

Environmental and Social Impact Assessment Al-Nairyah 1 Independent Power Naseem Energy Company Submitted to National Center for Environmental Compliance Oversight

المركز الوطني
للمراقبة على الالتزام البيئي
National Center for Environmental Compliance
المملكة العربية السعودية



رؤية
VISION
2030
المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

مكتب الدكتور
عيسى الحرتاني
للاستشارات البيئية
AL-HARTANY
ENVIRONMENTAL CONSULTANCY



شركة نسيم للطاقة
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LIST OF ABBREVIATIONS

Abbreviation	Meaning
AC	Alternating Current
ACC	Air Cooled Condenser
AEP	Annual Exceedance Probability
AVR	Automatic Voltage Regulator
BAT	Best Available Techniques
BOO	Build Own and Operate
BSDG	Black start diesel generators
CCGT	Combined Cycle Gas Turbine
CEDI	Continuous electro-deionisation
CEMS	Continuous Emission Monitoring System
CESMP	Construction Environmental and Social Management Plan
CH	Critical Habitat
CIA	Cumulative Impact Assessment
CRPD	Convention on the Rights of Persons with Disabilities
CT	Current Transformers
DC	Direct Current
DMF	Dual Media Filtration
EC	Environmental Classification
ECA	Export Credit Agencies
EDG	Emergency Diesel Generators
EHEC	Dr. Eisa Al Hartani Environmental Consulting
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EP	Equator Principles
EPC	Engineering, Procurement and Construction
EPFI	Equator Principles Financial Institutions
ESF	Electrical Special Facilities
ESIA	Environmental & Social Impact Assessment
ESMS	Environmental and Social Management System
ETP	Effluent treatment plant
FCF	Fuel Connection Facilities
GAMEP	General Authority of Meteorology and Environmental Protection
GASat	General Authority of Statistics Saudi Arabia
GCC	Gulf Cooperation Council
GER	General Environmental Regulations
GHG	Greenhouse Gas Emissions

Abbreviation	Meaning
GIIP	Good International Industry Practice
GT	Gas Turbines
GW	Gigawatt
HP	High Pressure
HRSG	Heat Recovery Steam Generators
HVAC	Heating Ventilation and Air Conditioning
IBA	Important Bird Area
IBAT	Integrated Biodiversity Assessment Tool
ICOD	Initial Commercial Operation Date
IFC	International Finance Corporation
ILO	International Labour Organisation
IPP	Independent Power Plant
KSA	Kingdom of Saudi Arabia
Leq (A)	A-weighted Equivalent Continuous Sound Level
LP	Low Pressure
LV	Low Voltage
MEWA	Ministry of Environment, Water and Agriculture
MV	Medium Voltage
MW	Mega Watt
MWAN	National Centre for Waste Management
NCEC	National Centre of Environmental Compliance
NCM	National Centre for Meteorology
NCVC	The National Centre for the Development of Vegetation Cover and Combating Desertification
NCW	National Centre for Wildlife
NDC	Nationally Determined Contribution
O&M	Operation and Maintenance
ODS	Ozone Depleting Substances
OECD	Organization for Economic Co-operation and Development
OESMP	Operational Environmental and Social Management Plan
OHTL	Over Head Transmission Line
PCOD	Project Commercial Operation Date
PPA	Power Purchase Agreement
PPE	Personal Protective Equipment
PSs	Performance Standards
RfP	Request for Proposal
RO	Reverse Osmosis
SA	Saudi Aramco

Abbreviation	Meaning
SASE	Saudi Aramco Standards for Engineering
SIO	Saudi Irrigation Organisation
SPPC	Saudi Power Procurement Company
STG	Steam Turbine Generator
SUA	Site Use Agreement
SWA	Saudi Wildlife Authority
TSS	Total Suspended Solids
UN	United Nations
UNCLOS	United National Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VT	Voltage Transformers
WBG	World Bank Group
WHO	World Health Organisation

1 Introduction

1.1 Project Background

The Saudi Power Procurement Company (SPPC) is proposing to develop two new power plants, located adjacent to each other, collectively termed as the Nairyah IPP in Eastern Province on a build, own and operate (BOO) basis in a bid to help satisfy the increasing national demand for electricity. The individual power plants within the Project are known as IPP1 and IPP2. Naseem Energy Company has been appointed by SPPC to develop one of the two power plants, the Nairyah IPP1 (hereby referred to as 'the Project'). The Project will be a conventional Combined Cycle Gas Turbine (CCGT) power plant with a net power generation capacity of approximately 1,800 Megawatts (MW). The proposed IPP2 which will be developed by a different company appointed by SPPC is also expected to be of same capacity. The primary fuel used for power generation will be natural gas, with diesel as back up fuel. IPP2 is not part of this ESIA and will undergo a separate permitting process. SPPC will be the 'Principal Buyer' for the generated electricity.

The power plant will have a 3+1 configuration [3 Gas Turbines (GT) + 1 Steam Turbine (ST)]. The configuration is based on steam turbine with air-cooled condenser. The electrical capacity of the Project shall be installed in power generation configurations based on combined cycle gas and steam turbine technology with/without supplementary firing. Each gas turbine unit will have an associated heat recovery steam generator (HRSG).

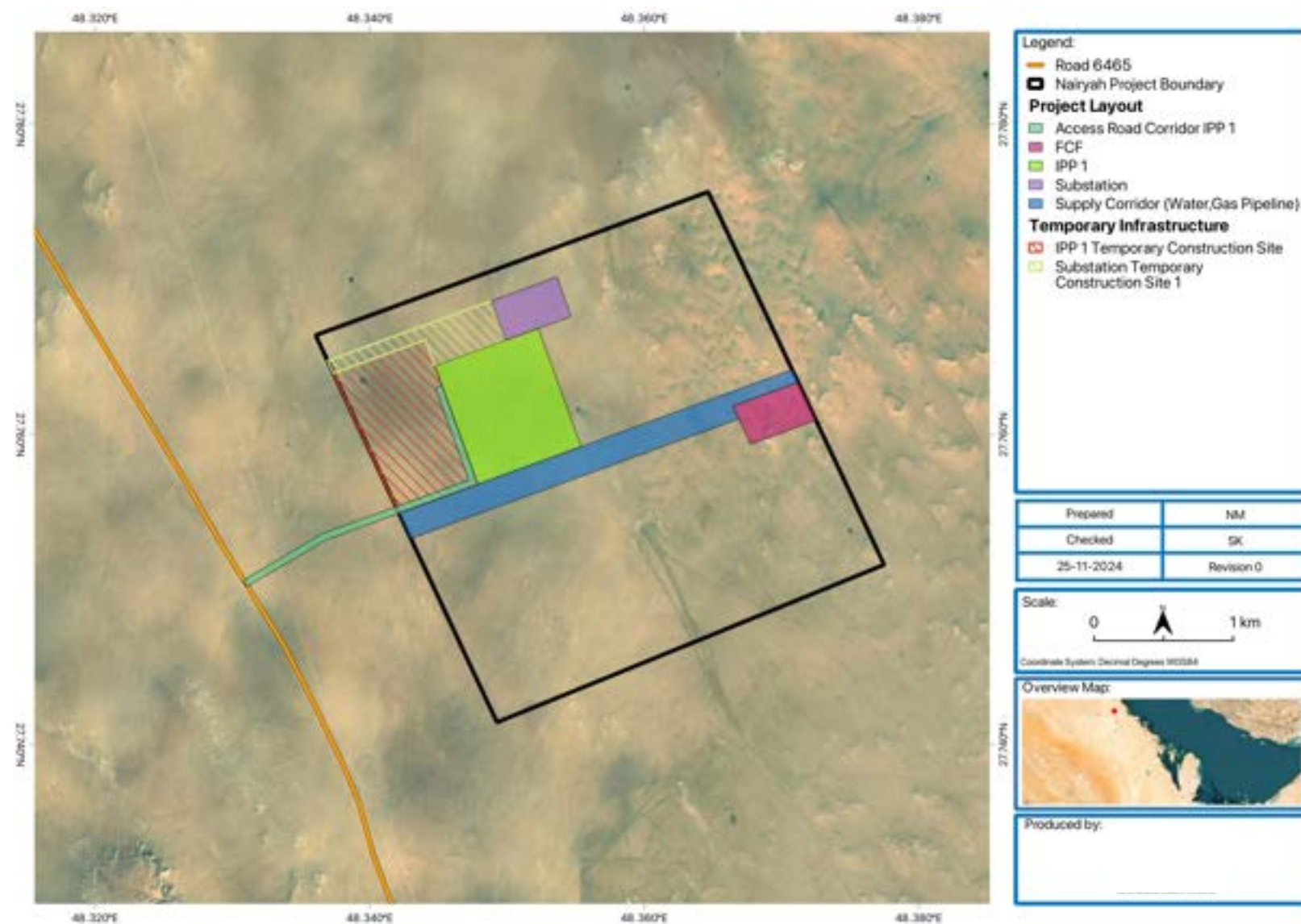
This Environmental and Social Impact Assessment (ESIA) has been prepared by Dr. Eisa Al Hartani Environmental Consulting (EHEC) a registered environmental consultancy based in KSA. An ESIA Scoping Report was prepared by EHEC, which is approved by NCEC.

The term ESIA will be used throughout this Report and is intended to encompass the Environmental Impact Assessment (EIA) requirements of NCEC as well as the ESIA requirements of the lenders. Consequently, references to the assessment of environmental and social impacts will be referred to as ESIA, unless specifically stated otherwise in relation to NCEC's EIA requirements.

Even though IPP2 is not part of the scope of this ESIA, potential cumulative impacts, such as those related to air emissions during operation, have been considered for both phases, as both IPP1 and IPP2 will be developed simultaneously and hence this impact needs to be assessed.

Following figure shows the location of the Project components in relation to existing Infrastructure in the area.

Figure 1-1 Location of Main Project Components



1.2 ESIA Requirement, Objectives and Scope

1.2.1 Requirement for ESIA Report

An Environmental Impact Assessment (EIA) is required by the NCEC for all activities that have environmental impacts and are classified as second and third category projects as promulgated by the Executive Regulations for 'Environmental Permits for the Construction and Operation of Activities' of the Environment Law issued by the Royal Decree No. (M/165) as of 19/11/1441 AH.

An ESIA is required to also meet the environmental and social requirements of the anticipated Project lenders as set out in Equator Principles (EP), Organization for Economic Co-operation and Development (OECD) Common Approaches, International Finance Corporation (IFC) Performance Standards (PSs) (2012) and the applicable World Bank Group (WBG) Environmental Health and Safety (EHS) Guidelines (2007).

This Report has been informed by the ESIA Scoping Report prepared in accordance with Ministry of Environment, Water & Agriculture (MEWA) Executive Regulations, the environmental and social requirements of the anticipated Project lenders.

The Environmental Classification Form (EC Form) and ESIA Scoping Report for the Project were submitted under application number EPC3-2024-003077 in accordance with the required online process of the NCEC in January 2025 and subsequently approved by NCEC, which is the basis of preparing this ESIA report. This submission was made under the Commercial Registration of Naseem Energy Company.

The Project is considered as "Category 3" which under NCEC Project Classification requires a detailed ESIA for the purpose of environmental permit application (further explained in section 2.2.1.7).

1.2.2 Objectives of the ESIA

The ESIA aims to ensure that the key environmental and social impacts associated with the Project are identified and accordingly the necessary mitigation and management measures are incorporated as far as possible into the design, construction and operation of the Project. In addition, the objectives of this report are as follows:

- Provide an overview of the Project.
- Review of the regulatory and legislative framework, including KSA laws, applicable international regulations and standards and international lender requirements;
- Assess the existing environmental baseline conditions prior to the development of the Project through a review of available existing data and the undertaking of environmental baseline surveys;
- Assess the Project's environmental and social impacts for the construction and operational phases including residual and cumulative impacts;
- Determine applicable mitigation and management measures to be implemented in order to avoid or minimise potential adverse impacts and enhance beneficial impacts;
- Consider alternatives that can be used for the Project leading to greater social and environmental gains; and

- Prepare a framework for which the construction and operational phase management systems and plans can be developed and implemented.

1.2.3 Scope of the ESIA

The scope of the ESIA relates to the design, construction, and operation of the CCGT (one phase of the IPP only) which includes the following elements:

- Three gas turbine generators;
- Three heat recovery steam generators (HRSG);
- One steam turbine generator;
- Future Carbon Capture and Sequestration network infrastructure; and
- One Peak Augmentation Gas Turbine.

1.3 Structure of the ESIA Report

To comply with the requirements of organisational and legal framework (Section 2.1 of the ESIA) and considering the Project is "Category 3", the structure of this ESIA Report is in line with Appendix 4 of *The Implementing Regulations for Environmental Permits for the Construction and Operation Activities of the Environmental Law issues by Royal Decree No.(M/165) as of 19/11/1441 AH*. Therefore, this ESIA report is structured as follows:

- **Executive Summary:** provides a non-technical summary of the Report, including the main outcomes and conclusions;
- **Chapter 1- Introduction:** provides a brief overview and description of the Project and describes the ESIA and approvals process for the Project as well as outlining the ESIA and environmental permitting team;
- **Chapter 2 – Institutional and Organisational Framework:** describes the national, regional, and international legislative framework and requirements for the ESIA;
- **Chapter 3 – Project Information:** provides a description of the scope of the Project, including detail on the Project site, asset technologies, planned construction and operation activities and delivery programme;
- **Chapter 4 – Analysis of Alternatives:** provides a description of the Project alternatives that were considered during the Project's development;
- **Chapter 5 – Baseline Environment:** provides a description of the existing baseline conditions for the environmental and social aspects included in the scope of the ESIA. This chapters also outlines the scope, methodologies, and results of all baseline survey efforts;
- **Chapter 6 – Impact Identification, Analysis and Assessment:** provides a description of the ESIA methodology adopted to assesses the environmental and social impacts of the Project. The chapter presents the technical assessments of the environmental and social topics that have been identified as being relevant and applicable to the Project. The significance of these impacts prior to the implementation mitigation and management measures are presented.
- **Chapter 7 – Environmental and Social Mitigation and Management:** describes the environmental and social mitigation and management opportunities for the impacts identified in Chapter 6 to determine the residual significance of the impacts. The

recommended monitoring and management plans are also set out as well as the framework Construction Environmental and Social Management Plan (CESMP).

- **Chapter 8 – Key Findings and Conclusions:** summarises the key findings and conclusions of the ESIA Report.
- **Chapter 9:** includes the relevant technical appendices.

1.4 Environmental Permit Applicants

SPPC, the Project proponent/owner has appointed Naseem Energy Company who will be the Project developer/sponsor, with the overall responsibility in constructing and operating the Project.

1.4.1 SPPC

The SPPC is a government entity, also known as the Principal Buyer whose main role, among others, is procuring electrical energy and capacity from various generators within the Kingdom of Saudi Arabia (KSA) by entering into Power Purchase Agreement (PPA) for the sale of produced electricity to retail licensees and large consumers in KSA. SPPC has a key role in enabling the upcoming open and Competitive Electricity Market (CEM) in the KSA. The CEM aim to improve efficiency, transparency of the sector through continuous competitive price discoveries and enhance participation of all market players and to sustainably move from a regulated electricity market with the vertically integrated utility towards a competitive electricity market. SPPC has been granted the license to facilitate the transitions and the major changes in the sector by the government of KSA.

1.4.2 Naseem Energy Company

Naseem Energy Company is the Special Purpose Vehicle (SPV) and Project Company, which is a registered entity in KSA, established for the development and operation of the Project. It is a consortium comprising Saudi Electric Company (SEC), ACWA Power and Korea Electric Power Corporation (KEPCO).

1.5 ESIA and Environmental Permitting Project Team

The multi-disciplinary ESIA project team responsible for the production and delivery of this ESIA and the environmental permit applications for Nairyah 1 IPP are summarised in the following table.

Table 1-1 ESIA Project Team

Company	Role
Dr. Eisa Al Hartany Environmental Consulting (EHEC).  	Preparing environmental and social impact assessment documents to support the application for issuing an environmental permit from the National Center for Oversight of Environmental Compliance.
Australian Arab Laboratory Services Company Limited  Araabia right solutions. right partner.	Analytical laboratory used for soil analyses

Company	Role
Integrated Company for Laboratories and Environmental Testing 	Analytical laboratory used for air quality and noise baseline surveys.
Entran 	Entran is a specialist air, noise and transport company in the UK with >15 years' experience of modelling emissions and odour. Entran was appointed to undertake the air dispersion and noise modelling to inform the Project.

1.5.1 Key Project Information

Table 1-2 Key Project Information

Project Title	Nairyah Independent Power Plant 1
Location	230 km Northwest of Dammam – Saudi Arabia
Project Developer	Saudi Power Procurement Company (SPPC)
Project Company	Naseem Energy Company
EPC Contractor	Doosan and Sepco 3
O&M Company	NOMAC
NCEC Registered Environmental Consultant	Dr. Eisa Al Hartany Environmental Consulting (EHEC) is a Class A NCEC environmental consultant with Registration No. ELES-2024-000283 (Appendix D). Address: 7041 Jeddah Ruwais District Fayd Alsama Street

2 Institutional and Organisational Framework

The following chapters present the regulatory requirements for conducting an ESIA in accordance with national and lender regulations and standards.

2.1 Institutional and Organisation Framework

The Project will be required to comply with all applicable environmental and social laws, regulations, policies, standards, and guidelines that form KSA's regulatory framework. In doing so, the process of environmental and social impact identification and evaluation will need to demonstrate that the Project can comply with such criteria during both the construction and operational phases. The Project will adopt and comply with the following regulations and standards:

- National regulations and standards.
- International and Regional Treaties ratified by the KSA, and
- International guidelines and standards adopted by anticipated Project lenders, including EP IV (2020), OECD Common Approaches, IFC Performance Standards (2012) and WBG/IFC EHS Guidelines (2007).

The stakeholders involved in the implementation of the institutional framework for the Project include MEWA and the new National Environmental Centres that fall under MEWA's remit which include NCEC. The Project Company, the Engineering, Procurement and Construction (EPC) Contractor(s) and Operation and Maintenance (O&M) Company are also responsible for ensuring adherence to and implementation of the institutional framework.

2.1.1 National Environmental Regulator

2.1.1.1 Ministry of Environment, Water and Agriculture

The MEWA is a government ministry in KSA responsible for overseeing environmental protection, water resources management, and agricultural development in the country. MEWA is responsible for developing and implementing policies and regulations to protect the environment, conserve biodiversity, and mitigate the impact of human activities on ecosystems. The ministry works towards preventing pollution, managing waste, and promoting sustainable practices in various sectors, including industry, agriculture, and transportation.

2.1.1.2 National Centre for Environmental Compliance

The NCEC has been the environmental regulator in KSA since 1st January 2021. NCEC is responsible for the issuing and renewal of environmental licenses for Category 1, 2 and 3 projects in accordance with the KSA Environmental Law and applicable MEWA Executive Regulations. NCEC review the environmental studies to determine the potential environmental impacts of proposed projects and provide recommendations or conditions for approval to ensure that environmental concerns are addressed. NCEC also monitors various industries, activities, and projects to ensure they comply with environmental regulations and standards.

2.1.2 Lenders & Financial Institutions

The Project is seeking project finance from international lenders understood to require compliance with the EPs, OECD Common Approaches, IFC PSs and the applicable WBG EHS Guidelines.

These Financial Institutions require projects to conduct an environmental and social assessment to address the relevant environmental and social risks and impacts of the proposed Project. Therefore, an Environmental and Social Impact Assessment (ESIA) study will be prepared for these institutions.

2.2 Organisational Framework

2.2.1 National Laws, Regulations, Standards and Requirements

2.2.1.1 Basic Law of Governance 1992

The Basic Law of Governance (Royal Decree No. A/90 dated 27/08/1412H) is commonly referred to as the Constitution of Saudi Arabia. Article 32 of the Basic Law states: *'The State shall preserve, protect and improve the environment and prevent its pollution'*.

2.2.1.2 National Environmental Law 2020

The previous national KSA legislation, the General Environmental Regulations (GER) (2001) has been superseded by the National Environmental Law (July 2020) and Executive Implementing Regulations (January 2021).

2.2.1.3 MEWA Executive Regulations

The new Environmental Law issued under Royal Decree M/165 of 19th Dhul Qada 1441 Hejra in July 2020 will be supported by new Executive Regulations which became law in June 2022. The law consolidates and supersedes much of the existing national legislation including the GER and conservation legislation into one law. The Implementing Regulations include:

These include:

- The Executive Regulations for Environmental Permits for the Construction and Operation of Activities;
- The Executive Regulations for Environmental Inspection and Auditing;
- The Executive Regulations for Air Quality;
- The Executive Regulations for Noise;
- The Executive Regulations for Preventing and Treating Soil Contamination;
- The Executive Regulations for Protecting the Aquatic Media from Pollution;
- The Executive Regulations for Ozone Depleting Substances (ODS) and Hydrofluorocarbons (HFCs);
- The Executive Regulations for Environmental Rehabilitation of Degraded Sites and Treatment of Contaminated Sites;
- The Executive Regulations for Controls and Procedures Pertaining to Financial Dues for Environmental Licenses, Permits, and Services;

- The Executive Regulations for Hunting Terrestrial Wildlife Species;
- The Executive Regulations for Logging;
- The Executive Regulations for Development of Vegetation Cover Development and Combating Desertification;
- The Executive Regulations for Apprehension of Violations and Imposing Penalties.
- The Executive Regulations for Preparing and Implementing Preparedness and Response Plans for Emergencies and Environmental Disasters.

2.2.1.4 Waste management system

The waste management system issued pursuant to Royal Decree No. (M/3) dated 1/5/1443 AH/August 2021 and Council of Ministers Resolution No. (11) dated 1/2/1443 AH. The system aims to regulate waste collection, transportation, sorting, storage, import, export, treatment and safe disposal activities, including aftercare of waste disposal sites. Everyone who practices in an activity related to waste management must provide the best environmental and economic results, according to the following priorities: recycling, resource recovery, and safe disposal.

The waste management system is supported by the executive regulations for waste management issued by Ministerial Resolution No. 332291/1, dated 10/18/1443 AH, which aims to clarify the executive frameworks of the system, such as provisions for licenses and permits, waste generator responsibility, and other waste management standards that must be applied.

2.2.1.5 Environmental Standards

The applicable environmental standards for the Project as per the national regulations and lender guidelines are outlined in **Appendix B**. These standards require project compliance. Where there is contradiction in limits between national standards and lender guidelines, the most stringent will apply.

In accordance with lender requirements, where specific national standards do not exist, a good practice standard should be applied.

2.2.1.6 National Environmental Centres

In addition to the NCEC which has superseded GAMEP as the Environmental Regulator in KSA, the following National Centres have also been established and have their own policies and standards which need to be followed where applicable.

- **National Centre for Meteorology (NCM).** This monitors weather and climate conditions, prepares forecasts, provides airports, ports and other bodies with data and weather forecasts, and operates regional weather monitoring stations;
- **National Centre for Wildlife (NCW);** This will supervise programmes related to the protection and development of wildlife and biological diversity, as well as planning and managing protected areas and managing centres for the breeding and resettlement of endangered animals;
- **The National Centre for the Development of Vegetation Cover and Combating Desertification (NCVC).** This will develop and manage national parks, develop and rehabilitate vegetation cover in forests, protect local endangered plant species,

combat desertification and conducting studies and supporting research related to vegetation; and

- **National Centre for Waste Management (MWAN):** organizes the waste management sector to improve the quality of services, enhances the level of capabilities and competencies, enhances the economic sustainability of the sector by stimulating investment and maximizing the participation of the private sector, and reduces waste disposal in landfills by stimulating the use of best practices in resource recovery.

2.2.1.7 National ESIA Requirements and Approval

Projects within KSA with potential to cause environmental impacts are subject to an ESIA as part of the planning and permitting process in accordance with the National Environmental Law issued by Royal Decree No. (M/165) as of 19/11/1441 AH and as described in the Executive Regulations on Environmental Permits for the Construction and Operation of Activities of the Ministry of Environment, Water & Agriculture (MEWA).

Whilst all major development projects are required to pass through the ESIA process, the level of reporting and detail required is subject to classifying the project into three (3) individual classes based upon their predicted impacts. The table below provides further detail on these classes as described in the relevant Environmental Regulations.

The Executive Regulation on Environmental Permits for the Construction and Operation of Activities refer to NCEC as the Competent Authority, who is responsible for ensuring the environmental protection of KSA and implementing legislation as required. The Competent Authority is able to delegate responsibility of issuing approvals to other government authorities.

Table 2-1 ESIA Classes as per the Executive Regulation on Environmental Permits for the Construction and Operation of Activities

Class	Details
C1	Projects with Limited Environmental Impacts Covers projects that are not expected to have tangible adverse environmental and social impacts. Require submission of an Environmental Management Plan and Environmental Rehabilitation Plan to NCEC.
C2	Projects with Significant Environmental Impacts Covers projects that are likely to have some adverse environmental and social impacts which can be substantially mitigated and will not significantly impact areas beyond the site boundary. Require submission of an EIA to NCEC as per Article 7 of this executive regulation.
C3	Projects with Serious Environmental Impacts Covers projects that are likely to have significant adverse environmental and social impacts, which cannot be fully mitigated, and likely affect areas beyond the site boundary. Require submission of an ESIA to NCEC as per Article 8 of this executive regulation.

Based on the table above, and the nature of the Project, which is Thermal Power Plant, the Project is considered a Class 3 “*Projects with Serious Environmental Impacts*” which will require the submission of an EIA to NCEC. This will be confirmed upon the receipt of a response from NCEC after the submission of the Environmental Classification Form (ECF).

2.2.1.8 NCEC Permitting and Approvals Process

Under the National Environmental Law 2020 and as described in the Implementing Regulations on Environmental Permits for the Construction and Operation of Activities, the environmental permitting and approval process for Class 3 Projects includes the following key stages:

- **Stage 1:** Applicant to identify relevant category of the development and to complete the related Environmental Classification Form;
- **Stage 2:** Submission of Environmental Classification Form to NCEC by Applicant;
- **Stage 3:** NCEC review of Environmental Classification Form (ECF) and confirmation of activity classification to Applicant within 10 working days;
- **Stage 4:** Class 3 activity, Applicant prepares a Scoping Report in Accordance with Appendix 3 and submits to NCEC;
- **Stage 5:** NCEC reviews and provides feedback of Scoping Report to Applicant for Class 3 activities within 15 working days;
- **Stage 6:** Applicant prepares ESIA Report in line with the suggested structure and content outlined in Appendix 4 and submits the ESIA Report to NCEC;
- **Stage 7:** NCEC review and approval of ESIA Report and issuance Environmental Permit for the construction of the Project within 60 working days. Re-submission may be required if information provided is deemed insufficient by NCEC. The Environmental Permit to commence construction works is valid for three (3) years, construction activities must commence within this time to avoid the requirement for a new permit;
- **Stage 8:** Applicant commences construction, ensuring all commitments i.e., environmental reporting is met and reported as required to NCEC throughout works; and
- **Stage 9:** EPC Contractor appointed by the applicant completes construction and applies for an Environmental Permit for operation activities. Prior to the issuance of the Environmental Permit for operation, NCEC will review the conditions of the construction Environmental Permit to ensure all requirements have been met and may undertake a site inspection. If all information is satisfactory, NCEC will issue the Environmental Permit for operation. The duration of the operational permit will depend on the activity but will be no less than three (3) years and no more than six (6) years.

The timeframe to complete all stages detailed above will differ between developments, indicative timeframes for NCEC approval is provided in the Implementing Regulations. The stage 2, 3, 4, and 5 above mentioned has been undertaken under SPPCs commercial registration.

Throughout all stages of the environmental permitting and approval process, liaison and consultation with MEWA, NCEC and other relevant National Centres should be undertaken by the NCEC registered environmental consultancy.

For this Project, the ESIA liaison and submission of report will be undertaken by Dr. Eisa Al Hartani Environmental Consulting.

2.3 Regional Laws, Regulations, Standards and Requirements

KSA is signatory to several regional agreements related to the environmental and social aspects. Table 2-2 below lists those relevant to the Project.

Table 2-2 Regional Conventions and Protocols

Conventions, Agreements and Protocols	Date Signed	Summary	Applicability to the Project
Agreement for the Establishment for Arab Centre for the Studies of Dry and Barren Land	03/09/1968	The Centre was established to conduct regional studies on barren areas in Arab countries, including e.g. studies of soils, studies on the degree of soil erosion and studies on the geological and geomorphological aspects of the different areas.	The Project will implement the necessary mitigation to avoid soil erosion and contamination
The Convention of Conservation of Wildlife and its Natural Habitat in the Gulf Cooperation Council (GCC) Countries	30/12/2001	Legal agreement binding all GCC states to coordinate their activities towards the conservation of wildlife and natural habitats.	The Project will implement the necessary mitigation and monitoring to avoid where possible and reduce impact to terrestrial ecology.

2.4 Lenders Requirements

The Project will be seeking financing from one of more financial institutions who:

- Have their own internal E&S investment guidelines that align with or are similar to the IFC Performance Standards
- Are Export Credit Agencies and require compliance with the OECD Common Approaches; or
- Are members of the collective environmental and social agreements such as the Equator Principles.

It is noted that ACWA Power implements the E&S requirements of IFC on all its projects as such the Project must comply with the IFC Performance Standards and IFC EHS Guidelines as part of ACWA Power Internal E&S requirements.

Also, both the Equator Principles and OECD Common Approaches necessitate Project compliance with the IFC Performance Standards and EHS Guidelines. The key E&S requirements for financial institutions are summarised below.

2.4.1 Equator Principles

The Equator Principles (EPs) are voluntary set of guidelines for assessing and managing environmental and social risks in project financing and have become the project finance industry standards for addressing environmental and social issues in global project financing. The latest iteration of the EPs, EPIV, was released in October 2020.

In accordance with the EPs, for projects located in Non-Designated Countries (which includes KSA), the assessment process evaluates compliance with the applicable IFC Performance Standards and the EHS Guidelines.

The Equator Principles consist of the following 10 Principles, which must be applied by the lenders providing finance:

- Principle 1 - Review and Categorisation
- Principle 2 - Environmental and Social Assessment
- Principle 3 - Applicable Environmental and Social Standards
- Principle 4 - Environmental and Social Management System and Equator Principles Action Plan
- Principle 5 - Stakeholder Engagement
- Principle 6 - Grievance Mechanism
- Principle 7 - Independent Review
- Principle 8 - Covenants
- Principle 9 - Independent Monitoring and Reporting
- Principle 10 - Reporting and Transparency

2.4.2 OECD Common Approaches (2016)

The Recommendation of the Council on Common Approaches for Officially Supported Export Credits and Environment and Social Due Diligence (often referred to as “the Common Approaches” are a set of recommendations for identifying and addressing potential environmental and social impacts and risks relating to applications for officially supported export credits and Export Credit Agencies (ECAs) based in OECD countries.

The OECD Common Approaches require project implementation of all eight IFC Performance Standards and IFC EHS Guidelines, including the relevant sector specific IFC EHS Guidelines.

2.4.3 IFC Performance Standards

The IFC Performance Standards (PSs) are a key component of the IFC’s Sustainability Framework and directed towards clients (i.e., the party responsible for implementing and operating the project that is being financed), providing guidance on how to identify risks and impacts. The IFC Performance Standards are designed to help avoid, mitigate and manage risks and impacts throughout the life of a project. The IFC Performance Standards aim to initiate sustainable business which includes stakeholder engagement and disclosure obligations of the client at a project-level.

The 2006 version of the IFC Performance Standard was reviewed and made applicable to all new projects from 1st January 2012. The updated IFC Performance Standard reflect IFC’s stronger commitment to climate change, business and human rights, corporate governance and gender equality as well as strengthening the due diligence process for IFIs. Such updates include comparable labour terms for migrant and non-migrant workers, clarification of levels of stakeholder engagement, monitoring of supply chains and an enhanced focus on energy efficiency.

The following lists the IFC Performance Standards (2012):

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts

- Performance Standard 2: Labour and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

Of the IFC Performance Standards listed above, all are applicable to the Project, with the exception of IFC Performance Standards 5 and 7.

2.4.4 WBG/IFC EHS Guidelines

The EHS Guidelines have been set out by the IFC and the World Bank Group to provide general guidelines for its members when involved in a project or when providing financial support to a project. The EHS Guidelines serve as technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The following EHS Guidelines relevant to this Project include:

- General EHS Guidelines, Environmental:
 - Air Emissions and Ambient Air Quality;
 - Energy Conservation;
 - Wastewater and Ambient Water Quality;
 - Water Conservation;
 - Hazardous Materials Management;
 - Waste Management;
 - Noise; and,
 - Contaminated Land.
- General EHS Guidelines, Occupational Health & Safety:
 - General Facility Design and Operation;
 - Communication and Training;
 - Physical Hazards;
 - Chemical Hazards;
 - Biological Hazards;
 - Radiological Hazards;
 - Personal Protective Equipment (PPE);
 - Special Hazard Environment; and,
 - Monitoring.
- Community Health & Safety:
 - Water Quality and Availability;
 - Structural Safety of Project Infrastructure;
 - Life and Fire Safety;
 - Traffic Safety;
 - Transport of Hazardous Materials;
 - Disease prevention; and
 - Emergency Preparedness and Response.

- Construction and Decommissioning;
 - Environment;
 - Occupational Health and Safety; and
 - Community Health and Safety.
- Industry Sector Guidelines:
 - EHS Guidelines for Thermal Power Plants
 - EHS Guidelines for Electric Power Transmission and Distribution;

2.4.5 Project Categorization

Based on the abovementioned criteria for Project Classification under EP IV and IFC, the Project is expected to be a "Category A" Project ('Category A: Business activities with potential significant adverse environmental or social risks and/or impacts that are diverse, irreversible, or unprecedented'). However, the category will be determined by the Lenders separately based on their own risk assessments and project categorisation criteria.

2.5 International and Regional Conventions / Protocols

KSA is signatory to several international and regional agreements related to the environment and social. The table below lists those relevant to the Project.

Table 2-3 International and Regional Conventions and Protocols

Conventions, Agreements and Protocols	Date Signed / Ratified	Summary
Convention Concerning the Protection of the World Cultural and Natural Heritage	23/11/1972	Established to protect and enhance cultural and natural heritage, whilst there has been a focus on United Nations Educational Scientific and Cultural Organisation (UNESCO) designated sites the convention requires member states to protect all relevant resources and specifically states. that because a resource is not listed it should not be implied that the resource has no value.
Convention on International Trade in Endangered Species of Wild Fauna and Flora and Subsequent Amendments	03/03/1973	Established to identify species at risk and control trade in endangered species
Convention of the Conservation of Migratory Species of Wild Animals and all Amendments (Bonn Convention)	23/06/1979	An international agreement that aims to conserve migratory species throughout their ranges. This covers a wide range of species, including birds, marine mammals, sea turtles and bats. Requires member states to preserve and protect species and habitats which occur regularly in their area.
International Plant Protection Convention (1979 Revised Text)	28/11/1979	A convention established to protect the genetic resources of native plant species for agricultural and biological conservation purposes.
Protocol Concerning Regional Cooperation in Combating Pollution by Oil and Other Harmful Substances in Cases of Emergency	14/02/1982	Contracting Parties undertake to cooperate in combatting pollution by oil and other harmful substances and maintain and promote contingency plans.
United National Convention on the Law of the Sea (UNCLOS)	10/12/1982	An international agreement that establishes a legal framework for all marine and maritime activities for all signatories.
Vienna Convention for the Protection of the Ozone Layer	22/03/1985	A multilateral environmental agreement that provided frameworks for international reductions in the production

Conventions, Agreements and Protocols	Date Signed / Ratified	Summary
		of chlorofluorocarbons due to their contribution to the destruction of the ozone layer, resulting in an increased threat of skin cancer.
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	10/09/1998	The Rotterdam Convention is an international treaty designed to facilitate informed decision-making by countries with regard to trade in hazardous chemicals.
Montreal Protocol on Substances that Deplete the Ozone Layer and All Amendments	16/09/1987	Established to reduce emissions of chemicals harmful to the upper ozone layer.
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	22/03/1989	The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Includes restrictions on exporting of wastes but also includes requirements on member states to minimise production of hazardous waste and manage appropriately regardless of disposal location.
Paris Agreement to the United Nations Framework Convention on Climate Change (UNFCCC)	12/03/2016	UNFCCC is the main convention addressing the impacts and causes of climate change and aimed at returning global temperatures to a level which will not cause irreversible significant harm to ecosystem functioning.
United Nations Convention on Biological Diversity	05/06/1992	An international legally binding treaty with three (3) main objectives: conservation of biodiversity, sustainable use of biodiversity, fair and equitable sharing of the benefits arising from the use of genetic resource. The overall goal is to encourage actions which protect wildlife and ecosystems and lead to a sustainable future.
Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa	17/06/1994	Aims to conduct research and prevent/reverse desertification of natural habitats.
Convention for the Protection of the World Cultural and Natural Heritage	23/11/1972	Established to protect and enhance cultural and natural heritage, whilst there has been a focus on UNESCO designated sites the convention requires member states to protect all relevant resources and specifically states that because a resource is not listed it should not be implied that the resource has no value.
Kyoto Protocol to the United Nations (UN) Framework Convention on Climate Change	11/12/1997	Annex I parties of the framework agreed to commitments with a view to reducing their overall emission of six (6) greenhouse gases by at least 5% below 1990 levels between 2008 and 2012. Established emissions trading and a clean development mechanism.
Cartagena Protocol on Biosafety to the Convention on Biological Diversity	29/01/2000	Relates to the transfer and use of living modified organisms and may apply to any hybrid species which are imported for planting if genetically modified.
Stockholm Convention on Persistent Organic Pollutants (POPs)	25/06/2012	A global treaty to protect human health and the environment from persistent organic pollutants (POPs). Requires member states to eliminate use of Persistent Organic Pollutants, mainly focused on herbicides but now extended to other substances.
Convention on the Rights of Persons with Disabilities (CRPD) and its Optional Protocols	13/12/2006	International human rights treaty intended to protect the rights and dignity of persons with disabilities.

2.5.1 ILO Conventions

KSA is signatory to six of ten fundamental conventions under the International Labour Organization (ILO), namely:

- Forced Labour Convention (C029 of 1930 ratified in June 1978);
- Equal Remuneration Convention (C100 of 1951 ratified in June 1978);
- Abolition of Forced Labour Convention (C105 of 1957 ratified in June 1978);
- Discrimination (Employment and Occupation) Convention (C111 of 1960 ratified in June 1978);
- Minimum Age Convention (C138 of 1973 ratified in April 2014); and
- Worst Forms of Child Labour Convention (C182 of 1999 ratified in October 2001).

The four fundamental ILO conventions that Saudi Arabia is not signatory to include¹:

- ILO Convention 87 on Freedom of Association and Protection of the Right to Organize of 1948.
- ILO Convention 98 on the Right to Organize and Collective Bargaining of 1949.
- ILO Convention 155 on Occupational Safety and Health of 1981.
- ILO Convention 187 on Promotional Framework for Occupational Safety and Health of 2006.

KSA is signatory of one of four priority Governance Conventions, the Labour Inspection Convention C081 of 1947 ratified in June 1978 and 11 of 178 technical conventions.

¹ Retrieved from: https://www.ilo.org/dyn/normlex/en/f?p=1000:11210:0::NO:11210:P11210_COUNTRY_ID:103208

3 Project Information

3.1 Project Objectives and Need

The development of the Nairyah IPP 1 project is an extension of the energy ecosystem's efforts towards realizing KSA's Vision 2030's objectives and contributing to improving electricity generation efficiency and reducing costs by diversifying energy production sources to achieve the optimal energy mix and displacing liquid fuels in the Kingdom's power sector.

In line with the KSA Vision 2030 which aims to diversify the national energy mix used in electricity production, increase the share of natural gas (and renewable energy sources) to approximately 50% while reducing the use of liquid fuel. In addition, the power industry is a strategic industry in the KSA which has ensured its continued economic development and industrial diversification. The Project also aligns with KSA climate change strategy which includes transition from liquid-based fossil fuels to natural gas power generation.

Additionally, the Project will consider decarbonisation measures implemented to allow for the addition of carbon capture and sequestration technology at a later date without major modifications to the Plant, such measures shall include:

- Provision of sufficient reserve space along the flue gas path of the Plant,
- Extendibility of the power supply to enable the supply of the future carbon capture plant,
- Extendibility of the raw water supply system with major supply pumps to enable the supply of the future carbon capture plant,
- Extendibility of the wastewater system to treat the wastewater from a future carbon capture plant,
- Extendibility of the central control room for operation of the additional processes of the future carbon capture plant,

Reserve space to enable CO₂ circulation from the exhaust to the inlet of the gas turbines, if applied,

As such, the Project is of national importance in its contribution to the continued economic growth in KSA.

3.2 Project Location

The Project will be developed as a greenfield power plant in the Nairyah area, in the eastern region of Saudi Arabia, approximately 230km and 150km from Dammam city and Jubail industrial city respectively, in the northwest direction. The site is also located 30 km north of Nairyah town (refer figure below).

The site for the Nairyah IPP projects covers an area of approximately 9 km², roughly square shaped, with each side approximately 3 km long. The site observations mentioned in this ESIA report refer to the entire area, including the portion dedicated to the Project which lies within this boundary. The site for IPP1 represents only a portion of this area as indicated in Figure 1-1. The access to the site is using

the single carriage way (Road 6465) which is located about 1km to the west. This roads connects to the Highway 85 which is a dual carriage way located to the south which is shown below.

