities and other stakeholders. SPGL will determine effective communication methods for making affected communities aware of actions they may need to take to avoid exposure to operation-related hazards and how they can maximize on opportunities resulting from the operation.
- **Monitoring and evaluation**: Participatory monitoring is desirable. This entails involvement of stakeholders, particularly affected communities, in monitoring and verifying information to check that impact mitigation measures are appropriate. Grievances will be handled as incidents and managed through the incident procedure to enable the grievance to be received, documented, addressed and

results fed back to the complainants. This procedure will protect the confidentiality of the persons raising the complaint. The feedback will be easily accessible and understandable to members of the affected community and/or staff.

- **Reporting**: Stakeholders affected by the Project will be informed of progress in the implementation of the management plans and of the effectiveness of management measures.

SPGL will formally established a program of stakeholder engagement for the Project and this will continue throughout the life of the project. When the Project enters the construction phase, and throughout the remaining life of the Project, stakeholder engagement will include:

- reporting on the implementation of the ESMP and relevant supporting management plans;
- opportunities for stakeholders to respond to the information received; and
- constructive dialogue on environmental and social issues and performance.

The stakeholder engagement process will be documented, including:

- maintenance of a stakeholder database with stakeholder;
- records of information disclosed to stakeholders;
- records of stakeholder engagements; and
- records of inputs from stakeholders and responses to these.

8.7 Grievience Mechanism

SPGL recognizes that the stakeholders, in particular the community living in the vicinity of the Project site, need a trusted way to voice and resolve concerns linked to the Project. SPGL intends to develop an effective way to address community concerns. It is recognized that a well-functioning grievance mechanism:

- takes into consideration the local customs, awareness, literacy, and communication means;
- provides a predictable, transparent, and credible process to all parties, resulting in outcomes that are seen as fair, effective, and lasting;
- builds trust as an integral component of broader community relations activities; and
- enables more systematic identification of emerging issues and trends, facilitating corrective action and preemptive engagement.

SPGL will develop and implement a grievance mechanism for the stakeholders, in particular the community living in the vicinity of the Project. The development and implementation can be broken down into four phases as follows:

1. **Define scope and determine goals**: Develop the overarching purpose and goals for the grievance mechanism.

2. **Design**: Assembles a preliminary plan that outlines the purpose, goals, scope, resolution approaches, structure, and specifics about how the grievance mechanism will function. This preliminary plan is tested and refined through consultation with stakeholders.
3. **Implement**: Work with the stakeholders to introduce, refine, and institutionalize the grievance mechanism.
4. **Monitor, report, and learn**: Gather information is the effectiveness of the mechanism in particular and, more generally, on the SPGL's ability to prevent and address grievances. Refine the system based on this information.

8.8 Emergency Preparedness and Response

The Project will implement and maintain an Emergency Preparedness. Response and Recovery Plan (EPR&R). The purpose of the EPR&R is to provide a framework for a comprehensive system to:

- establish a process to identify potential emergency situations prior to their occurrence;
- take steps to prevent or minimize the impact of potential emergencies;
- train personnel to appropriately identify, report and respond to emergencies;
- provide and maintain emergency response resources and equipment to mitigate potential emergencies;
- define detailed procedural steps to respond and manage various types of potential emergencies;
- provide information to and consult with the surrounding community regarding environmental risks and response measures;
- coordinate with external emergency response organizations;
- test communications, emergency procedures and equipment on a periodic basis;
- contain, where practicable, any emergencies and their effects within Project site boundaries;
- safely return to normal operations following an emergency;
- identify the cause(s) of an emergency event and the corrective and preventative measure to avoid a reoccurrence; and
- review and update plans and procedures based on lessons learned from tests and responses to actual emergencies.

The EPR&R will be prepared in accordance with:

- IFC Performance Standards (PS) PS3 Pollution Prevention and Abatement and PS4 Community Health and Safety, which require that a plan is in place to effectively respond to emergencies associated with project hazards and that local communities are involved in the planning process;

- IFC's EHS Guidelines, Volume 3 Community Health and Safety, Section 3.7 Emergency Preparedness and Response and the equivalent sections of the Sectoral EHS Guidelines relevant to the Project .

For the purposes of the EPR&R, the term "emergency" will refer to an unplanned event when a project operation loses control, or could lose control, of a situation that may result in risks to human health, property or the environment. The EPR&R will not cover safe work practices for frequent upsets or events, which will be covered by occupational health and safety plans.

The EPR&R may contain the following elements:

- **Administration**: relevant policy, purpose, distribution, definitions, scope, criteria for triggering the EP&R, date and frequency of updates;
- **Organization of emergency areas**: for example command centers and medical stations;
- **Roles and responsibilities**;
- **Communication systems**: worker notification and communication, community notification, media contacts and media relations strategy;
- **Emergency resources**: finance and emergency funds, fire services and medical services, mutual aid agreements provide a clear basis for response by mutual aid providers, contact list;
- **Emergency equipment**: such as location of isolation valves, equipment for fire fighting, personal protection and pollution prevention equipment;
- **Training and drills**;
- **Updating**: to account for changes in equipment, personnel, and facilities;
- **Checklists**: role and action list and equipment checklist;
- **Business continuity and contingency**: including measures to allow business continuity following an emergency, back-ups of critical information in a secure location to expedite the return to normal operations following an emergency and alternative supplies of resources such as water;
- **Clean up**: options and procedures for clean up following accidents;
- **Emergency scenarios and risks**: identified scenarios, people and environments at risk, maps of risk areas, locations of hazardous substances and properties of hazardous substances;
- **Emergency response procedures for each emergency scenario:** with specific information on specific procedure triggers, response actions, equipment, relevant notification procedures, relevant communication procedures, alarm systems, relevant evacuation procedures, relevant media procedures, medical procedures, assessment, monitoring and recording of the progress of the accident, procedures for operational shut down if necessary, relevant procedures for clean up, recording of actions taken to respond and de-activation of the procedure; and

- **Review**: to identify missing or weak elements, consistency with any regional and national disasters plans and compliance with relevant legislation and codes.

The emergency scenarios covered by the EPR&R will be determined by means of risk assessments. Procedures will be developed for at least the following events:

- off-site chemical, oil or fuel spills;
- on-site chemical, oil or fuel spills;
- emergencies arising from natural hazards such as earthquakes, sandstorms, extreme heat/cold, floods, moving sand dunes, and extreme precipitation;
- security incidents such as lost contact/ missing person, sabotage or a threat to kill/injure employees;
- vehicle or equipment accidents;
- fire; and
- medical emergencies.

The EPR&R will distinguish between two types of emergencies, emergencies contained within Plant site boundaries requiring use of SPGL's emergency resources, but not requiring external resources; and emergencies not contained within the Plant site boundaries and/ or requiring involvement of external resources.

9. Conclusion

This environmental assessment was conducted to assess the environmental and socioeconomic impacts of the Star Power combined cycle power plant installation project, which is located in Daharki taluka of Ghotki district, Sindh. The environmental assessment procedure and methodology followed national and international guidelines and legislation.

Baseline environmental and socioeconomic information was collected from a variety of sources, including previous environmental reports, published literature, and field surveys. The information collected was used to compose profiles of the natural and socioeconomic environments likely to be affected by the Proposed Project.

Information for the project description section came mainly from Star Power Generation Limited.

An assessment was then made of the potential impacts of the described project on the area's natural and socioeconomic environments, using both qualitative and quantitative assessment methods.

A summary of the assessment both in the construction and operational phase of the Project is provided separately in **Exhibits 9.1** and **9.2** respectively.

After assessing the significance of potential impacts, it has been concluded that if the Project activities are carried out as described in this report, and the suggested mitigation measures are implemented, the proposed Project will not have a significant impact on the area's natural and socioeconomic environments. The Project will also comply with all relevant statutory requirements and standards listed in **Section 2**. The Project Social and Environmental management System is presented in **Section 9** and the environmental management plan of the Project is presented as **Appendix F**.