Plate 3-1 Roads Near Project Site

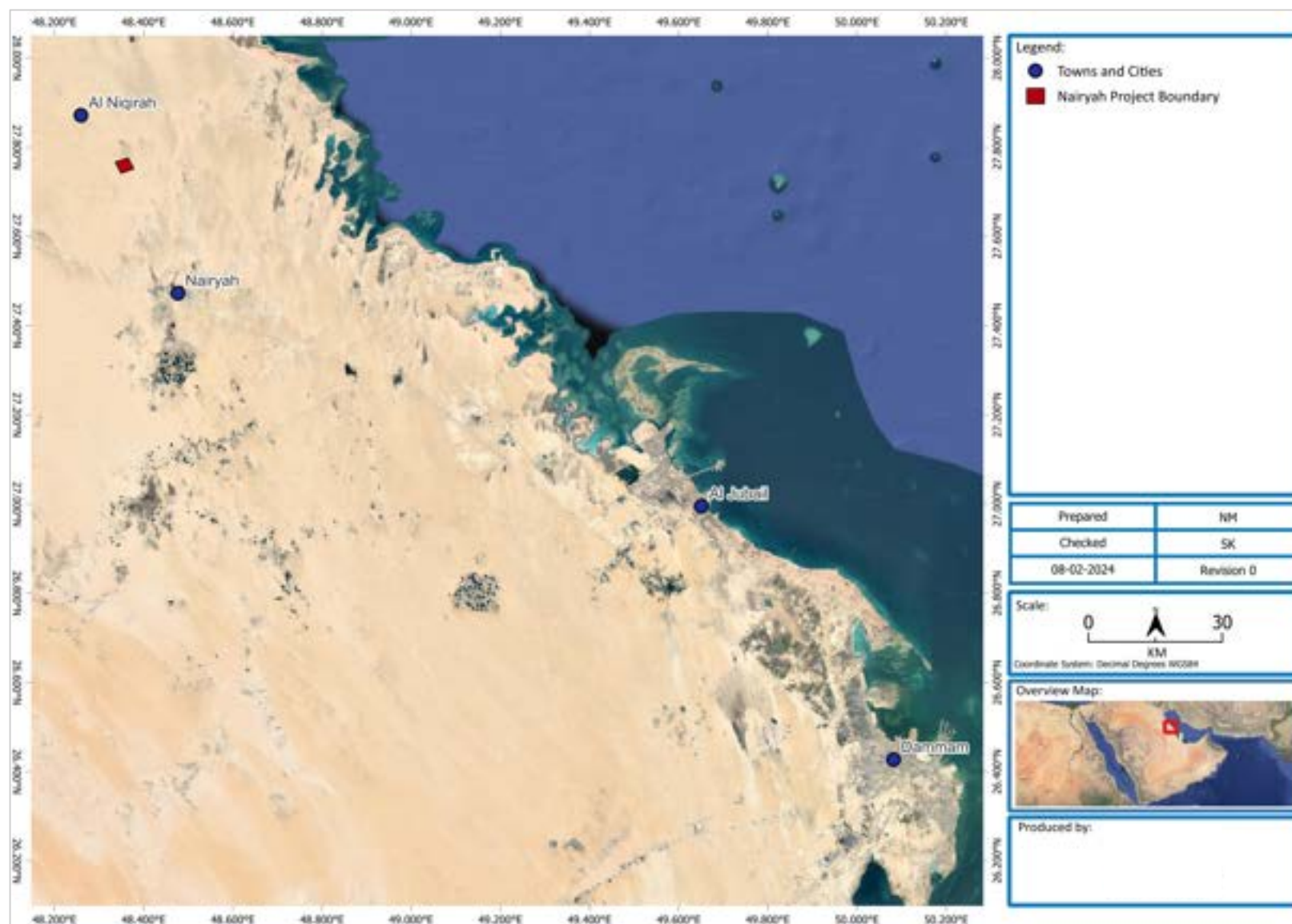


Highway 85



Road 6465

Figure 3-1 Location of the Nairyah IPP



3.3 Project Description

3.3.1 General Description of the Plant

The Project will comprise of a natural gas fired combined cycle power plant with an approximate total net capacity of 1,800MW. The power generation requirements for the Project are as shown in the table below.

Table 3-1 Power Generation Requirement

	Date	Main Fuel	Remarks
ICOD	31. May 2027	Natural Gas	All units in open cycle mode
PCOD	31. May 2028	Natural Gas	All units in combined cycle mode

The plant will be installed in power generation configurations based on H/J type gas turbine technology in combined configuration. The conventional combined cycle power plant will utilize evaporative cooling, fogging or wet compression and water steam process cooled with air-cooled condenser, under reference site conditions, at site elevation.

The primary fuel will be natural gas which will be transported to site via a new pipeline that will connect to a new fuel connection facility to be installed, owned, and operated by SPPC. Back-up fuel shall only be used when the gas supply is disturbed or completely interrupted and it will utilize diesel fuel which will be transported to site via trucks, with the necessary storage tanks and unloading bays to be installed at the Site by the Project Company. See Figure 3-2 below for the basic Project layout, with detailed discussions of key components in the following sections. Complete Project Layout drawings is available in **Appendix G**.

Figure 3-2 Plant Layout

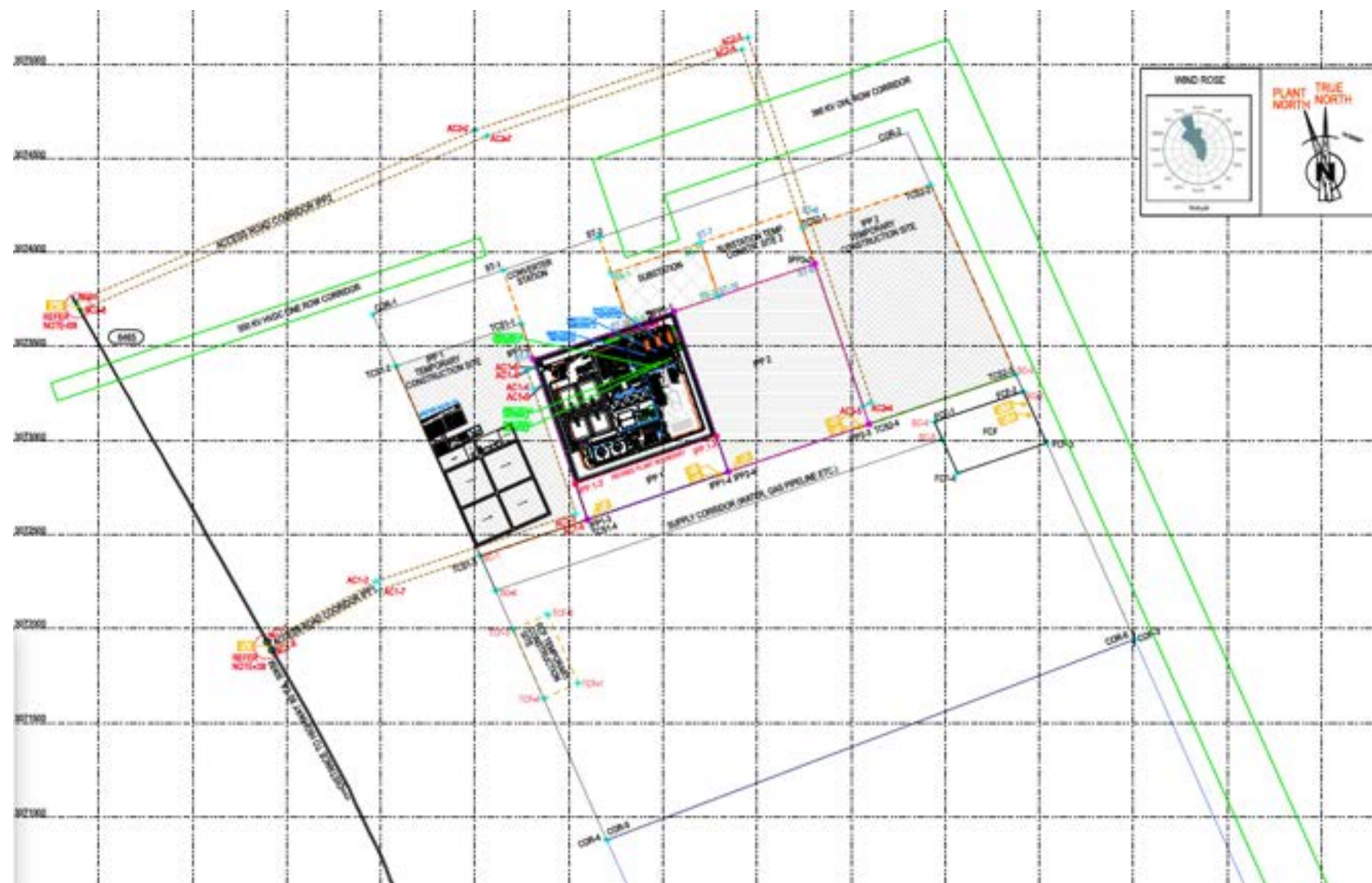
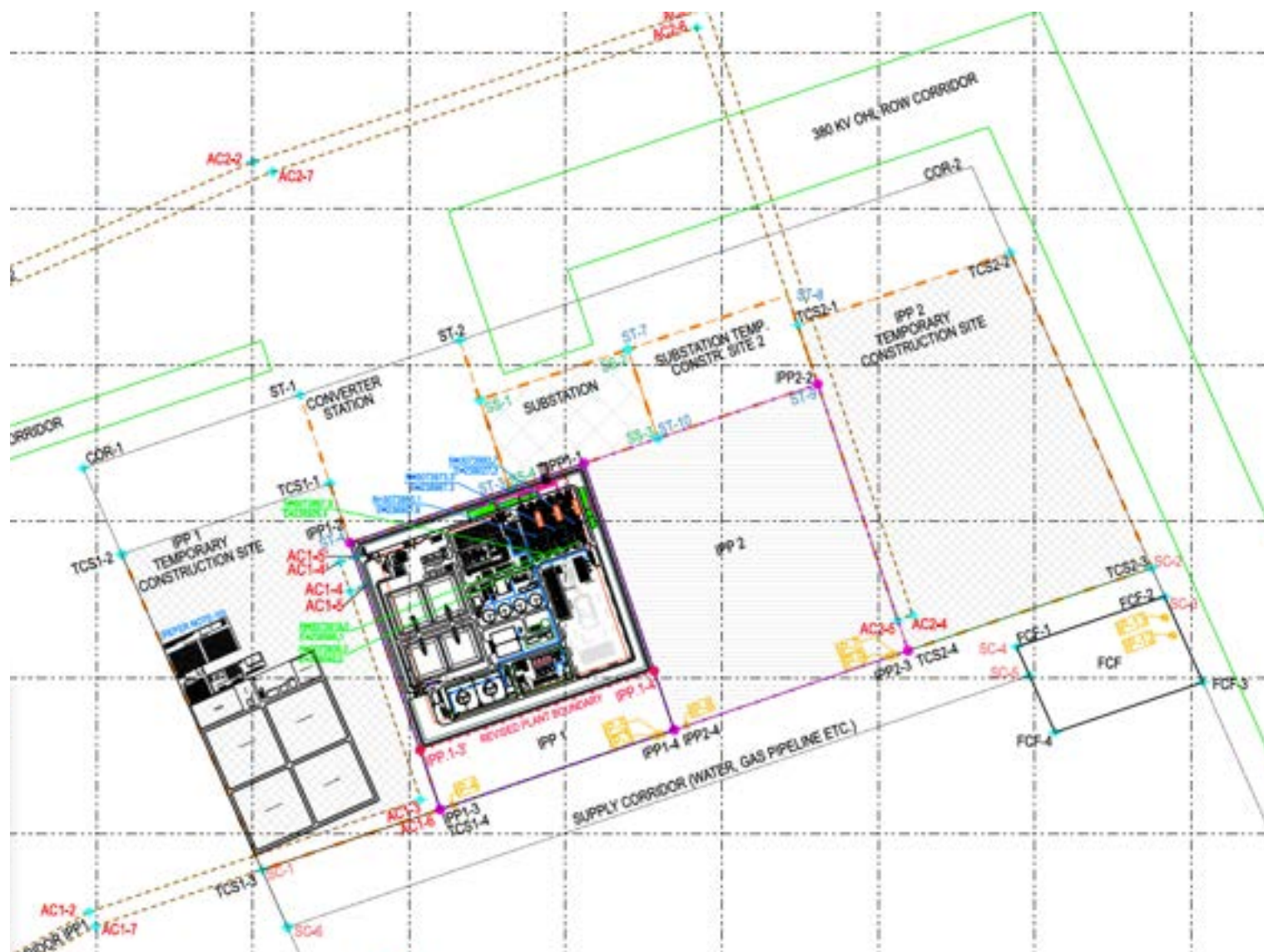


Figure 3-3 Plant Layout (closer view)



3.3.2 Gas Turbine Generator Island

3.3.2.1 Gas Turbine

The Project will have three (3) gas turbines that will each be designed for firing natural gas as the primary fuel and liquid fuel as back fuel. The gas turbine packages of multiple shaft units may be installed indoors or outdoors in compliance with the manufacturer's standard solutions.

The Gas Turbine Generator units will be incorporating the following main features.

- Dry low-NOx combustion chambers and complete gas fuel system for operation on the specified fuel,
- Lube oil systems for turbine, gearbox(es) and generator, complete with all pumps, filters, heaters, coolers, controls etc.,
- Closed-circuit cooling water system for lube oil and generator cooling, pumps, piping etc.,
- Compressor washing system for on- and off-line cleaning.,
- Gearbox(es) if required, couplings, etc.,
- Instrumentation and control equipment,
- Synchronous alternating current (AC) generator with complete air/water cooling system,
- Compounded excitation system (brushless rotating system) and automatic voltage regulator (AVR) with power factor control,
- Generator stars point and terminal cubicles including the required Current Transformers (CTs), Voltage Transformers (VTs) and star point earthing transformers,
- Generator main connection (isolated phase bus-duct or single core cables) up to generator step- up transformer and unit auxiliary transformer, including generator circuit-breaker, isolators, voltage and current transformers, surge arrestors/capacitors, etc.,
- Electrical auxiliary systems such as medium voltage (MV) and low voltage (LV) switchgears, Safe AC and direct current (DC) supply,
- Portable lube oil conditioning unit (common),
- Power and control cabling within the gas turbine generator package,
- Generator and unit protection and synchronization equipment,
- Measuring, metering, and monitoring equipment,
- Enclosure for the gas turbine/generator unit in order to obtain reduced sound power level and environmental protection including heating, ventilation, and air conditioning (HVAC), lighting etc.,
- Housing for the local electrical and control and instrumentation equipment,
- Air inlet filter system including self-cleaning pulse filter, high efficiency filter, silencers, inlet duct system, inlet support system,
- Evaporation type air cooling system, if necessary

-
- All exhaust gas ducts including expansion joints, noise-absorbing elements, silencer(s), guide vanes and other internals,
 - Insulating of ducts, outer insulation of auxiliaries.

3.3.2.2 Heat Recovery Steam Generator

Three (3) outdoor type Heat Recovery Steam Generators (HRSG) will be provided for the Project which will be able to withstand all ambient conditions expected at the site. It will also be designed to operate as part of the combined cycle plant. The HRSG units will also include an Ammonia Injection Grid along with Selective Catalytic Reduction system.

The main stack will be 7.5m diameter and minimum 60m height self-supporting type exhaust stack. It will be fabricated from carbon steel with a caged ladder to the access the platform and make provision for emission monitoring facilities etc.

In addition, a complete exhaust gas bypass system will be provided to run the simple cycle operation mode and combined cycle operation. This system will include, among other components, a 45-meter-tall steel stack with an 8-meter diameter, supported structure, and a diverter damper.

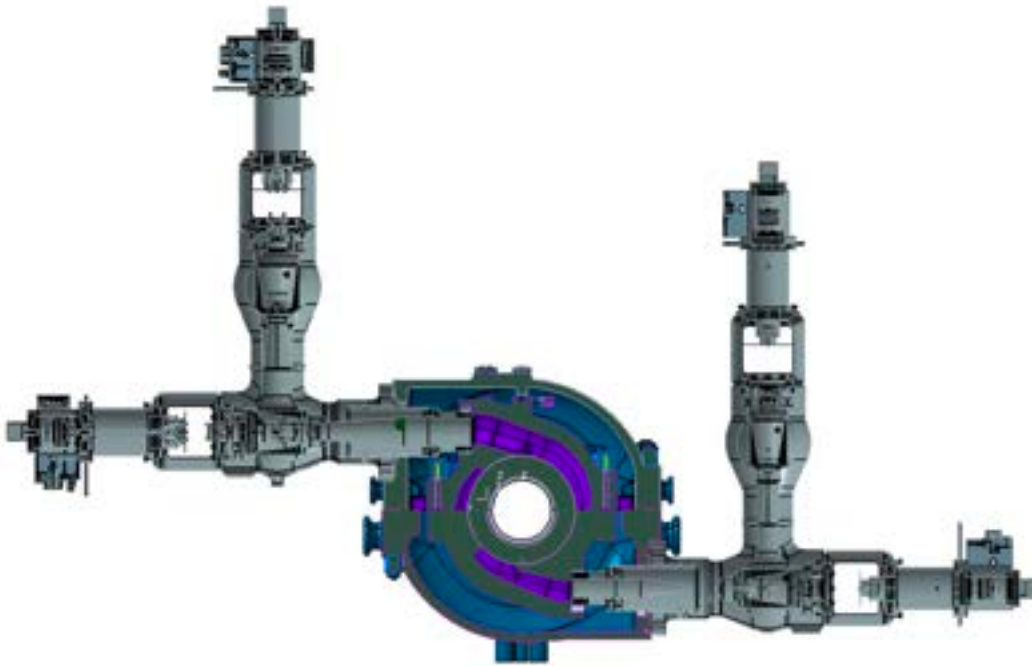
3.3.2.3 Steam Turbine Generator

The steam turbine generator will be a condensing steam turbine with a reheat, tandem-compound four (4) casings unit. It will consist of single flow high pressure (HP) section, double flow intermediate pressure (IP) section, two (2) double flow exhaust low pressure (LP) section.

3.3.2.4 High Pressure Turbine Casing

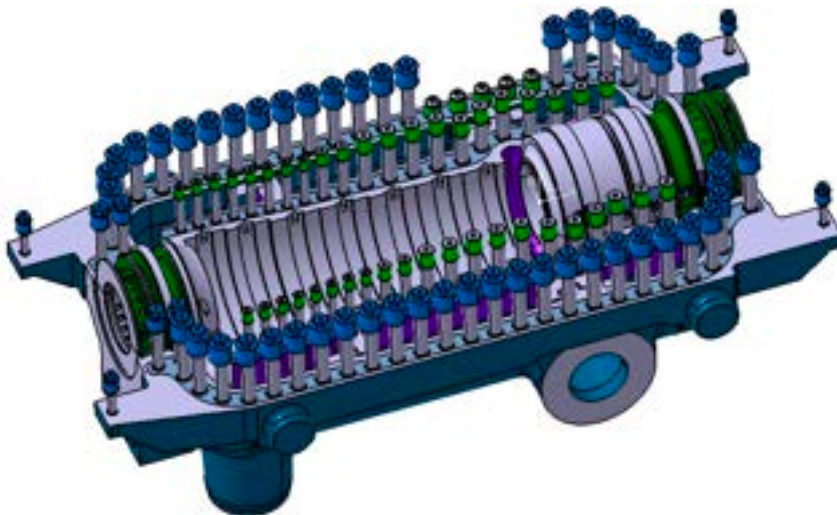
The HP casing will have a horizontally split design with two shells. The main steam will enter into the HP inner casing via two inlet connections. The HP steam flows in the direction towards the HP front pedestal. The inlet connections will be sealed in the inlet section of the HP nozzle adaptor with special sealing rings.

Figure 3-4 Typical HP Inlet Section View (for reference only)



The turbine casings will be divided by a horizontal plane into the upper and lower halves. The outer casing will be mounted over lugs in the horizontal plane on the bearing pedestals. Mounting in the horizontal plane ensures that any expansion due to thermal effects has a neutral effect and rotor and stator alignment in the hot and cold conditions remain the same. The inner casing will be mounted in the horizontal plane of the outer casing on the lugs.

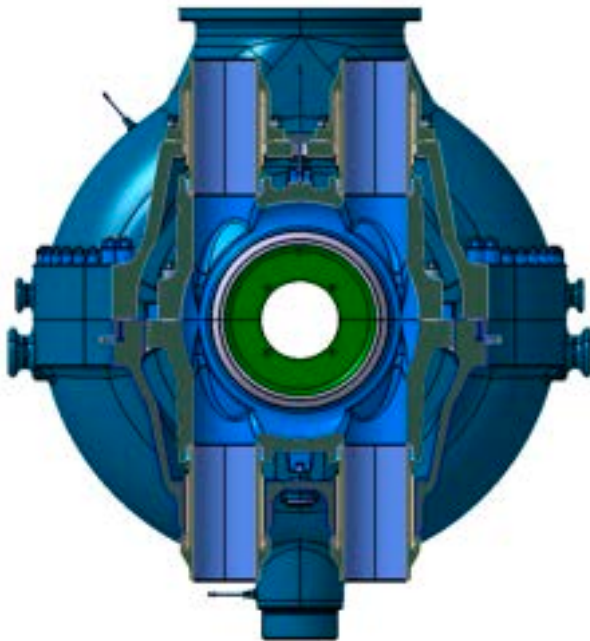
Figure 3-5 Typical Horizontal Stud Bolt Arrangement (for reference only)



3.3.2.5 Intermediate Pressure (IP) Casing

The Intermediate Pressure (IP) casing will have a horizontally split design with two shells in the inlet part. The reheat steam enters into the IP inner casing via four inlet connections. The steam entering into the IP inner casing will be conducted into the IP nozzle adaptor, which is casted in the inner casing. The inlet connections will be sealed in the inlet section of the IP nozzle adaptor with special rings.

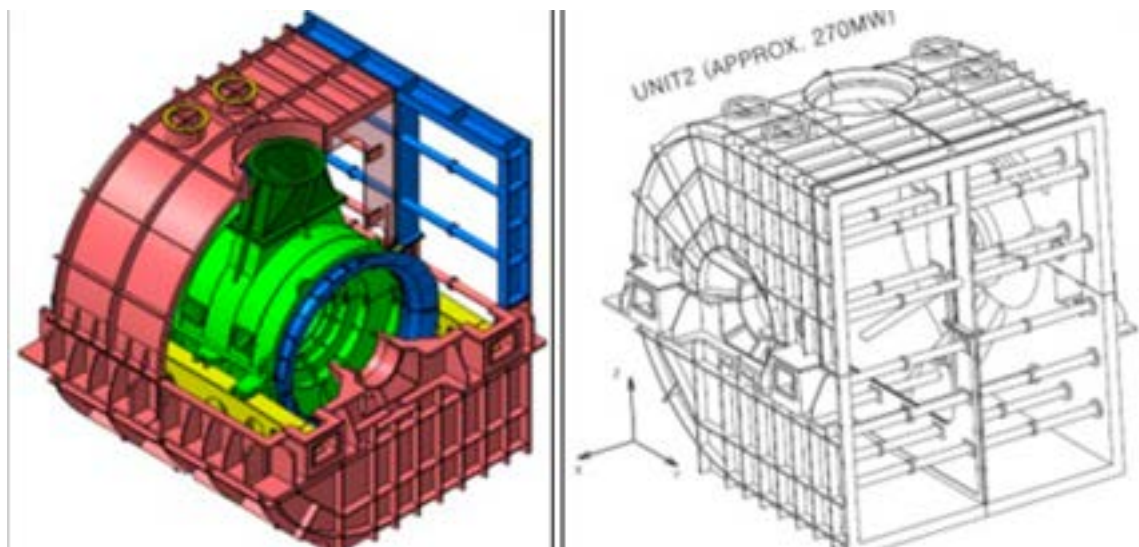
Figure 3-6 Typical IP Inlet Section View (for reference only)



3.3.2.6 Low Pressure Turbine Casing

The low-pressure turbine will have an inner and outer casing. The outer casing prevents air from entering the turbine exhaust and condenser and directs the steam from the turbine exhaust to the condenser and so is under a partial vacuum on operation. The turbine is applied side exhaust steam, and the inner casing is installed inside the outer casing and mounted on a separate bridge.

Figure 3-7 Typical LP Casing Assembly for reference only)



3.3.2.7 Generator

The generator will be designed for continuous operation and will be constructed to withstand per IEEE or IEC standards without harm, all normal conditions of operation, as well as transient conditions such as system faults, load rejection and mal synchronization. Temperature detectors that will be installed in the generator will permit the measurement of the stator winding and gas temperatures.

3.3.3 Steam, Feedwater and Condensate Systems

3.3.3.1 Condensate System

The function of the condensate system will be to condense the LP exhaust steam and pump condensate from the condenser to deaerator. Each equipment will be provided in the following configuration per Steam Turbine Generator (STG) unit:

- Air cooled condenser (ACC) and air removal system: The system design will be based on full condensing load point in heat and mass balance calculations.
- Condensate pump: The condensate water will be pumped from ACC condensate storage tank to HRSG condensate preheater by (N+1) condensate extraction pumps.
- 1x100% gland steam condenser; and
- Piping and valves.

3.3.3.2 Feedwater System

The feedwater system will provide the following functions:

- Receiving water from condensate system and removes dissolved gases from condensate by elevating its temperature in the LP drum (deaerator).
- N+1 capacity of HP/IP feedwater pumps are provided to supply feedwater to each HRSG through economizers.

3.3.3.3 Steam System

The function of the main steam line will be to convey superheated steam at high pressure and temperature from HRSG HP common steam line to HP turbine stop valve inlet, HP PRDS and HP bypass. It will include:

- HP steam lines.
- One HP bypass for each HRSG; and
- Steam drain line.

3.3.3.4 Cold Reheat Steam System

Cold reheat steam lines will be routed from the HP turbine exhaust connection to HRSG reheat inlet connection. The scope will include cold reheat steam line and steam drain line.

3.3.3.5 Hot Reheat Steam System

The function of the hot reheat steam line will be to convey superheated steam at intermediate pressure & temperature from HRSG IP steam line to IP turbine stop valve inlet and IP bypass.

3.3.3.6 Low Pressure Steam System

The function of the Low Pressure (LP) steam line will be to convey superheated steam at low pressure & temperature from HRSG LP steam line to LP turbine stop valve inlet and LP bypass.

3.3.4 Air Cooled Condenser System

Each steam turbine will be provided with an air-cooled condenser system to condense the exhaust steam. The condenser will comply with the manufacturer's standard design and will comply with the Heat Exchange Institute (HEI) Standards for Air Cooled Condensers (ACC).

The ACC and its auxiliaries will be designed to allow operation for the entire temperature range under all possible normal and abnormal operating loads and transients and ensure a condensing pressure such that no limitations occur for the Steam Turbine exhaust capabilities. This includes start-up, shut-down, emergency shut-down, sudden isolation from the grid and full load by-pass operation.

3.3.5 Fuel System

3.3.5.1 Main Fuel System

As stated above, natural gas will be the main fuel used in the operation of the plant. The Fuel Connection Facilities (FCF) will be erected, owned and operated by SPPC. SPPC will also be responsible for supplying the Project with gas, on an energy conversion basis. The FCF will include a gas interconnection to a new Saudi Aramco pipeline connecting from either Tanajib or Marafiq in Jubail and it will be designed by Saudi Aramco in accordance with the Saudi Aramco Standards for Engineering (SASE).

3.3.5.2 Back-up Fuel System

The power plant will be equipped with 18 backup diesel generators of a total capacity of 35 MW. Out of these, 6MW emergency diesel generators (EDGs) will be activated in case of a complete power plant shutdown (trip) and are expected to run for a maximum of 2 hours per incident. The anticipated frequency of such incidents is less than two per year. Additionally, all the generators of 35MW capacity will be utilised as black start diesel generators (BSDGs), to initiate the power plant when/if the Saudi national power grid is down. These BSDGs operate for a brief duration of approximately 10-15 minutes, with no expected incidents within a 25-year period.

It is important to note that both EDGs and BSDGs are only operated when the power plant is not operating under normal conditions and therefore, the backup generators will not operate in parallel with the power plant. Therefore, back-up fuel will be used only when the gas supply is interrupted or completely shut down.

The back-up fuel will be supplied by SPPC via trucks and the storage will be sufficient to operate the plant at full load over a period of five days. As such, the Project will include facilities for receiving and

unloading of the fuel from tankers and storage tanks. Refilling of the fuel tanks shall then be achieved within the subsequent 25 days.

If operated on back-up fuel, the maximum net plant power output will be as high as possible, but at least 85% of the contracted capacity.

A total of five (5) fuel (diesel) tanks will be installed aboveground. These will be single walled provided with dike (bund) area around them and equipped with level transmitters on the tanks to detect any potential leaks.

The required standards for fire safety and detection system will be considered, including:

- Foam injection system inside the fuel storage tanks with heat detectors
- Water spray system for fuel storage tanks surface cooling with heat detectors
- Dike area foam/water hydrant/monitor system with heat/flame detectors

3.3.6 Water System and Treatment Plants

The onsite water facilities will include, but not limited to a high recovery 2 stage RO plant with pre-treatment including feedwater chemical conditioning. Part of the RO permeate will be post treated/remineralized to make it of potable grade. The remaining permeate water will be treated through a demineralization plant (either ion exchange type or continuous electro-deionization type). A condensate polishing plant will be in place for the processing of returned condensate from the steam generators prior to feeding it into the demineralization tanks.

3.3.6.1 Service Water Supply System

SPPC will be responsible for supplying the Project with service water. The service water will be supplied to the plant by a new pipeline constructed by SPPC. Water source is not available at the Nairyah IPP site and therefore raw water must be provided from external sources. The design of the service water system connection to the service water interconnection pipeline shall closely be coordinated with SPPC and the company erecting the pipeline on SPPC's behalf during the detailed design stage.

The Project company will be responsible for the facilities (i.e., buffer tank, pumping station etc) required for the provision of receiving and forwarding water from the service water delivery point into the Plant service water storage, treatment, and distribution system.

The service water supply system will include, but not limited to the following systems and components:

- Service (raw) water buffer tank connected to the service water interconnection pipeline at the plant boundary with chlorination equipment and a capacity of at least seven days of full load operation at reference conditions at gas fuel operation, utilizing gas turbine inlet air cooling and maximum water/steam process blowdown requirements.
- Service water truck unloading system with forwarding pumps, piping, valves etc for emergency cases;
- Service water pumping station complete with forwarding pumps, piping, valves, etc;

-
- Treated service water storage tanks (including firefighting reserve), complete with valves, level control and indication, piping to consumer etc and cathodic protection system;
 - Transfer pumps, piping, valves; and
 - Instrumentation, water quality monitoring and consumption measurements devices for each consumer pipeline.

It is noted that the design of the water system connection to the service water interconnection pipeline will be coordinated with the SPCC during the detailed designed stage.

3.3.6.2 Reverse Osmosis Unit

The purpose of the RO desalination units will be to cover the production of own process and service water for the plant. The design will ensure continuous, steady state water production is maintained throughout the year even in the case of chemical cleaning, DMF back wash or other maintenance activities executed.

The RO system shall consist of at least three (3) trains. The 1st RO pass shall include at least one (1) standby train and at least three (3) separate trains for the 2nd RO pass, where and if applicable.

3.3.6.3 Potable Water Supply and Storage Tanks

The supply of the plant with potable water will be subject to the Project Company optimization and arrangements. The water quality will be in accordance with the relevant laws and regulations of KSA as well as the World Health Organisation (WHO) guidelines.

The potable water capacity shall be sufficient to serve all operational and operation personnel requirements under all normal operation circumstances and according to best practices, plus a 20% safety margin.

3.3.6.4 Demineralization Plant

The demineralization plant will produce demineralized water for the operational phase of the plant by applying mixed bed ion exchange (IEX) or continuous electro-deionisation (CEDI).

The demineralization plant shall have 3 x 50% streams. Each 50% stream shall be sized in such way that two streams running simultaneously provide, as a minimum, the flow rate needed to meet the requirements stated above. Furthermore, the demineralized water systems shall be sized to enable continuous fuel operation.

All chemical handling equipment will be bunded (bund volume of at least 110% capacity is required) in order to contain any chemical spillage. A bulk storage tank for each of the required chemicals will be provided with a minimum capacity of 7 days consumption at a maximum plant output.

3.3.6.5 Water Recycling System

As much water will be recovered and re-used as far as practicable. The following will be implemented (as far as possible):

-
- Consideration will be taken for Oil and TSS Separation and neutralization within the wastewater treatment plant.

3.3.7 Water Treatment & Discharge Systems

Where not recycled in the plant process, the Nairyah IPPs will discharge treated liquid effluents (i.e. treated industrial and sanitary wastewater effluents) and uncontaminated (clean) stormwater to evaporation pond. Nairyah IPPs will be designed with Zero Liquid discharge (ZLD) which means that no emissions of liquid effluents will be discharged to the environment.

3.3.7.1 Emergency Retention Tanks

In accordance with the MEWA Executive Regulations for the Protection of Aqueous Media from Pollution, article (7), the plant will be equipped with an evaporation pond to provide containment of wastewater in emergency situations for 36 hours and lined with an impermeable materials.

3.3.7.2 Sanitary Wastewater

Sanitary wastewater drainage from the plants will be collected in the plant sanitary drainage system and it will be treated in the plant sanitary wastewater treatment plant.

Dewatered sludge from the sanitary treatment system will be removed from the site by trucks for further treatment and/or disposal by an authorised company at an authorised facility off-site. Treated sludge may be reused on-site as a fertiliser.

3.3.7.3 Other Wastewater

Other wastewater will be collected for treatment including any rainwater or any other surface water flows from areas which are likely to be contaminated.

The wastewater streams will be separated according to their origin and/or type of pollution and the type of treatment that they require. As such, the following separate treatment systems will be provided:

- Oily wastewater treatment system: All oily water will be treated at least by oil separators and further adequate and suitable treatment steps in order to meet the relevant requirements.
- Chemical waste from chemical dosing area, eye wash and safety shower and floor wash will be collected in the N-pit and neutralized. The neutralized chemical water will then be transferred to the effluent treatment plant (ETP).
- Wastewater from raw water treatment ultra filters, treated water from oily water separators and neutralized chemical wastewater are collected and transferred to ETP. Treated water from the ETP will be transferred back to the raw water storage tank.
- HRSG blowdown water will be transferred back to the raw water storage tank for further treatment.
- Evaporative cooler blowdown will be transferred back to filtered water storage tank for further treatment.

3.3.7.4 Storm Water

The storm water network will be provided within the plant to allow stormwater that will be generated from within the catchment area of the plant to be discharged into the evaporation pond and will not be discharged to the environment. The design of the evaporation pond will consider 100 year storm return period. The plant protection system shall be such that no stormwater from outside could enter within the plant area. The system shall consist of a piping system with inspection manholes every 60 m and at each change of direction.

3.3.8 Environmental Monitoring System

The plant will include a Continuous Emission Monitoring System (CEMS) for each HRSG which will comply with local regulatory requirements in KSA and those of the lenders. The continuous, quantitative analysis of flue gas for the purpose of emissions monitoring will be performed by appropriate analysers of proven type, acknowledged by the local authorities.

Monitoring will be undertaken for:

- Total particulates (only for back-up liquid fuel);
- Nitrogen oxides (NO_x);
- Carbon Dioxide (CO₂);
- Sulfur Dioxide (SO₂);
- Carbon Monoxide (CO);
- O₂;
- Flue gas velocity;
- Flue gas pressure; and
- Flue gas temperature.

All CEMS equipment will be suitable for operation in dusty and humid environments at high ambient and flue gas temperatures. In addition, the emission data will be calculated, converted, printed, and stored according to government requirements. Additionally, these parameters will be transmitted from the central control room to the SPPC, or any other company authority agreed/approved by SPPC.

3.3.9 Access to Site

Currently there is no access road to reach the Project site. The Nairyah Projects area is located at about 2 km distance from an existing public asphalt road. Two newly constructed permanent access roads will connect the Project site with the Road 6465.

3.3.10 Ancillary/Support Facilities

The following elements will also be part of the Project:

- Administration buildings (office, meeting rooms, prayer rooms etc).
- Social building (including kitchen, dining room, social room, sanitary facilities etc.).
- Workshop & store.

- Gate house.
- Emergency diesel for safe shutdown.
- Fire-fighting system.
- Parking facilities.
- Heating, ventilation & air conditioning (HVAC) system.
- Laboratory.
- Other mobile plant and vehicles.

3.4 Project Associated Facilities

In accordance with IFC PS1 there is a requirement to assess the impacts of the Project's associated facilities. 'Associated facilities... are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.'

Project's associated facilities are likely to include:

- Fuel connection facilities (FCF) including a gas interconnection to a new existing Saudi Aramco pipeline.
- Service water supply system.
- Substation to receive evacuated electricity
- New Overhead Transmission Line (OHTL) to tie in with the substation.

3.5 Construction Requirements

3.5.1 Civil Works

The Project will include considerable civil works. The main civil works required for the construction phase will consist of the following:

- Site development,
- Flood protection and embankments, as required,
- Road design and construction,
- Plant buildings,
- Support structures for equipment and other facilities,
- Service water, sewage, drainage, storm water and wastewater systems;
- Boundary fences; and
- Water treatment systems etc.

3.5.1.1 Concrete Placing

Building of the plant will commence after site grading and excavation have progressed to a point that large areas are at their final grade. Either a neat excavation will be made to the size of the foundation, or a concrete form will be built to contain the foundation. Reinforcement steel (rebar) will then be placed in the form of excavation. In addition, placing of any embedded items such as anchor bolts, drains etc

will be undertaken and concrete placed. For some foundations concrete will be poured directly from the mixing trucks into the forms. However, most of the concrete will be placed by pumping the concrete either with trailer mounted pumps or with boom trucks.

3.5.1.2 Mechanical Equipment

Installation of equipment and process systems will begin after the power plant units are constructed and the concrete has cured. It is expected that equipment deliveries will be ongoing throughout the project, but this will increase as various system components become ready for installation. After delivery, equipment will be placed on foundation, levelled, balanced, and finally grouted into place. The equipment will be connected to piping, ductwork, electrical power, and control systems as applicable.

Crawler cranes, forklifts, or other hoists will be required onsite to offload and install the equipment.

3.5.1.3 Instrumentation and Controls

Each piece of equipment in the power plant will be monitored and controlled from the centralized control console located in the centre control building. The equipment will be wired back to the central control panel which will allow operators to see the status of each equipment at any time. The controls will have multiple set points, different status denotations, and automated programs to optimize the plant operations. The systems will be able to test the process effectiveness and adjust operating parameters to reduce power consumption, improve effluent quality, monitor odour etc. These will be based on providing devices at the point of operation and tying them back to the central computer and control panel via hard wired or remote signal connections.

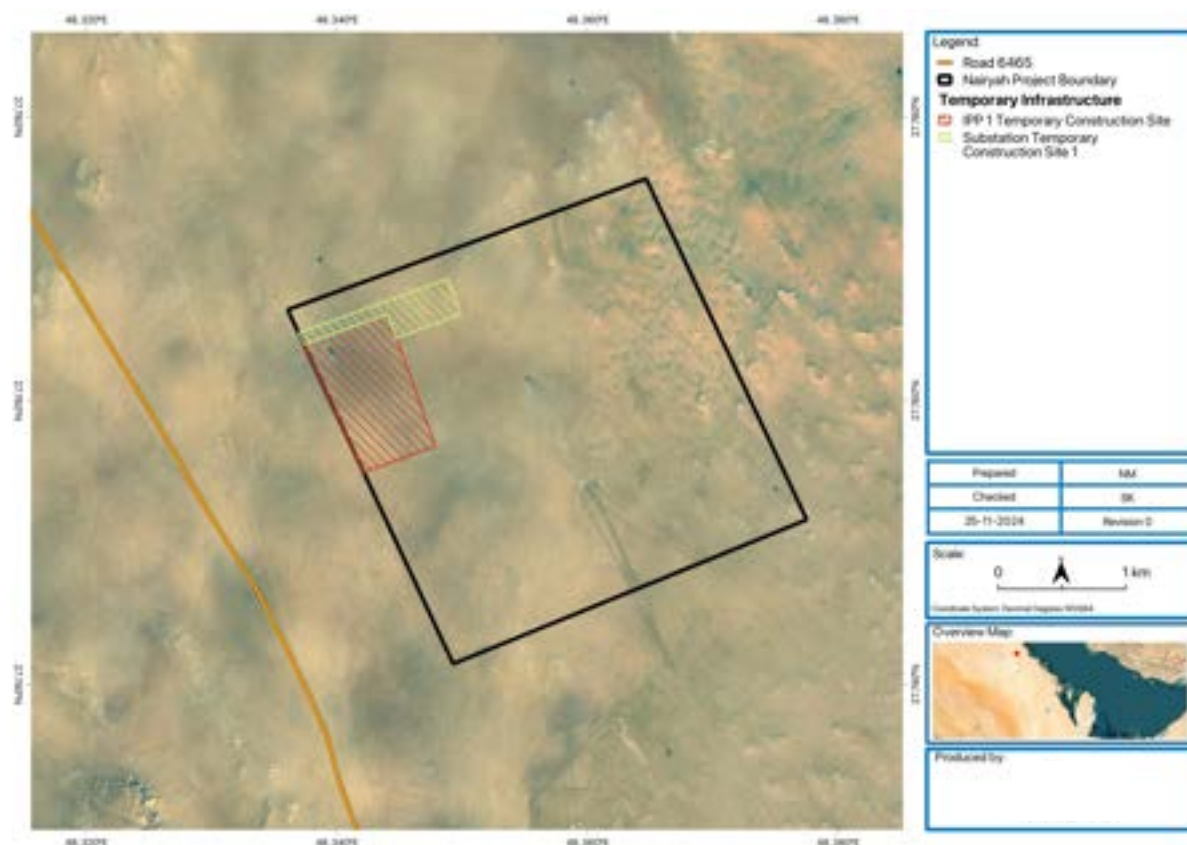
3.5.2 Temporary Construction Areas

The laydown areas will be located within the temporary site installation area within the Project boundaries and will include:

- Offices;
- Storage area and warehouse;
- Workshop and fabrication yard;
- Housing compounds.

The construction phase will also include the provision of temporary site fencing including gates, first aid, site safety and security system, temporary roads and site drainage including water and sanitary drainage etc.

Figure 3-8 Locations of Temporary Construction Area



3.5.3 Construction Workforce

At this stage it is understood that about 5,000 personnel is expected to be present on site during peak periods. It is noted that the Project Company is obliged to employ qualified Saudi Arabia citizens to the maximum extent possible and in accordance with the Saudi nationalization scheme and also known as Nitaqat, a policy implemented by the Ministry of Labor and Social Development. The Project will prioritise to recruit and hire workers from the local community and region and where available nationally, provided that they have the necessary skills and qualifications to perform the required tasks. If not available locally, labour force will likely be expatriates, recruited from China, India, Pakistan, Egypt, Bangladesh etc.

The Nairyah 1 IPP Project Company will also promote the recruitment and retention of women in the workforce.

3.5.4 Temporary Construction Accommodation Facilities

It is understood that the worker accommodation camp will be located within the 9km² Project land allocation from SPPC, but outside of the IPP1 and IPP2 plant facilities.

The accommodation camp will align with the applicable local regulations and requirements of the IFC/European Bank for Reconstruction and Development (EBRD) Worker Accommodation Processes and Standards.

3.5.5 Security

It is expected that required site-based security personnel for the Project will be sub-contracted from a third-party company. It is understood that by law in KSA all security personnel have to be Saudi locals and are not allowed to be armed. Security personnel are expected to be stationed at the project offices and laydown areas and patrol the project area to prevent the public from trespassing onto the construction sites. Their presence will help maintain a secure environment and minimize the risk of construction site incidents. The Project construction sites will also be secured from public access and trespassing by proper fencing and delineation of sites, installation of warning boards, and appointment of onsite guards.

3.5.6 Construction Equipment

The likely types and number of the main construction plant and equipment are listed in following table.

Table 3-2 Indicative Construction Plant and Equipment

Description	Capacity	Number
Civil & Building Works		
Excavator	-	1
Dump Truck	-	1
Water Truck	-	1
Crane	-	1
Pile Rig	-	1
Heat Recovery Steam Generators		
Crawler Crane	400 & 750 Ton	2
Hydraulic Crane	50, 80 & 120 Ton	3
Cargo Crane	5/11 Ton	1
Forklift	10 & 15 Ton	2
Module Trailer	350 Ton	1
Trailer	30 Ton	1
Man Lift	42 M	1
Diesel Generator	150, 300 & 500 KVA	3
Air Compressor	800 CFM	1
Engine Welding M/C	500 A	1
Steam Turbine Generator, Gas Turbine Generator and Piping		
Hydraulic Crane	50, 80 & 120 Ton	3
Cargo Crane	5/11 Ton	1
Crawler Crane	300 Ton	1
Forklift	10 & 15 Ton	2
Trailer	30 Ton	1
Man Lift	26 M & 42 M	2
Diesel Generator	150, 300 & 500 KVA	3
Air Compressor	800 CFM	1
Engine Welding M/C	500 A	1

Description	Capacity	Number
Electrical		
Hydraulic Crane	25 Ton	1
Self-Cargo Crane	11 Ton	1
Trailer	30 Ton	1
Forklift	10 Ton	1
Man Lift	12 Meter	1
Truck	2.5 Ton	1
Diesel Generator	100, & 150 KVA	2
Tig Welding M/C	500 A	1
Arc Welding M/C (Portable Type)	10 kW	1
Winch (for Cable)	3 Ton	1

Note: The equipment/machinery listed above are indicative

3.5.7 Utility Requirements

The Engineering, Procurement and Construction (EPC) Contractor will be solely responsible for all construction utilities including power supply, potable water, firefighting supplies and systems and waste management and temporary medical and welfare facilities etc.

It is likely that the EPC Contractor will purchase potable water from a qualified water supply company and purify the water through a qualified drinking water purification equipment for the staff. The drinking water will be tested by a KSA accredited laboratory.

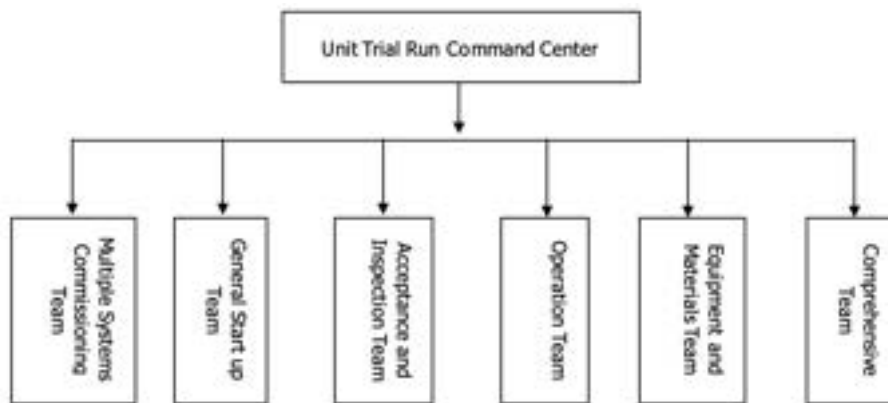
Utility and Raw Materials Requirements

The quantities of utilities such as water, power, fuel etc. and raw materials required for the project is not known at this stage. Such details will be provided at the ESIA stage where available.

3.6 Commissioning Requirements

Commissioning is a process of ensuring that the Project's building systems (boiler, steam turbine, HVAC systems etc) are all functioning properly as designed and capable of safe and reliable operation and control. To ensure this, the EPC Contractor will establish a Unit Trial Run Command Centre (UTRCC) who will oversee the project commissioning phase. The expected organisation chart for the UTRCC is as provided in the figure below.

Figure 3-9 Unit Trial Run Command Centre



The key commissioning stages are summarised below.

- Hand over from erection to commissioning: When the erection of a system is completed, it will be handed over by the construction team to the commissioning team. A turnover package including the list of equipment handed over, associated relevant erection quality control form etc will be provided.
- The individual system commissioning work will begin from the back energizing up to the general start-up including individual equipment commissioning and subsystem commissioning.
 - The main steps will include receiving construction completed certificate (ECC) → pre-commissioning → commissioning → system/ equipment testing → commissioning acceptance → commissioning of individual system → commissioning completed certificate → handover to operation team.
- Unit start-up will begin from the first light up of the unit, including start-up of non- load, part load commissioning, full load commissioning and function tests.
 - The main steps will include jointly inspecting before unit start-up → general start-up → no load tuning → part loading tuning → full load tuning → Function Tests → commissioning completed certificate.

BOILER FLUSHING AND CHEMICAL CLEANING

Boiler flushing and chemical cleaning are crucial steps in the commissioning process. These processes help remove impurities and contaminants from the boiler system, ensuring optimal performance and longevity. This includes the following:

- Chemical cleaning of temporary pipe installation (system to system);
- Auxiliary pipe installation (Demineralized water supply pipeline, temporary steam pipeline, and discharge pipeline);
- Preparation for chemical cleaning;
- Flow rate control;
- Determination of cleaning process conditions and process procedure including:
 - Water flush which is the initial step to remove loose debris, dirt, and initial contaminants from the system.
 - Superheater protection which involves filling the superheater with a protective fluid to prevent corrosion during subsequent cleaning stages.

- Alkaline cleaning to help remove grease, oil, and other organic materials from the boiler surfaces.
- Acid cleaning to dissolve scale, mineral deposits, and other inorganic contaminants.
- Rinsing the system thoroughly to remove any remaining cleaning agents and by-products.
- Passivation which forms a protective layer on the metal surfaces to prevent corrosion and enhance the system's corrosion resistance.
- Disposal of harmful materials and chemicals resulting from cleaning operations through entities licensed by the National Centre for Waste Management.

STEAM BLOWING:

HRSG steam blowing will be conducted to remove all foreign matters (e.g., welding slag, oxide scale, and sand, etc.) remaining inside the superheater and pipelines during storage and installation to ensure the cleanness of the superheater and the steam pipelines, prevent these foreign matters from entering the steam turbine and damaging the vanes, and to improve the operational safety and economic efficiency of the HRSG and the steam turbine.

The steam blowing will cover the HRSG HP/IP/LP/RH steam system, HP/IP/LP common steam header and HP/IP/LP bypass steam system. Meanwhile, manual cleaning will be taken for the parts that cannot be steam blown after the bypass valve. There are three stages of HRSG steam blowing.

- Stage 1: Single HRSG HP, IP, RH and bypass steam system combined steam blowing, LP and bypass steam system separate steam blowing. HRSG is cooled for 12 hours after steam blowing completed.
- Stage 2: Perform the first stage steam blowing procedures and procedures; HRSG is cooled for 12 hours after steam blowing completed.
- Stage 3: Single HRSG HP, IP, RH and bypass steam system combined steam blowing, LP and bypass system separate steam blowing, and the HP, IP, LP system for the respectively target plate acceptance.

After stage 3 steam blowing is completed, the three HRSG combined steam blowing HP, IP, LP common header will begin.

During all commissioning stages, the wastewater and waste would be collected and handled by qualified and licensed waste and wastewater treatment companies.

3.7 Operation and Maintenance Requirements

The CCGT plant will be operational for a period of 25 years based on a Power Purchase Agreement that will be signed between SPPC who the off-taker and the Special Purpose Vehicle (SPV) Project Company established by the awarded developer. It is expected that during the early power period operation (i.e., initial 4 months of operation), the plant(s) will operate in open-cycle (simple cycle) mode. Following this, the expectation is that the plant(s) will operate in combined cycle, utilising both that gas and steam turbines for power generation and higher electrical output.

All facilities will be designed to ensure the stability of the electrical system in the event of a Power Unit tripping or any other transient condition affecting the grid stability. The maximum loss of net power in case of forced outage of any single Power Unit shall be limited to 740 MW at Reference Site Conditions.

Maintenance activities for the Plant Units are likely to take place during winter, when power demand in KSA is at its lowest. Planned maintenance will take place in sequence, with a maximum of one (1) Gas Turbine Unit being maintained at a time.

3.7.1 Operational Workforce

The requirements for the operational phase workforce are expected to be more than 100 personnel. It is noted that the O&M is obliged to employ qualified Saudi Arabia citizens to the maximum extent possible and in accordance with Saudization law. The Project will prioritise to recruit and hire workers from the local community and where available nationally, provided that they have the necessary skills and qualifications to perform the required tasks. If not available locally, labour force will likely be expatriates,

In addition, the Project Company will be required to implement a long-term training program for the plant personnel.

3.7.2 Permanent Accommodation Compound

The exact accommodation arrangements for the operational phase have not been finalised at this stage. However, the provision of housing in nearby areas, with transportation provided to workers is under consideration.

3.8 Project Footprint

3.8.1 Project Area

The Project site is approximately 9 km², roughly square shaped, with each side approximately 3 km long.

3.8.2 Project Resources

3.8.2.1 Construction Phase

The Engineering, Procurement and Construction (EPC) Contractor will be solely responsible for all construction utilities including power supply, potable water, firefighting supplies and systems and waste management and temporary medical and welfare facilities etc.

It is understood that the EPC Contractor will purchase potable water from a qualified water supply company and purify the water through a qualified drinking water purification equipment for the staff. The drinking water will be tested by a KSA accredited laboratory.

ENERGY & FUEL REQUIREMENTS

Construction phase electricity will be provided by temporary diesel generators. At this time, it is estimated the Project will use approximately 300,000L of diesel a month during peak construction. The monthly electricity usage for the Project, including site office and camps is estimated at approximately 1000Mwh/month but this might be subject to change.

WATER REQUIREMENTS

During the construction phase the Project is expected to use an estimated 350m³ of water a day for drinking, washing and various site activities. Potable water will be purchased from a Water Company and transported to the site by trucks.

RAW MATERIALS REQUIREMENTS

the main raw materials required during the construction stage include steel structures, cement and sand of roughly estimated at 7,000 tons, 44,000 tons and 55,000 tons respectively. It is understood that the local sourcing of raw materials will be prioritised, however, materials may also be sourced internationally depending on availability.

CONCRETE

A temporary batching plant for the construction phase will be located within the 'Temporary Site Installation Area' boundary. The batching plant is expected to produce around 110,000m³ of concrete which will be sufficient for the project and therefore, purchasing concrete will be not required.

3.8.2.2 Commissioning Phase

Energy and Fuel requirements

Approximately 355 MBD of fuel oil and fuel gas 25,240 MMSCFD with HHV of 1080 BTU/SCF will be required during the commissioning stage.

Water requirements

During the commissioning phase the Project is expected to require an estimated 800,000m³ of water.

3.8.2.3 Operation Phase

Raw Materials

During Operation, Ammonia (aqueous), Sulfuric Acid, Coagulant, and Mineral Oil will be required for the process and the quantity will be subject to the operating regime. These chemicals will be stored in designated areas with proper management to prevent spills and leaks.

Energy and Fuel requirements

Natural gas required for operating the power plant is 253 MMSCFD, with HHV of 1080 BTU/SCF gas heating value.

In the event of an emergency where the standby generators will be required, the diesel fuel consumption rates for BSDG and EDG are 7400 kg/h and 1300 kg/h, respectively.

Water requirements

During operation, the Project is expected to require an estimated 400,000m³ of water annually. SPPC will be responsible for supplying the Project with service water sourced from the discharge of the National Water Company sewage treatment plant. The service water will be supplied to the plant by a new pipeline constructed by SPPC.

3.8.3 Waste and Wastewater

3.8.3.1 Construction Phase

Dedicated areas will be allocated within the Temporary Site Installation Area for storing and handling waste materials. The following types of wastes are expected to be generated during construction of the Project:

- Concrete debris, bricks, tiles and ceramics
- Glass, plastic (primarily arising out of packaging)
- Wood and Cardboard (arising out of packaging)
- Spent containers, cans, tools
- Used oil or residual paints/varnishes etc.
- Domestic waste from construction workers

Domestic wastewater will be stored in temporary storage tanks and transferred to licensed wastewater treatment plants within the region

Excavated material will be stored in designated temporary stockpiling areas for reuse where possible. Where it is deemed unsuitable, excavated material will be removed from site to a licensed disposal facility.

The EPC Contractor will enter contractual agreements with MWAN licensed waste service providers to transport and dispose or treat different construction waste streams.

3.8.3.2 Operation Phase

3.8.3.2.1 Solid waste

Maintenance waste: these may potentially be generated, from used equipment parts, filters, cleaning materials, and any other consumables utilized during the maintenance and repair of the Project.

Domestic waste: these will be generated from the operation workforce.

The O&M Company will enter contractual agreements with MWAN licensed waste service providers to transport and dispose or treat different waste streams.

3.8.3.2.2 Water Discharge Systems

The Nairyah IPP will be designed with Zero Liquid Discharge meaning that no emissions of liquid effluents other than uncontaminated (clean) storm water will be discharged to the environment. As such, all wastewaters will be discharged either to the evaporation pond or sent outside the plant boundary via trucks. Process wastewater discharged into the pond is not expected to generate large amounts of sludge, however, any accumulating sludge in the evaporation ponds will be removed during cleaning and disposed by licensed waste management contractors.

PROCESS WASTEWATER

Wastewater will be collected for treatment including any rainwater or any other surface water flows from areas which are likely to be contaminated.

The wastewater streams will be separated according to their origin and/or type of pollution and the type of treatment that they require. As such, the following separate treatment systems will be provided:

- Oily wastewater treatment system: All oily water will be treated by oil water separators with adequate and suitable treatment steps in order to meet the relevant requirements. The removed oil will be collected in separate collection tanks and transferred by licensed tanker trucks to designated treatment facilities.
- Chemical waste from chemical dosing area, eye wash and safety shower and floor wash will be collected in the N-pit and neutralized.
- Wastewater from water treatment ultra-filters, backwash, treated water (de-oiled water) from oily water separators and neutralized chemical wastewater will be collected and transferred to the effluent treatment plant (ETP).
- Treated water from the ETP will be transferred back to the raw water storage tank and reject water from ETP will be discharged into the process wastewater evaporation pond.
- HRSG blowdown water will be transferred back to the raw water storage tank for further treatment.
- Evaporative cooler blowdown will be transferred back to filtered water storage tank for further treatment.

SANITARY WASTEWATER

Sanitary wastewater drainage from the entire site will be collected in the plant sanitary drainage system and it will be treated in the plant sanitary wastewater treatment plant. Treated sanitary wastewater will be collected in the evaporation pond or will be used for landscaping or irrigation purposes.

Solid waste (sludge) from the sanitary treatment system will be removed from the site by trucks to a disposal site.

STORM WATER

The storm water network will be provided to allow clean, non-industrial contact storm water to drain freely from the site to a designated evaporation pond. The design of the evaporation pond will consider a 100 year storm return period. The Plant storm water drainage system shall be capable of carrying corresponding discharge of flows from the offsite area. The plant protection system shall be such that no stormwater from outside could enter within the plant area. The system shall consist of a piping system with inspection manholes every 60 m and at each change of direction and shall discharge to the Plant storm water infiltration and evaporation pond(s).

3.9 Project Life and Decommissioning

The design lifetime of the Project will be 25-years and the day-to-day operation of the Plant (O&M) will be the responsibility of the O&M and the Project Company.

Although there will be certain environmental and social risks during decommissioning, due to the type of project, it is not expected that there will be major or other significant risks that necessitate management or specialised mitigation outside of common good practices (or that would be like those implemented during construction).

Based on the PPA, it is expected that the Project will have a lifetime of at least 25-years prior to decommissioning. Based on this timeline there may also be changes to future environmental and social conditions including the sensitivity of current or future receptors, or facilities to handle wastes etc., or the extent of environmental and social regulation that may exist.

As such, the ESIA will not assess in detail (or provide mitigation recommendations) for potential E&S at the time of decommissioning. However, it is proposed that all impacts relating to the decommissioning stage will be planned to be approached and mitigated via a specific decommissioning plan and updated baseline surveys prepared closer to the time of decommissioning. This would be able to account for changes in national requirements and regulations (e.g., which may be linked to circular economy and requirements for developing and implementing plans for restoration and environmental rehabilitation of sites, if applicable), improvements in technology and requirements for re-use and recycling of components and materials. The decommissioning plan would be developed at least 12-months prior to decommissioning and would be based on the Project's ESMS.

3.10 Project Agreements

The Project Company will enter into the agreements provided in the table below.

Table 3-3 Key Project Agreements and Parties

Key Document	Parties
Power Purchase Agreement (PPA)	Project Company & SPPC
Project Development Agreement (PDA)	Project Company & SPPC
Site Use Agreement (SUA)	Project Company & SPPC
Electricity Interconnection Agreement	Project Company and EPC Contractor
EPC Contract	Project Company & O&M
O&M Contract	Financing Parties, Project Company & SPPC
Power Purchase Direct Agreement	Financing Parties, Project Company & SPPC
Site Use Direct Agreement	Financing Parties, Project Company & National Grid S.A.
EIA direct Agreement	SPPC and Saudi Aramco
Fuel Supply Agreement	SPPC and Saudi Irrigation Organisation
Water Supply Agreement	Project Company & SPPC

3.11 Project Timeline and Key Milestones

Based on the details provided by the Project Company, the Project will have the following timeline.

Table 3-4 Key Project Milestone/Timeline Dates

Milestones	Duration/Date
Detailed design duration	1.5 years
Construction duration	2 years
Commercial Operation Date for all Units in open cycle mode (ICOD)	31 May 2027
Project Commercial Operation Date for all units in open cycle mode (PCOD)	31 May 2028
Operation duration	25 years

4 Project Alternatives

4.1 Project Alternatives

In accordance with good practice methodologies for ESIA, the evaluation of various project design and activity alternatives should be considered, in order to ensure that the objectives of the proposed project have accounted for social, environmental, economic and technological options. The following project alternatives were considered:

- No Project Alternative.
- Site Location;
- Project Layout; and
- Project Technology.

4.1.1 No Project Alternative

The no project alternative would result in future demand for electricity in KSA exceeding supply and result to a deficit. The lack of a secure and reliable electricity generation and supply system would have significant social and economic development implications including the realisation of the KSA vision 2030. In addition, the no project alternative would hinder KSA's efforts to transition existing liquid-based fossil fuel plants to natural gas power generation.

As such, the "no project alternative" option is not considered a viable option and it would not align with KSA's development goals.

4.1.2 Site Location

The current site location has been identified by SPPC on a defined plot of land with specified technical requirements taking into account factors such as land availability as well as the absence of any large human settlements in the surrounding area. No alternative land has been considered.

Considering the limited receptors, locally and availability of nearby infrastructure such as existing roads, limiting the development of associated facilities (and associated environmental & social impacts), the location is likely to be suitable for this type of Project.

4.1.2.1 Project Layout

The current Project layout was provided by the Project Company. The layout has been optimised considering the presence existing OHTLs as well as site terrain to avoid any excessive land preparation works.

5 Baseline Environment

5.1 Baseline Data Collection

The baseline environment for the Project was determined based on literature review of secondary data from available online sources and site visit conducted by the ESIA consultant in January 2024 and supplemented by site specific environmental baseline surveys conducted during December 2024.

5.2 Project Area

5.2.1 Site Conditions and Land Use

Almost entire Project site is an undeveloped open sand sheet with seasonal grass cover. The nearest residential area is a small village called Dhulayat Al Khalilayn, located approximately 3.2 km to the north. Other than vehicle tracks, there is little disturbance within the project boundary. The site has slightly undulated terrains with ground levels ranging from approximately 55 m to 90 m above Mean Sea Level (MSL).

Plate 5-1 Sandy Plain with Seasonal Grass Cover



The Project site is mostly devoid of any trees. There were signs of land use for animal grazing, mainly for camels at several locations within the site and offsite, noted during the site visit, evident from the presence of caravan and small temporary camels farms (see following figure).

Plate 5-2 Example of Caravan Used by Herders on Site



Plate 5-3 Small Village (Dhulayat Al Khalilayn) to the North



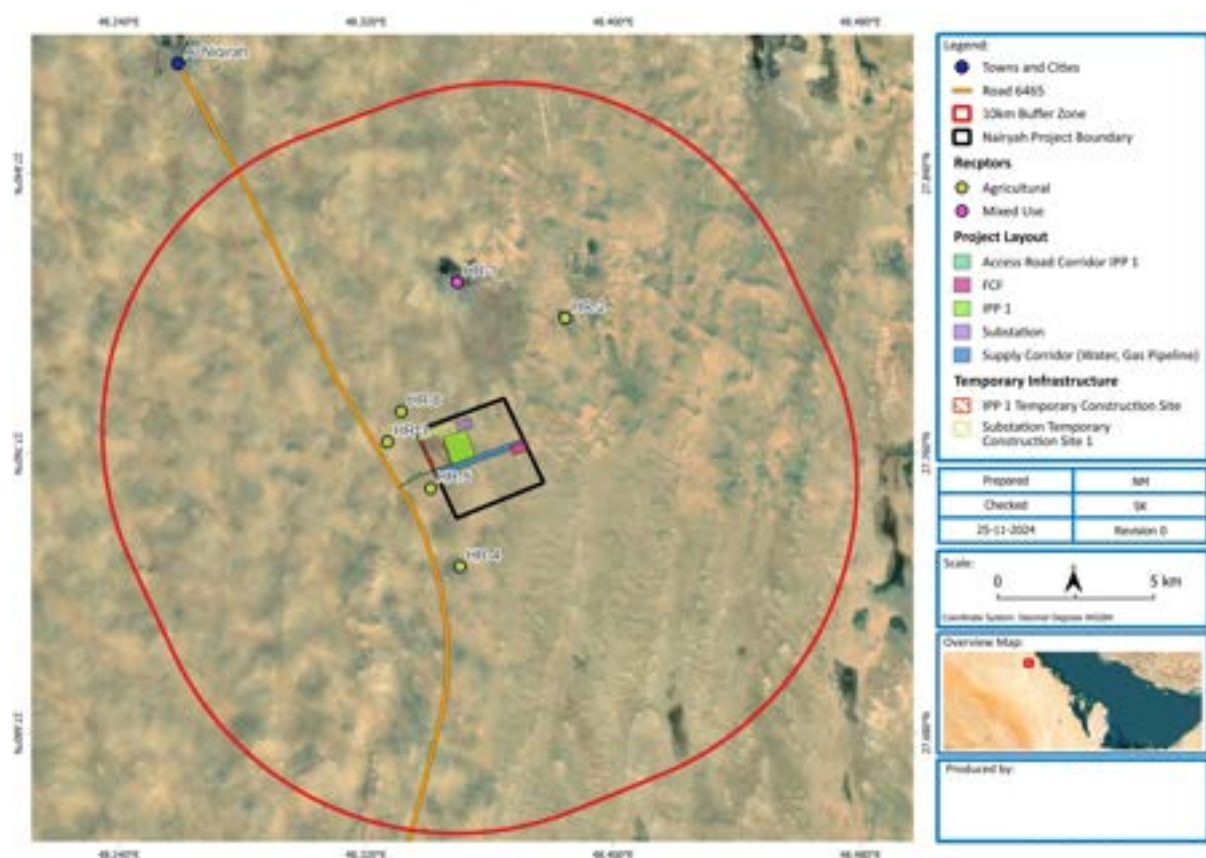
A desktop study and satellite imagery identified these land users as farmers and residential area.

Table 5-1 Land Users/Receptors adjacent to project location

ID	Receptor	Receptor Type	Approximate Distance to the Project Site (km)
HR-1	Small village	Residential/ Mixed Use	3.2
HR-2	Agricultural compound	Agricultural	3.0
HR-3	Herders Camp 1	Agricultural	1.0
HR-4	Herders Camp 2	Agricultural	1.5
HR-5	Herders Camp 3	Agricultural	0.3
HR-6	Herders Camp 4	Agricultural	0.8

HR: Human Receptor

Figure 5-1 Land Users/Receptors adjacent to project location



5.3 Physical Environment

5.3.1 Air Quality

5.3.1.1 Observations and Baseline Conditions

The Project site is located in a largely undeveloped area approximately 230 km northwest of Dammam city. The nearest population cluster of significance is a small village located about 3 km to the north and another small settlement called Al Niqirah, situated about 13 km in the northwest direction. The town of Nairyah, is approximately 30 km to the southeast of the Project site.

Based on observations made during site visit and review of satellite imagery, there are no anthropogenic point sources of emissions within or in the vicinity of the project site. The nearest highway which the Highway 85 is about 25km away which will not have any considerable influence on the background air quality at the site due to distance to the project site.

5.3.1.2 Sensitive Receptors

In relation to ambient air quality impacts from the project, the expected range of impacts are likely to be within a zone of 10km. This is because the project is a CCGT plant, and its operation is expected to result in air emissions that may extend beyond the project boundary.

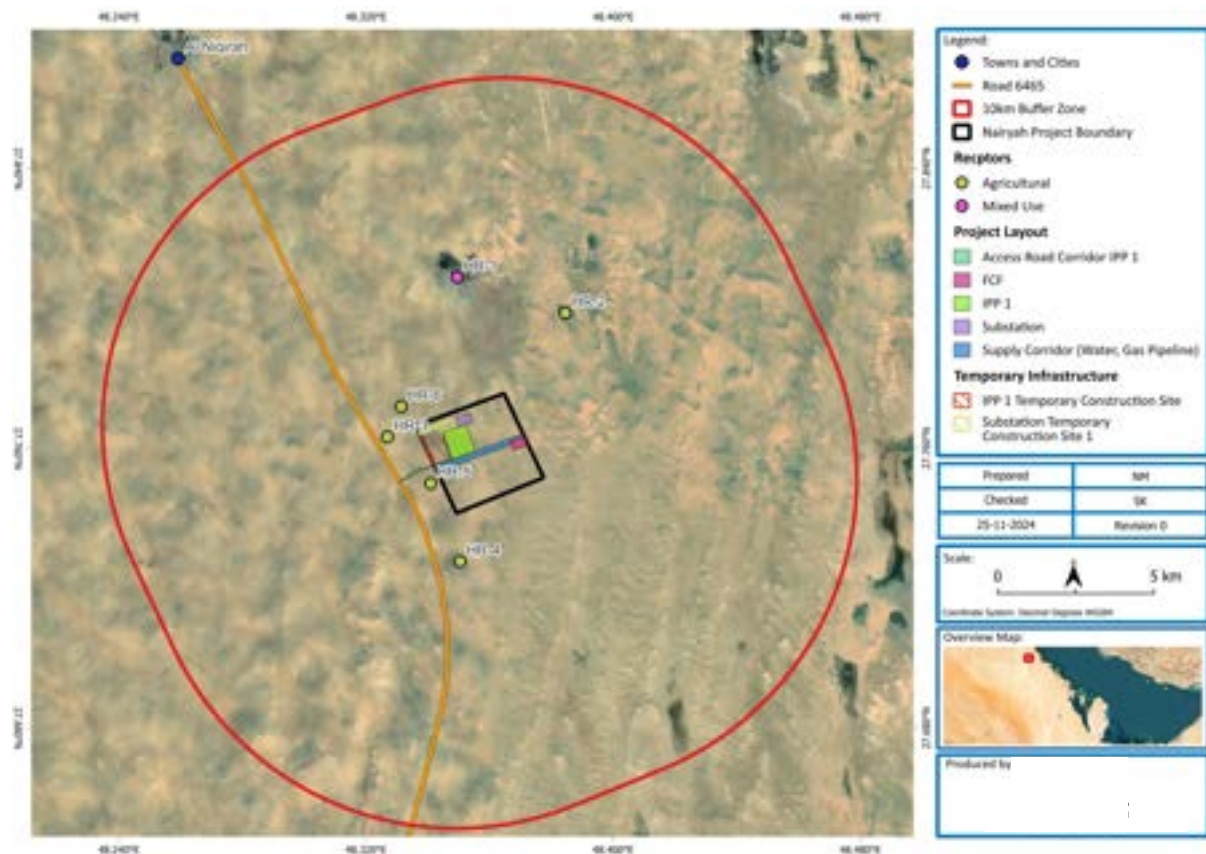
During construction, local ambient air quality may potentially be affected by increased dust, particularly during the site preparation stage (site clearance, levelling, and excavations), the movement of vehicles on unpaved road surfaces and by the exhaust fumes of construction vehicles, equipment and temporary power generators. These activities can cause impacts to nearby receptors (e.g., <200m for gaseous emissions and <500m for particulate emissions).

Findings from the site visit undertaken in January 2024 and review of satellite imagery has identified the following main receptors around the proposed project site and these are outlined in the table below.

Table 5-2 Air Quality Receptors

ID	Receptor	Receptor Type	Sensitivity	Justification
HR-1	Small village to the north	Residential/commercial	High	There is a small village with multiple residential and few shops/commercial facilities located about 3 km from the northern boundary and would be vulnerable to changes in ambient air quality.
HR-2	Agricultural compound	Agricultural	High	There is a large agricultural compound with small buildings likely to be used by human receptors who may be vulnerable to changes in ambient air quality
HR-3	Herders Camp 1	Agricultural	High	The temporary herder camps are located relatively close to the Project site. The camps are transient but may have presence of herders and animals who are vulnerable to changes in air quality.
HR-4	Herders Camp 2	Agricultural	High	
HR-5	Herders Camp 3	Agricultural	High	
HR-6	Herders Camp 4	Agricultural	High	

Figure 5-2 Air Quality Sensitive Receptor Locations



5.3.1.3 Baseline Survey Methodology

Ambient air quality monitoring was undertaken in order to capture the current ambient air quality at the project area and enable a representative assessment of the significance of potential impacts.

In order to have an indication of the existing air quality at the Project site, continuous ambient air quality monitoring was carried out to identify short-term peaks and troughs in air quality and to identify influences of meteorology on ambient air quality. This monitoring involved monitoring ambient air quality at a location within the within the Project site for 10-days, starting from 9th December 2024.

The monitoring survey conducted by a local laboratory approved by NCEC measured ambient air quality for NO₂, SO₂, CO, O₃, PM₁₀, PM_{2.5}. Meteorological data for temperature, relative humidity, pressure, wind speed and wind direction were also recorded during these measurement periods.

5.3.1.4 Ambient Air Quality Baseline Survey Results

A summary of the results of ambient air quality monitoring is provided in following table.

Table 5-3 Ambient Air Quality Monitoring Results Summary

Day	Parameters, Average Concentrations ($\mu\text{g}/\text{m}^3$)					
	CO	NO ₂	O ₃	SO ₂	PM ₁₀	PM _{2.5}
Day 1	190.69	3.67	128.84	8.46	52.72	32.92
	260.89		104.15			
	263.16		83.31			
Day 2	203.02	3.06	138.68	9.43	39.59	27.26
	193.64		100.64			
	214.67		92.79			
Day 3	200.35	1.86	137.50	7.04	25.63	20.01
	182.94		94.80			
	186.08		81.91			
Day 4	186.59	2.12	126.82	5.59	23.05	15.70
	182.70		73.08			
	182.34		89.33			
Day 5	188.77	1.76	133.79	4.90	41.71	25.62
	194.97		103.78			
	289.54		89.25			
Day 6	207.50	1.60	133.37	5.04	388.58	129.85
	197.75		96.10			
	192.35		76.05			
Day 7	184.68	1.90	99.07	4.09	183.35	94.30
	200.14		79.90			
	197.92		74.92			
Day 8	206.24	2.36	126.58	4.67	29.91	16.78
	202.73		75.29			
	176.49		57.62			
Day 9	199.76	2.81	104.61	7.07	28.93	15.38
	154.42		58.85			
	201.43		70.45			
Day 10	285.16	3.80	106.55	7.67	25.51	15.36
	202.07		74.75			
	209.57		81.50			
NCEC Limits and Average period	10,000	200	157	217	340	35
	8-hour	1-hour	8-hour	24-hour	24-hour	24-hour

Note: figures in bold shows exceedance from standards

The survey results indicate that the ground level concentrations of measured parameters were well within their respective NCEC standards, except for particulate matter on three occasions, based on daily averages. These exceedances are attributed to the desert environment and natural conditions at the time, resulting from sandstorm conditions that prevailed during the monitoring period.

Further details are included in the laboratory survey report which is Appendix H.

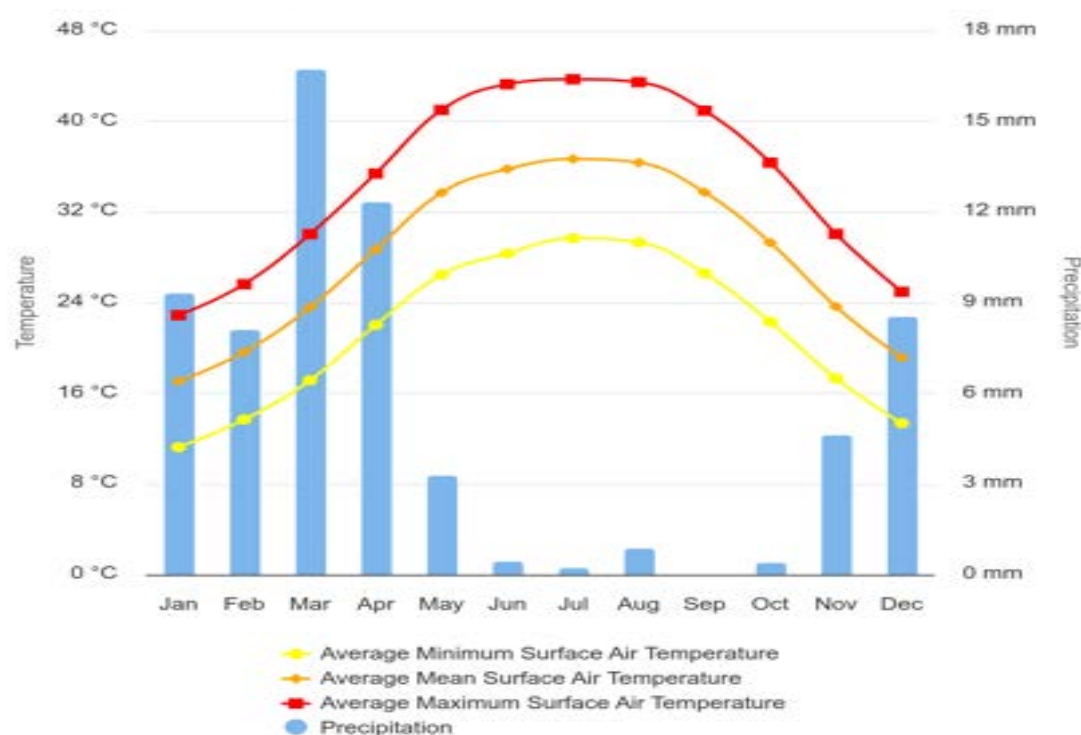
5.3.2 Climate Change Impacts & Adaptation

5.3.2.1 Historic/ Existing Climate Conditions

KSA is characterised as having a desert climate, with the exception of the southwestern part of the country, which exhibits a semi-arid climate. Summers in the central region are extremely hot and dry, temperature in inland areas range from 27°C to 43°C and in coastal areas range from 27°C to 38°C. In winter, the temperature ranges of 19°C to 29°C have been recorded in the coastal areas of Red Sea. The average annual rainfall in most parts of the country is below 150mm throughout the year (World Bank Climate Change Knowledge Portal (WBCKKP), 2023).

Figure 5-3 presents the average monthly temperature and precipitation from 1991 till 2022 in Nairyah. The highest average maximum temperature of 41.73°C and the lowest average minimum temperature of 11.25°C were recorded in July and January respectively. The annual mean temperature in Nairyah was recorded at 27.3°C in 1991, increasing to 28.92°C in 2022. The highest precipitation levels of 16.75mm are recorded in March compared to the lowest levels of 0.04mm in September (WBCKKP, 2024).

Figure 5-3 Average Monthly Climate Conditions in Nairyah (Eastern region) for 1991-2020 (WBCKKP, 2024)



The World Bank Climate Change Knowledge Portal reported the natural disasters occurring in KSA between 1985 and 2020. Out of these, flooding is considered the most common in the country. Floods in KSA occur as flash floods with little warning, damaging property and causing loss of lives. Sand and dust storms are also frequent in the country mainly due to its desert nature. High winds carrying sand and dust rise into the air forming clouds that often disrupt transport, communication, increase respiratory health-related diseases, and impact crops and natural habitats.

As indicated in Figure 5-4, the most significant floods that occurred were recorded in 1985, 2003, 2004, 2005, 2009, 2010, 2013, 2016, 2017, 2017 and 2019 as well as a storm that occurred in 2016.

Figure 5-4 Key Natural Disasters in KSA 1985 - 2020 (WBCCKP, 2023)

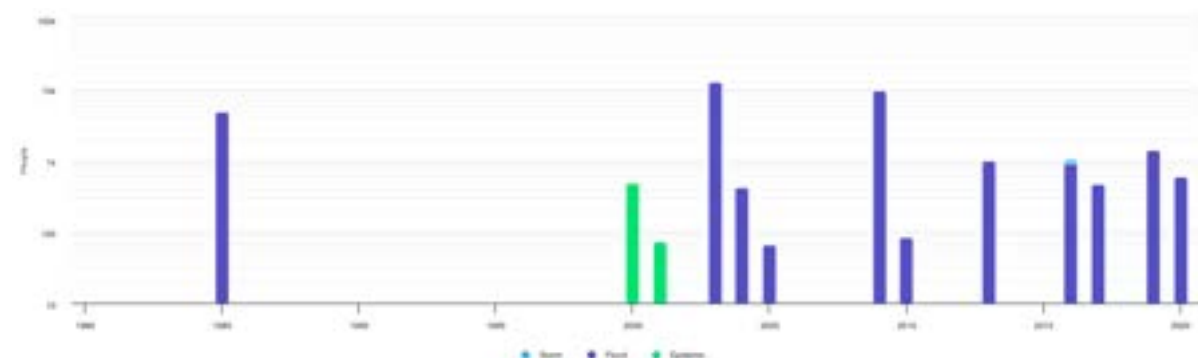


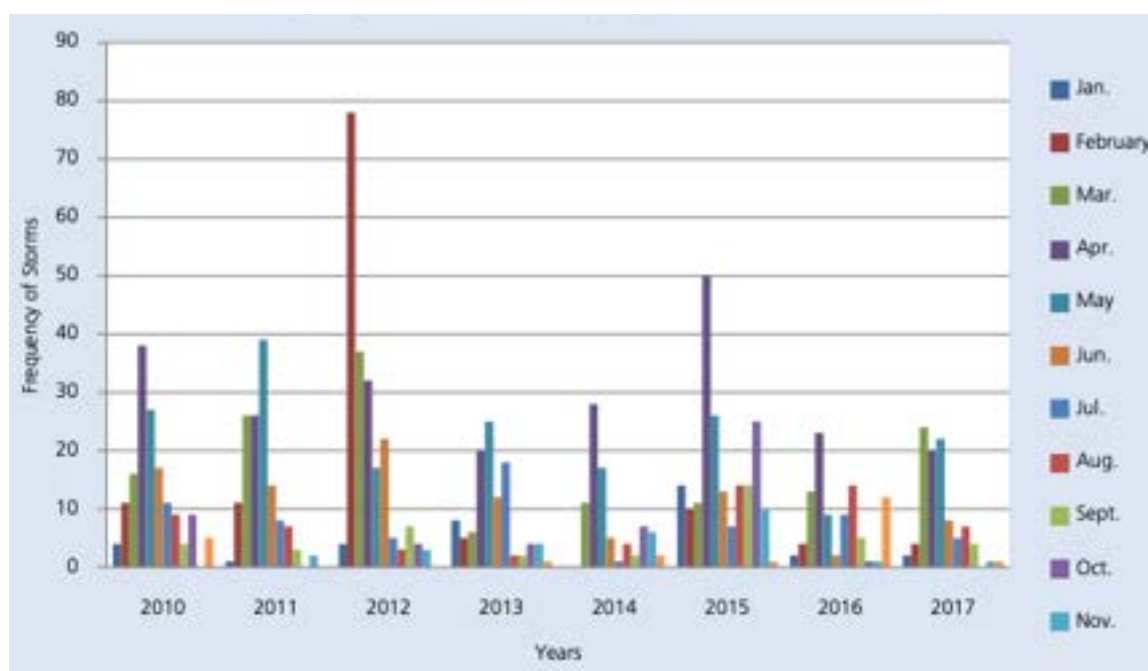
Table 5-4 presents the number of people affected by the key natural disasters in KSA (WBCCKP, 2023).