Exhibit 9.1: Summary of Environmental and Social Impact of the Construction Phase

Potential Impact	*Description of Potential Impact*	*Criteria for Determining Significance*	*Mitigations*
Environmental Issues			
Construction Noise—Disturbance to surrounding communities of power plant due to operation of construction machinery at the plant site	Disturbance to communities in surrounding areas of the proposed plant site due to construction machinery operation	The NEQS for noise and World Bank guidelines for noise require that the sound level in residential areas should not exceed 55 dB(A) during the day and 45 dB(A) during the night	▸ Reduction of equipment noise at source ▸ Conduct pre operation noise survey ▸ Prepare noise control plan ▸ Pre-construction noise survey of the construction equipment ▸ Select low noise equipment for the power plant ▸ Minimization of vehicular noise ▸ Training of all staff members for the use of PPE (Personal Protection Equipment)
Emissions—Particulate matter, NO_x and SO_2 emitted during construction activities can result in deterioration of ambient air quality in the vicinity of the source, and be a nuisance to the community.	Dust—nuisance to surrounding communities of the proposed plant due to emission of dust during construction on the plant site Vehicle and equipment exhaust—Combustion exhaust from vehicles and construction can affect the ambient air quality of the Study Area	An increase in visible dust beyond the boundaries of the proposed power plant due to the activities undertaken at the plant site, or on the access road Adverse impact on community assets There are persistent complaints from the community, or The vehicles are not in compliance with the NEQS for vehicles	▸ Sprinkling of water on unsealed surfaces for dust suppression ▸ Use of wind shield around aggregate and soil stockpiles ▸ Covering of material piles ▸ Restrictions on speed on unpaved roads ▸ Transportation of material in covered trucks and speed limits will be strictly observed ▸ Safe distance between the batching plant and the community ▸ Stockpiles will be placed at least 250 m from the community ▸ All vehicles and equipment will be properly tuned and maintained

Potential Impact	*Description of Potential Impact*	*Criteria for Determining Significance*	*Mitigations*
Soil and Water Contamination—Different types of liquid waste and sanitary effluent, solid waste and hazardous material may contaminate the water and soil resources of the Study Area	Untreated wastewater and liquid waste from the construction activities may contaminate the water resources of the Study Area Hazardous materials and non hazardous waste if disposed of into the surroundings may contaminate the soil and water resources of the Study area	If the run off contains visible quantities of oil and grease and contains silt above NEQS levels or if it flows towards the community If any NEQS and IFC non compliant effluent is released to the environment If any person is exposed to hazardous waste generated from project related activities Disposal of waste outside designated areas	▸ Use of spill prevention trays and impermeable sheets to avoid soil contamination ▸ Storage of fuels, chemicals and lubricants in bounded areas with impervious flooring ▸ Emergency Response plan will be developed for hazardous substances ▸ Equipment and material containing asbestos, poly-chlorinated biphenyls (PCBs), and ozone depleting substances (ODSs) will not be used ▸ Material Safety Data Sheet (MSDS) will be maintained

Potential Impact	*Description of Potential Impact*	*Criteria for Determining Significance*	*Mitigations*
Socioeconomic Issues			▸
Community Safety— Safety hazards associated with the construction activity, particularly the increase in traffic on the plant site access road	The proposed construction activity can potentially be a safety hazard for the community. In particular, the increase in construction related traffic on the proposed Project access road.	A significant community hazard will also be considered if a condition is created during the construction activity that would be considered a safety hazard under widely acceptable occupational and safety health criteria such as that of the Occupational Safety and Health Administration (OSHA) of the USA	▸ A public safety plan will be developed ▸ A speed limit of 20 km/h will be maintained on the proposed access road ▸ Nighttime driving of Project vehicles will be limited where possible ▸ Community complaint register and other means will be adopted for the community to complain about non-adherence of Project traffic to speed limits, safe driving and other safety-related concerns ▸ Work areas outside the proposed plant site, especially where machinery is involved, will be roped off and will be constantly monitored to ensure that local people, especially children, stay away
Employment Conflicts— Conflicts may arise if the nearby communities feel that they are not given substantial share in project related job opportunities	The potential employment related issue includes dissatisfaction among local communities over the number of jobs offered to them, disagreement on definition of 'local' and also on distribution of jobs within the local community	A significant impact will be interpreted if the proportion of available unskilled jobs offered to the locals in the immediate area is less than around 50%	▸ Maximum number of unskilled and semi-skilled jobs will be provided to the local communities ▸ A local labor selection criterion will be developed in consultation with the community