Table 5-4 Key Natural Disasters in KSA 1985 - 2020 (WBCCKP, 2023)

YEAR	NATURAL HAZARD/ DISASTER	PEOPLE AFFECTED
1985	Flood	5,000
2000	Epidemic	497
2001	Epidemic	74
2003	Flood	13,050
2004	Flood	430
2005	Flood	67
2009	Flood	10,000
2010	Flood	85
2013	Flood	1,021
2016	Storm	122
2016	Flood	915
2017	Flood	481
2019	Flood	1,418
2020	Flood	600

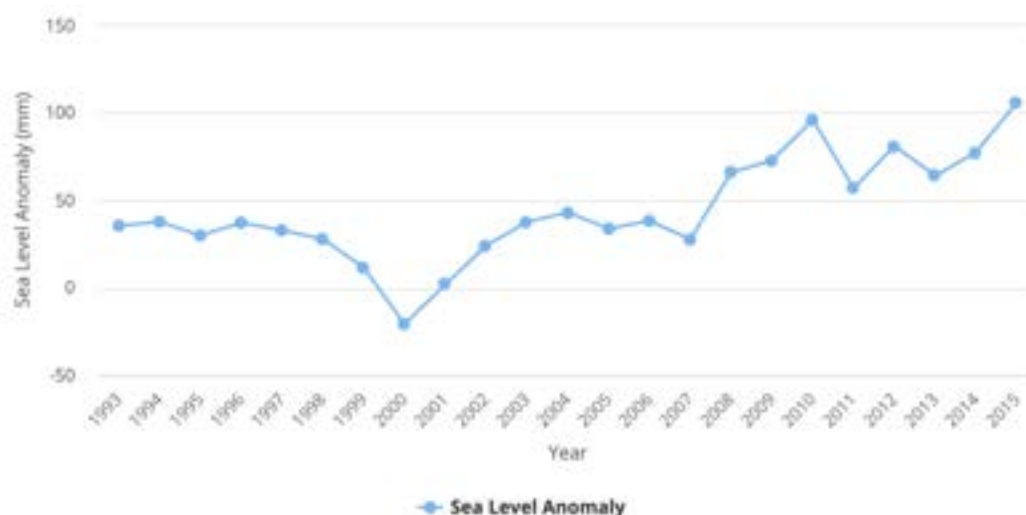
Sand and dust storms are frequent in KSA. The graph below presents the number of monthly sandstorms in KSA during the period 2010-2017. As per the GStat, the highest number of sandstorms was recorded in 2012 with 212 dust storms and the lowest in 2014 with 83 storms.

Figure 5-5 Frequency of Dust Storms in KSA Between 2010 and 2017 (GASat)



The sea level differences compared to the 1993 to 2015 annual averages for KSA are presented in the figure below which shows rising sea levels throughout the period. The sea level change reported from 2008 to 2015 indicates a difference between 50 and 100 mm.

Figure 5-6 Sea Level Anomaly of Saudi Arabia for the Period 1993 to 2015 (WBCKP, 2020)



Sea level temperature recorded the highest in 2010 with annual average of 28.31°C. The lowest temperature was recorded in 1997 and 2000 with annual averages of 27.49 °C and 27.50 °C, respectively.

5.3.2.2 Future Trends

Future climate scenarios indicate an increase in the length of dry periods, and high aridity, rapidly depleting groundwater reserves, and projected temperature increases indicate that the frequency of

dust storms and water stress is bound to increase. Greater rainfall variability may also result in prolonged droughts.

The key projected climate trends for KSA are summarised below. This is based on data published by the World Bank Group, Climate Change Knowledge Portal, which is based on the Coupled Model Intercomparison Project, Phase 5 (CMIP5) models included in the IPCC's Fifth Assessment Report (AR5) (World Bank Climate Change Knowledge Portal, 2020).

- Temperature:
 - Mean annual temperature is projected to increase by 2°C by 2050; and
 - With increased frequency and duration of heat waves, the highest increases are projected in the northern parts of the country by up to 3°C during June, July, and August.
- Precipitation:
 - Mean annual precipitation is expected to increase by 7% by 2050.

5.3.3 Noise & Vibration

5.3.3.1 Observation and Baseline Condition

Based on review of satellite imagery, there are no notable noise sources within the Project site. Baseline ambient noise surveys were undertaken to have an indication of the existing noise environment at the Project site and immediate surroundings.

5.3.3.2 Sensitive Receptors

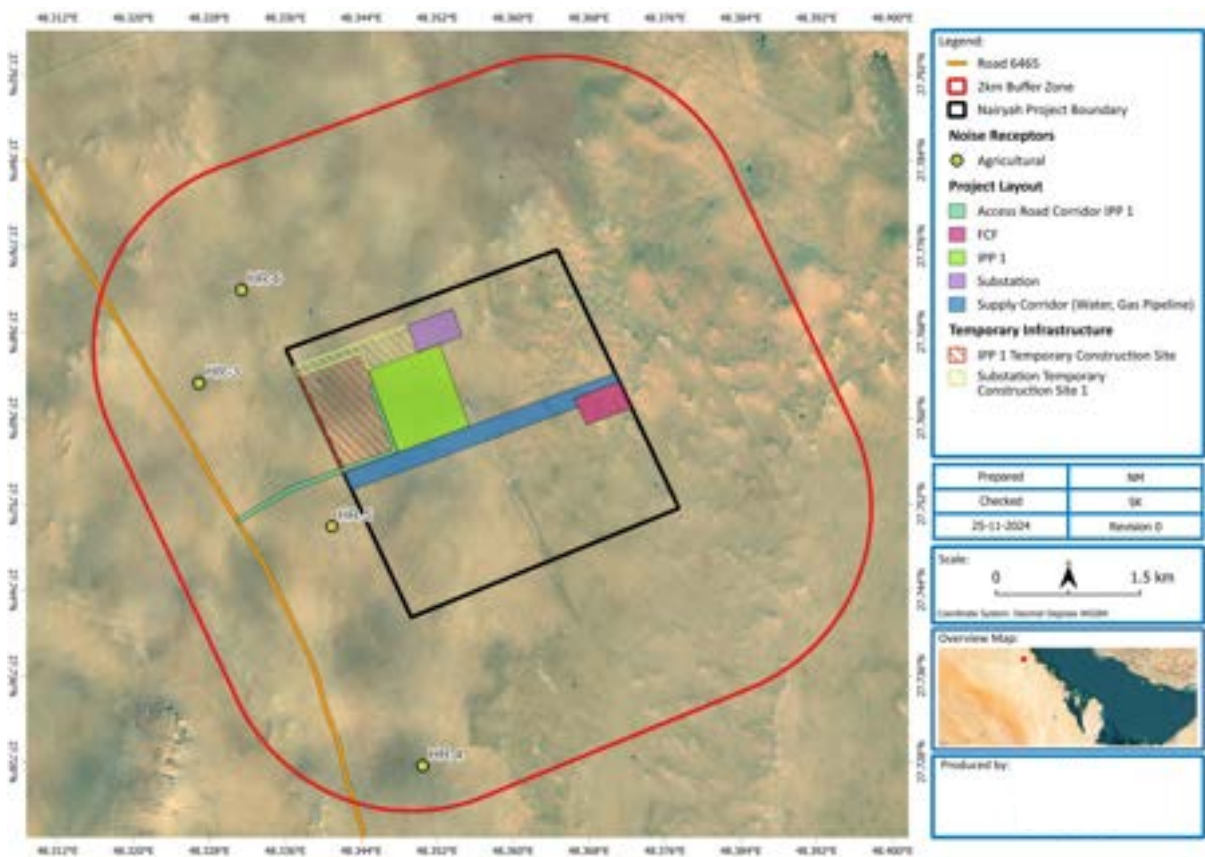
In relation to noise and vibration impacts, the expected range of impacts are likely to be within a zone of 2 km. This is due to noise attenuation by propagation over distance.

Findings from the site visit undertaken to date and review of satellite imagery has not identified any permanent potential receptor within the 2 km radius. However, there are four temporary (transient) herder camps within the 2km area of impacts related to noise.

Table 5-5 Potential Noise Sensitive Receptors

ID	Receptor	Receptor Type	Sensitivity	Justification
HR-3	Herders Camp 1	Agricultural	High	Four temporary herder camps are located between 0.3 km to 1.5 km from the Project boundaries. The camps are transient but may have presence of herders and animals who can discern changes in noise.
HR-4	Herders Camp 2	Agricultural	High	
HR-5	Herders Camp 3	Agricultural	High	
HR-6	Herders Camp 4	Agricultural	High	

Figure 5-7 Noise Sensitive Receptors



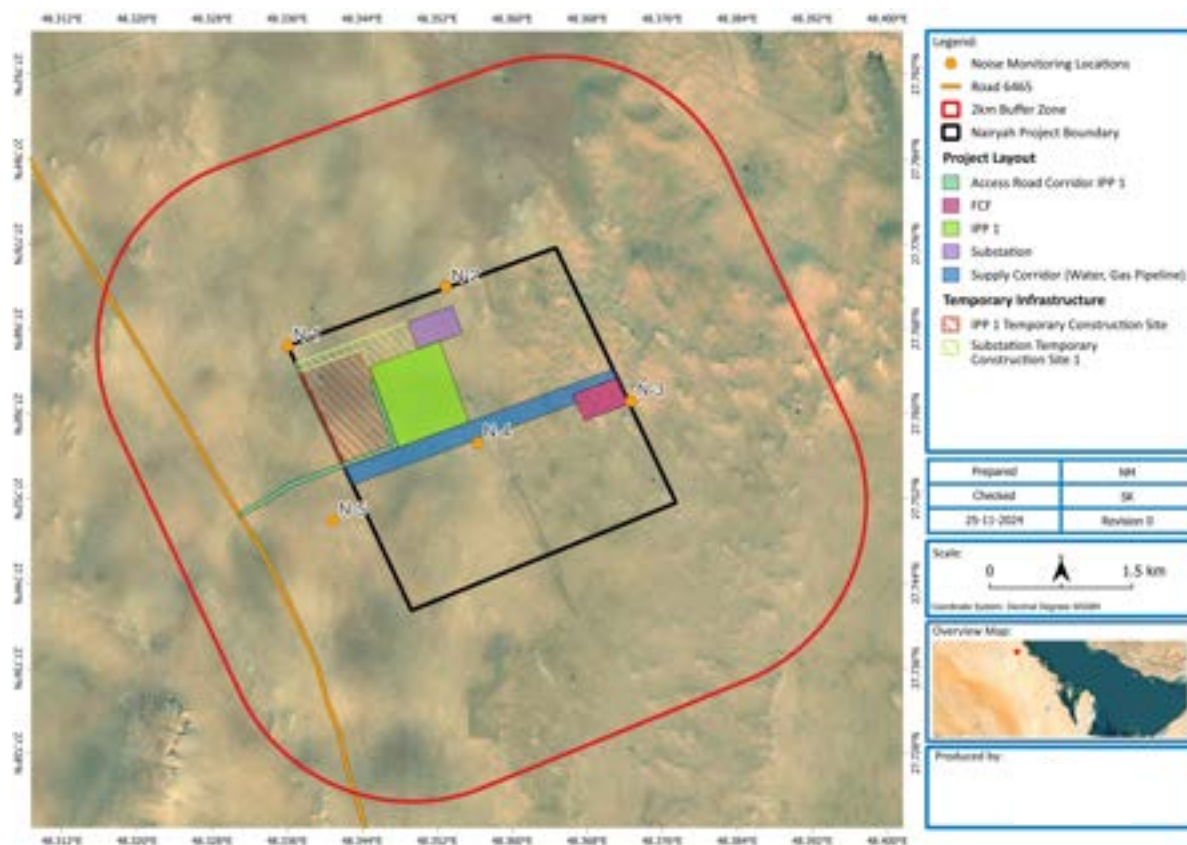
5.3.3.3 Ambient Noise Monitoring Survey Methodology

It is necessary to gain a benchmark of the existing noise condition in the local area to enable assessment of Project impacts and potential cumulative impacts from Project sources. For this purpose, baseline ambient noise monitoring was undertaken using a tripod mounted Class 1 noise level meter (with 100mm wind screen) at five (5) representative locations for 24hrs at each location. Noise monitoring locations were selected taking into account the Project site boundary and the nearest noise sensitive receptors.

Noise monitoring was carried out by a local NCEC approved laboratory using a calibrated Sound Level Meter (SLM) Class 1 (model: Cirrus Optimus CR 171 B), fixed on a tripod. Monitoring at each location recorded the ambient noise parameters: LA_{Eq}, LA_{FMax}, LA_{FMin}, LA₁₀ and LA₉₀. Monitoring were conducted during the period 9th December to 17th December 2024.

The locations where noise levels were recorded are indicated in the following figure.

Figure 5-8 Proposed Noise Monitoring Locations



5.3.3.4 Noise Survey Results

A summary of the noise surveys results at each locations are shown in following table. Further details are included in the laboratory report which is Appendix I.

Table 5-6 Summary of Ambient Noise Survey Results

Location ID	GPS Coordinates	Monitoring Date	LAEq (dB)	
			Daytime	Night Time
N1	27° 45' 59" N 48° 20' 09" E	10 Dec 2024 to 11 Dec 2024	55.1	50.9
N2	27° 46' 18" N 48° 21' 10" E	16 Dec 2024 to 17 Dec 2024	39.6	37.9
N3	27° 45' 40" N 48° 22' 21" E	13 Dec 2024 to 14 Dec 2024	49.3	39.1
N4	27° 45' 26" N 48° 21' 22" E	11 Dec 2024 to 12 Dec 2024	41.7	41.2
N5	27° 44' 59" N 48° 20' 27" E	9 Dec 2024 to 10 Dec 2024	47.4	48.9

There are no NCEC standards strictly applicable to a vacant desert environment such as the Project site. However, when compared to the most stringent category, Class A: Low-density residential areas (50 dB for daytime and 40 dB for nighttime), there are exceedances of these limits, primarily at N1. Nonetheless, all measured noise levels largely comply with the less stringent noise standards and remain well within the limits applicable to industrial zones as per NCEC

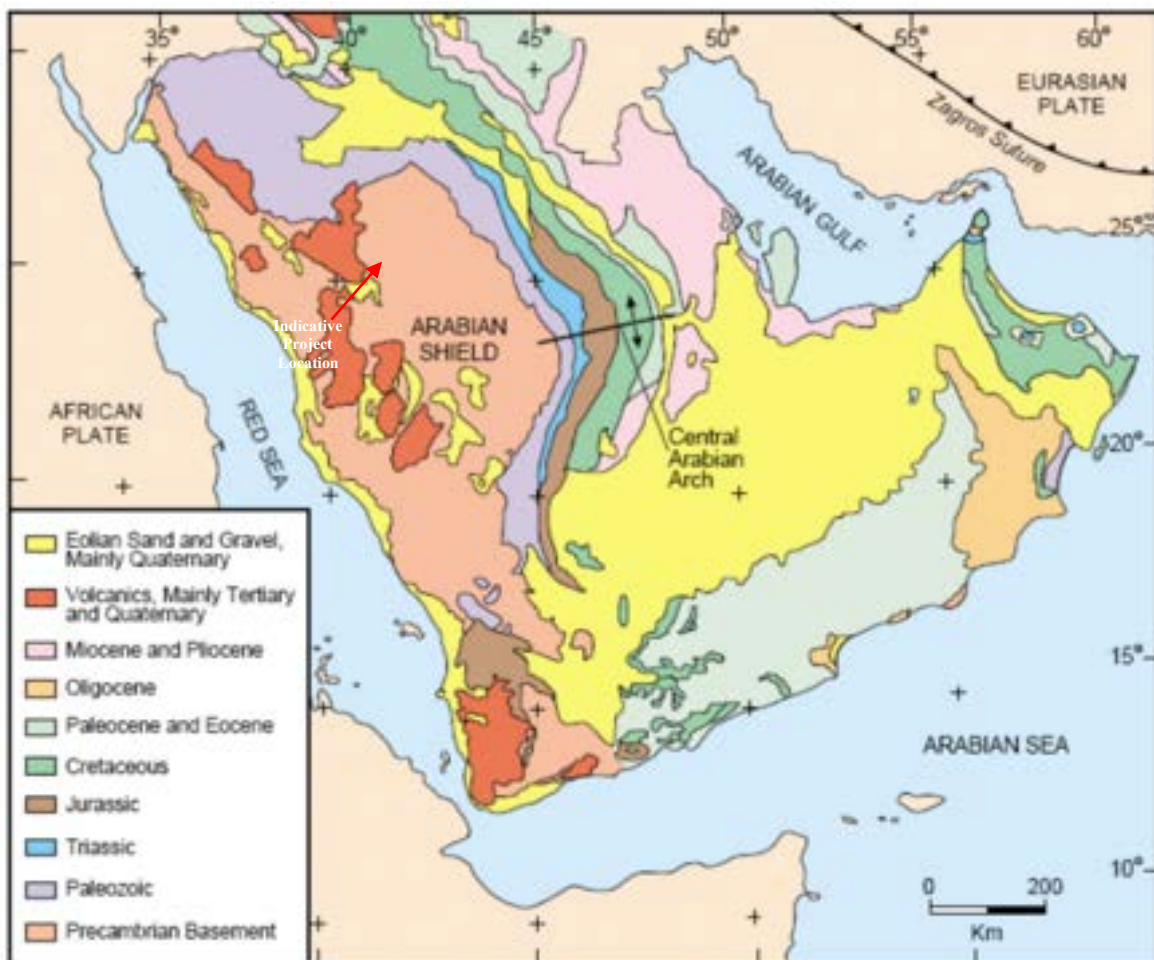
5.3.4 Soil, Geology and Groundwater

5.3.4.1 Observation and Baseline Condition

DESK STUDY OF SOIL GEOLOGY

The rocks underlying the entire Arabian Peninsula are pre-Cambrian and consist of a complex set of igneous and metamorphic rocks. The Nairyah IPP Project is located in the Eastern province of Saudi Arabia where a sequence of continental and shallow marine sediments extends along the Arabian Gulf with relatively low-relief terrain in which Tertiary and younger deposits cover the older units. The Upper Cretaceous and Eocene rocks represented by limestone and dolomite, while Quaternary sequences are made from sandstone, sandy marl, and sandy limestone of non-marine origin (M.S. Fnais).

Figure 5-9 Generalised Geological Map of the Arabian Peninsula



Source: USGS.

Based on Detailed Geotechnical Site Investigation for SPPC's Nairyah IPPS developed by ACES, the entire project area is covered by soil sand material with exposure to bedrock formations (on the surface) highlighted as "Hadruk formation" (Th).

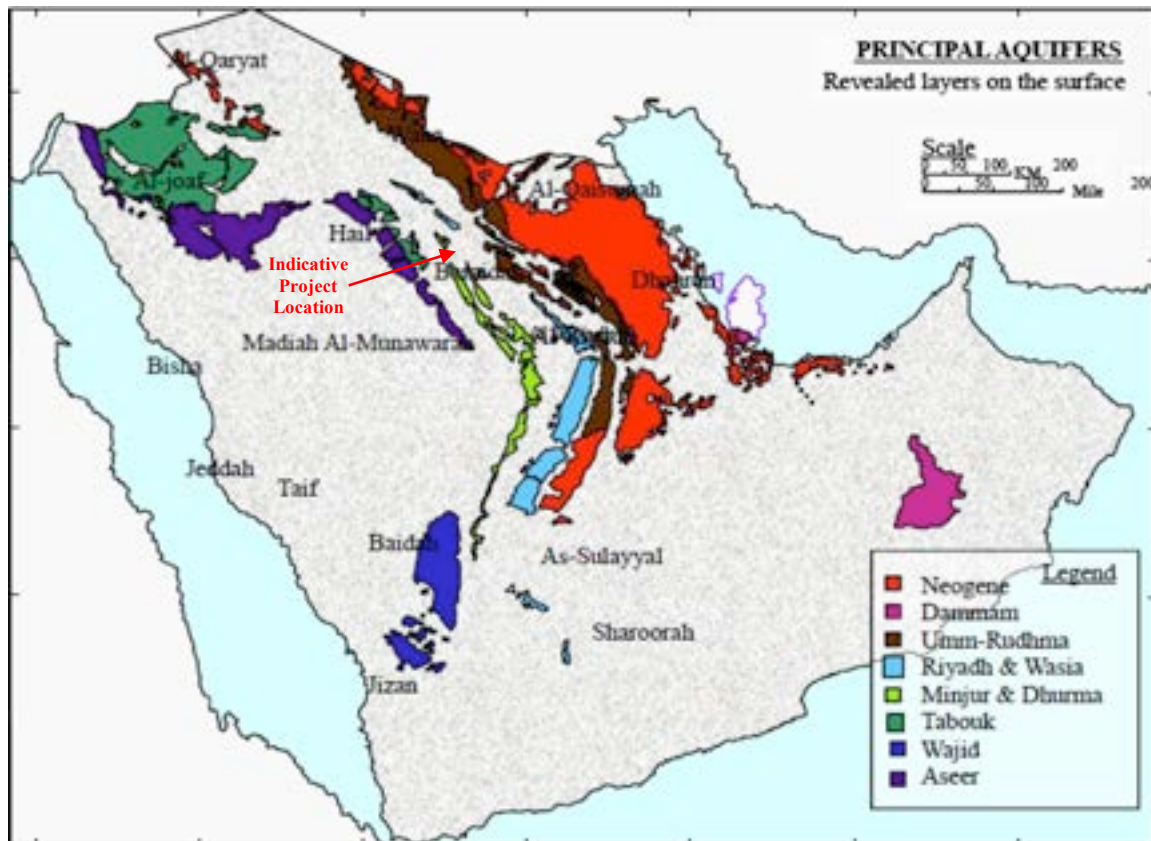
GROUNDWATER RESOURCES

Saudi Arabia is one of the driest regions in the world with no perennial rivers. The main source of groundwater in the Kingdom comes from six major consolidated old-age aquifers located in the eastern

and central parts of the country known as Arabian Shelf. These are namely, 5 different sandstone aquifers: The Saq, Wajid, Tabuk, Minjur, Wasia, and the limestone aquifer of Umm er Radhuma (Abderrahman, 2006).

The overexploitation or continuous mining of these aquifers for agricultural and domestic purposes without replenishment has resulted in depletion of groundwater. In 1995 the World Bank reported that 35% of non-renewable groundwater sources in Saudi Arabia were depleted.

Figure 5-10 Principal Aquifers in Saudi Arabia



Source: Chowdhury, S., & Al-Zahrani, M. (2015).

Based on the Geotechnical report developed by ACES, from the borehole test, there was no groundwater encountered at the location of all drilled boreholes at the time of the investigation. No cavities were encountered in any of the boreholes to the drilled depths during the drilling activities. Depth of the borehole were between 15 – 15.5 meters.

SEISMICITY

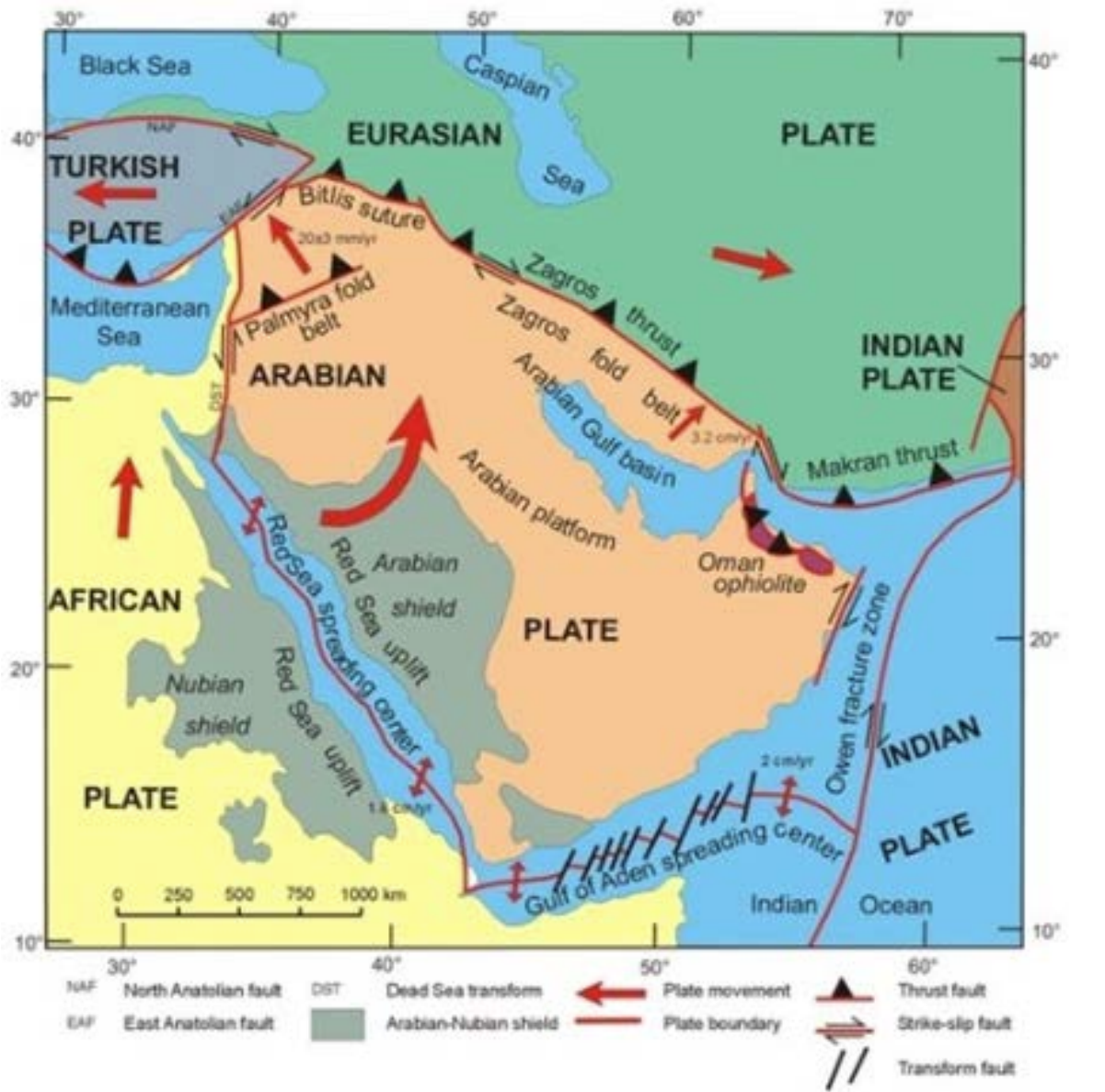
Saudi Geological Survey (SGS) is responsible for earthquake monitoring in Saudi Arabia. Currently, SGS has 75 stations, mostly concentrated in western Saudi Arabia, which is where most of the seismic activity occurs. According to SGS, the risk of damage from earthquakes is quite low over most of Saudi Arabia, with exception for areas near the Gulf of Aqaba and Jazan, with lower risk in the west near the Red Sea and in some of the Harrats (SGS, 2019).

The region of the Gulf has active sinistral transform faults with associated pull-apart basins (the deeps in the Gulf of Aqaba), and hence is an area where large damaging earthquakes occur quite regularly.

The last major event was the 1995 Haql earthquake in the Gulf of Aqaba (magnitude 7.3) which caused significant damage on both sides of the Gulf and was felt hundreds of kilometers away. Earthquakes of magnitude 6 are common along the spreading axis of the Red Sea but generally they are not felt onshore or further inland and appear to pose little risk to infrastructure (SGS, 2019).

Apart from the seismicity along the axis of the Red Sea and along the Gulf of Aden, considerable activity occurs along the Dead Sea transform fault system. In the central and western part of the shield some of the Cenozoic volcanic areas are still potentially active, and some seismicity is associated with this low-level volcanism (SGS, 2019). The figure below shows the graphical representation of the main plate tectonic features within the Kingdom.

Figure 5-11 Boundaries of Arabian Plate Relative to its Neighbouring Plates (Johnson, 1998)



The table below present the number of seismic shocks by level recorded for 2018.

Table 5-7 Number of Seismic Shocks in Saudi Arabia for 2018

Level of Seismic Shocks	Dec.	Nov.	Oct.	Sep.	Aug.	July	June	May	April	March	Feb.	Jan.	Total
< 1	617	497	470	320	363	457	263	263	274	282	318	617	4741
1-2	295	250	693	467	131	153	107	150	208	214	227	295	3190
2-3	42	51	59	25	17	29	6	24	39	41	31	42	406
3-4	5	5	1	5	1	4	0	0	2	2	2	5	32
4-5	1	1	1	2	2	8	0	3	0	1	1	1	21
5-6	0	1	0	1	1	3	0	1	2	0	0	0	9
6-7	0	1	0	0	1	2	0	0	0	0	0	0	4
>7	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	960	806	1224	820	516	656	376	441	525	540	579	960	8403

Source: General Authority for Statistics, Saudi Arabia

5.3.4.2 Project Site Conditions

SOIL

The proposed Project site and surroundings are mainly undeveloped open plains with sand sheets covered with seasonal grass. The sand observed on site are loose and unconsolidated, with no evidence of existing soil contamination observed during this preliminary site visit.

Plate 5-4 Typical Topsoil Condition Observed at the Project Area



5.3.4.3 Baseline Survey

As a precautionary approach to assess existing soil quality, topsoil samples were collected at five (5) locations within the site, taken from top 10cm from the surface. The following factors were taken into account to select representative site conditions for the soil samples:

- Coverage of project area;
- Different topography (soil type); and
- Closest to any potential risk areas (if present on site).

The soil samples were collected on the 8th of December 2024. The collected soil samples were analysed for a suite of selected chemical parameters by an NCEC approved local laboratory.

Samples were transported to the NCEC accredited laboratory under strict chain of custody and sampling information, including sampling date and time, sample label, sample number, project name and location.

The results of the soil analyses are presented in following table. Detailed laboratory reports are included in Appendix J.

Table 5-8 Soil Analyses Results

Analyte grouping/Analyte	Unit	S-1	S-2	S-3	S-4	S-5
Metals - Soluble						
Boron	mg/kg	0.85	0.84	0.86	0.87	0.76
Metals						
Antimony	mg/kg	<5	<5	<5	<5	<5
Arsenic	mg/kg	<5	<5	<5	<5	<5
Barium	mg/kg	<10	16	13	13	12
Beryllium	mg/kg	<1	<1	<1	<1	<1
Cadmium	mg/kg	<1	<1	<1	<1	<1
Chromium	mg/kg	7	10	8	9	8
Cobalt	mg/kg	<2	<2	<2	<2	<2
Copper	mg/kg	<5	<5	<5	<5	<5
Lead	mg/kg	<5	<5	<5	<5	<5
Mercury	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
Molybdenum	mg/kg	<2	<2	<2	<2	<2
Nickel	mg/kg	10	15	11	13	12
Selenium	mg/kg	<1.0	<1.0	<1.0	<1.0	<1.0
Silver	mg/kg	<2	<2	<2	<2	<2
Thallium	mg/kg	<0.10	<0.10	<0.10	<0.10	<0.10
Tin	mg/kg	<5	<5	<5	<5	<5
Uranium	mg/kg	<0.10	0.11	0.11	<0.10	<0.10
Vanadium	mg/kg	<5	7	7	6	6
Zinc	mg/kg	5	7	6	6	6
Total Petroleum Hydrocarbons (TPH)						
C6 - C10 Fraction	mg/kg	<10	<10	<10	<10	<10
C10 - C16 Fraction	mg/kg	<100	<100	<100	<100	<100
C16 - C34 Fraction	mg/kg	<100	<100	<100	<100	<100
C34 - C50 Fraction	mg/kg	<100	<100	<100	<100	<100
Volatile Organic Compounds - BTEX						
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Laboratory analysis results do not indicate the presence of contaminants suggesting soil contamination when compared to applicable local standards for the tested parameters.

GROUNDWATER

As outlined earlier in this report, a geotechnical investigation was undertaken by ACES in February 2024 which comprised drilling of 18 boreholes to depth of 15 m below ground level (mbgl). Groundwater was not encountered in any of the boreholes during the investigation which shows that groundwater level is expected to be at deep depth and unlikely to be impacted from Project activities. As such baseline surveys were not carried out for groundwater as part of the ESIA.

5.3.5 Hydrology, Surface Water Drainage and Flood Risk

5.3.5.1 Desktop Review

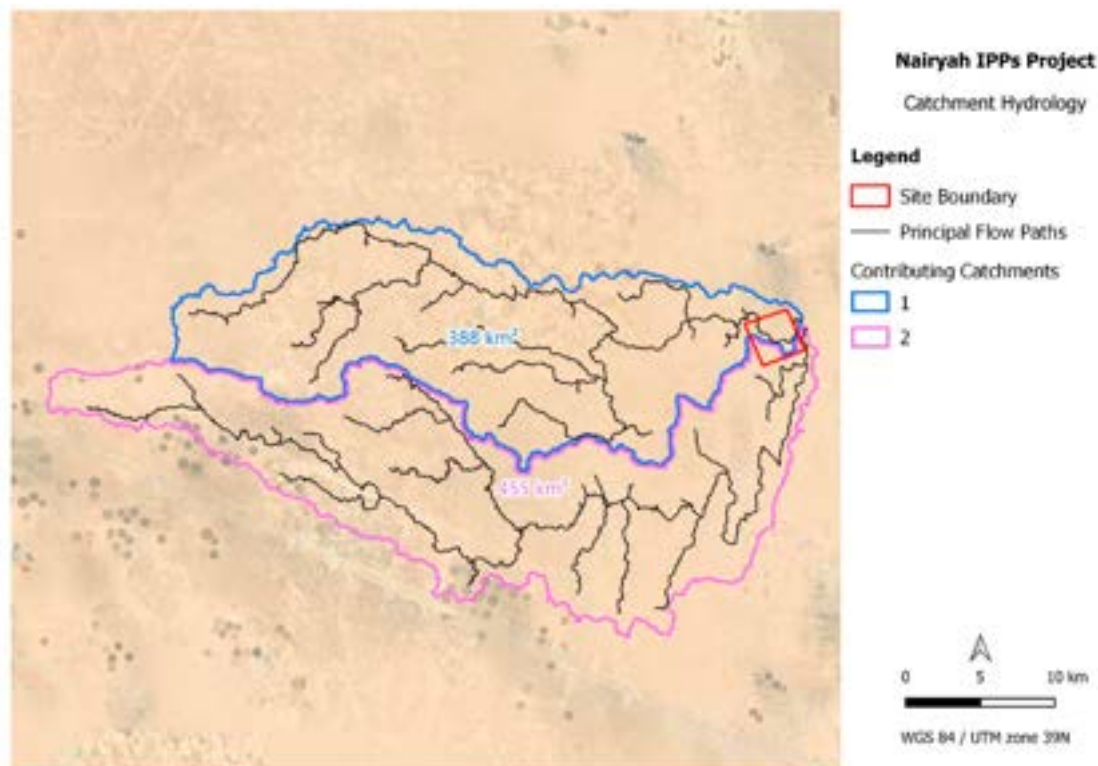
A hydrology study was conducted by Worley Consulting in 2024 for the Nairyah 1 & 2 IPP on behalf of ACWA Power. According to the study, the surface of site has relatively little topographical variation, with ground levels ranging from a maximum of approximately 85 m ASL in the north of the site to a minimum of 65 m ASL in the southeast of the site. There are minor internally draining depressions located to the north, west and south of the site, while the eastern portion of the site drains towards the east.

European Space Agency (2021) 30 m Digital Elevation Model (DEM) was used to determine potential flow paths and catchment areas to the downstream boundary of the site. The resulting catchment boundaries are presented in following figure. Catchment delineation indicates there are two main catchments with area 388 km² and 455 km² where flow generally drains from the west to the site. However, other lines of evidence suggest the catchment delineation is unlikely to be an accurate reflection of the runoff contribution to site as:

- a review of the DEM, aerial imagery and site observations indicated that no major wadis were present between the delineated catchment and the site;
- Slopes less than 0.5% along the catchment mainstream, indicates movement is likely to be restricted and storage of surface water along indicative flow pathways will occur;
- the contributing catchment is largely underlain by sandy soils which will facilitate high rates of infiltration of rainfall, limiting runoff.

As such, the catchment area contributing flow to site was confirmed through the development of the hydraulic model.

Figure 5-12 Contributing catchments to Nairyah IPP site (Source: Worley 2024)



5.3.5.2 Site Observations

Observations from the site visit conducted in 2024 (Worley, 2024) and the preliminary flood risk assessment (Fichtner, 2024) did not identify any wadis, permanent surface water features or signs of flooding at the site. Site observations made by Worley in July 2024 is shown in following figure which showed top soil which can be generally characterised as *'loose light brown, medium to coarse grained sand with some gravelly zones'*.

Figure 5-13 Photos of Site from Worley Visit July 2024



5.3.6 Solid Waste and Wastewater

5.3.6.1 Desk Review

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

Waste management sites and facilities in KSA are operated and managed by private companies or local municipalities, with MWAN providing an advisory role in their operation. Municipal solid waste is disposed of at landfill sites under the management/responsibility of the municipality. Whilst hazardous waste is regulated and permitted by NCEC in accordance with license transporters and hazardous waste management service providers. When new sites are proposed, NWMC will advise the operators on the environmental protection requirements for each facility.

Industrial waste generators are required to engage with MWAN licensed private contractors to collect, transport, manage, treat and/or dispose of their waste. Several waste management companies are available in KSA, and this depends on their region. A number of these own and operate their own treatment and/or landfill facilities, where industrial wastes are processed.

There is no data on the quantities of non-hazardous industrial waste produced in Saudi Arabia as it is calculated in the total of municipal solid waste. These wastes are disposed of as part of the municipal solid waste in municipal landfills.

The Ministry of Environment, Water and Agriculture (MEWA) is responsible for household wastewater from connected sewerage systems. Users that are not connected to sewerage systems (including all industrial generators) are required to arrange wastewater collections and treatment via licensed wastewater contractors and facilities.

Based on the MEWA website, there is around 353 facilities in KSA for the collection, transport, sorting, handling or management of general municipal waste, hazardous waste, construction and demolition waste etc.

5.3.7 Traffic & Transportation

5.3.7.1 Initial Observations and Baseline Conditions

The closest main road, which is the Highway 85, is located approximately 23 km to the south of the site. The Project will connect to this Highway 85 via an existing single carriage way road (Road 6465). Two newly constructed permanent access roads will connect the Project site with the Road 6465.

While no dedicated traffic surveys have been done at this stage, during the site visit, the observed traffic flow on the Highway 85 is steady, but of low intensity. Traffic on the Road 6465 that connects the Project site areas and the Highway is sporadic, expected to be used only by small number of residents at the nearby village.

5.3.7.2 Traffic and Transportation Logistics

The Project will be required to take into consideration the loading capacities and clearances of existing bridges, OHTLs and connecting roads when carrying out transportation from the ports or from other places to the site and vice-versa.

Roads (including existing roads that need to be upgraded if needed) for common and frequent use by the Project will be designed to include sufficient width and load as well with regard to the frequency of traffic as to the heavy load transportations.

5.3.7.3 Sensitive Receptors

Sensitive receptors will include residents of nearby communities, road users, highways and local access roads used to deliver materials and staff to the Project site.

5.3.8 Terrestrial Ecology

5.3.8.1 Observations and Baseline Conditions

The flora and fauna diversity of the Saudi Arabia is influenced by the habitats that are created by the varying topography, geology, and localised climate conditions. The vast majority of the Saudi Arabia is characterised by arid desert conditions, which provides harsh environments for species to thrive in due to the extreme temperatures and lack of water sources.

Protected Area

Based on satellite imagery review, there are no protected areas or areas of significant biodiversity close to the project site. The nearest protected areas are more than 100 km away as indicated in following figure.

Figure 5-14 Protected Areas



5.3.8.2 Sensitive Receptors

Table 5-9 Terrestrial Ecology Sensitive Receptors

Receptor	Sensitivity	Justification
Fauna	Low	The site visit undertaken in January 2024 did not identify any specific habitats or species of concern relating to terrestrial ecology at or within proximity of the site (such as protected, or IUCN designated species). The habitats in the project's footprint are common for inland regions of Saudi Arabia.
Flora	Low	

5.3.8.3 Terrestrial Ecology Baseline Survey

A single season rapid terrestrial ecological survey was conducted to identify the presence of any sensitive flora and fauna species through direct field surveys and observations. The Project site was initially visited during a preliminary site visit in January 2024, followed by a subsequent survey in December 2024.

The Project site is located in a remote area within the Eastern province of KSA within minimal anthropogenic influences. Satellite imagery indicates that the site primarily comprises 'Natural Habitat' while areas of 'Modified Habitat' are present outside the project boundary due to the presence of existing infrastructure such as OHTL, road etc.

Based on observations made during the site visit conducted in January and December 2024, the Project site is typical desert habitat with largely homogenous seasonal grass cover (see following figure) with limited number of flora species. No fauna species were identified during the site visit except for camels that use the site for grazing.

Plate 5-5 Typical Site Condition with Grass Cover



5.3.8.4 Critical Habitat Screening

Approach

The assessment commenced with a global perspective, followed by the examination of regional and localized datasets to comprehensively evaluate both broad and specific biodiversity sensitivities. At the global level, this entailed a comprehensive evaluation of protected areas, Key Biodiversity Areas (KBA) including Important Bird Areas (IBA) and Alliance for Zero Extinction (AZE) Sites, biodiversity hotspots, and the distribution of IUCN Redlist Species. Moving to national and regional contexts, assessment was conducted to analyse conservation priorities/areas. Finally, at the local scale, the assessment focused on available species occurrence and habitats. Available landscape level or regional data were considered for the screening of the species.

Table 5-10 IFC PS6 Critical Habitat Criteria with Quantitative Thresholds

Criteria	Thresholds
<i>Criterion 1: Critically Endangered and</i>	a) Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (0.5% of the global population AND 5 reproductive units of a CR or EN species);

Criteria	Thresholds
Endangered Species	b) Areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds at (a). c) As appropriate, areas containing nationally/regionally-important concentrations of an IUCN Red-listed EN or CR species.
Criterion 2: Endemic and Restricted-range Species	a) areas that regularly hold $\geq 10\%$ of the global population size AND ≥ 10 reproductive units of a species.
Criterion 3: Migratory and Congregatory Species	a) areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle. b) areas that predictably support ≥ 10 percent of the global population of a species during periods of environmental stress.
Criterion 4: Highly threatened and/or unique ecosystems	a) Areas representing $\geq 5\%$ of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN. b) Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning.

Methodology

IBAT Assessment

The Integrated Biodiversity Assessment Tool (IBAT) was utilized during the Critical Habitat (CH) screening process to identify potential overlaps with globally recognized biodiversity priorities. The IBAT platform provides access to data from key global conservation datasets, including the IUCN Red List of Threatened Species, the World Database on Protected Areas (WDPA), and Key Biodiversity Areas (KBAs). This assessment was instrumental in identifying the presence of critical species and habitats within the scoping area.

Review of Literature and Secondary Resources

A review of available data and literature on the biodiversity potentially occurring in and around the Project landscape was undertaken. This included published and publicly available literature, national and regional biodiversity reports, and biodiversity datasets. Detailed information was incorporated from datasets such as the IUCN Redlist of species including range distributions and occurrence points. Additional occurrence data were downloaded from the Global Biodiversity Information Facility and iNaturalist.org, as needed.

SN	Data Source	Purpose
1	IUCN Red List for Threatened Species Online Version (2024-2)	It is the world's most comprehensive inventory of global conservation status of species. It provides a list of threatened species by classifying them under different categories from Least Concern (LC) to Extinct (EX) through an understanding of global distribution, population status and trends of the species. Classification of species, distribution, habitat preference and threats of species are also given.
2	ebird.org	ebird.org provides a geo-referenced list of identified bird species in a given area.
3	Alliance for Zero Extinction	The Alliance for Zero Extinction (AZE) is a global initiative aimed at preventing extinctions by identifying and safeguarding sites that are crucial for the survival of endangered species. These sites, known as Alliance for Zero Extinction sites, are locations where species considered to be at the brink of extinction have their last remaining habitat.
4	Integrated Biodiversity Assessment Tool (IBAT)	It screens the Project landscape for the presence of IUCN threatened, migratory, endemic species and provide a list of potential species for the assessment.
5	Bird Life International Data Zone	Birdlife International maintains a database of Important Bird Areas (IBAs) with a species list found in these IBAs, measure of sensitivity of these habitats and identifies migratory, congregatory and threatened species in the area.
6	iNaturalist	An online social network of naturalists, citizen scientists, and biologists built on the concept of mapping and sharing observations of biodiversity across the globe. Areas falling within scoping area were run through this database.
7	Global Biodiversity Information Facility (GBIF)	GBIF is an international organization that focuses on making scientific data on biodiversity available online. The data are provided by many institutions from around the world; GBIF's information architecture makes these data accessible and searchable through a single portal.
8	Research Publications	Available research articles, papers related to the target species were referred for understanding the presence/absence in the Project landscape, status, habitat, ecology, population, etc.

Identification of Scoping Area for Screening

It involved defining relatively wider landscape to evaluate the potential presence of species or habitats that could meet Critical Habitat criteria. Given the absence of any Protected Area or Key Biodiversity Area in the Project's vicinity, and the homogenous landscape in the region, a buffer of 10 km to the Project Site was considered as scoping area for the screening exercise. However, it is important to note that the scoping area is not inherently equivalent to the spatial extent used for assessing biodiversity impacts or implementing mitigation measures.

Screening against Criteria 1 through 3

During the screening process, the Least Concern and Near Threatened species (for Criterion 1), non-restricted range species (for Criterion 2) and non-migratory / non-congregatory species (for Criterion 3) were excluded from further considerations. Most of the species were scoped out of requirement of further assessment considering no known occurrence from the landscape, or with sporadic/no likelihood of crossing quantitative thresholds.

An initial list of potential species was carefully examined using the available literature. Existing data were reviewed to assess the likelihood of occurrences and preferred habitats in and around the Project landscape. As an additional step, for species with overlapping distribution ranges, a high-level assessment was conducted to evaluate their likelihood of occurring in globally significant concentrations. This evaluation considered their occurrences, population, and habitats in the Project Area and in the surrounding landscape. All of the species were excluded from further assessment due to insufficient evidence of regular occurrence or the unlikelihood of meeting quantitative thresholds.

SN	Class	Common Name	Scientific Name	IFC PS6 CH Criteria	IUCN, National Status	Restricted Range	Distribution Range Overlap with Scoping Area	Global Population (IUCN)	Scoped In/Out	Rationale and Species Information
1	Aves	Egyptian Vulture	<i>Neophron percnopterus</i>	1 a, c	EN	No	Yes	8,600-54,000 individuals	Out	Although the distribution range overlaps the scoping area, the species is relatively rare in the region. A review of available online biodiversity databases, including eBird, iNaturalist, and GBIF indicates that the species is predominantly reported from the western coastal regions of Saudi Arabia and around Riyadh city ² . However, no confirmed records of sightings exist from the immediate vicinity of the Project Site or the scoping area. This absence is corroborated by the lack of breeding, roosting, or foraging evidence within this area, as per accessible secondary data. Thus, it is unlikely that the scoping area supports globally significant i.e. 0.5% of the global population or regionally important concentrations of the species.
2	Aves	Steppe Eagle	<i>Aquila nipalensis</i>	1 a, c	EN	No	Yes	78,042-110,193 individuals	Out	The species has extremely wide distribution range. In Saudi Arabia, significant congregations have been documented near Riyadh, with approximately 4,900 individuals observed at rubbish dumps northwest of the city in 2019 ³ which is located at more than 400 km southwest of the Project Site. There are no such dumping sites located in the vicinity of the Project Site. In addition, a review of available online databases reveals an absence of confirmed sightings of the Steppe Eagle within the scoping area. Given the lack of recorded sightings and congregation sites, it is unlikely that the scoping area supports globally significant i.e. 0.5% of the global population or regionally important concentrations of the species.
3	Aves	European Turtle-dove	<i>Streptopelia turtur</i>	1 b	VU	No	Yes	19,300,000-71,400,000 individuals	Out	The species is migratory, breeding in Europe and parts of the Middle East, including Saudi Arabia, and wintering in sub-Saharan Africa ⁴ . A review of biodiversity data sources does not confirm any records of <i>S. turtur</i> within the scoping area. The scoping area's habitat, characterized by arid conditions and sparse grasses may offer limited resources for the species, which prefers areas with scattered trees, shrubs, and agricultural lands ⁴ . In addition, the global population of the species is estimated to range between 19.3 million and 71.4 million individuals, despite its Vulnerable (VU) status on the IUCN Red List due to significant declines in parts of its range ⁵ . While, the species' distribution extends across a vast area, the scoping area constitutes a very

² <https://ebird.org/species/egyvul1>

³ Ornithological Society of the Middle East (https://osme.org/2019/11/globally-important-number-of-steppe-eagles-discovered-in-saudi-arabia/?utm_source=chatgpt.com)

⁴ IUCN Redlist

⁵ <https://www.iucnredlist.org/species/22690419/154373407#population>

SN	Class	Common Name	Scientific Name	IFC PS6 CH Criteria	IUCN, National Status	Restricted Range	Distribution Range Overlap with Scoping Area	Global Population (IUCN)	Scoped In/Out	Rationale and Species Information
										small fraction of this extensive distribution range. Thus, it is highly unlikely that the area holds a globally significant population of this species.
4	Aves	Greater Spotted Eagle	<i>Clanga clanga</i>	1 b, 3a	VU	No	Yes	3,900-10,000 mature individuals	Out	Greater Spotted Eagle is a migratory raptor that breeds in Eastern Europe and parts of Asia, wintering in regions including the Middle East ⁶ . Its preferred habitats encompass wetlands, wet meadows, and floodplain forests, which are crucial for foraging and breeding. The scoping area is characterized by arid desert conditions and lacks the wetland habitats. In addition, the review of online databases reveals no records of <i>C. clanga</i> in the scoping area. Given the absence of suitable habitats and lack of documented presence, the scoping area is unlikely to support significant population of the species to meet Criteria 1(b) and/or 3a.
5	Aves	Eastern Imperial Eagle	<i>Aquila heliaca</i>	1 b, 3a	VU	No	Yes	3,500-15,000 individuals	Out	Eastern Imperial Eagle is a large raptor species that migrates across Eastern Europe, Central Asia, and the Middle East. It is predominantly found in semi-arid landscapes with open grasslands, steppe, and scrub habitats where it forages for small mammals and birds and breeds in large trees or cliffs ⁷ . It is a passage migrant and winter visitor to Saudi Arabia. Most documented sightings of the species are from central and northern regions of the country during migration periods, with some records from the western and eastern areas (BirdLife International, 2023). Review of eBird database indicates that there are only two historical sighting records of the species near Nairyah from 1980s. Furthermore, the scoping area represents only a small portion of the species' overall distribution range, making it unlikely to meet the quantitative thresholds of PS6.
6	Aves	Asian Houbara	<i>Chlamydotis macqueenii</i>	1 b	VU	No	Yes	78,960-97,000 individuals	Out	Asian Houbara is found in arid and semi-arid regions across Central Asia, the Middle East, and the Indian subcontinent. It inhabits open grasslands, deserts, and scrublands ⁸ . The species' range extends across parts of Saudi Arabia, where it occurs as a winter/passage migrant and occasional resident ⁹ . Seddon, Philip (1997) indicates that the Project Site and the scoping area fall within the historic range of the species (pre-

⁶ https://osme.org/wp-content/uploads/2019/10/F_Babbington-Roberts_Sandgrouse34-1_compr.pdf?utm_source=chatgpt.com

⁷ IUCN Redlist

⁸ IUCN Redlist

⁹ BirdLife International (2014) Review of the global conservation status of the Asian Houbara Bustard *Chlamydotis macqueenii*. Report to the Convention on Migratory Species Office – Abu Dhabi. Cambridge, UK: BirdLife International.

SN	Class	Common Name	Scientific Name	IFC PS6 CH Criteria	IUCN, National Status	Restricted Range	Distribution Range Overlap with Scoping Area	Global Population (IUCN)	Scoped In/Out	Rationale and Species Information
										1954) ¹⁰ . Satellite imagery and field observation indicate a lack of extensive vegetated plains or seasonally productive habitats in the scoping area, reducing the likelihood of the area being critical for feeding or sheltering significant numbers of the species. A review of online biodiversity databases shows no confirmed records of the species in the scoping area. Regional observations of the species are concentrated in northwestern and western regions ¹¹ . IFC GN6 Criterion 1(b) requires areas to support globally important concentrations of a Vulnerable species, such that their loss would impact IUCN Red List status. The absence of documented significant concentrations in the scoping area and surrounding region suggests the site is unlikely to qualify as critical habitat.
7	Mammalia	Arabian Sand Gazelle	<i>Gazella marica</i>	1 b	VU	No	Yes	1,750-2,150 mature individuals	Out	The species inhabits arid and semi-arid environments, such as open plains, sand dunes, and rocky desert landscapes. Within Saudi Arabia, <i>G. marica</i> populations are concentrated in protected areas, such as the Uruq Bani Ma'arid Reserve and the Mahazat as-Sayd Reserve, where conservation programs are in place ¹² . A review of the iNaturalist and GBIF databases reveals no confirmed records of the species within the scoping area. Sporadic observations are limited to the western regions of Saudi Arabia. Therefore, it can be reasonably concluded that the scoping area and its surrounding landscape are unlikely to support a globally significant population of the species, the loss of which could result in a change to its IUCN Red List status.
8	Reptilia	Egyptian Spiny-tailed Lizard	<i>Uromastix aegyptia</i>	1 b	VU	No	Yes	Not available	Out	It is a large herbivorous lizard species endemic to arid and semi-arid habitats across the Middle East and North Africa. It is well-adapted to extreme desert conditions and prefers open, flat, gravelly, stony and rocky areas with scattered vegetation for burrowing and feeding ¹³ . Saudi Arabia is a key part of the species' range, with populations distributed across its central and eastern deserts. However, significant concentrations are typically found in protected or relatively undisturbed areas.

¹⁰ Seddon, Philip. (1997). Resident houbara bustard populations in Saudi Arabia: Do summer ambient temperatures limit distribution? Journal of Arid Environments. 37. 551-556. 10.1006/jare.1997.0310.

¹¹ eBird.org database

¹² Cunningham, Peter & Wachter, Tim. (2009). Changes in the distribution, abundance and status of Arabian Sand Gazelle (*Gazella subgutturosa marica*) in Saudi Arabia: A review. Mammalia. 73. 203-210. 10.1515/MAMM.2009.041.

¹³ IUCN Redlist

SN	Class	Common Name	Scientific Name	IFC PS6 CH Criteria	IUCN, National Status	Restricted Range	Distribution Range Overlap with Scoping Area	Global Population (IUCN)	Scoped In/Out	Rationale and Species Information
										Data from iNaturalist and GBIF databases do not confirm the presence of <i>U. aegyptia</i> within the scoping area. Most documented occurrences in Saudi Arabia are concentrated in Imam Turki bin Abdullah Royal Reserve and King Abdulaziz Royal Reserve¹⁴. The presence of the species within the scoping area cannot be ruled out. However, based on the available evidence and the fact that the majority of the population is reported from the protected and less disturbed areas, it is unlikely that the scoping area supports a globally significant population of the species.

¹⁴ https://www.inaturalist.org/observations?subview=map&taxon_id=31332

Criterion 4: Highly threatened and/or unique ecosystems

The habitats within the immediate Project Area are predominantly arid, characterized by sparse vegetation, primarily consisting of short grasses. These habitat types are widespread across the region and do not exhibit unique ecological features or high levels of endemism. Furthermore, they are not recognized as highly threatened ecosystems in global or regional conservation frameworks, such as those identified by the IUCN Red List of Ecosystems, etc.

Consequently, the habitats in the Project Area are unlikely to meet the thresholds required to qualify as highly threatened and/or unique ecosystems as per Criterion 4 of IFC PS6.

Criterion 5: Areas Associated with Key Evolutionary Processes

A review of available data did not identify any spatial features within the scoping area that are likely to be associated with key evolutionary processes. Additionally, the absence of restricted-range species in the scoping area further supports the conclusion that it does not exhibit attributes that would qualify it as critical habitat under Criterion 5 of IFC PS6.

5.3.9 Archaeology & Cultural Heritage

5.3.9.1 Observation and Baseline Condition

KSA has a rich archaeological and cultural heritage resource, which extends back some 100,000 years or more. A review of existing literature on archeologically and historically relevant sites in KSA shows a selection of significant sites, which include ancient palaces, castles, trading villages and more. Within these sites, archaeological artefacts have also been found.

Intangible Cultural Heritage

Intangible heritage is defined as the practices, representations, expressions, as well as the knowledge and skills (including instruments, objects, artefacts, cultural spaces), that communities, groups and, in some cases, individuals recognised as part of their cultural heritage. It is sometimes called living cultural heritage and includes oral traditions and expressions, including language; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; and traditional craftsmanship (UNESCO, 2003).

Saudi Arabia is a signatory of the UNESCO Convention on Intangible Cultural Heritage (ICH), and a number of elements of ICH within KSA have been added to UNESCO's Representative List of the Intangible Cultural Heritage of Humanity. These are:

- Date palm, knowledge, skills, traditions, and practices
- Almezmar, drumming and dancing with sticks.
- Falconry, a living heritage
- Alardah Alnajdiyah, dance, drumming and poetry in Saudi Arabia
- Arabic coffee, a symbol of generosity
- Majlis, a cultural and social space
- Al-Qatt Al-Asiri, female traditional interior wall decoration in Asir

Critical Cultural Heritage

Critical cultural heritage consists of one or both of the following types of cultural heritage:

- (i) The internationally recognised heritage of communities who use, or have used within living memory, their cultural heritage for long-standing cultural purposes; or
- (ii) Legally protected cultural heritage areas, including those proposed by host governments for such designation.

Saudi Arabia has six (6) cultural sites inscribed on the World Heritage List:

- Al-Hijr Archaeological Site (Madâin Sâlih) (2008; WHS Ref. 1293);
- At-Turaif District in ad-Dir'iyah (2010; WHS Ref. 1329);
- Historic Jeddah, the Gate to Makkah (2014; WHS Ref. 1361);
- Rock Art in the Hail Region of Saudi Arabia (2015; WHS Ref. 1472);
- Al-Ahsa Oasis, an Evolving Cultural Landscape (2018; WHS Ref. 1563); and
- Hima Cultural Area (2021; WHS Ref. 1619);

The closest UNESCO World Heritage Site to the Project site is the 'At Turaif District in ad-Dir'iyah' which is around 270km southeast of the site.

5.3.9.2 Project Site Observations

There are no known archaeological sites within or in the immediate vicinity of the Project site. No specific observations pertaining to cultural heritage or other archaeological features were made during the preliminary site visit.

5.3.9.3 Sensitive Receptors

Although there are no archaeological or cultural items of importance in the proposed project site, considering the nearby protected area, receptors are expected to include unknown buried archaeology.

Table 5-11 Archaeology & Cultural Heritage – Sensitive Receptors

Receptor	Sensitivity	Justification
Unknown buried artefacts	Medium	Any underground archaeological items if present, may be of importance on a regional scale.

5.3.10 Landscape and Visual Amenities

5.3.10.1 Observations and Baseline Conditions

Based on initial site observations and review of satellite imagery, the general characteristics of the Project site is predominantly undeveloped open desert landscape composed of barren sandy plains devoid of any considerable vegetation. There are certain anthropogenic influences on the landscape

that were observed during the site visit and include the existing roads and OHTL that runs close to the Project site.

5.3.10.2 Sensitive Receptors

The identified receptor which may be impacted as a result of changes to the landscape and visual amenity is shown in following table.

Table 5-12 Landscape and Visual Amenity – Sensitive Receptors

Receptor	Sensitivity	Justification
Local residents at nearby village and other human receptors	Medium	The Project stacks, lighting and some of the buildings will be visible to the residential neighbourhoods near the Project site. Their sensitivity to the view of the Project is considered to be medium as the area is currently not impacted by any major man-made infrastructures except for small roads and OHTLs in the surrounding area.

5.3.10.3 Existing Landscape Conditions

Landscape character could be defined as "a distinct, recognisable and consistent pattern of elements, be it natural (soil, landform) and/or human (for example settlement and development) in the landscape that makes one landscape different from another, rather than better or worse" (Natural England, 2014).

Based on site observations, the general characteristics of the Project site are predominantly an undeveloped open desert landscape composed of barren sandy plains devoid of any considerable vegetation. While undeveloped, as outlined above, there are certain anthropogenic influences on the landscape that were observed during the site visit and include the existing roads and OHTL that runs close to the Project site and the mobile herders that use parts of the site.

Below are photographic records of the project site and immediate surroundings.



Figure 5-15 Views from Dhulayát Al Khalilayn town, north of the Project site



Figure 5-16 Views of the herders (left) and the OHTL between the project boundary and Road 6465 (right)

5.3.10.4 Existing Visual Amenity

The term visual amenity refers to the aesthetic value or visual appeal of a place, object, or views as perceived by people. It encompasses features like natural landscapes, architectural elements, and well-maintained spaces that enhance the visual quality of an environment.

When establishing the value of views and visual amenity, the inter-relations between individuals or groups of people and landscape will be considered such as the change of views that people have of the landscape and the effects of change on their visual amenity. The Visual baseline has therefore been established by:

- Identifying views, viewpoints, and extent of possible visibility.
- Identifying people who may be affected

As described in the landscape section above, the Project is located in a mostly undeveloped desert environment with some anthropogenic influence from the herders on an in the vicinity of the project site.

With regards to visual receptors inside the area, apart from the mobile herders, findings from the site visits and satellite imagery of the site confirmed no permanent dwellings within or close to the Project site.

However, regarding visual receptors outside of the Project, the herders/farmers and residents of the **Dhulayát Al Khalilayn town** as well as **users of the Road 6465** can obtain a distant view of the site which is more than a kilometre away.

5.3.11 Socio-Economic

5.3.11.1 Baseline Conditions

Administrative Structure

KSA is divided into 13 Administrative Regions which are governed by a Governor, Deputy Governor and Provincial Council. These Administrative Regions are further divided into Governates and Districts. The Project area is located in the Eastern Province of Saudi Arabia, also known as the Eastern Region, is the easternmost of the 13 provinces of Saudi Arabia. It is the nation's largest province by area.

Population and Demographics

According to General Authority of Statistics Saudi Arabia (GASat) the population of the Kingdom in mid-year 2022 was 34,110,821 million, of which approximately 12,420,173 individuals are thought to be non-nationals, representing approximately 36.4% of the total population. According to the CIA World factbook, official growth rate estimates put the current rate of annual growth at 1.63%, although this is currently focused upon a few key growth points. The table below gives summarises the KSA population information.

Table 5-13 Saudi Arabia Population Data Summary

Criteria	Data (2022 Estimates unless otherwise stated)
Population	35,939,806 (Est. 2023) Including 12,420,173 non-nationals (According to GASat)
Age Structure	0-14 years: 24.55% 15-24 years: 14.53% 25-54 years: 51.35% 55-64 years: 6.07% 65 years and over: 3.48% (According to GASat)
Median Age	Total: 30.8 years Male: 33 years Female: 27.9 years (According to CIA World Factbook)
Annual Growth	1.63% (According to CIA World Factbook – 2023 est)
Source: https://www.stats.gov.sa/en/43 and https://www.cia.gov/the-world-factbook/countries/saudi-arabia/#people-and-society Accessed 14 th September 2023.	

The project is located in the Eastern Province of Saudi Arabia. According to the KSA General Authority for Statistics, the total population of the Eastern Region was estimated in 2019 to be 5,148,598 individuals (both Saudi Nationals and expatriates). Of these 3,103,263 were males and 2,045,335 were females, representing approximately 60% and 40% respectively of the total population. In comparison with the estimated 2019 Saudi Arabia population of 34,218,169 individuals (both Saudi Nationals and expatriates), Eastern Region represented in 2019 approximately 15.04% of the national population.

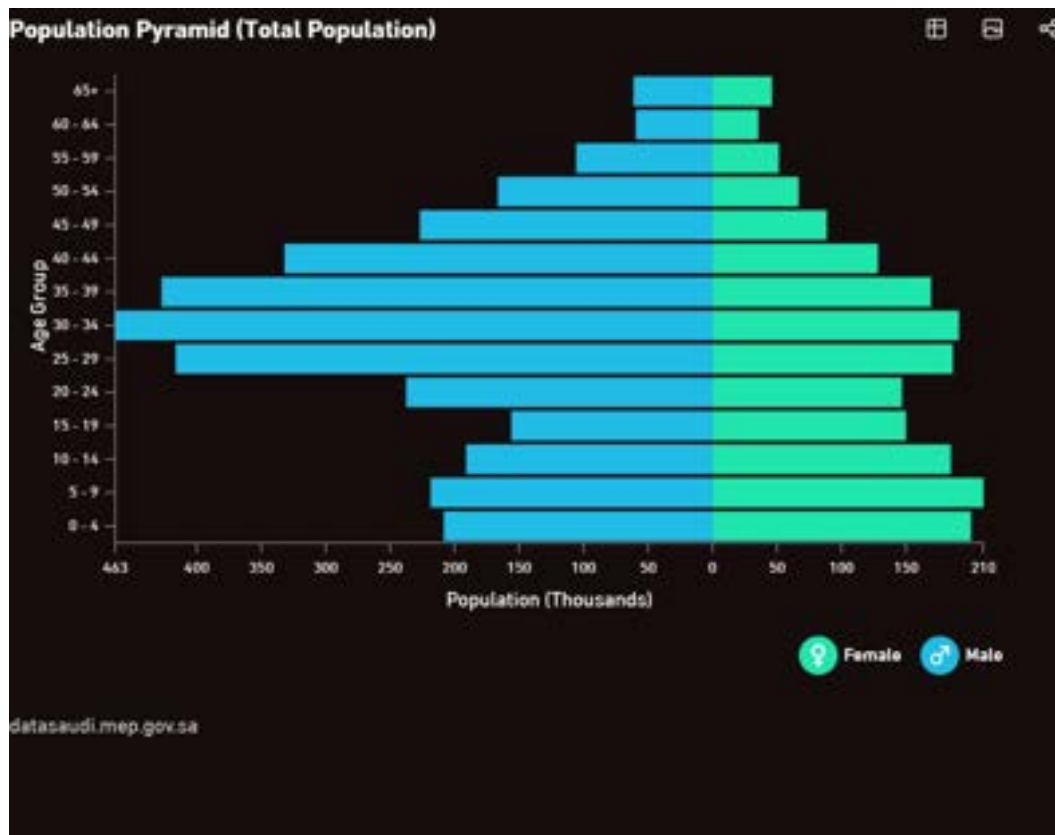
Table 5-14 Eastern Administrative Region Population Data

Indicator Name	2019 Data
Total Population	5,148,598
Female	2,045,335
Male	3,103,263
Source: General Authority for Statistics Kingdom of Saudi Arabia. https://www.stats.gov.sa/en/1007-0 Accessed 10 th December 2023	

The age groups distribution of the population in Eastern Region are shown in the figure below. In 2022, the female population in Eastern Region was concentrated in the age group of 5 - 9 years, with 210,012 women, accounting for 11.3% of the total female population of Eastern Region. Similarly, the male

population was concentrated in the age group of 30 - 34 years, with 463,131 men, representing 14.2% of the total male population.

Figure 5-17 Age Distribution (2022)



Economy and Employment

Official figures from the CIA World Factbook place the Gross Domestic Product (GDP) of Saudi Arabia at approximately \$792.8 billion. National GDP growth rate for 2017 was estimated in -0.9%. As one might anticipate, the economy of the Kingdom is heavily focused upon hydrocarbon-based industry, with this accounting for almost half of overall GDP. The Kingdom possesses about 16% of the world's proven petroleum reserves, ranking as the largest global exporter of petroleum, and playing a pivotal role in OPEC management of world oil markets.

Although the hydrocarbon sector accounts for roughly 42% of GDP, it's importance to the economy of the Kingdom is not truly reflected in this figure. Petroleum accounts for roughly 87% of budget revenues within Saudi Arabia and for 90% of export earnings, thus providing the country with its main source of both Government revenue and foreign currency. The petroleum market within the Kingdom has also been used in recent years as the Government's primary means of regulating inflationary pressures within the economy. Outside of the hydrocarbon sector and other industries, the next largest contributor to the economy is the service sector. Unlike the hydrocarbon sector, this exists chiefly to service the domestic market and accounts for very little export earnings.

The labour market of Saudi Arabia is subject to significant challenges, with considerable unemployment and skills shortage in key sectors. Official records estimate to total labour force to be 13.8 million with approximately 6% to be unemployed. Unemployment amongst the Saudi national are more than double

that of expatriates. Despite this high level of unemployment, there is a large demand for expatriate labour, particularly in high skill sectors. A further pool of low skill expatriate labour exists to serve a requirement for manual labour and service sector support staff, of which there is also an apparent shortage at the prevailing market rate.

Table 5-15 Summary of Saudi Arabia Economic Data

Criteria	Data (2017 Estimates unless otherwise stated)
GDP (Official Exchange)	US\$792.8 billion
GDP (Purchasing Power Parity)	US\$1.54 trillion (2020 estimate)
GDP per Capita (Purchasing Power Parity)	US\$44,300 (2020 estimate)
GDP Real Growth Rate	-0.9%
Industrial Production Growth Rate	1.71% (2023 est)
Labour Force	13.8 million (About 78% are Non-Saudi National)
Labour Force - by Sector	Agriculture: 6.7% Industry: 21.4% Services: 71.9% (2005 Est.)
Unemployment Rate	7.36% (2021 est)
Exports	US\$ 286.502 billion (2021 estimate)
Imports	US\$ 213.016 billion (2021 estimate)

Source: <https://www.cia.gov/the-world-factbook/countries/saudi-arabia/#economy> Accessed 14th September 2023.

Indigenous Peoples

The legislation of the KSA does not recognize any segment of the local population as meeting the essential qualification criteria for Indigenous Peoples. The population of Saudi Arabia is considered homogenous and predominantly Arab and Muslim. Bedouin were estimated by the government in the 1960s to be over 50% of the total population (Bedouin settlements, 1977). Due to rapid economic and urban growth and the oil revenue boom, the majority of the nomadic and semi-nomadic Bedouin have settled and resided in permanent housing while retaining their tribal identity, while the herding activities of their livestock is carried out by hired male shepherds (Cole, 2003), who are predominantly foreign workers. Therefore, Bedouin and tribal groups are not considered Indigenous People or minorities in Saudi Arabia.

In addition, the World Directory of Minorities and Indigenous Peoples indicates that there are no Indigenous Groups listed for Saudi Arabia however it lists some religious minorities including Shi'is, Isma'ilis and Zaydis Muslims. Shi'a, estimated at 10-15% of the population (though some estimates suggest their numbers may be as high as 25%) are mainly in the Eastern Province or 'Ash Sharqiyah' with communities elsewhere as well. Isma'ilis are mainly in the region of Najran while the Zaydis live on the borders with Yemen (Saudi Arabia - World Directory of Minorities & Indigenous Peoples, 2023)¹⁵.

¹⁵ <https://minorityrights.org/country/saudi-arabia/>

However, these minorities are not characterized by nationally distinct ethnic backgrounds, exclusive and aggregated historical attachment to natural resource bases and customary community-level autonomy, and they are demonstrably well integrated into the mainstream population. Also, Indigenous People were not identified for Saudi in the Indigenous World 2023 Report issued by the International Work Group for Indigenous Affairs (IWGIA), which is a global human rights organisation dedicated to promoting, protecting and defending Indigenous Peoples' rights, with broad-based expertise on Indigenous Peoples and broader social inclusion.

5.3.11.2 Sensitive Receptors

The main sensitive receptors for socio-economic impacts are:

- Local residents and businesses.
- Saudi population; and
- Employment market.

5.4 Environmental Receptors

The sensitive environmental and social receptors that may potentially be impacted during the Project construction or operation and are sensitive to the changes caused by the Project are presented below.

No.	Receptor	Sensitivity	Description of Receptor
1	Local Communities (HR-1)	High	There is a small village with multiple residential and few shops/ commercial facilities located about 3 km from the northern boundary and may be impacted by the construction and operation activities (Project and cumulative).
2	Agricultural Compound and Herders Camps (HR-2, HR-3, HR-4, HR-5, HR-6)	High	There is a large agricultural compound with small buildings likely to be used by human receptors in surrounding area that may be impacted by the construction and operation activities (Project and cumulative). The temporary herder camps are located relatively close to the Project site. The camps are transient but may have presence of herders and animals may be impacted by the construction and operation activities (Project and cumulative).
3	Workers (migrant and local, including temporary accommodation facilities)	Medium	Manpower employed for the Project may be impacted by the construction and operation activities and vulnerable to poor working conditions and welfare.
4	Climate	High	KSA is a signatory to The Paris Agreement, UNFCCC addressing the impacts and causes of climate change and aimed at returning global temperatures to a level which will not cause irreversible significant harm to ecosystem functioning. The Paris Agreement's long-term temperature goal is to keep the rise in mean global temperature to well below 2°C above pre-industrial levels, and preferably limit the increase to 1.5°C, recognising that this would substantially reduce the impacts of climate change.
5	Soil and groundwater quality	Low	Changes in soil quality may create secondary impacts on local terrestrial ecology or groundwater.
6	External run-off areas	Low	There are no wadis identified in and around the project site. Catchment delineation indicates there are two main catchments where flow generally drains from the west to the site.
7	Waste management infrastructure	Medium	Capacity of existing waste and wastewater management infrastructure (offsite) may be impacted by the Project.
8	Transport infrastructure and motorists	Low	Capacity of existing transport infrastructure may be impacted by the Project.
9	Terrestrial ecology - common species and habitats	Low	Common flora and fauna species may be impacted by the Project during construction.
10	Unknown subsurface archaeological sites	Medium	Potential presence of unknown buried artefacts of any cultural significance within the project footprint is not expected but cannot be completely ruled out.
11	Local economy	Low	Local businesses and employment may be impacted by the Project during construction
12	Future human receptors	Medium	This includes the Project operational workforce and visitors that may be impacted by the Project
13	Project structures	Low	Project structures that may be impacted by unplanned events

6 Impact Identification, Analysis and Assessment

6.1 Scope of Work & Key Deliverables

The key deliverables of the ESIA process as defined by MEWA executive regulations and regulated by NCEC and lenders are:

- Environmental Classification Form.
- Environmental and Social Scoping Report; and
- ESIA Report.

6.1.1 Scope of Assessment

6.1.1.1 Study Area (Area of Influence)

The primary study area comprises the Project footprint, which includes, the proposed CCGT site, the Electrical Special Facilities (comprising of a new 380/230kV substation, switchgear), new access roads, laydown areas, equipment, and construction/operational activities inside this area.

The study area is determined based on the area of influence of Project effects. For this Project, the study area will be generally limited to a 10km radius from the Project boundary and associated facilities. However, the exact area of effect may vary for certain impacts. This is further described in the subsequent sections.

6.1.1.2 High Level Screening of Associated Facilities

The associated facilities screening¹⁶ will include:

- Fuel Connection Facilities (including a gas interconnection to an existing Saudi Aramco pipeline).
- Service water supply system from the National Water Company sewage treatment plant to a service water delivery point.
- New Overhead Transmission Line (OHTL) to tie in with the substation.

The screening of impacts for these facilities will include their construction and operations.

6.2 ESIA Methodology

This section provides information about the data collection and other processes followed to inform the ESIA and the methodology that has been used to describe the sensitivity of environmental receptors; predict the magnitude of environmental impacts and assess the significance of impacts upon applicable environmental parameters.

¹⁶ High level screening of associated facilities was undertaken based on qualitative assessment.

6.2.1 Baseline Data Collection

Forming an integral part of the ESIA, the baseline studies as outlined in the previous section of this ESIA Report provide a benchmark of existing conditions and allow a platform for which Project potential impacts can be assessed for the construction and operational phases.

A series of physical site surveys within the Project's AoI were carried out, these have been described in the relevant environmental and social impact assessment chapters of this report. These were supplemented by existing secondary data. The environmental baseline surveys carried out as part of the ESIA as summarised in Section 5 of this ESIA.

6.2.2 Impact Assessment Methodology

6.2.2.1 Process

The ESIA process is a systematic tool for examining and assessing the potential beneficial and adverse environmental and social impacts of a proposed development. In addition to identifying impacts of the Project, the ESIA has also identified key environmental and social mitigation measures and guidance to avoid, minimise and compensate for any adverse environmental and social impacts associated with the construction and operation of the Project. To obtain a credible assessment of environmental and social impacts, the assignment of 'significance' to each identified impact needs to be a robust, consistent, and transparent process. The methodology to assess 'effect significance' is outlined below and follows a GIIP approach based on the assumption that the significance of an impact on resources or receptors is considered to result from an interaction between two factors:

- The nature and magnitude of the impact (i.e., a change in the environment, social and/or health baseline conditions); and
- The environmental value or sensitivity of those resources or receptors to the change.

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

- **Step 1** – Evaluation of value/sensitivity/vulnerability of resource or receptor.
- **Step 2** – Assessing the magnitude of the impact on the resource or receptor; a
- **Step 3** – Determining the significance of impacts.

6.2.2.2 Impact Assessment Significance Criteria

DETERMINING RECEPTOR SENSITIVITY

The sensitivity of a receptor is understood as the sensitivity of the environmental or social receptor to change, including its capacity to accommodate changes that the Project may bring about. The sensitivity is assigned at the receptor level and as such details regarding sensitivity are provided within the topic specific chapters of this Report. The table below outlines the definition criteria upon which the receptor sensitivities of this ESIA are based.

Sensitive receptors are defined as:

- Elements of the **environment** that are of value to the functioning of natural systems (i.e., areas or elements of ecological, landscape or heritage value, species, habitats and ecosystems, soil, air and water bodies or land-use patterns); and
- **Human** receptors, such as stakeholders (i.e., users of dwellings, places of recreation, places of employment, community facilities or household relocation, cultural heritage – tangible & intangible-, community health, livelihoods & economic activities, gender relationships) and human systems (e.g. employment market, population disease susceptibility and disease communicability, public infrastructure and services, exposure to toxicity of chemicals).

Table 6-1 Receptor Sensitivity Criteria

Sensitivity	Description of Value
Very High	• High importance and rarity on an international scale and limited or no potential for substitution. • The receptor has already reached its carrying capacity, so any further impact is likely to lead to an excessive damage to the system that it supports (e.g., very limited or non-existent infrastructure and services such as hospitals and schools, available natural, economic or local resources are not sufficient to provide means of livelihoods for all local populations). • Locations or communities that are highly vulnerable to the environmental and social impact under consideration or critical for society (e.g., indigenous peoples, hospitals, schools). • Other examples are very high proportion of vulnerable groups (women, elderly, disabled, etc.) in the Project area, very frequent occurrences of gender-based violence, very low probability of female participation in decision making and in the labour market, archaeological items of international importance or designated UNESCO world heritage sites, tangible or intangible cultural assets that contribute to international research objectives, etc.
High	• High importance and rarity on a national scale, and limited potential for substitution. • The receptor is close to reaching its carrying capacity, so a further impact may lead to a significant damage to the system that it supports (e.g., poor or limited public infrastructure and services, with limited access and high pressure on existing natural or economic resources available). • Locations or communities that are particularly vulnerable to the environmental impact under consideration (e.g., residential areas, vulnerable/marginalized groups). • Other examples are high proportion of vulnerable/marginalised groups (women, elderly, disabled, etc.), locations with poor health practices, poor education level, high crime rate, frequent occurrences of gender-based violence, tangible or intangible cultural assets that contribute to national research objectives, etc).
Medium	• High or medium importance and rarity on a regional scale, limited potential for substitution. • The receptor is already significantly impacted, but it is not close to reaching its carrying capacity. Further impacts will increase the stress of the underlying system, but evidence does not suggest that it is about to reach a critical point (e.g., public infrastructure and services with some capacity, alternative natural or economic resources are available but not sufficient or easily accessible). • Locations or groups that are relatively vulnerable to the environmental impact under consideration (e.g., commercial areas). • Other examples area: average proportion of vulnerable/marginalised groups, occasional occurrences of gender-based violence, tangible or intangible cultural assets that contribute to regional research objectives, etc).
Low	• Low or medium importance and rarity on a local scale.