Exhibit 9.2: Summary of Environmental and Social Impact of the Operation Phase

Potential Impact	*Description of Potential Impact*	*Criteria for Determining Significance*	*Mitigations*
Environmental Issues			
Plant Noise	Unacceptable increase in noise levels in the communities	The NEQS for noise and World Bank guidelines for noise require that the sound level in residential areas should not exceed 55 dB(A) during the day and 45 dB(A) during the night	▸ Low noise equipment will be preferred ▸ Fans for cooling tower will be of low noise type ▸ Silencers will be used on vents and ventilators ▸ Noise levels will be monitored regularly within the communities in order to take timely corrective measures, if needed
Plant Effluents	The power plant is expected to generate liquid effluents in the form of Liquid Waste (oily water, washing water etc), Thermal Discharge (blow down water), treatment system effluent and sanitary wastewater	No discharge of untreated effluent to the environment or the drainage canals	▸ The power plant water treatment system will be designed to ensure that the wastewater meets NEQS before it is drained into the drainage channels or used for arboriculture
Emission	Emission from the plant can potentially affect air quality	NEQS and the IFC Thermal Power Plants Environment Health and Safety guidelines	▸ No specific mitigation measures required
Water Resources	An adverse impact on the water resources will be interpreted if it is established that the water consumed by the Project has directly affected the ability of the community to meet their water needs	The extraction of water for the power plant construction activities can affect the groundwater availability for local communities	▸ SPGL management will bore tube wells designated for its requirements along the banks of perennial canal Dahar Wah Lower and Dahar Wah Upper ▸ Approval from SIDA will be obtained for installation of tube wells, if they are to be installed within 300 m either side of a major canal or 200 m either side of a distributory or minor canal

Potential Impact	*Description of Potential Impact*	*Criteria for Determining Significance*	*Mitigations*
			▸ Initiation of a water conservation program
Hazardous and Non-Hazardous Waste	Various types of wastes such as packing waste; metal scrap, and excess materials, uprooted vegetation, and excess soil will be generated during the construction phase. Besides being an eyesore, the waste can be a health hazard and pollute waterways, if disposed improperly	Material Safety Data Sheets (MSDS)	▸ Storage and handling of hazardous materials in accordance with international standards and appropriate to their hazard characteristics. ▸ Labeling of all storage vessels ▸ All hazardous waste will be separated from other wastes ▸ Availability of supporting information such as the MSDS ▸ A Hazardous Materials Register to be in place.
Waste Management	Waste generated during power plant operation can potentially damage the environment	Any person is exposed to potentially hazardous waste generated by the Project Project generates waste that can be avoided through practicable means (waste minimization) Reusable waste generated by the Project is discarded Recyclable waste instead of separation at the source is dumped at the trash bins Non-recyclable and non-reusable waste ends up at any place other than the designated landfill site.	▸ Separation at the source of the recyclable material ▸ Regular audits of waste management system ▸ Maintenance of a Waste Tracking Register ▸ Separation and isolation of hazardous waste from non-hazardous waste. ▸ On-site storage facility for hazardous waste to hold hazardous waste until an off-site hazardous waste disposal facility is located. ▸ Recyclable waste to be disposed via approved waste contractors ▸ Audits of the waste disposal contractors and waste disposal facilities ▸ An emergency response plan for the hazardous substances ▸ Training of personnel in identification, segregation, and management of waste ▸ Appropriate labeling of all containers of hazardous waste

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