Sensitivity	Description of Value
	- The receptor is not significantly impacted and shows a large spare carrying capacity. Impacts are not likely to generate any noticeable stress in the underlying system (e.g., reasonable public infrastructures and services, sufficient natural, economic, or local resources available but not easily accessible). - Locations or groups that show a low vulnerability to the environmental impact under consideration (e.g., industrial areas). - Other examples are low proportion of vulnerable/marginalised groups, rare occurrences of gender-based violence, tangible or intangible cultural assets that contribute to local research objectives, etc).
Very Low	- Very low importance and rarity on a local scale. - The receptor is not impacted and shows a very large spare carrying capacity. Impacts are very unlikely to generate any noticeable stress in the underlying system (e.g., very good public infrastructures and services with some capacity, equivalent natural, economic, or local resources available and easily accessibly). - Locations or groups that show a very low vulnerability to the environmental impact under consideration (e.g., industrial areas). - Other examples are very low proportion of vulnerable/marginalised groups, no occurrence of gender-based violence, tangible or intangible cultural assets that are not legally protected and have no significance to local people (i.e. local people no longer use the cultural asset, etc).

IDENTIFYING POTENTIAL IMPACTS

The following types of impacts have been considered:

- Direct Impacts - Potential impacts that may result from the construction, commissioning, and operations of the Project acting directly on an environmental or social receptor.
- Indirect Impacts – Potential impacts which are not a direct result of a Project activity, that may be realised later in time or at distances further removed from the project footprint but are normally a result of a complex pathway.
- Cumulative Impacts – Changes to the environment that are caused by an action in combination with other past present and future actions.
- Beneficial Impacts – Those impacts that have a positive, desirable or favourable effect on the sensitive resources or receptors (e.g. landscape providing artificial habitat for a variety of species, jobs opportunities during the construction and/or occupation phases of a project);
- Adverse Impacts – Those impacts that are detrimental and have a negative influence on the environment, social structures, resources, or other receptors.
- Secondary Impacts - Potential impacts that may result from the implementation of protection measures applied to mitigate potential direct impacts; and
- Event Related Impacts - Potential unplanned or accidental impacts stemming from an unintentional event such as fire, explosion, oil spill, etc.

DETERMINING IMPACT MAGNITUDE

The magnitude of an impact has numerous components, for example:

- The extent of physical change.
- The level of change in an environmental condition.

- The permanence of impact and the reversibility of the impacted condition.
- Its spatial footprint.
- Its duration and frequency; and
- Its likelihood of occurrence where the impact is not certain to occur.

The magnitude of the impact will be defined wherever possible in quantitative terms and where necessary, the determination of impact magnitude will be assisted through the use of modelling. The general criteria used for identifying the magnitude of impacts is provided within the table below.

Table 6-2 Impact Magnitude Criteria

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

6.2.2.3 Determining Significance

The significance of effects is a combination of the sensitivity of a receptor or resource and the magnitude of the project impact.

The following matrix provides criterion used for determining the significance of environmental effects through consideration of the potential magnitude of impact and sensitivity of the associated receptor.

As is evident from the matrix, in some cases the significance product is a range (i.e., a 'Minor' Magnitude and a 'Very High' Sensitivity results in a 'Moderate to Major' Significance). In these cases, professional judgement will be used to determine which significance the impact best represents.

Table 6-3 Criteria for Determining Significance of Effects

		Magnitude of impact (degree of change)				
		No change	Negligible	Minor	Moderate	Major
Sensitivity of Receptor	Very High	Neutral	Minor	Moderate or Major	Major	Major
	High	Neutral	Minor	Moderate	Moderate or Major	Major
	Medium	Neutral	Negligible or minor	Minor	Moderate	Moderate or Major
	Low	Neutral	Negligible or minor	Negligible or minor	Minor	Moderate
	Very Low	Neutral	Negligible	Negligible or minor	Minor	Minor

The following table outlines general definitions of significance.

Table 6-4 Definition of Significance

Significance Category	Criteria
Major	- The impact is large scale and would cause a large improvement or deterioration in the environment, - Adverse impacts may be considered unacceptable due to exceeded of statutory limits and may require additional studies to ascertain if alternatives (in terms design and location) with the potential for lower impacts should be considered. These impacts represent key factors in the decision-making process. - These impacts are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Moderate	- The impact gives rise to noticeable improvement or deterioration to the existing environment at a regional or local scale. - If adverse, impacts are potential concerns to the project and may become key factors in the decision-making process. - Whilst the impacts will be experienced, mitigation measures and detailed design work may reduce (or enhance) the effect. Some residual effects will still arise.
Minor	- The impact is small scale and would cause a small improvement or deterioration to the existing environment. - Adverse effects are undesirable but acceptable and within statutory limits and not likely to be key decision-making issues. - Mitigation measures are typically not required to mitigate such effects. - The cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.
Negligible	- No discernible improvement or deterioration to the existing environment as a result of the Project will occur. - Local issue unlikely to be of importance in the decision-making process. - Effects do not exceed statutory limits. - They are of relevance in enhancing the subsequent design of the project and consideration of mitigation or compensation measures.
Neutral	- No effect or effect that is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error. - No mitigation is required.

The approach to assigning significance relies on reasoned argument, professional judgement and cognisance to the advice and views of the appropriate regulators and organisation. For some

disciplines, it is determined by comparison, wherever possible with locally, nationally, or internationally accepted standards.

6.2.3 Mitigation & Management Measures

A key component of the ESIA process is to explore practical ways of avoiding or reducing potentially significant impacts caused by development of the Project. These are commonly referred to as mitigation measures and will incorporate into this Report and the future CESMP and Operational ESMP (OESMP). Mitigation will be aimed at preventing, minimising, or managing significant adverse impacts to as low as reasonably practicable (ALARP) and enhancing and maximising any potential beneficial impacts of the Project.

The approach taken to identifying and incorporating mitigation measures into the Project is based on a typical hierarchy of decisions and measures. This is aimed at ensuring that, wherever possible, potential impacts are mitigated at source rather than mitigated through restoration after the impact has occurred. In ensuring the Project achieves the applicable environmental standards and guidelines, mitigation measures have been adopted within the Project's design. In addition to specific measures included within the design of the Project, the ESIA outlines further mitigation and/or management measures for the construction and the operational phases, upon which the Project can further minimise or avoid negative impacts and enhance positive impacts.

Upon approval of the Project, the stated mitigation and management measures in the approved ESIA will be required for implementation as a condition of the Environmental Permit or as part of the lenders loan agreement.

6.2.4 Residual Impacts

The residual impacts consider the overall significance of impacts following the implementation of the additional mitigation and management measures not included by design. The significance of such impacts is based upon the same criteria used to determine the impact significance stated above.

6.2.5 Cumulative Impact Assessment (CIA)

IFC Handbook on Cumulative Impact Assessment defines cumulative impacts as "those that 'result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones' (IFC, 2013).

In practice, the assessment of cumulative effects requires consideration of some concepts:

- Assessment of effects over a larger (i.e., "regional") area that may be transboundary/cross-jurisdictional; (including effects due to natural perturbations affecting environmental components and human actions).
- Assessment of effects during a longer period of time into the past and future;
- Assessment of effects on Valued Environmental Components due to interactions with other actions, and not just the effects of the single action under review; and
- Evaluation of significance in consideration of other than just local, direct effects.

6.2.6 Transboundary Impacts

As per the IFC Performance Standard 1 Guidance Note 1, *“Transboundary impacts are impacts that extend to multiple countries, beyond the host country of the project, but are not global in nature. Examples include air pollution extending to multiple countries, use or pollution of international waterways and transboundary epidemic disease transmission.”*

The Project is not expected to abstract water or risk polluting international waterways in addition, and as per the air emissions modelling, the Project emissions are not likely to extend outside the Project area. The Project impacts due to the Project will fall within an AOI within KSA only, hence there is considered to be no need for a detailed assessment relating to transboundary impacts.

6.2.7 Project Stakeholder Analysis and Consultation

Consultation with stakeholders is an essential part of the ESIA process. The key objective of the consultation is to establish a dialogue with those stakeholders who may be affected by aspects of the Project or may have an interest in the outcome of the ESIA process.

With regard to the lender requirements, all of the IFC PS include requirements for a certain level of stakeholder engagement (either in the ESIA, or as part of the future ESMS) and therefore the Project will require a level of engagement. In particular, IFC PS 1 on “Social and Environmental Assessment and Management Systems” describes the stakeholder engagement requirements in more depth. It states the following:

“Stakeholder engagement is the basis for building strong, constructive, and responsive relationships that are essential for the successful management of a project’s environmental and social impacts. Stakeholder engagement is an on-going process that may involve, in varying degrees, the following elements:

- *Stakeholder analysis and planning;*
- *Disclosure and dissemination of information;*
- *Consultation and participation;*
- *Grievance mechanism; and*
- *On-going reporting to Affected Communities.*

The nature, frequency, and level of effort of stakeholder engagement may vary considerably and will be commensurate with the project’s risks and adverse impacts, and the project’s phase of development.”

As is common and good practice, stakeholder engagement is considered a key aspect of all projects and should be undertaken at the ESIA stage in order to notify, gain views and enable a better understanding of the dynamics of the local environment.

Throughout the ESIA process for the Project, Project stakeholders have been consulted to obtain information and further understand the Project design, construction methods and operational activities.

Meetings and engagement with NCEC for the purpose of the ESIA’s environmental permitting will be carried out as necessary at a later stage.

There are no regulatory processes relating to the ESIA permitting that require consultation with communities. National legal and cultural factors in KSA prevent open public meetings or other mass consultations and public participation activities. As such, detailed socio-economic surveys or public consultations were not carried out.

Stakeholder engagement that is carried out with the governmental entities, regulators, ministries or municipalities is usually led by the Project sponsors. In general, if stakeholder engagement is necessary with affected landowners where land acquisition is required, then this is carried out by the Project sponsors in coordination with the Ministry of Municipal and Rural Affairs in line with the national Law of Eminent Domain and Temporary Taking of Property (Royal Decree No. M/15, May 12, 2003) and its implementing regulation (Ministerial Resolution No. 54, November 23, 2015).

For the Project, a stakeholder engagement plan (SEP) and grievance mechanism (GM) will be developed to coordinate engagement with NCEC and other municipal and regulatory bodies required to be engaged with for permitting purpose or interest-based stakeholders relevant to the Project. The GM will be for workers and local affected communities due to Project related works which will enable any complaints or concerns to be dealt with swiftly and adequately.

6.2.8 Framework for Environmental and Social Management

The ESIA includes a framework to guide the Project parties in establishing structures for the management of Environmental and Social risks, impacts, opportunities, and compliance associated with both the construction and operational phases of the Project.

The Framework outlines systematic structures and management programmes that will ultimately be prepared to comprise the Project's respective construction and operational phase Environmental and Social Management Systems (ESMS).

This framework ensures alignment with applicable elements of the established ACWA Power corporate level E&S Policy and ESMS Implementation Manual.

It is intended that the EPC Contractor and O&M Company will prepare their detailed respective Construction Environmental & Social Management Plan (CESMP) and Operational Environmental & Social Management Plan (OESMP) as part of their wider ESMS'. Both the CESMP and OESMP will align with the Project Company and ACWA Power ESMS Implementation Manual.

Other management plans that will be required based on the outcomes of the ESIA and respective risks and impacts at the Project are included in section 7.6.11 of the ESIA. It is expected that the EPC Contractor and O&M Company will develop E&S policies in line with corporate level Project Company overarching project specific E&S policy.

6.3 Assessment of Impacts

6.3.1 Scoping Exercise Summary

A key objective of the Scoping Report was to determine the scope of the environmental aspects (e.g., air, noise, ecology) that will be included in this ESIA Report. Table 6-5 summarises the scoping exercise outcomes.

Table 6-5 Scoping Exercise Summary

Environmental Component	Construction / Operation	Scoped	Justification
Air Quality	Construction	In	The construction phase will result in dust generation and gaseous emissions and there are sensitive receptors in the area of influence (Aol).
	Operation	In	The operation of the power plant will result in gaseous emissions and there are sensitive receptors in the area of influence.
Climate Change	Construction	In	Climate change impacts includes contribution to current global warming trends (on a global scale).
	Operation	In	Climate change impacts includes contribution to current global warming trends (on a global scale) due to the operation of the power plant.
Noise and Vibration	Construction	In	Construction activities will result in noise emissions and there are noise sensitive receptors in the area of influence.
	Operation	In	The operation of the power plant will result in noise generation and there are sensitive receptors in the area of influence.
Terrestrial Ecology	Construction	In	The construction of the Project will result in habitat and flora loss, disturbance or mortality to fauna within the Project footprint.
	Operation	Out	No impacts to archaeology and cultural heritage are anticipated as a result of the operation of the Project. Operation phase impact assessment has therefore been scoped out.
Geology, Soils, Surface Water and Groundwater	Construction	In	Potential risks during the construction phase are expected to include the management and storage of hazardous materials, chemicals and wastes.
	Operation	In	Potential risks during the operational phase are expected to include the management and storage of fuel for the power plant, hazardous materials, chemicals and wastes in addition to emergency situations.
Hydrology, Surface Water Drainage and Flood Risk	Construction	In	There is no wadi identified, however two main catchment area indicated from the flood study. Potential risks during the construction phase are expected to include the management and storage of hazardous materials, chemicals and wastes that could lead to runoff of pollutants during storm events to surrounding areas of the Project site.
	Operation	In	Potential risks during the operation due to the alteration of site drainage and flood risk at Project footprint and surrounding areas affecting the natural drainage of stormwater.
Solid Waste and Wastewater Management	Construction	In	The construction phase will result in the generation of wastes which, if not managed in line with good practice, can strain waste management infrastructure and impact receptors.
	Operation	In	The operation phase will result in the generation of wastes including wastewater and sludge which, if not managed in line with good practice, can strain waste management infrastructure and impact receptors.
Archaeology and Cultural Heritage	Construction	In	The construction activities may result in potential damage of any unknown buried artefacts in footprint of all works.
	Operation	Out	No impacts to archaeology and cultural heritage are anticipated as a result of the operation of the Project. Operation phase impact assessment has therefore been scoped out.

Environmental Component	Construction / Operation	Scoped	Justification
Landscape and Visual Amenity	Construction	In	The construction activities may potentially result in temporary impacts to the landscape character in the Project area and the visual amenity of the receptors within direct line of sight to the Project.
	Operation	In	The operation phase may potentially result in impacts to the landscape character in the Project area and the visual amenity of the receptors within direct line of sight to the Project.
Traffic and Transportation	Construction	In	Increase in number of vehicles transporting materials and workers may potentially increase the flow of traffic on local roads and the potential for incidents and road safety risks to communities on highways and local roads.
	Operation	Out	Movement of maintenance materials, waste removal and staff will be minimal and are not expected to result in noticeable traffic impact. Therefore, this has been scoped out.
Socioeconomics	Construction	In	There are potential negative socioeconomic impacts linked with worker influx and ecosystem services. In addition to potential positive impacts with regards to employment opportunities and dissemination of skills.
	Operation	In	There are potential positive impacts with regards to employment opportunities and dissemination of skills.
Community Health, Safety & Security	Construction	In	Potential impacts relate to worker influx which can result in community disgruntlement, health risks, gender-based violence and harassment. Impacts also arise from construction works, movement of construction vehicles and plant, and emergency situations.
	Operation	In	Health, Safety and Security impacts arising in the construction phase are also relevant during the operation phase.
Labour & Working Conditions	Construction	In	The Project will require a dedicated construction and operation workforce.
	Operation	In	

6.3.2 Air Quality

6.3.2.1 Construction Phase Impacts and Mitigation

The main Project and the associated facilities construction activities including access road, FCF, ESF, and SWCF that could contribute to potential changes in air quality are summarised discussed below.

DUST EMISSIONS FROM SITE PREPARATION AND EARTH WORKS

The principal sources of dust and particulate emissions during construction will be:

- Excavations and earthworks, such as ground-breaking, cutting, filling and levelling;
- Vehicle movements on unpaved, or compacted surfaces; and
- Particulate dispersion from uncovered truckloads;
- Operation of the temporary batching plant.

Nuisance dust can reduce well-being resulting in increased incidence of eye irritation and infection. Nuisance dust is typically defined as particulate matter greater than 10 microns in diameter. Dust resulting from excavations and earthworks typically comprises large diameter particles, which settle rapidly and close to the generation source.

According to the screening guidance of the UK's Institute of Air Quality Management (IAQM) for construction dust, detailed assessment relating to dust generation is required where there is a 'human

receptor' within 350m of the boundary of the site. In the case of this Project and with respect to the screening criteria above, the closest receptor is HR-1 (farming area) located 1km from the eastern Project boundary which is outside the direct Aol of dust emissions. As such, the potential for impacts relating to dust emissions as a result of site preparation and earthworks activities upon the surrounding receptors is unlikely. The main impact would be on construction workers and the accommodation facilities if they are within the 350m Aol.

DUST EMISSIONS FROM MOVEMENT OF VEHICLES

In addition to vehicle movements on unpaved surfaces, dust generation from truck movements and particulate dispersion from uncovered truckloads would only occur where mitigation measures are not effectively implemented at the site, or by contractors bringing materials to the site.

Uncontained and/or un-sheeted trucks may be subject to losses of material where the containment is not effective (e.g. spills), or where wind or other air turbulence may disturb the contents and result in dispersion of materials. Such impacts have the potential to degrade local air quality in the immediate area of such movements.

In accordance with the UK's IAQM Guidance on the Assessment of Dust from Demolition and Construction, detailed assessment of vehicle movements should only be required where 'human' receptors are located within 50m of the route used by construction vehicles on public roads, up to 500m from the project site entrance. There are no residential and commercial receptors within 50m of the route that will be used by construction vehicles or at 500m from the Project site and as a result the potential for impacts on receptors as a result of dust generation or particulate emissions due to increased vehicle movement on Project routes is considered unlikely.

Considering the location of the receptors from the Project site, and the transient and short-term nature of impacts, magnitude of potential impacts from dust are assessed to be negligible.

GASEOUS EMISSIONS

Exhaust emissions from construction equipment and plants typically include NO_x, carbon monoxide CO, sulfur dioxide SO₂, VOC, and PM. All these pollutants have a diversity of potential adverse health impacts ranging from mild headache to more serious illnesses such as cancer, particularly when exposure is chronic. The quantity of gaseous emissions from the construction equipment in addition to their numbers, will also depend on the number hours of operation and efficiency. As per the design manual for roads and bridges (DMRB), increase concentration of gaseous pollutants is distinguishable from background within a of 200m from source. Considering the location of the receptors from the Project site, and the transient and short-term nature of impacts, magnitude of potential impacts from gaseous emissions are assessed to be negligible.

ODOUR EMISSIONS

Temporary accommodation and sanitary facilities will be provided during construction. Odour related issues as a result of release of malodorous gases such as H₂S could arise as a result of improper waste management practices such as accumulation of biodegradable wastes. Sewage generated from temporary site sanitary facilities such as toilets and holding tanks can cause odour nuisance if not properly managed.

Odours emitted from sewage storage and handling comprise a range of different chemical compounds, though H₂S is often used as an 'indicator' or proxy for the often-complex odour mixture. Whilst exposure to odours can give rise to nuisance, particularly where human receptors may expect a high degree of amenity, this seldom represents a concern for physical health effects.

Any potential odour nuisance impacts associated with the temporary on-site storage of sewage in tanks, on-site treatment / pre-treatment (if applicable) and the transfer to bulk road tankers for transportation for off-site disposal / treatment are anticipated to be limited to 100m from the source.

Considering the absence of residential receptors within 100m of the Project site who may be adversely affected from potential odour related nuisance, magnitude of such impacts has been assessed as negligible.

EMISSION OF VOCs

Small quantity of fuels, paints, solvents and other volatile substances are likely to be required during the construction phase, which will be stored in secure areas within the construction laydown areas. If not adequately contained, such substances have the potential to result in the dispersion of volatile emissions to the immediate air shed. Given that the storage of such volatile substances will be in small quantities, any potential impacts will be temporary and limited to the immediate surrounding area, likely to be within the Project site or in close proximity to the construction boundaries. Magnitude of potential impacts will be negligible.

Table 6-6 Construction Phase - Air Quality Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Dust emissions as a result of site preparation and excavation works and movement of vehicles on unpaved surfaces	Minor Adverse	Workers	Medium	Minor	- Dust generating activities (excavation, etc.) and moving of uncovered waste/materials within the site should be undertaken during periods of low winds (e.g. <15 km/h is recommended as a threshold when a review of works is conducted). - Vehicle speeds on all non-public site access and internal site roads will be restricted to 30km/h. - Where sand and other dusty materials are transported to the site, trucks will not be overloaded and will be appropriately covered / sheeted to avoid losses en-route. - Cement and other fine powders will be sealed or covered after use, stored and transported in enclosed or banded containers.	Minor
	Negligible Adverse	Small Village in the North side of the Project site	High	Minor	- Dusty material stockpiles (i.e. any fine sands and powders) dust generating activities (e.g. stone cutting) are to be located away from the site boundaries and be contained or covered with suitable netting to avoid dust dispersion during storage or use. - Where paved routes are not available vehicles routes will be clearly demarcated and appropriate signage displayed around the site. - Compact unpaved site roads in order to reduce dust generation and wet down key access roads if necessary. - The provision of a wheel-washing facilities or high-pressure hose to ensure all vehicles leaving the site are in a satisfactory state of cleanliness.	Negligible
	Negligible Adverse	Farms and herders in the area	High	Minor	- No burning of wastes will be allowed onsite. - Erect worker shelter on site for protection in the event of a major dust event. - Provide project workers with full PPE kit including dust masks. - If possible, locate the accommodation areas outside the dust emissions Aol (i.e., >350m) away from the construction activities. - Notice will be provided to the sensitive receptors near the site (i.e., any herder is the Project vicinity) as early as possible (minimum one-week notice) if there will be activities that might generate a lot of dust. - Communicate the grievance mechanism to allow sharing any complaints or concerns regarding air emissions during the construction phase.	Negligible

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Gaseous emissions from vehicle and plant exhaust	Minor Adverse	Workers	Medium	Minor	- Construction roads in the sites will be designated and made clear to the drivers with signage for directions and speed limits placed all along the roads. - Internal roads inside the project site will be compacted as it reduces vehicular power consumption. - Unnecessary usage of vehicles, plant and equipment will be minimised – No unnecessary idling. - Where practical, efficiently manage deliveries of equipment to the site to reduce the number of trips. - Exhaust emissions from Project generators and vehicles will be subject to acceptance checks for authorisation of use on site. This includes a pre-requisite requirement of site vehicles to ensure no black smoke before entering site and that any identified machinery or vehicles with black smoke will require maintenance and re-assessment before it is returned.	Negligible
	Negligible Adverse	Farms and herders in the area	High	Minor	- Lorries and truck engines will be turned off while waiting on site to minimize gaseous emissions. Air-conditioned or heated shelters should be provided for drivers in designated waiting, loading and unloading areas to prevent drivers waiting in vehicles. - Regular maintenance of vehicles and equipment. - Emissions from machinery and equipment will be free from visible black smoke.	Negligible
VOC Emissions	Negligible Adverse	Workers	Medium	Negligible	- Hazardous materials stored and used on site with potential gas emissions (e.g. Volatile Organic Compounds) will be located in well-ventilated, but secure low-risk areas, away from major transport routes and away from the site boundary (where possible). - Volatile fuels and chemicals (including hazardous wastes) will be stored in sealed containers. On site storage of large quantities of volatile fuels will be avoided, equally prolonged exposure to direct sun and heat will be avoided. - Fires and material burning will not be allowed on the Project site. - Chemical storage areas will be purpose built and well maintained. A data log of all chemicals with MSDSs will be provided at the storage facility within easy access.	Negligible
Odour	Negligible Adverse	Workers	Medium	Negligible	- Adequate and sufficient sanitary facilities for site workers will be provided. - Effective cleaning and maintenance of toilets to be undertaken to avoid odour dispersion and cleaning records/inspection sheets displayed in the toilets. - All septic tanks must be sealed and fully functioning. - Septic tanks must be operated and maintained according to manufacturer recommendations. - Sanitary waste will be removed from site by licensed contractors and disposed in wastewater treatment facilities approved by the applicable regulator.	Negligible

6.3.2.2 Operation Phase Impacts and Mitigation

The identification of aspects associated with the operation of the Project and the receptors that may be potentially affected has been used to identify potential impacts associated with air emissions. These are presented below. **Note:** Details of the overall greenhouse gas (GHG) emissions during construction are provided in chapter 6.3.3.1 of this ESIA.

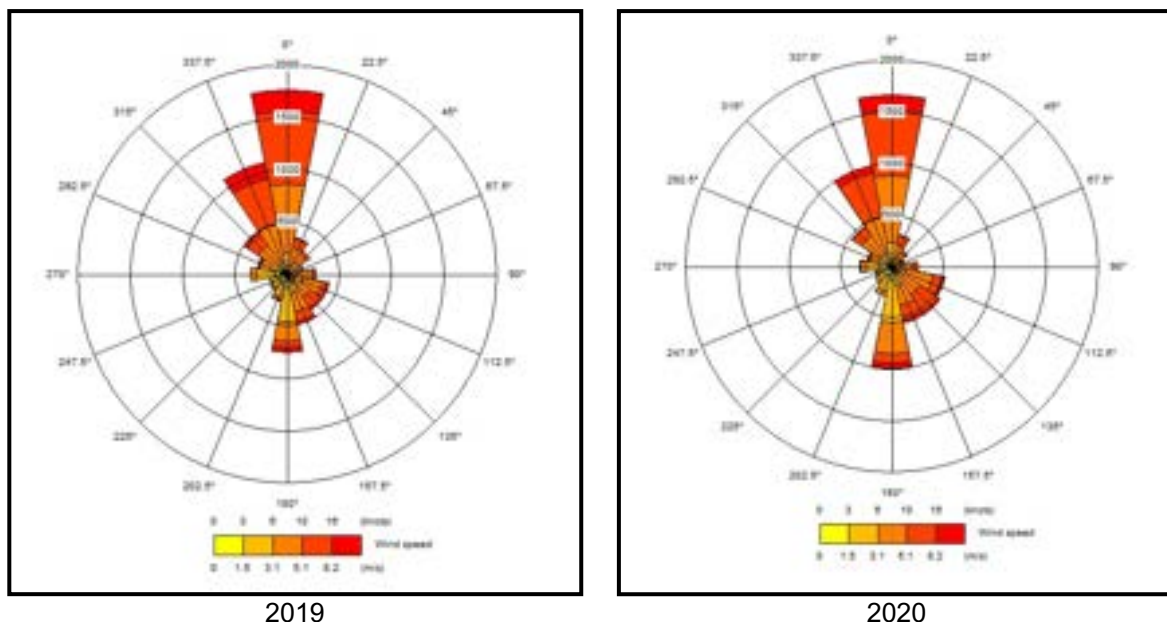
AIR EMISSIONS FROM THE PLANT OPERATION

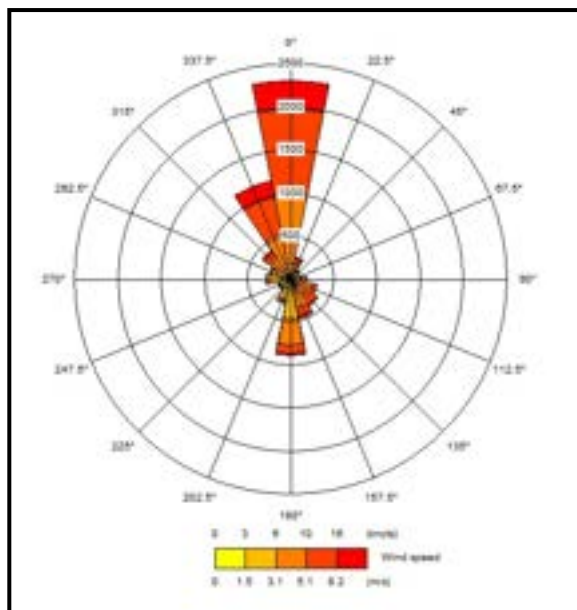
Operational activities associated with the Project will result in the emissions of gaseous pollutants, primarily from the operation of the CCGT power blocks. These emissions will occur under both simple and combined cycle operating modes using natural gas fuel. However, it is noted that once the plant is fully operational the primary mode of operation will be combined cycle.

Modelling Methodology

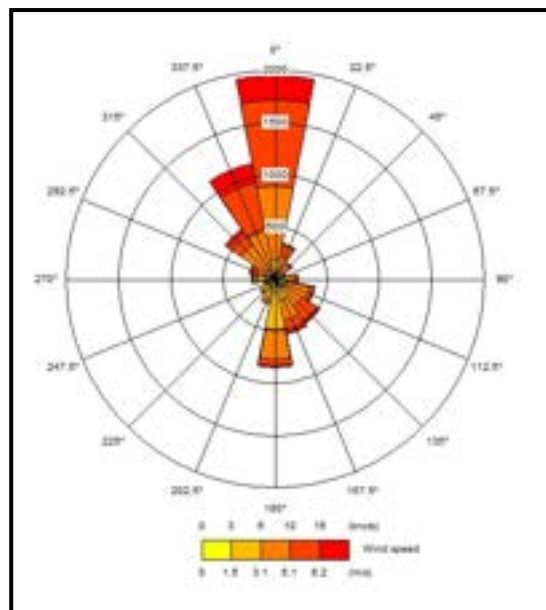
A detailed air quality dispersion modelling assessment has been undertaken to determine impacts associated with the proposed Nairyah IPP Project. Dispersion modelling has been carried out using the United States (US) Environmental Protection Agency (EPA) Breeze AERMOD, a new generation dispersion model that incorporates the latest understanding of the atmospheric boundary layer. Five years of meteorological data from Kuwait International Airport (2019 to 2023) and terrain data for the local area were also utilised for the modelling. Wind roses for each of these years are presented in following figure; these show that the predominant wind direction is from the north and northeast. The full modelling report is included in **Appendix E**.

Figure 6-1 Wind from Kuwait Airport (2019-2023)

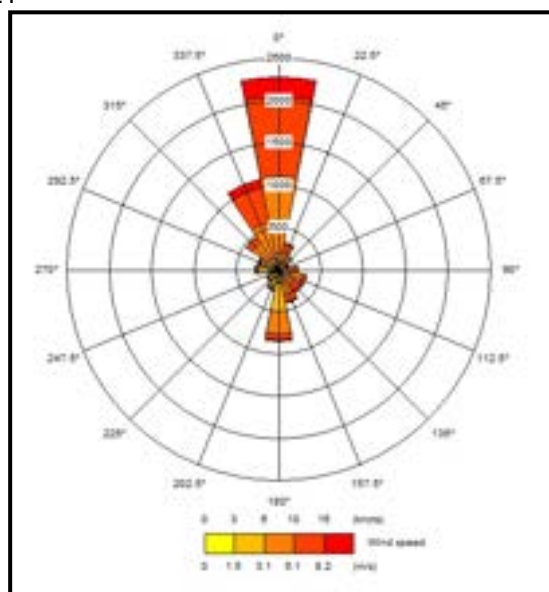




2021



2022



2023

The following pollutants have been considered in the assessment:

- Nitrogen dioxide (NO₂);
- Carbon monoxide (CO);
- Sulphur dioxide (SO₂) and
- Ammonia (NH₃)¹⁷.

The predicted results shown in the following sections for the modelled air pollutants and scenarios are evaluated at identified sensitive receptors and may not necessarily be the maximum ground level concentrations. Predicted concentrations have been compared with relevant standards and guidelines

¹⁷ Ammonia from the NO_x abatement system

incorporated into applicable KSA law and also the WBG/IFC EHS Guidelines that reference the WHO ambient standards.

The air quality dispersion modelling assessment has been undertaken to determine impacts associated with the proposed CCGT facilities which include the impacts of the Nairyah 1 emissions and also the cumulative impact of emissions from both Nairyah 1 and Nairyah 2. The assessment covered the receptors identified during the ESIA. The assessment for Nairyah 1 is included here while the cumulative impacts are summarised in section 6.7 and detailed in **Appendix E**.

The primary fuel for the CCGT plants will be natural gas, with diesel as a back-up (emergency use only). The assessment has considered three operational scenarios, as shown in following table.

Table 6-7 Operational Scenarios

	Open Cycle		Combined Cycle
Nairyah 1			
Fuel	Gas	Diesel	Gas
Number of GT's	3	3	3
Annual hours of operation	2880	120	3400
Nairyah 2			
Fuel	Gas	Diesel	Gas
Number of GT's	3	3	3
Annual hours of operation	2880	120	3400

Emissions to air in combined-cycle mode will be via three 60m stacks, with emissions via 45m bypass stacks during open-cycle operation.

Two potential gas engines manufacturers have also been considered, Mitsubishi Heavy Industries (MHI) and General Electric (GE). Selective Catalytic Reduction (SCR) will be employed to ensure compliance with the emissions standards for NO_x, resulting in an NH₃ emission of 2 ppm.

Emergency diesel-fired operation will only occur for a maximum of 120 hours per annum and therefore the impact on local air quality has been assessed for short-term averaging periods only (≤ 24 -hours). Long-term mass emission rates for the gas-fired operational scenarios have been calculated by adjusting for the number of operational hours per year. Due to the limited operating hours, the impacts associated with emergency back-up diesel operation are presented for short-term averaging periods only.

Modelling Results

The modelling results are summarised below, and the detailed results are provided in **Appendix E**. The predicted modelling results present the worst-case meteorological conditions recorded during the 5 years of data. As per the IFC Thermal Power Plants EHS Guidelines, emissions should not result in pollutant concentrations that reach or exceed relevant ambient quality guidelines and standards and emissions from a single Project should not contribute more than 25% of the applicable ambient air quality standards to allow additional, future sustainable development in the same airshed.

NO₂ Modelling Results

The predicted annual mean, 24-hour mean (99th percentile) and 1 hour mean NO₂ concentrations are presented in following tables and examples of dispersion illustrated in following figures.

Table 6-8 Predicted Annual Mean NO₂ Concentrations (µg/m³)

Operational Mode	Open Cycle				Combined Cycle	
Fuel	Gas		Diesel		Gas	
Manufacturer	MHI	GE	MHI	GE	MHI	GE
Mixed-Use	0.027	0.028	-	-	0.043	0.043
Agricultural	0.013	0.014	-	-	0.019	0.019
Agricultural	0.031	0.032	-	-	0.064	0.064
Agricultural	0.10	0.11	-	-	0.22	0.22
Agricultural	0.039	0.039	-	-	0.099	0.099
Agricultural	0.058	0.058	-	-	0.12	0.12
Maximum	0.10	0.11	-	-	0.22	0.22
Maximum (% AQS)	1.0%	1.1%	-	-	2.2%	2.2%
Maximum + Baseline	2.6	2.6	-	-	2.7	2.7
AQS (µg/m³)	10					

Table 6-9 Predicted 99th Percentile of 24-Hour Mean NO₂ Concentrations (µg/m³)

Operational Mode	Open Cycle				Combined Cycle	
Fuel	Gas		Diesel		Gas	
Manufacturer	MHI	GE	MHI	GE	MHI	GE
Mixed-Use	0.31	0.30	1.1	0.57	0.45	0.45
Agricultural	0.13	0.14	0.43	0.24	0.21	0.21
Agricultural	0.43	0.44	1.4	0.79	0.60	0.60
Agricultural	0.71	0.72	2.3	1.3	1.4	1.4
Agricultural	0.78	0.79	2.5	1.4	1.1	1.1
Agricultural	0.54	0.55	1.8	0.99	0.93	0.93
Maximum	0.78	0.79	2.5	1.4	1.4	1.4
Maximum (% AQS)	3.1%	3.2%	10.1%	5.7%	5.4%	5.4%
Maximum + Baseline	4.6	4.6	6.3	5.2	5.2	5.2
AQS (µg/m³)	25					

Table 6-10 Predicted 1-Hour Mean NO₂ Concentrations (µg/m³)

Operational Mode	Open Cycle				Combined Cycle	
Fuel	Gas		Diesel		Gas	
Manufacturer	MHI	GE	MHI	GE	MHI	GE
Mixed-Use	3.4	3.6	10.6	6.2	2.9	2.9
Agricultural	2.1	2.3	6.3	3.8	2.9	2.9
Agricultural	3.4	3.6	10.8	6.2	5.7	5.7
Agricultural	4.0	4.0	13.1	7.4	4.1	4.1
Agricultural	4.4	4.6	13.9	8.0	8.4	8.4
Agricultural	4.1	4.3	12.9	7.4	6.8	6.7
Maximum	4.4	4.6	13.9	8.0	8.4	8.4
Maximum (% AQS)	2.2%	2.3%	6.9%	4.0%	4.2%	4.2%
Maximum + Baseline	11.8	12.0	21.3	15.4	15.8	15.8
AQS (µg/m³)	200					

Figure 6-2 Predicted Annual Mean NO₂ Concentrations – MHI Gas-Fired Combined Cycle (µg/m³)

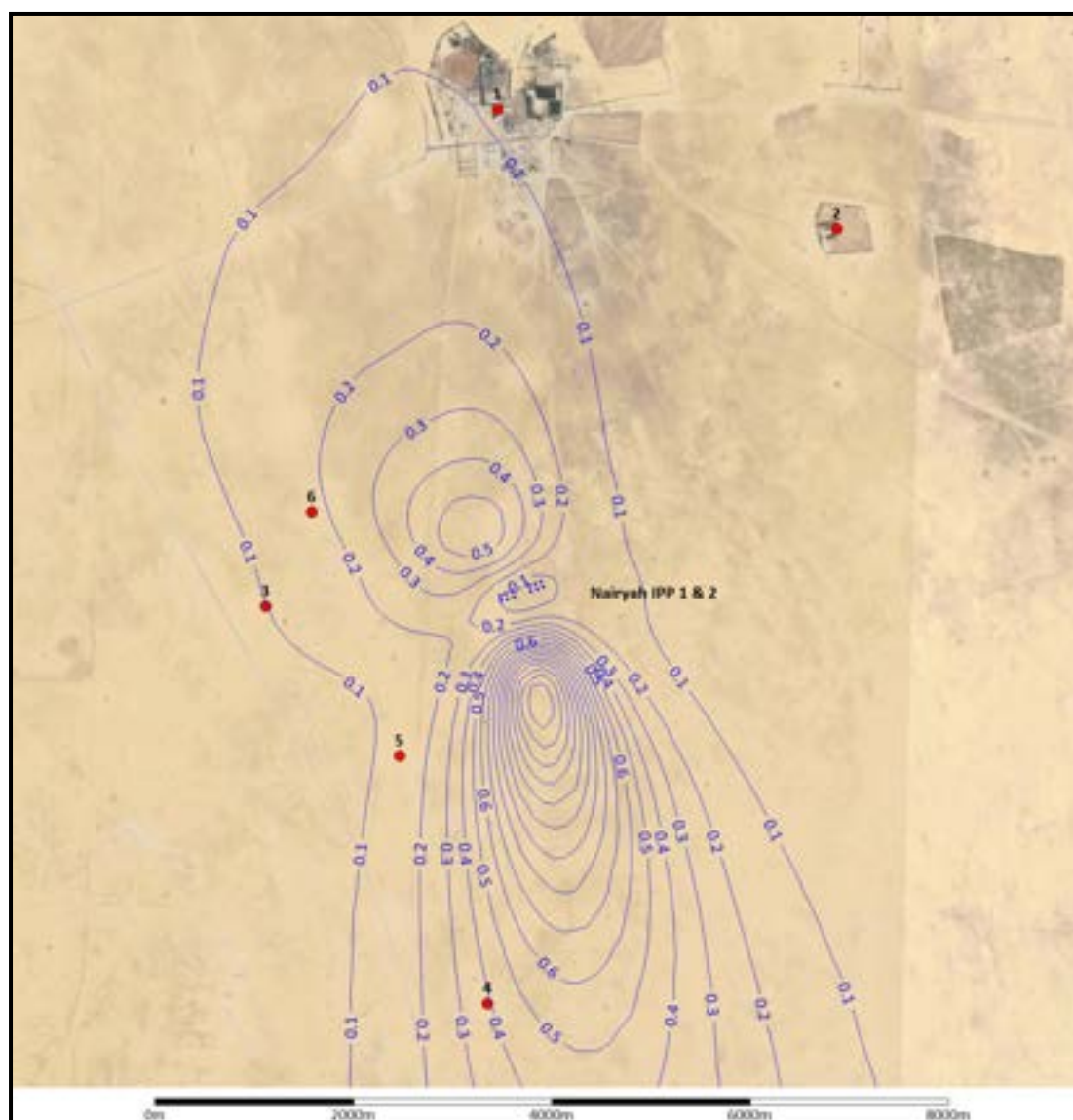


Figure 6-3 Predicted 99th Percentile of 24-Hour Mean NO₂ Process Concentrations – MHI Gas-Fired Combined Cycle ($\mu\text{g}/\text{m}^3$)

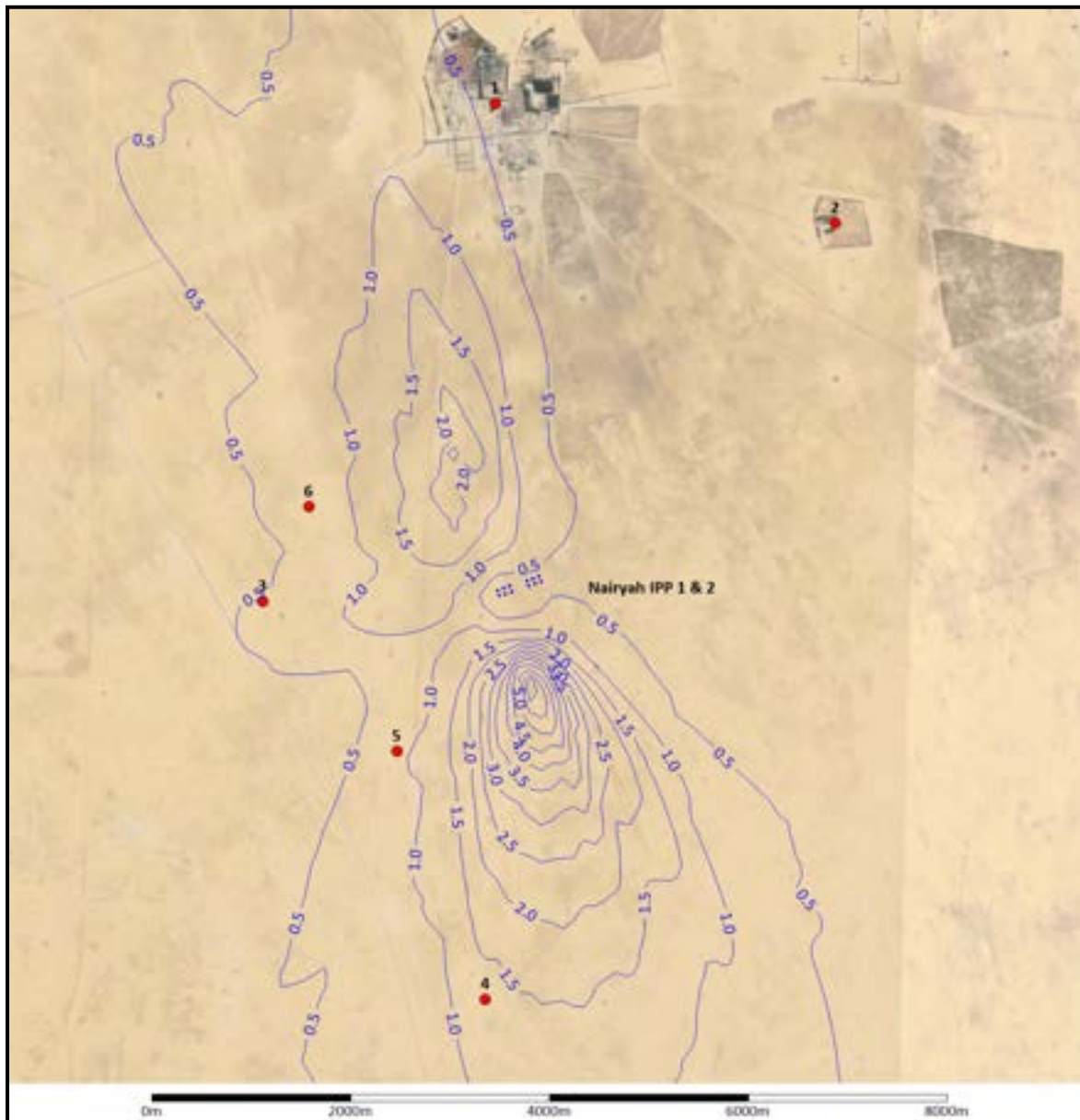
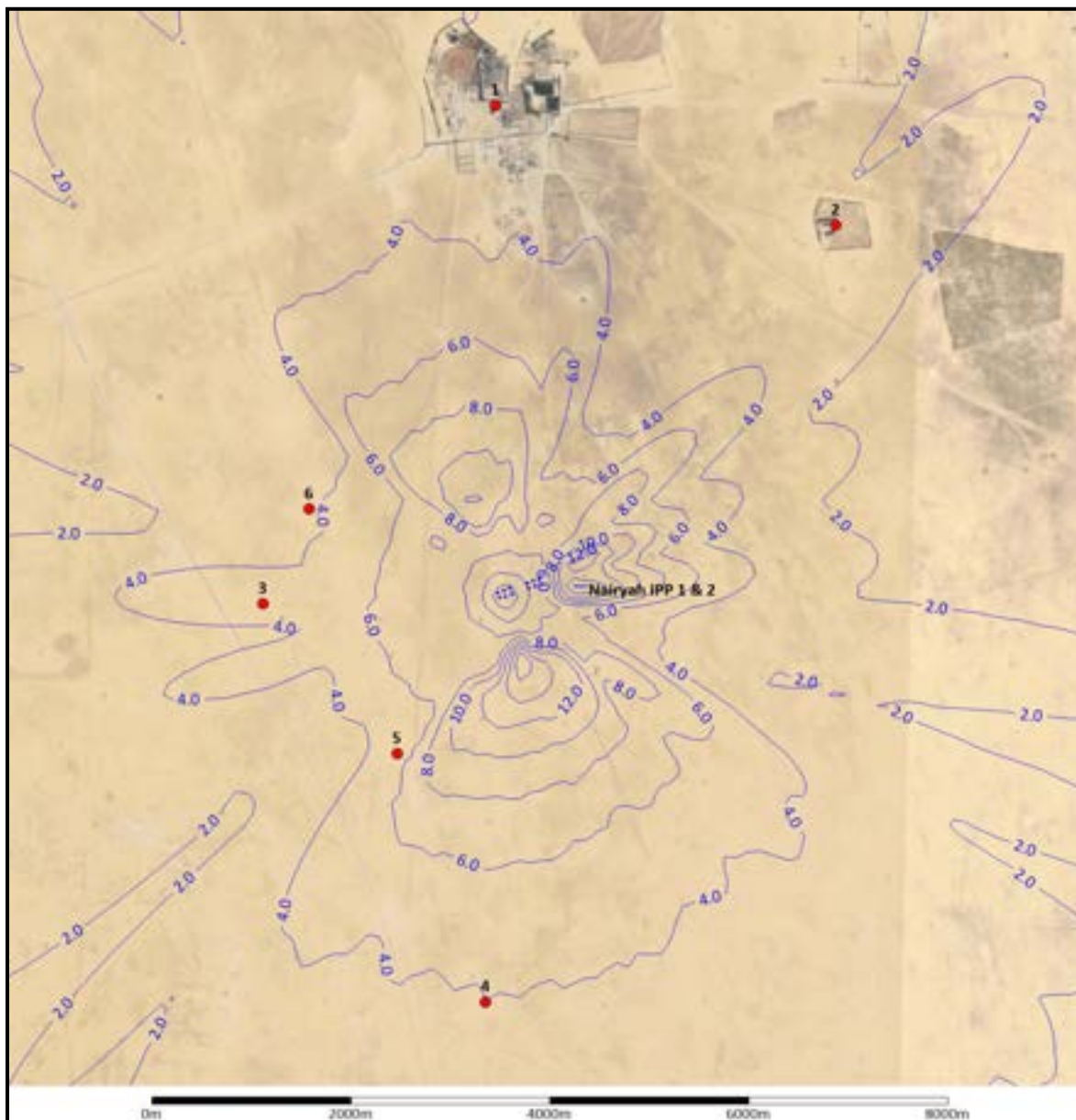


Figure 6-4 Predicted 1-Hour Mean NO₂ Process Concentrations – MHI Gas-Fired Combined Cycle ($\mu\text{g}/\text{m}^3$)



The maximum predicted annual mean concentration at a receptor location is 2.2% of the most stringent AQS, the WHO guideline value of 10 $\mu\text{g}/\text{m}^3$. Since the area around the site is largely undeveloped, the existing background concentrations are expected to be low, and the risk of an exceedance is considered to be negligible.

The maximum predicted 24-hour mean (99th percentile) and 1-hour mean concentrations are less than 10% of the relevant AQS's and therefore insignificant for all scenarios.

The annual, 24-hour (99th percentile) and 1-hour mean NO₂ concentrations for MHI combined-cycle operation are presented as contour plots in Figures 6-2, 6-3 and 6-4. It should be noted that the contour plots have been produced for the year of meteorological data that produced the maximum annual mean

impacts (2021) and therefore the locations of maximum short-term impact may not coincide with the data presented in Tables 6-9 and 6-10.

Carbon Monoxide (CO) Modelling Results

The 24-hour mean (99th percentile), 8-hour mean, 1-hour mean and 15-minute mean CO concentrations are presented in Tables 6-11, 6-12, 6-13 and 6-14 respectively. The predicted impact of the proposed IPP's is less than 10% of the AQS's at all locations and is therefore insignificant.

Table 6-11 Predicted 99th Percentile of 24-Hour Mean CO Concentrations ($\mu\text{g}/\text{m}^3$)

Operational Mode	Open Cycle				Combined Cycle	
Fuel	Gas		Diesel		Gas	
Manufacturer	MHI	GE	MHI	GE	MHI	GE
Mixed-Use	0.86	0.19	0.99	0.60	3.5	0.79
Agricultural	0.37	0.090	0.40	0.25	1.6	0.36
Agricultural	1.2	0.28	1.3	0.82	4.6	1.0
Agricultural	2.0	0.45	2.1	1.3	10.5	2.3
Agricultural	2.2	0.50	2.4	1.5	8.3	1.9
Agricultural	1.5	0.34	1.7	1.0	7.2	1.6
Maximum	2.2	0.50	2.4	1.5	10.5	2.3
Maximum (% AQS)	0.054%	0.012%	0.059%	0.037%	0.26%	0.059%
Maximum + Baseline	240	239	240	240	249	240
AQS ($\mu\text{g}/\text{m}^3$)	4,000					

Table 6-12 Predicted 8-Hour Mean CO Concentrations ($\mu\text{g}/\text{m}^3$)

Operational Mode	Open Cycle				Combined Cycle	
Fuel	Gas		Diesel		Gas	
Manufacturer	MHI	GE	MHI	GE	MHI	GE
Mixed-Use	3.4	0.74	3.9	2.3	10.5	2.3
Agricultural	1.7	0.41	1.7	1.1	5.4	1.2
Agricultural	4.2	0.97	4.5	2.8	14.4	3.2
Agricultural	5.3	1.3	5.6	3.6	22.7	5.1
Agricultural	5.8	1.3	6.4	4.0	27.9	6.3
Agricultural	5.3	1.2	5.8	3.6	18.8	4.2
Maximum	5.8	1.3	6.4	4.0	27.9	6.3
Maximum (% AQS)	0.058%	0.013%	0.064%	0.040%	0.28%	0.063%
Maximum + Baseline	296	291	296	294	318	296
AQS ($\mu\text{g}/\text{m}^3$)	10,000					

Table 6-13 Predicted 1-Hour Mean CO Concentrations ($\mu\text{g}/\text{m}^3$)

Operational Mode	Open Cycle				Combined Cycle	
Fuel	Gas		Diesel		Gas	
Manufacturer	MHI	GE	MHI	GE	MHI	GE
Mixed-Use	9.4	2.2	9.8	6.4	22.1	5.0
Agricultural	5.8	1.4	5.9	3.9	22.2	5.0
Agricultural	9.5	2.3	10.0	6.5	44.2	10.0
Agricultural	11.2	2.5	12.2	7.6	31.5	7.1
Agricultural	12.2	2.9	12.9	8.3	65.2	14.6
Agricultural	11.3	2.7	12.0	7.7	52.2	11.7
Maximum	12.2	2.9	12.9	8.3	65.2	14.6
Maximum (% AQS)	0.035%	0.0082%	0.037%	0.024%	0.19%	0.049%
Maximum + Baseline	357	348	358	353	410	360
AQS ($\mu\text{g}/\text{m}^3$)	35,000					

Table 6-14 Predicted 15-Minute Mean CO Concentrations ($\mu\text{g}/\text{m}^3$)

Operational Mode	Open Cycle				Combined Cycle	
Fuel	Gas		Diesel		Gas	
Manufacturer	MHI	GE	MHI	GE	MHI	GE
Mixed-Use	12.6	3.0	13.1	8.5	29.6	6.7
Agricultural	7.7	1.9	7.9	5.2	29.7	6.7
Agricultural	12.8	3.0	13.5	8.7	59.2	13.4
Agricultural	15.0	3.4	16.3	10.2	42.2	9.5
Agricultural	16.3	3.8	17.2	11.1	87.3	19.6
Agricultural	15.2	3.6	16.0	10.3	70.0	15.7
Maximum	16.3	3.8	17.2	11.1	87.3	19.6
Maximum (% AQS)	0.016%	0.0038%	0.017%	0.011%	0.087%	0.020%
AQS ($\mu\text{g}/\text{m}^3$)	100,000					

Ammonia (NH_3) Modelling Results

The annual mean and 1-hour mean NH_3 concentrations for combined-cycle operation are presented in the following tables. The predicted long and short-term impacts are less than 1% and 10% of the AQS's respectively and are therefore insignificant.

Table 6-15 Predicted Annual Mean NH_3 Concentrations ($\mu\text{g}/\text{m}^3$)

Operational Mode	Combined Cycle	
Fuel	Gas	
Manufacturer	MHI	GE
Mixed-Use	0.0051	0.0051
Agricultural	0.0022	0.0022
Agricultural	0.0076	0.0075
Agricultural	0.026	0.026
Agricultural	0.012	0.012
Agricultural	0.014	0.014

Maximum	0.026	0.026
Maximum (% AQS)	0.028%	0.028%
AQS (µg/m³)	92	

Table 6-16 Predicted 1-Hour Mean NH₃ Concentrations (µg/m³)

Operational Mode	Combined Cycle	
Fuel	Gas	
Manufacturer	MHI	GE
Mixed-Use	0.67	0.67
Agricultural	0.67	0.67
Agricultural	1.3	1.3
Agricultural	0.96	0.96
Agricultural	2.0	2.0
Agricultural	1.6	1.6
Maximum	2.0	2.0
Maximum (% AQS)	1.1%	1.1%
AQS (µg/m³)	180	

Sulphur Dioxide (SO₂) Modelling Results

The predicted 24-hour mean (99th percentile), 1-hour mean (99.7th percentile) and 10-minute mean SO₂ concentrations for open-cycle diesel operation are presented in the following tables below. The predicted impact of the proposed IPP's is less than 10% of the AQS's at all locations and is therefore insignificant.

Table 6-17 Predicted 99th Percentile of 24-Hour Mean SO₂ Concentrations (µg/m³)

Operational Mode	Open-Cycle	
Fuel	Diesel	
Manufacturer	MHI	GE
Mixed-Use	0.90	0.87
Agricultural	0.36	0.36
Agricultural	1.2	1.2
Agricultural	1.9	2.0
Agricultural	2.1	2.1
Agricultural	1.5	1.5
Maximum	2.1	2.1
Maximum (% AQS)	5.3%	5.4%
Maximum + Baseline	11.5	11.5
AQS (µg/m³)	40	

Table 6-18 Predicted 99.7th Percentile of 1-Hour Mean SO₂ Concentrations (µg/m³)

Operational Mode	Open-Cycle	
Fuel	Diesel	
Manufacturer	MHI	GE
Mixed-Use	2.2	2.2
Agricultural	1.3	1.3
Agricultural	3.6	3.6
Agricultural	4.1	4.2
Agricultural	4.6	4.4
Agricultural	5.0	5.0
Maximum	5.0	5.0
Maximum (% AQS)	1.1%	1.1%
Maximum + Baseline	20.6	20.6
AQS ($\mu\text{g}/\text{m}^3$)	441	

Table 6-19 Predicted 10-Minute Mean SO₂ Concentrations ($\mu\text{g}/\text{m}^3$)

Operational Mode	Open-Cycle	
Fuel	Diesel	
Manufacturer	MHI	GE
Mixed-Use	11.9	12.5
Agricultural	7.1	7.6
Agricultural	12.2	12.6
Agricultural	14.9	14.9
Agricultural	15.7	16.1
Agricultural	14.6	15.0
Maximum	15.7	16.1
Maximum (% AQS)	3.1%	3.2%
AQS ($\mu\text{g}/\text{m}^3$)	500	

Modelling Results Conclusion for Nairyah 1 IPP

Continuous monitoring of ambient NO₂, CO and SO₂ concentrations was undertaken at the Project site for a period of 10 days in December 2024. The data show that existing concentrations in the area are well below the relevant air quality standards.

For operation of Nairyah 1 IPP alone, the predicted CO, NH₃ and SO₂ impacts at sensitive receptor locations are insignificant for all modelled scenarios. The maximum predicted annual mean ground-level NO₂ concentration at a receptor location is 2.2% of the WHO guideline value, however the area is largely undeveloped and existing baseline pollutant concentrations are expected to be low. On this basis, the risk of an annual mean exceedance is considered negligible.

For diesel operation with an MHI engine, the 24-hour mean (99th percentile) NO₂ impacts are just over 10% of the air quality standard, however the modelling assumes continuous back-up operation which accounts for the full range of meteorological conditions that occur over the course of a year. Since back-up mode will occur for a maximum of 120 hours per annum, this provides an excessively conservative prediction of short-term impacts and assumes that the back-up operation will be co-incident with the

least favourable meteorological conditions for the dispersion of emissions. In reality, the impact on short-term NO₂ concentrations is unlikely to be significant.

OPERATIONAL VEHICLE EMISSIONS

Operation of the Project will introduce a small number of commuter vehicles and delivery/removal vehicles along the local roads. The expected number of vehicles and their type are not available at the time of preparing this ESIA but are likely to be limited. Emissions from these vehicles will not result in discernible impacts on the local air quality and as such detailed assessment has not been conducted.

Table 6-20 Operation Phase - Air Quality Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Operational emissions of gaseous air pollutants	Negligible Adverse	Human receptors in the area	High	Minor	- During commissioning, the stack emissions will be tested to ensure that the control systems are operating correctly and that emission values comply with applicable national and IFC EHS standards/guidelines. - During operation there will be continuous monitoring of stack emissions, by CEMS systems, to ensure that the plant is operated efficiently, and compliant conditions are maintained through appropriate process controls. - Regular scheduled maintenance activities will be undertaken to ensure that equipment is operating in its most effective manner, to reduce emissions. - A grievance mechanism will be established to allow local communities to make complaints relating to Project air emissions nuisance.	Minor
Emissions from backup diesel generators	Negligible Adverse	Human receptors in the area	High	Minor	- Backup diesel generator will be used only during emergency only. - Low Sulphur diesel fuel will be used. - Implement a grievance mechanism and address any complaints received in a timely manner including implementing applicable corrective actions.	Negligible
Emissions from operational vehicles	Negligible Adverse	Human receptors in the area	High	Minor	- Limit unnecessary usage of vehicles and avoid idling. - Emissions from vehicles will be free from significant black smoke - remedial measures shall be taken if this is observed. - Implement a regular maintenance program of vehicles and keep documentary evidence.	Negligible

6.3.3 Climate Change Impacts & Adaptation

6.3.3.1 Construction Phase Impacts and Mitigation

GHG EMISSIONS

The stationary combustion sources used during the construction phase of the Project will primarily relate to temporary diesel generators. The construction phase of the Project will also necessitate an amount of mobile equipment/plant and vehicles to facilitate works. Equipment such as excavators, cranes, and other vehicles will be ample on the site and are expected to be used in most construction processes.

The estimated quantity of fuel required during the construction phase is 300,000 L/month. Using the Greenhouse Gas Protocol calculation tool for GHG Emissions from Stationary Combustion (World Resources Institute, 2015), the GHG emissions during construction were calculated and are summarised in Table 6-21 below.

The monthly GHG emissions, during the Project construction phase is estimated to be 805.58 tonnes of carbon dioxide equivalent (tCO₂e). The annual estimate of GHG emissions during construction is 9,666.97 tCO₂e. This will be less much less than the IFC threshold value of significance of 25,000 tCO₂e per year. The construction period is expected to be over a period of 40 months, totalling around 32,223.23 tCO₂e during the Construction period.

Table 6-21 Construction Phase GHG Emissions

Fuel Type	Volume of Fuel (L/month)	GHG Emissions (tonnes)			Total GHG (tCO ₂ e)
		CO ₂	CH ₄	N ₂ O	
Liquid Fossil (Diesel)	300,000	802.95	3.25e ⁻²	6.50e ⁻³	805.58
Monthly GHG emissions from fossil fuels (tCO₂e)					805.58
Annual GHG emissions from fossil fuels (tCO₂e)					9,666.97
Construction Period GHG emissions from fossil fuels (tCO₂e)					32,223.23

Scope 2 emissions (electricity use) are not relevant during construction as the site is not connected to the power grid supply.

GHG emissions are also expected for the construction of the associated facilities construction activities including access road, FCF, ESF, and SWCF, however, these could not be assessed quantitatively.

VULNERABILITY OF THE PROJECT TO CLIMATE CHANGE – PHYSICAL RISKS

The construction of the Project and the associated facilities impacts expected due to the climate conditions are discussed below.

Increased Temperatures and Extreme Heat

Current trends in global warming are resulting in temperature increases worldwide, which are also expected to impact KSA. Historical meteorological records between 1991 – 2016 indicate that the mean annual temperature for 115 years was 24.7°C (WBG, 2021). According to KSA First National Communication, general warming was reported all over the country since 1950 with a minimum of about 0.15°C of warming in Tabuk, Makkah and Al Ahssa to a maximum of about 0.75°C in Khamis Mushait, Wadi Al Dawasser and Yanbu with an average of 0.40 °C.

Heatwaves can cause heat exhaustion, heatstroke, and dehydration, especially for outdoor workers. Increased temperatures or prolonged periods of extreme heat can also affect worker productivity and safety as workers may experience reduced concentration, fatigue, and slower reaction times, leading to an increased risk of accidents and injuries. These have been assessed under the occupational health and safety (OHS) section 6.3.14 of this report and management measures defined.

Dust Storms

Dust storms can impact the construction workers that are exposed to such harsh weather conditions in the absence of shelter or proper mitigation. These have been assessed under the occupational health and safety (OHS) section 6.3.14 of this report and management measures defined.

Flash Flood Risk

KSA's mean annual precipitation is expected to increase by 7% by 2050 (WBG, 2021). Climate change is predicted to increase both the frequency and the intensity of rainfall which will result in increased run-off flows. Intense rainfall that may potentially result is floods that can create physical hazards at construction sites, such as submerged debris, fast-moving drainage, and unstable ground which could also impact construction schedules. Workers may face an increased risk of slips, trips, falls, and other accidents, leading to injuries.

A Project specific hydrology and flood risk study was carried out for the Project (Worley, 2024) taking into account possible impact of climate change on the rainfall event in the Project area. A 10% increase was applied to the rainfall estimates to account for increased rainfall intensity due to climate change. Modelling results indicate that flow is impeded by undulating terrain and collects in depressions located in both the upstream catchments and within the site. As such, there are no continuous external wadis/flow paths to the site. Within the site, results indicate flood depths reach 0.5 m and flood velocities reach 0.4 m/s. While no major impacts are identified from flooding, certain design mitigation measures are recommended to ensure there are no risks of flooding which are discussed in section 6.3.6 and detailed in **Appendix F**.

Table 6-22 Construction Phase – Climate Change Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Increase in GHGs emissions from on-site power generators, heavy machinery and vehicles	Minor Adverse	Global atmosphere	Medium	Minor	- Implement the gaseous air emissions mitigation listed in Table 6-6. - Manage energy and fuel demand through use of energy efficient equipment, monitoring fuel and electricity consumption and training the workforce on possible consumption reduction practices.	Negligible
Vulnerability of the Project to climate change	Moderate Adverse	Project	Low	Minor	- Implement the hydrology mitigation measures listed in section 6.3.6.1. - Provide workers with appropriate PPE and safety training related to flood risks, dust storms, high temperature etc. - Monitor weather forecasts and be prepared to suspend work if there's a high risk of flooding or extreme heat. - Implement an emergency evacuation plan and conduct regular drills. - Elevate equipment and materials above expected flood levels where possible. - Ensure that electrical systems are properly grounded and protected from water exposure. - The EPC contractor will complete a risk assessment of extreme weather events (extreme heat, dust storms etc.) on workers and implement the necessary mitigation. - Provide access to medical facilities and first-aid equipment on-site.	Negligible

6.3.3.2 Operation Phase Impacts and Mitigation

GHG EMISSIONS FROM THE PLANT OPERATION

During operation, the Plant will run on a continuous supply of natural gas. Scope 1 emissions for the Project's operational phase were quantified using the GHG Calculation Tool developed by the Greenhouse Gas Protocol with specialized workings for GHG emissions from stationary combustion sources. The following table provides an overview of GHG emissions based on the yearly fuel usage along with the carbon intensity of power generation during the operational period (25 years).

Table 6-23 Estimates of GHG Emission from the Plant Operation

Year	Period Dispatch (MWh)	Greenhouse Gas Emission (tonnes CO ₂ eq)	CO ₂ Intensity (gCO ₂ e/kWh)
IOP			
TBC	3,681,164	1,837,995	499
Operation			
Year 1	11,715,951	3,947,024	337
Year 2	11,928,403	4,024,952	337
Year 3	11,730,978	3,962,535	338
Year 4	11,544,674	3,902,497	338
Year 5	12,117,258	4,099,144	338
Year 6	12,066,235	4,084,381	338
Year 7	12,091,598	4,095,282	339
Year 8	11,644,376	3,945,497	339
Year 9	11,598,391	3,916,692	338
Year 10	12,108,868	4,088,579	338
Year 11	12,053,348	4,074,389	338
Year 12	11,883,790	4,020,155	338
Year 13	11,427,143	3,867,923	338
Year 14	12,100,172	4,098,352	339
Year 15	12,055,143	4,085,267	339
Year 16	11,720,601	3,973,497	339
Year 17	11,593,714	3,922,719	338
Year 18	12,160,750	4,099,660	337
Year 19	12,107,265	4,086,406	338
Year 20	11,806,046	3,987,721	338
Year 21	11,663,070	3,941,732	338
Year 22	12,116,102	4,097,268	338
Year 23	12,073,316	4,084,508	338

Year	Period Dispatch (MWh)	Greenhouse Gas Emission (tonnes CO ₂ eq)	CO ₂ Intensity (gCO ₂ e/kWh)
Year 24	11,850,104	4,010,517	338
Year 25	12,135,232	4,108,746	339
Total		102,363,438	

The project is estimated to produce ~4 MtCO₂/year. When this is compared to KSA's total emissions of 712Mt in 2020¹⁸, the project represents ~0.57% of the national total. When compared to the country's energy sector emissions (~562 MtCO₂e in 2020) the Project represents ~0.73% of the country's energy sector processes and product use emissions.

The annual emissions of ~4.1MtCO₂e/year significantly exceed the IFC threshold for GHG quantification (25,000tCO₂/year), for emissions that are within direct control of the facility within the study period.

The powerplant will be self-sufficient and therefore, power grid supply is not expected to be required under normal conditions, therefore, Scope 2 emissions (electricity use) is not assessed during operation. GHG emissions are not expected from the operation of the associated facilities and have therefore not been considered in the assessment.

GHG EMISSIONS FROM THE OPERATION OF BACKUP DIESEL GENERATORS

The stationary combustion emission may result from the operation of backup diesel generators in emergency cases which are considered infrequent. The estimation of operation of backup diesel generation will be done once information on quantity of fuel required received.

The estimated quantity of fuel required during the operation phase for EDG and BSDG are 1,300 kg/h and 7,400 kg/h, respectively. The emissions will depend on the actual emergency situations where the operation of the diesel generator will be required. However, for reference, the hourly GHG emissions during the operation of the backup generators were calculated using the Greenhouse Gas Protocol calculation tool for GHG Emissions from Stationary Combustion (World Resources Institute, 2015). As shown in Table 6-21 below, the GHG emissions will be insignificant considering the limited operation periods and compared to the IFC threshold value of significance of 25,000 tCO₂e per year.

Table 6-24 Estimates of GHG Emission in the Event of Backup Diesel Generators Operation

Fuel Type	Volume of Fuel (L/hour) *	GHG Emissions (tonnes)			Total GHG (tCO ₂ e)
		CO ₂	CH ₄	N ₂ O	
Liquid Fossil (Diesel) for the EDG	1,529.41	4.093	1.657e- ⁰⁴	3.315e- ⁰⁵	4.107
Liquid Fossil (Diesel) for the BSDG	8,705.88	23.301	9.434e- ⁰⁴	1.887e- ⁰⁴	23.378

*Converted from kg/h to L/h assuming a density of 0.85 kg/L for diesel

GHG EMISSIONS FROM THE OPERATION OF VEHICLES

Emissions from the operation of vehicles are also anticipated during the operational phase of the Project. Emissions are expected to be from the delivery vehicles to the Project site and those of the

¹⁸ https://www.climatewatchdata.org/countries/SAU?end_year=2020&start_year=1990

employees as well as equipment during maintenance; however, the impacts are not considered to be significant and have therefore been excluded from this assessment.

VULNERABILITY OF THE PROJECT TO CLIMATE CHANGE - PHYSICAL RISK

Future climate scenarios indicate an increase in the length of dry periods, and high aridity, rapidly depleting groundwater reserves, and projected temperature increases indicate that the frequency of dust storms and water stress is bound to increase. Greater rainfall variability may also result in prolonged droughts.

The assessment was carried out based on key projected climate trends for KSA are summarised below. This is based on data published by the World Bank Group, Climate Change Knowledge Portal, which is based on the Coupled Model Intercomparison Project, Phase 6 (CMIP6) models included in the IPCC's Fifth Assessment Report (AR5) (World Bank Climate Change Knowledge Portal, 2025).

Decreased Power Generation Capacity due to Cooling System Constraints

Water and air-cooling systems used at thermal plants become less efficient at higher temperatures, causing operators to curtail or shut down plant operations in response. Recent studies have demonstrated that an increase in the temperature of ambient air and cooling water affects the capacity of thermal power plants in the following respects:

- Increased environmental temperatures result in a decreased thermal efficiency of thermal power plants;
- Elevated environmental temperatures also act to reduce the power load of thermal power plants by limiting condenser pressure;
- Increased environmental temperatures lead to an increased demand for cooling water and a lower cooling efficiency. Regulatory constraints on water abstraction during low environmental flow and temperature of return water also play into operational declines during temperature extremes.

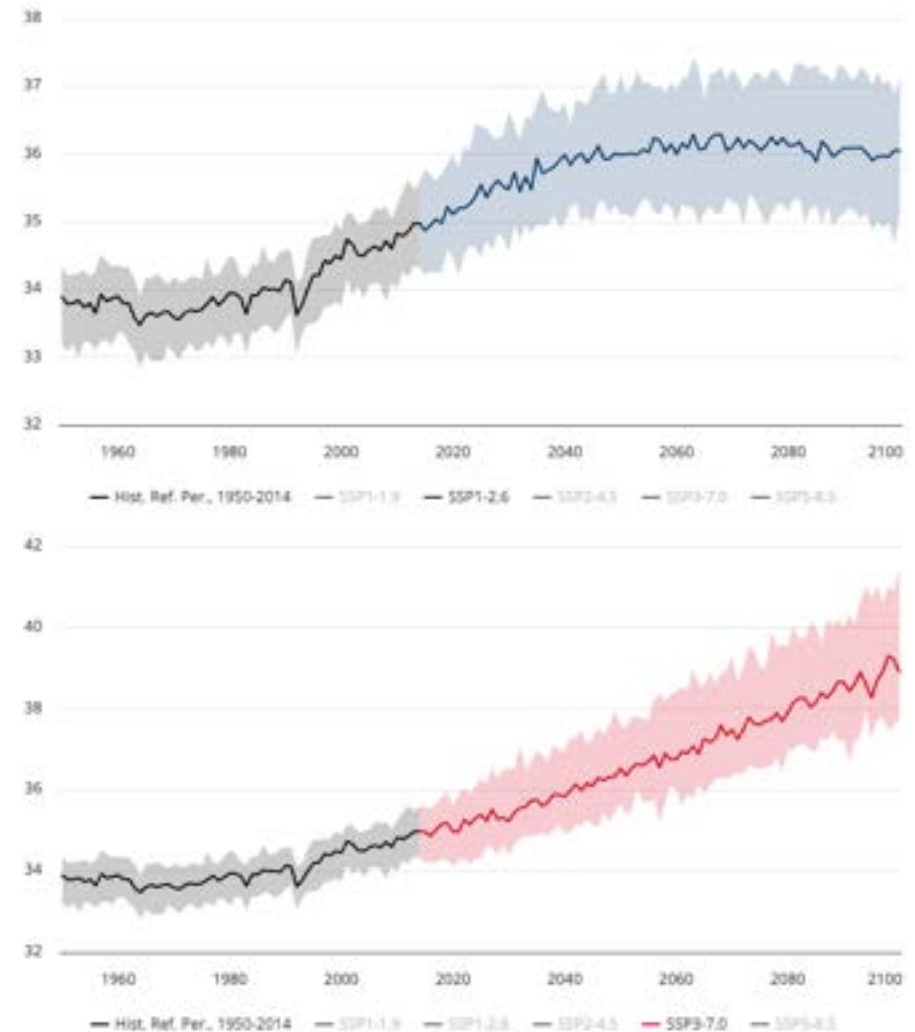
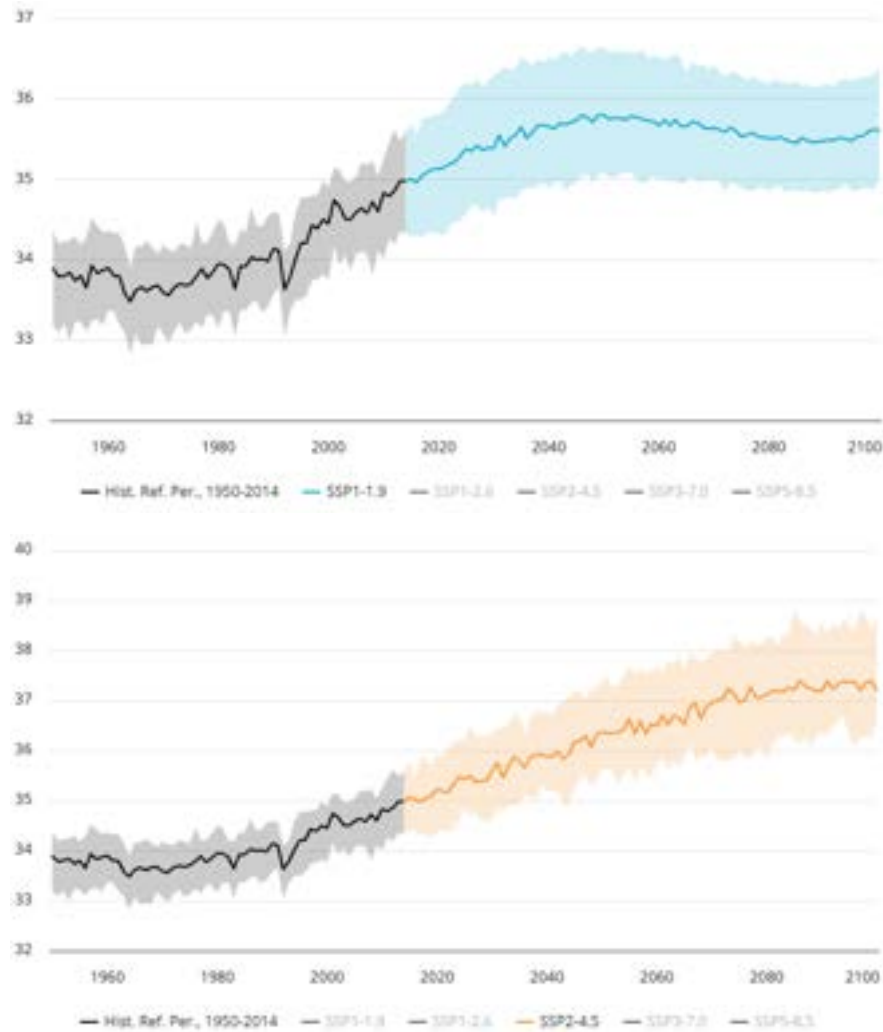
The studies further indicate that a 1°C increase in ambient air temperature translates into a 0.8-1.2% increase in curtailment of thermal power plant operations during periods of peak electrical demand.

To assess the potential climate change risks during the Project's lifetime, the projected average maximum surface air temperature anomaly for Ash Sharqiyah, KSA (reference period 1995-2014) were extracted and are presented below.

- Under scenario SSP1-1.9, by 2052, the 10-90th percentile range of average maximum surface air temperature in the Project area is 35.01°C to 36.60°C (median 35.76°C) which represents a maximum 90th percentile increase of 0.61°C during the month of June.
- Under scenario SSP1-2.6, by 2052, the 10-90th percentile range of average maximum surface air temperature in the Project area is 35.05°C to 36.98°C (median 36.01°C) which represents a maximum 90th percentile increase of 1.43°C during the month of September.
- Under scenario SSP2-4.5, by 2052, the 10-90th percentile range of average maximum surface air temperature in the Project area is expected to reach 35.57°C to 37.28°C (median 36.36°C)

which represents a maximum 90th percentile increase of 1.57°C during the month of September.

- Under scenario SSP3-7.0, by 2052, the 10-90th percentile range of average maximum surface air temperature in the Project area is expected to reach 35.05°C to 37.81°C (median 36.54°C) which represents a maximum 90th percentile increase of 1.69°C during the month of November.
- Under scenario SSP5-8.5, by 2052, the 10-90th percentile range of average maximum surface air temperature in the Project area is expected to reach 35.96°C to 38.41°C (median 37.08°C) which represents a maximum 90th percentile increase of 2.15°C during the month of September.



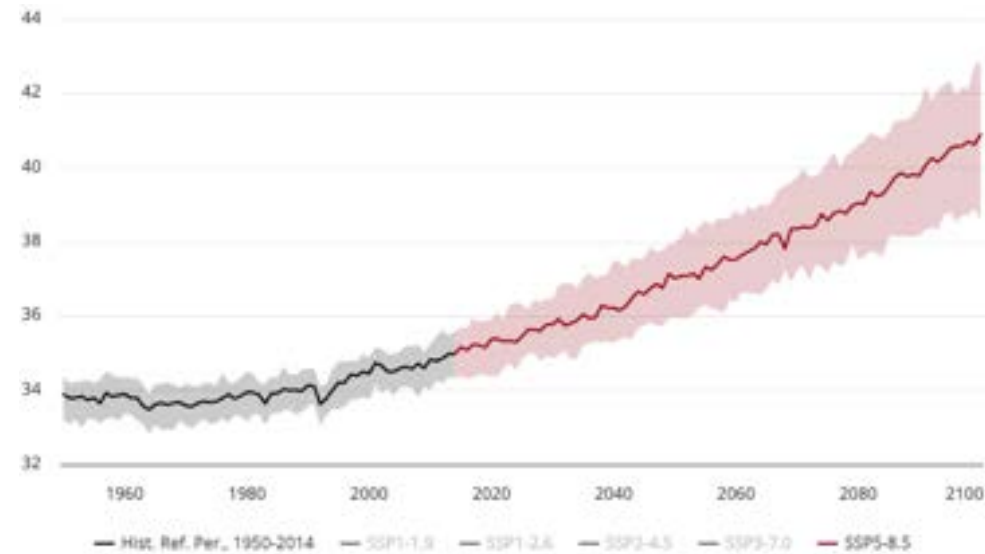


Figure 6-5 Projected Average Maximum Surface Air Temperature Anomaly for Ash Sharqiyah, KSA (reference period 1995-2014) For Each Scenario

The graphs below present the projected climatology of average maximum surface air temperature for Ash Sharqiyah during the Project lifetime. As per the projections under the worst-case scenario SSP5-8.5, the maximum 90th percentile temperature is forecasted to peak in August, reaching 39.96°C between 2020 and 2039. This temperature is expected to rise to 41.08°C between 2040 and 2059.

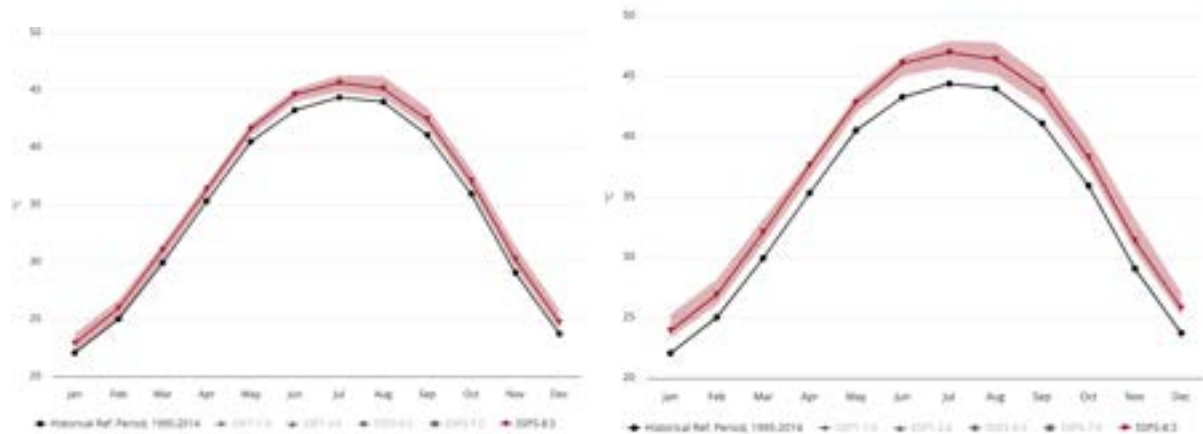


Figure 6-6 Annual Average Maximum Surface Air Temperature for 2020-2039 (left) 2040-2059 (right) for Ash Sharqiyah (Ref. Period: 1995-2014), SSP5-8.5, Multi-Model Ensemble

The thermal power plant in its entirety has been designed to endure high temperatures of up to 50°C, exceeding the projected temperature increases for Ash Sharqiyah. Given these projections, the potential impact of rising temperatures on the project's components and operation is **not expected**. The plant will be equipped with a fire protection system that features comprehensive fire detection and response facilities.

Forced Outage and Service Interruptions due to Damage from Climate-Related Hazards

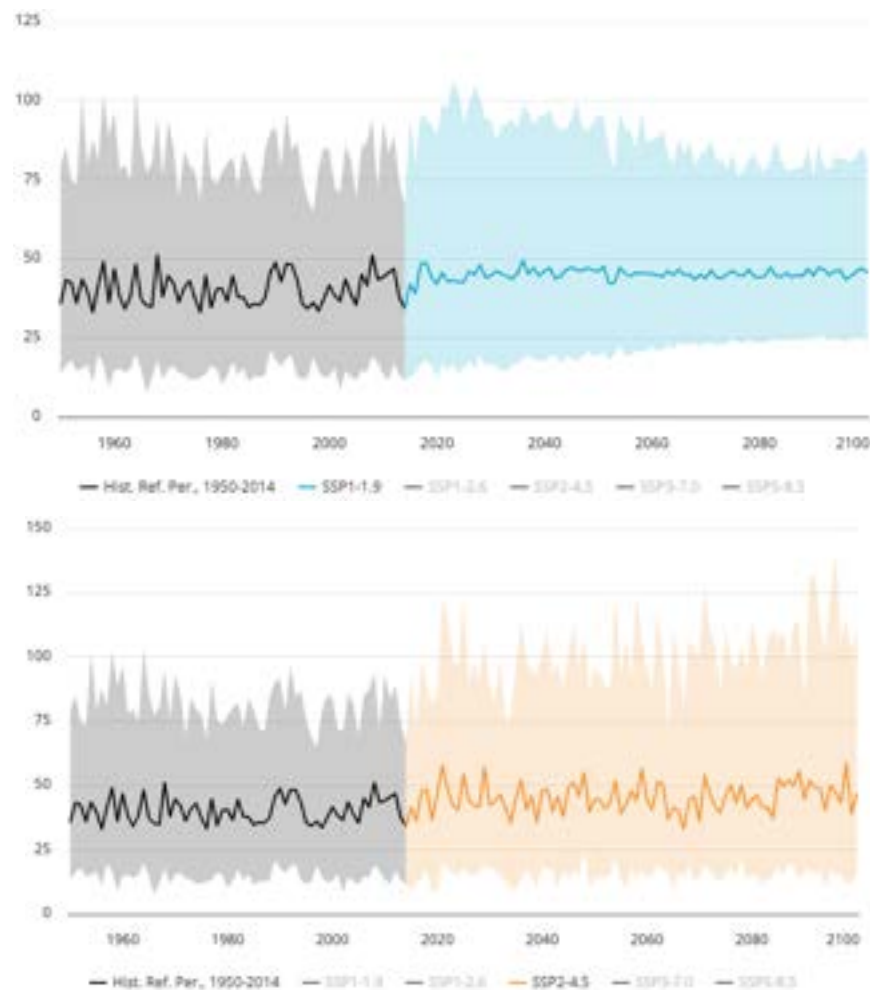
Climate-induced natural disasters, such as floods, droughts, extreme heat, high-intensity rainfall events and wild-fires can also interrupt power plant operations through severe damage to plant buildings, equipment and materials. Forced power outages resulting from natural hazards can therefore compound the risk of economic losses and heat stress to communities reliant on the power grid.

To assess the potential climate change risks during the Project's lifetime that is expected to be till 2052, the projected mean precipitation for Ash Sharqiyah, KSA (reference period 1995-2014) were extracted and are presented below.

- Under scenario SSP1-1.9, by 2052, the 10-90th percentile range of mean precipitation in the Project area is 18.11mm to 84.17mm (median 42.37mm).
- Under scenario SSP1-2.6, by 2052, the 10-90th percentile range of mean precipitation in the Project area is 9.53mm to 113.64mm (median 44.67mm).
- Under scenario SSP2-4.5, by 2052, the 10-90th percentile range of mean precipitation in the Project area is 14.18mm to 88.44mm (median 40.97mm).
- Under scenario SSP3-7.0, by 2052, the 10-90th percentile range of mean precipitation in the Project area is 10.00mm to 96.87mm (median 40.58mm).

- Under scenario SSP5-8.5, by 2052, the 10-90th percentile range of mean precipitation in the Project area is 13.76mm to 80.10mm (median 38.63mm).

For the period between 2040 and 2059, across all scenarios, the anticipated median (50th percentile) precipitation is expected to remain comparable to historical patterns, showing fluctuations without significant projected increases in the future. However, there is a decrease pattern observed overtime. Furthermore, precipitation levels are expected to peak in January, March, and November across all scenarios.



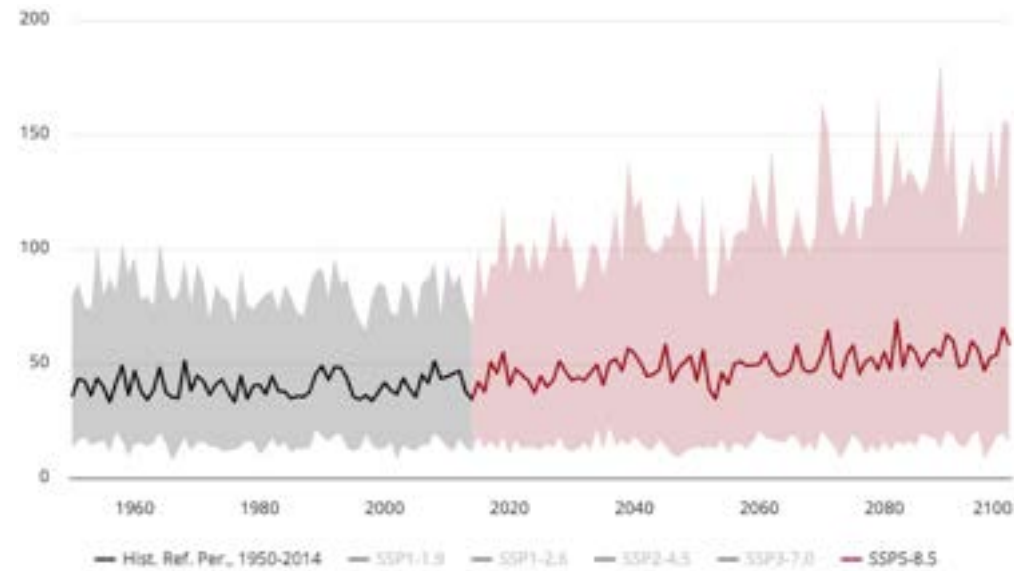


Figure 6-7 Projected Precipitation in Ash Sharqiyah, Saudi Arabia; (Ref. Period: 1995-2014), for Each Scenario, Multi-Model Ensemble

Considering the rainfall projections, significant impacts due to increased precipitation is not expected. Damaging incidents from climatic hazards (e.g., fire outbreak and heat waves) also pose occupational health and safety risks such as injury, disability and fatalities. This impact is not considered significant, as the EPC contractor is committed to implementing the following safeguards to mitigate against service interruptions due to climate related extreme events:

- The facility will be designed to withstand the high temperatures and weather conditions of KSA.
- The Project design will ensure no loss of operation for a flooding level with a return period of 1 in 100 years. Stormwater drainage systems will be designed to withstand the maximum discharge in the most extreme foreseeable precipitation events.
- The plant will be equipped with a fire protection system that features comprehensive fire detection and response facilities.

Health and Safety Incidents due to Extreme Heat Events

Acute physical climate risks relevant to the Project include health and safety incidents amongst operational plant workers during periods of extreme heat. The incidence of substantially high temperatures could potentially impact on the wellbeing of workers, particularly those who will not operate within units with controlled temperatures. Workers stationed in the Plant's exterior, for instance, will be prone to health effects such as dehydration, and heat stress, heat stroke, heat exhaustion, heat cramps, heat rashes and burns from contact with overheated surfaces.

These have been assessed under the occupational health and safety (OHS) section 6.3.14 of this report and management measures defined.

TRANSITION CLIMATE RISK

As per requirements of the Equator Principles IV, consideration of climate transition risks (as defined by the TCFD) is mandatory for all projects which are expected to have combined Scope 1 and 2 emissions of more than 100,000tCO₂e annually. The annual Project emissions have been estimated at around 4MtCO₂e per year, which is above the threshold.

The Paris Agreement came into force on 4th November 2016. The KSA signed and ratified the Agreement on 3rd November 2016 (UNTC, 2020). The overarching aim of the Paris Agreement is to limit the increase in global temperature increase to well below 2°C, with efforts to restrict the increase to 1.5°C. Following the launch of Vision 2030 in 2016, the Kingdom of Saudi Arabia has taken several steps towards a more sustainable future with establishing a number of initiatives to address the climate change issue. The KSA has committed to diversify the national energy mix used in electricity production while reducing the use of liquid fuel and have 50% of its power generated from renewable sources by 2030.

In 2021, the government inaugurated the Saudi Green Initiative (SGI) which unites environmental protection, energy transition and sustainability programs with the overarching aims of offsetting and reducing emissions, increasing the Kingdom's use of clean energy and addressing climate change. SGI is steering the implementation of a sustainable long-term climate action plan with three (3) overarching targets, one of which is reducing emissions. Beyond a domestic energy mix transformation, SGI is

steering a range of ambitious initiatives that will reduce emissions including investing in new energy sources, improving energy efficiency, and developing a carbon capture and storage program.

In 2021, KSA submitted its Updated First Nationally Determined Contribution (NDC) to the United Nations Framework Convention on Climate Change (UNFCCC). This aimed to align with its sustainable development goals by implementing measures for economic diversification, focusing on:

- Greenhouse gas emission avoidance, reduction, and removal.
- Climate adaptation.
- Managing the impacts of response measures.

As part of reforms in its domestic energy sector, the KSA intends to boost the use of natural gas in its energy mix. By 2030, it aims for up to 50% of its electricity generation to be sources from natural gas, reducing the carbon intensity of domestic energy production.

While the project does not represent an addition to the country's renewable energy base, it serves the purpose of utilizing modernized, efficient and relatively clean combustion technology for thermal power generation. Because the opted technology is reliant on natural gas rather than coal or fuel oil, and on combined cycle generation rather than conventional steam power generation, it does not pose reputational risks pertaining to the development of non-renewable power generation with a large carbon footprint. As part of the NDC commitments, KSA is planning to build upon its experience in the world's largest carbon capture and utilization plant as part of the National Circular Carbon Economy Program. The Project is also considering to be Carbon Capture Infrastructure ready in terms of layout, stack design as well as interfaces with up to 95% CO₂ capture to proactively address potential changes in emissions standards. The development of the Nairyah 1 IPP is in line with the KSA Vision 2030 and therefore carries no climate transition risk in the short term.

The table below presents an overview of a preliminary review of the Projects compatibility with the Country's National Climate Commitments (NCC).

Table 6-25 Preliminary NCC Compatibility Review

Aspect	Applicability and Overview
List of "Universally Not-Aligned" with the Paris Agreement goals	These include the following Projects: • Mining of thermal coal • Electricity generation from coal • Extraction of peat • Electricity generation from peat The Project does not feature in the "Universally Not-Aligned" activities.
List of Projects aligned with the Paris Agreements	As a facility utilising natural gas as the main source of energy, the Project does not feature in the "Universally Aligned" activities.
Nationally Determined Contributions	The Project contributes to KSA's NDC commitments including: 1- Increasing power generation by natural gas. 2- Carbon Capture Utilization & Storage

Aspect	Applicability and Overview
Long Term Strategies	KSA has not yet developed its Long-Term Strategies yet. The project falls under the broader KSA energy and power development strategies under KSA Vision 2030, which aims to diversify the national energy mix used in electricity production, increase the share of natural gas (and renewable energy sources) to approximately 50% while reducing the use of liquid fuel. In theory, this would also tie into broader multi-lateral government agreements (such as the Paris Agreement) and the updated NDCs.
Low Carbon Pathway	While the project does not represent an addition to the country's renewable energy base, it serves the purpose of utilizing modernized, efficient and relatively clean combustion technology for thermal power generation. Because the opted technology is reliant on natural gas rather than coal or fuel oil, and on combined cycle generation rather than open cycle (except during kick-start and maintenance) and conventional steam power generation.
Carbon Lock-in	The Project demonstrates technical and economic carbon reduction readiness by having its Carbon Capture Infrastructure ready in terms of layout, stack design as well as interfaces with up to 95% CO ₂ capture to proactively address potential changes in emissions standards. Therefore, the Project is committed to any requirement for future decarbonisation.

Given that KSA is committed to a reduction in the use of fossil fuels, it is expected that further strategies and policy will be implemented to promote energy efficiency and the use of clean, renewable energy. This could pose a risk to the long-term viability of the Project, particularly relating to any future limits / taxes on emissions that may imposed by any future changes to policy and legislation. However, considering the Nairyah 1 IPP design is a more modern plant that operates on natural gas, it is likely to be at less risk.

Table 6-26 Operation Phase – Climate Change Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Increase in GHGs emissions from the Nairyah 1 IPP Project	Moderate Adverse	Global atmosphere	High	Moderate	- Implement energy efficiency measures to reduce the heating, cooling and power demands. - Implement and operate the Carbon Capture system as required to reduce the GHG emissions. - Use of high-performance monitoring and process control techniques, good design and maintenance of the combustion system so that the initially designed efficiency and GHG emission performance can be maintained. - Prior to operation, a GHG Management and Reporting Plan will be prepared to implement and monitor control measures to reduce emission of GHGs on an annual basis.	Moderate
Increase in GHGs emissions from back-up power generators	Negligible Adverse	Global atmosphere	High	Negligible	- Implement the gaseous air emissions mitigation listed in Table 6-20. - Regular maintenance of the backup generators so that the initially designed efficiency and emission performance can be maintained.	Negligible
Vulnerability of the Project to climate change	Moderate Adverse	Project	Low	Minor	- Ensure the Project design and material selection takes into consideration climate change risks including increased temperatures and flood. - Stormwater drainage systems will be designed to withstand the maximum discharge in the most extreme foreseeable precipitation events to ensure no loss of operation for a flooding level with a return period of 1 in 1000 years. - The plant will be equipped with a fire protection system that features comprehensive fire detection and response facilities. - Detailed design and procurement shall ensure that all equipment and machines shall allow continuous operation at rated power (or rated current), in the full range of site conditions, without exceeding applicable temperature and temperature rise limits or failing upon exceptional electric and electromechanical stresses. - The following mitigation measures shall be implemented to mitigate against heat-related medical conditions, for operational labour: - Workers assigned to operations in the exterior of the Plant's buildings and shaded areas will be provided with appropriate PPE (e.g., sun hats and cooling vests). - Shaded resting areas and adequate access to potable water will be provided for workers stationed outside of the Plant's buildings (e.g., guard houses). - Work locations (and duration, to the extent possible) will be restricted during periods of extreme heat to lessen the risk of heat-related health effects.	Negligible

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
					Maintenance work within high-temperature units will be avoided during days with inordinately high temperatures. – Staff rooms on the plant's premises will be equipped with HVAC or fans to enable operations at workstations during periods of extreme heat. – Induction and refresher health and safety (H&S) trainings will include trainings on prevention of and first response to extreme heat exposure. The trainings will cover risk factors, mitigating PPE, first aid measures and nearest health centre for treatment of hyperthermia. – Further information and management plans to address workers welfare will be included in the Project H&S Plan.	

6.3.4 Noise and Vibration

6.3.4.1 Construction Phase Impacts and Mitigation

Noise will be generated by construction and propagated from the project site and the associated facilities to the surrounding areas via a range of processes. Pertinent construction activities at the project site in relation to noise are likely to include:

- Site preparation (e.g. earthworks, compaction);
- Civil works including trenching;
- Construction, mechanical and electrical installation; and
- Road compacting;
- Vehicles movement.

NOISE FROM CONSTRUCTION ACTIVITIES

The accumulation of noise from the above sources can introduce potential cumulative impacts when generated in tandem. All of the impacts may have negative effect to the nearby receptors within 2km of the Project boundary. The sensitive receptors within 2km from the Project include HR-3, HR-4, HR-5, and HR-6 that are located between 0.3 km to 1.5 km (these are temporary herder camps).

The types and number of the main plant and equipment that are likely to be used during construction are assumed typical use for the construction of CCGT power plant and listed earlier in this report (section 3.5.6, titled “Construction Equipment”) is used in this assessment. Noise generation data for the anticipated plant and equipment used during the different construction stages has been obtained from ‘British Standards (BS): Code of practice for noise and vibration on construction and open sites’ where available. The type and number of equipment that will potentially be used during the construction stages and their respective noise levels are provided in the table below.

Table 6-27 Noise Level of Proposed Construction Machinery

Equipment*	Number of Equipment	BS 5228-1:2009 Reference	SPL dB(A)
Civil Works			
Excavator	1	Table C.2 - #2	77
Dump Truck	1	Table C.2 - #30	79
Water Truck	1	Table C.4 - #91	78
Crane	1	Table C.4 - #43	70
Piling machine	1	Table C.3 - #8	88
HRSG Construction			
Crane	6	Table C.4 - #43	70
Trailer	2	Table C.4 - #75	79
Man lift	1	Table C.4 - #62	66
Diesel Generator	3	Table C.4 - #79	64
Air Compressor	1	Table C.5 - #5	65
Welding Machine	1	Table C.3 - #31	73
STG, GTG and Piping			

Equipment*	Number of Equipment	BS 5228-1:2009 Reference	SPL dB(A)
Crane	5	Table C.4 - #43	70
Trailer	1	Table C.4 - #75	79
Man lift	1	Table C.4 - #62	66
Diesel Generator	3	Table C.4 - #79	64
Air Compressor	1	Table C.5 - #5	65
Welding Machine	1	Table C.3 - #31	73
Electrical Works			
Crane	2	Table C.4 - #43	70
Trailer	1	Table C.4 - #75	79
Man lift	1	Table C.4 - #62	66
Dump Truck	1	Table C.2 - #30	79
Diesel Generator	2	Table C.4 - #79	64
Welding Machine	2	Table C.3 - #31	73
* Where the BS5228-1:2009 does not include specific noise levels for certain equipment. Other appropriate types of equipment have been referenced from the Plant List.			

Civil Works

The cumulative noise levels from the Project activities during civil works have been calculated below. The calculations are conservative in that they assume all equipment will be operating in parallel for 50% of time throughout the working period without any noise attenuation or barriers.

The calculated noise for construction activities at the Project location during civil works are presented in Table 6-28 below. The continued cumulative noise level as perceived at 10m distance from the source would be 86.2dB(A).

Table 6-28 Calculated Noise – Civil Works

Plant	BS 5228-1:2009 Reference	Noise at 10m dB(A)	On Time (%)	Overall noise with on time correction	Pressure (μPa)
Excavator	Table C.2 - #2	77	50	74.0	25059362
Dump Truck	Table C.2 - #30	79	50	76.0	39716412
Water Truck	Table C.4 - #91	78	50	75.0	31547867
Crane	Table C.4 - #43	70	50	67.0	5000000
Piling machine	Table C.3 - #8	88	50	85.0	315478672
Cumulative Source Noise Contribution at 10m db (A)				86.2	

Noise levels dissipate with distance and as such the potential for noise impacts from civil works upon receptors will significantly decrease with distance from the noise sources. Calculation of distance propagation and ground absorbance have been undertaken for receptors within 2km of asset boundary. Table 6-29 below shows the anticipated noise levels within 2km of asset boundary.

Table 6-29 Civil Works Noise Attenuation by Distance

Distance from Source (m)	Predicted Noise Level (dB(A))
10	86.2
50	70.7
100	63.2
250	53.3
500	45.7
750	41.3
1000	38.2
1500	33.8
2000	30.7

HRSG Construction

The cumulative noise levels from the Project activities during HRSG Construction have been calculated below. The calculations are conservative in that they assume all equipment will be operating in parallel for 50% of time throughout the working period without any noise attenuation or barriers.

The calculated noise for activities at the Project location during HRSG Construction are presented in Table 6-30 below. The continued cumulative noise level as perceived at 10m distance from the source would be 81.0dB(A).

Table 6-30 Calculated Noise – HRSG Construction

Plant	BS 5228-1:2009 Reference	Noise at 10m dB(A)	On Time (%)	Overall noise with on time correction	Pressure (μPa)
Crane	Table C.4 - #43	70	50	67.0	5000000
Trailer	Table C.4 - #75	79	50	76.0	39716412
Man lift	Table C.4 - #62	66	50	63.0	1990536
Diesel Generator	Table C.4 - #79	64	50	61.0	1255943
Air Compressor	Table C.5 - #5	65	50	62.0	1581139
Welding Machine	Table C.3 - #31	73	50	70.0	9976312
Cumulative Source Noise Contribution at 10m db (A)				81.0	

Table 6-31 HRSG Construction Noise Attenuation by Distance

Distance from Source (m)	Predicted Noise Level (dB(A))
10	81.0
50	65.6
100	58.0
250	48.1
500	40.6
750	36.2
1000	33.0
1500	28.6
2000	25.5

STG, GTG & Piping

The cumulative noise levels from the Project activities during STG, GTG and piping have been calculated below. The calculations are conservative in that they assume all equipment will be operating in parallel for 50% of time throughout the working period without any noise attenuation or barriers.

The calculated noise for construction activities at the Project location during STG, GTG and piping are presented in Table 6-32 below. The continued cumulative noise level as perceived at 10m distance from the source would be 79.1dB(A).

Table 6-32 Calculated Noise – STG, GTG and Piping

Plant	BS 5228-1:2009 Reference	Noise at 10m dB(A)	On Time (%)	Overall noise with on time correction	Pressure (μPa)
Crane	Table C.4 - #43	70	50	67.0	5000000
Trailer	Table C.4 - #75	79	50	76.0	39716412
Man lift	Table C.4 - #62	66	50	63.0	1990536
Diesel Generator	Table C.4 - #79	64	50	61.0	1255943
Air Compressor	Table C.5 - #5	65	50	62.0	1581139
Welding Machine	Table C.3 - #31	73	50	70.0	9976312
Cumulative Source Noise Contribution at 10m db (A)				79.1	

Noise levels dissipate with distance and as such the potential for noise impacts from civil works upon receptors will significantly decrease with distance from the noise sources. Calculation of distance propagation and ground absorbance have been undertaken for receptors within 2km of asset boundary. Table 6-29 below shows the anticipated noise levels within 2km of asset boundary.

Table 6-33 STG, GTG and Piping Noise Attenuation by Distance

Distance from Source (m)	Predicted Noise Level (dB(A))
10	79.1
50	63.7
100	56.1
250	46.2
500	38.7
750	34.3
1000	31.1
1500	26.7
2000	23.6

Electrical Works

The cumulative noise levels from the Project activities during electrical works have been calculated below. The calculations are conservative in that they assume all equipment will be operating in parallel for 50% of time throughout the working period without any noise attenuation or barriers.

The calculated noise for construction activities at the Project location during electrical works are presented in Table 6-28 below. The continued cumulative noise level as perceived at 10m distance from the source would be 80.6dB(A).

Table 6-34 Calculated Noise – Electrical Works

Plant	BS 5228-1:2009 Reference	Noise at 10m dB(A)	On Time (%)	Overall noise with on time correction	Pressure (μPa)
Crane	Table C.4 - #43	70	50	67.0	5000000
Trailer	Table C.4 - #75	79	50	76.0	39716412
Man lift	Table C.4 - #62	66	50	63.0	1990536
Dump Truck	Table C.2 - #30	79	50	76.0	39716412
Diesel Generator	Table C.4 - #79	64	50	61.0	1255943
Welding Machine	Table C.3 - #31	73	50	70.7	9976312
Cumulative Source Noise Contribution at 10m db (A)				80.6	

Noise levels dissipate with distance and as such the potential for noise impacts from civil works upon receptors will significantly decrease with distance from the noise sources. Calculation of distance propagation and ground absorbance have been undertaken for receptors within 2km of asset boundary. Table 6-29 below shows the anticipated noise levels within 2km of asset boundary.

Table 6-35 Electrical Works Noise Attenuation by Distance

Distance from Source (m)	Predicted Noise Level (dB(A))
10	86.2
50	70.7
100	63.2
250	53.3
500	45.7
750	41.3
1000	38.2
1500	33.8
2000	30.7

It is important to note that the above calculations do not account for any acoustic barriers between the noise source and the sensitive receptors. Topography, buildings, acoustic enclosures, trees and fence lines between the Project and the receptors will act as an acoustic barrier and reduce the noise impact on the receptor. In addition, these will largely depend on the location of the activities with respect to these receptors. Therefore, noise impacts at the receptors identified within the 2km radius are not expected to be impacted by noise.

In addition to the above, based on the site visits and the typical herding activities in KSA, herders may be present in the surrounding area within the Project's noise area of influence and may potentially be impacted by noise. However, since herders are mobile, it is unlikely that the noise impact will be of high significance.

Construction noise will have a localised spatial extent, largely contained within the project footprint and its close proximity. The duration of the impact will be short considering individual noise emission events relative to the duration of the construction activities. The frequency of occurrence is high as noise emissions will likely occur daily, but noise emissions are reversible once the activity ceases. Therefore, noise magnitude during construction is considered to be negligible.

NOISE IMPACTS ON SITE WORKERS

Site workers will be exposed to varying levels of noise depending on their specific roles and activities being conducted. This may relate to exposure to noise in areas that are considered 'high' (e.g. above occupational health and safety guidelines). Without mitigation, noise impacts to the workforce could result in health impacts, for example hearing damage. However, it is expected that construction workers will adhere to Projects health and safety requirements including use of adequate PPEs. Considering this, the magnitude of potential impacts on construction workers due to noise is assessed to be of minor significance.

IMPACTS FROM VIBRATION

The threshold of perception of vibration by human beings are typically in the range between 0.14mm/s to 0.3mm/s (BS 5228). Impacts from exposure to vibration is expected to be considerable beyond these values with potential to cause disturbance, startle, cause annoyance or interfere with work activities. Considering the distance between the closest receptor and the Project site is $\pm 850\text{m}$, vibration from construction activities and construction traffic movements would be negligible.

NOISE FROM MOVEMENT OF CONSTRUCTION VEHICLES

In addition to the noise caused directly by construction activities, an indirect increase in road traffic noise is expected from trucks transporting building materials to and from the site. Transportation of workers and other site staff will also add to vehicular traffic. Noise from the transport of materials is heavily dependent on the number of trucks, the size of trucks, road surface and the route taken (in terms of which receptors are affected). The flow of vehicles in the local area is not constant, but the main road to the east of the Project site had generally low flow during the site visit.

The construction phase will result in the presence of larger vehicles (HGV's) and other more specialised equipment. As a major Project in the local area requiring hundreds of construction staff, associated equipment and deliveries, there will be a noticeable increase in vehicles at the site and along key access routes. This will influence noise levels and impacts to receptors in the adjacent corridors along these roads, in addition to existing impacts from existing vehicle flows. Considering the current proposed access road to the Project site, the nearest receptor is HR-3, a Herders Camp, and is unlikely to be subject to significant adverse impacts as it is located around 300m from the planned route of the access road. The potential impact of vehicles at these receptors is assessed to have a minor adverse magnitude.

Table 6-36 Construction Phase – Noise and Vibration Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Noise impacts due to onsite construction activities	Negligible Adverse	Existing farms and herders in the surrounding area	High	Minor	- Consideration of noise fences, or other methods to attenuate construction noise, will be required close to non-mobile equipment such as generators or at boundaries for key receptors that may have higher assessed impacts. - The EPC Contractor will, at all times, carry out all work in such a manner as to keep any disturbance from noise to a minimum (by phasing noisy works). - Acoustic covers on machine engines to remain closed at all times as applicable. - Where practical, electrically powered plant will be preferred to mechanically powered alternatives. - All mechanically powered plant, diesel engine vehicles and compression equipment will be fitted with noise control equipment (exhaust silencers, mufflers) as available from the manufacturer. - The highest noise emitting activities will be undertaken in a central site area, or within an enclosed structure. For example, fabrication of materials will be carried out away from the site boundaries and or within structures. - Careful planning of the sequence of work in order to minimise the effects of noise to surrounding areas. - Careful handling of materials and waste such as lowering rather than dropping items. - Items of plant on site operating intermittently will be shut down in the intervening periods between use. - Night-time construction works will be avoided as much as practicable to prevent noise impact at nearest noise sensitive receptors. Where unavoidable, night work permits (if applicable) will be obtained from the relevant authorities. - Notice will be provided to the sensitive receptors as early as possible (minimum one-week notice) of periods of noisier works in regard to certain construction and commissioning activities and for how long such activities will be likely to last in accordance with the SEP. - The impacted receptors will have access to a grievance mechanism in accordance with the Project SEP in order to make any complaints regarding noise during the construction phase. - A Noise Management Plan will be prepared for implementation by the EPC Contractor.	Negligible
	Minor Adverse	Construction workers	Medium	Minor	- Identify workers who may be exposed to elevated noise levels (equal to or exceeding 80dB(A)) and brief them of occupational risks from noise exposure. - Workers potentially exposed to high noise shall be trained to identify situation when PPE is required to be worn and how to effectively utilise the PPE.	Minor

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
					- Provide noise reduction PPE to workers, enforce their use and ensure replacement in case of damage. - Respond to noise related complaints from workers or receptors and take corrective and preventive actions as necessary. - Use hierarchy of control to reduce impacts on workers (in the order of physical removal of noise source, replace with quieter options, isolate workers from high noise sources, changes to work methodology, use of PPE). - These mitigation measures shall be incorporated to the applicable occupational H&S plan being developed by the EPC Contractor and implemented on-site.	
Noise impacts due to ground vibration	Negligible Adverse	Existing farms and herders in the surrounding area	High	Minor	- Wherever practical, all vibratory generating equipment and activities shall be sited away from the Project boundary and the temporary accommodation facilities. - Vibrating equipment/machinery will be switched off when not in use.	Negligible
	Minor Adverse	Construction workers	Medium	Minor	- Operators of vibrating hand-held machinery (if any) will be provided with appropriate PPE (e.g. protective gloves and earmuffs/plugs) and be given suitable breaks from using such equipment to reduce the impacts of vibration. - Workers potentially exposed to high vibration shall be trained to identify situation when PPE is required to be worn and how to effectively utilise the PPE.	Negligible

6.3.4.2 Operation Phase Impacts and Mitigation

PROJECT SIMPLE AND COMBINED CYCLE OPERATIONS

The operation of the Plant will typically result in a continuous low-level humming noise due constant and relatively stable operational processes such as rotating equipment, air intake, emissions release and water treatment. As such, impacts are likely to be discernible at the receptor locations in proximity to the site. The main source of noise is anticipated to be emitted from the gas turbines, HRSG's, steam turbines, stack emissions, fans, water pumps, ventilation units, switchgear equipment, etc. Noise levels may increase during transient (start-up) operation.

Noise modelling was conducted as part of the ESIA to predict the potential noise egress from the proposed Project and the potential effect on the nearby receptors.

Noise Modelling Methodology

A noise model was developed using proprietary software IMMI2024, based on the methodology outlined in ISO 9613:2024 (ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation"). This methodology provides a detailed procedure to compute sound levels from point, line, and area sources. The model considers source noise levels, the area of acoustic or non-acoustic enclosures (where applicable), and the intervening distance to the receptor.

In addition, cumulative noise effects of the Nairyah IPP2 plant (located just east of the Project) has also been considered.

Due to the differing sound propagation characteristics of area, line, and point sources (including acoustical 'far' and 'near' field propagation), the noise levels attributable to these sources were not simply aggregated. Instead, calculations adhered to the ISO 9613 methodology. Additionally, the model incorporated one order of reflection to enhance its accuracy. The general calculation approach accounted for the following attenuation factors:

- Geometric divergence
- Air absorption
- Reflecting obstacles
- Screening
- Vegetation
- Ground reflections

Attenuation resulting from the aforementioned factors was applied to the sound power levels of the noise sources. This process yielded the resulting noise levels at various receptor locations.

ISO 9613-2 computes long-term average sound levels under downwind conditions, where sound propagation is favorable due to significant positive wind from source to receiver.

Given the limitations in ISO 9613-2's guidance on determining the meteorological correction term (C0), the following global parameters were incorporated into the noise model to ensure worst-case noise propagation scenarios:

- Temperature 10°C;
- Relative Humidity 70%;
- Light downwind propagation towards the receptor;
- Ground attenuation factor 0;
- Hard Reflection of all on-site buildings;
- One order of reflection effects of on-site buildings.

In accordance with ISO/TR 17534-3:2015 ("Acoustics — Software for the calculation of sound outdoors - Part 3: Recommendations for quality assured implementation of ISO 9613-2 in software"), negative ground attenuation was disregarded. Furthermore, software corrections for mean height were implemented following the guidance provided in "Erlass Thüringen Ministerium Für Energie und Naturschutz Erfurt," dated October 1, 2015.

The topography model was obtained from the (Space) 'Shuttle Radar Topography Mission', (SRTM), at 30m resolution.

Noise attenuation from on-site buildings/significant plant has been included in the noise model. The extensive list of noise generating equipment together with the associated sound power levels data provided by the Project Company is presented in Appendix K. It is noted that this assessment does not consider the use of occasional emergency equipment.

Identification of Major Noise Sources

The key sources of noise generation have been identified based on consultation with the design team, encompassing both internal (within process buildings) and external (plant equipment) locations. Detailed noise source data for all equipment is provided in the Noise Modelling Report which is included in Appendix K. The primary noise sources include the following:

- Gas turbines and generator sets
- Heat Recovery Steam Generator (HRSG) and Steam Generator House
- 45-meter-high exhaust bypass stacks and 60-meter-high main stacks
- Ancillary equipment, including air-cooled condensers (ACC), water treatment plants, pumps, transformers, and similar installations

The turbines, generators, HRSG, steam house, and ancillary equipment enclosures were modelled as area sources with radiating walls and roofs. Similarly, the stack walls were modelled as radiating sources, with the stack exit point represented as a point source. Each source was modelled with appropriate directivity corrections, as detailed in the modelling report (Appendix K).

Noise levels at specific receptor locations were calculated in accordance with ISO 9613 guidelines. These calculations considered operations under both Simple Cycle and Combined Cycle modes.

Noise Modelling Results

The results of the noise level assessments are presented in following tables with comparison against the KSA and IFC standards. KSA guidance does not give advice on acceptable noise limits for structures such as small tents/herders/farming area accommodation and therefore, all such settlements are considered as Class B areas¹⁹.

It should be noted that the time frame for the noise limits for KSA and IFC vary slightly. The KSA National Standard applies to a daytime period of 07:00 to 20:00 hrs and at night, from 20:00 to 07:00 hrs. The IFC/WBG EHS limits apply between 07:00 to 22:00 hrs (day) and 22:00 to 07:00 hrs at night. For the purposes of reporting the impacts, both timeframes have been adopted for the assessment and reporting. The noise contours around the Project site during combined cycle operation is illustrated in following figure.

Table 6-37 Calculated Noise Levels – Simple Cycle (Pre-Mitigation)

Receptor	Noise Levels, LAeq,T dB (rounded)	IFC Noise Limits		KSA Noise Limits	
	Simple Cycle Operation	LAeq,T dB		LAeq,T dB	
		Day	Night	Day	Night
HR-1	30	55	45	55	45
HR-2	32	55	45	55	45
HR-3	43	55	45	55	45
HR-4	36	55	45	55	45
HR-5	48	55	45	55	45
HR-6	42	55	45	55	45

Note: Bold text shows exceedance

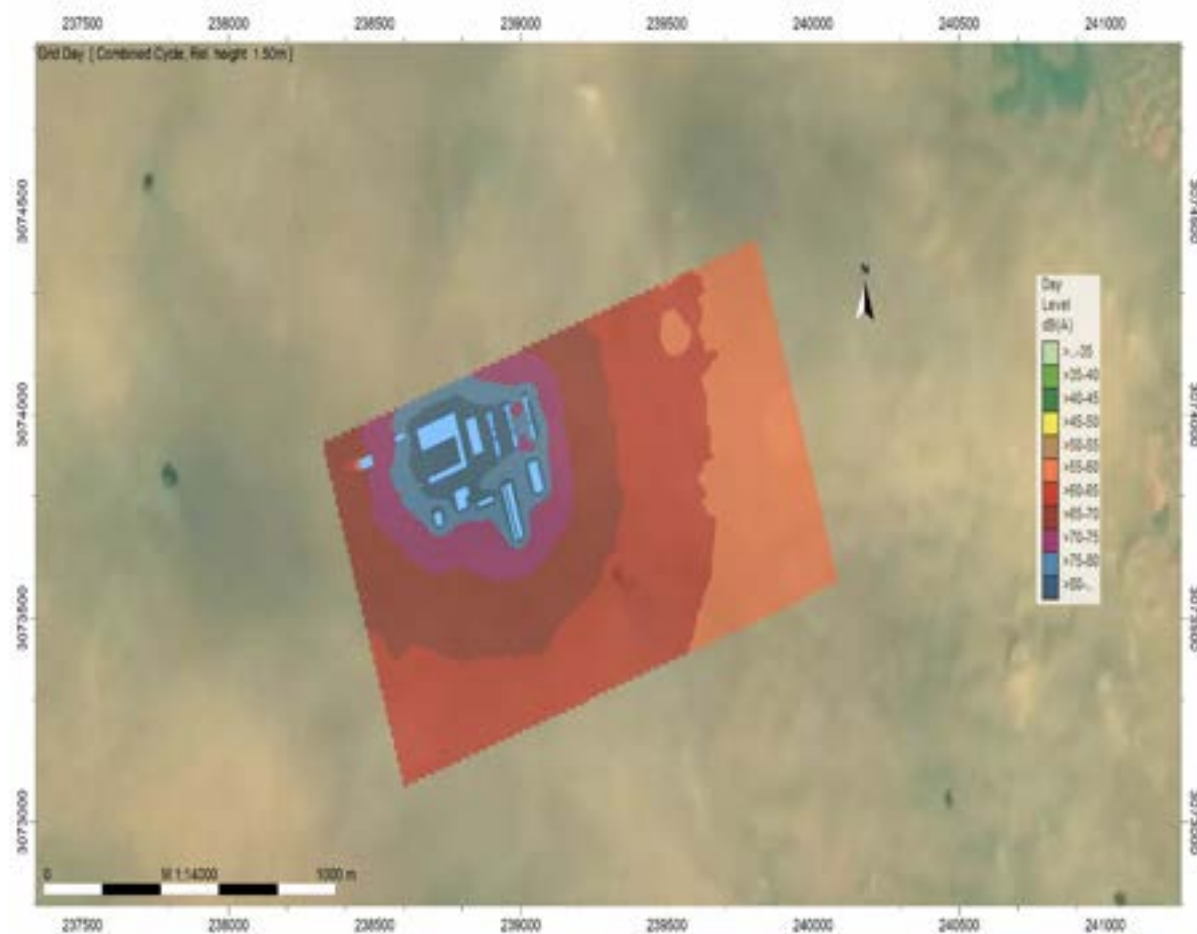
Table 6-38 Calculated Noise Levels – Combined Cycle (Pre-Mitigation)

Receptor	Noise Levels, LAeq,T dB (rounded)	IFC Noise Limits		KSA Noise Limits	
	Combined Cycle Operation	LAeq,T dB		LAeq,T dB	
		Day	Night	Day	Night
HR-1	37	55	45	55	45
HR-2	37	55	45	55	45
HR-3	49	55	45	55	45
HR-4	41	55	45	55	45
HR-5	52	55	45	55	45
HR-6	50	55	45	55	45

Note: Bold text shows exceedance

¹⁹ Class B: Including Medium-density residential areas. Medium density residential areas are defined as 'Areas containing 9-8 housing units/10,000 m² or 4,000-6.999 people/km²'

Figure 6-8 Noise Propagation Contours for Combined Cycle Operation



The noise emissions prediction modeling conducted for the Project indicates that most of the identified receptors will meet the IFC and KSA noise limits for both day and nighttime without requiring specific mitigation measures. However, receptor HR-5 does not comply with the standards during the simple cycle mode, and receptors HR-3, HR-5, and HR-6 exceed the standards during the combined cycle mode. All these receptors are temporary transient camps set up by the herders which are assigned a high sensitivity as a precautionary approach. Magnitude of potential impacts is assessed as minor to moderate considering the level of exceedances.

The mitigation measures outlined in the following table will be implemented to reduce noise impacts at these receptors during operation. These measures aim to ensure that the Plant's design will maintain noise levels at the fence line below 55 dB during both simple cycle and combined cycle operations.

Cumulative Effects

In addition to noise emissions from the Project, cumulative noise effects of the Nairyah IPP2 plant (located just east of the Project) has also been considered with the adjacent Nairyah IPP2 site in operation. Both plants are assumed to operate in a similar manner to each other with identical equipment.

Using the same methodology outlined above, receptor noise levels have been calculated with both plants operating simultaneously either with simple cycles and combined cycles which are presented in following tables.

Table 6-39 Nairyah IPP1 and IPP2 Cumulative Calculated Noise Levels – Simple Cycle (Pre-Mitigation)

Receptor	Noise Levels, LAeq,T dB (rounded)	IFC Noise Limits		KSA Noise Limits	
	Simple Cycle Operation	LAeq,T dB		LAeq,T dB	
		Day	Night	Day	Night
HR-1	34	55	45	55	45
HR-2	36	55	45	55	45
HR-3	44	55	45	55	45
HR-4	39	55	45	55	45
HR-5	49	55	45	55	45
HR-6	44	55	45	55	45

Note: Bold text shows exceedance

Table 6-40 Nairyah IPP1 and IPP2 Cumulative Calculated Noise Levels – Combined Cycle (Pre-Mitigation)

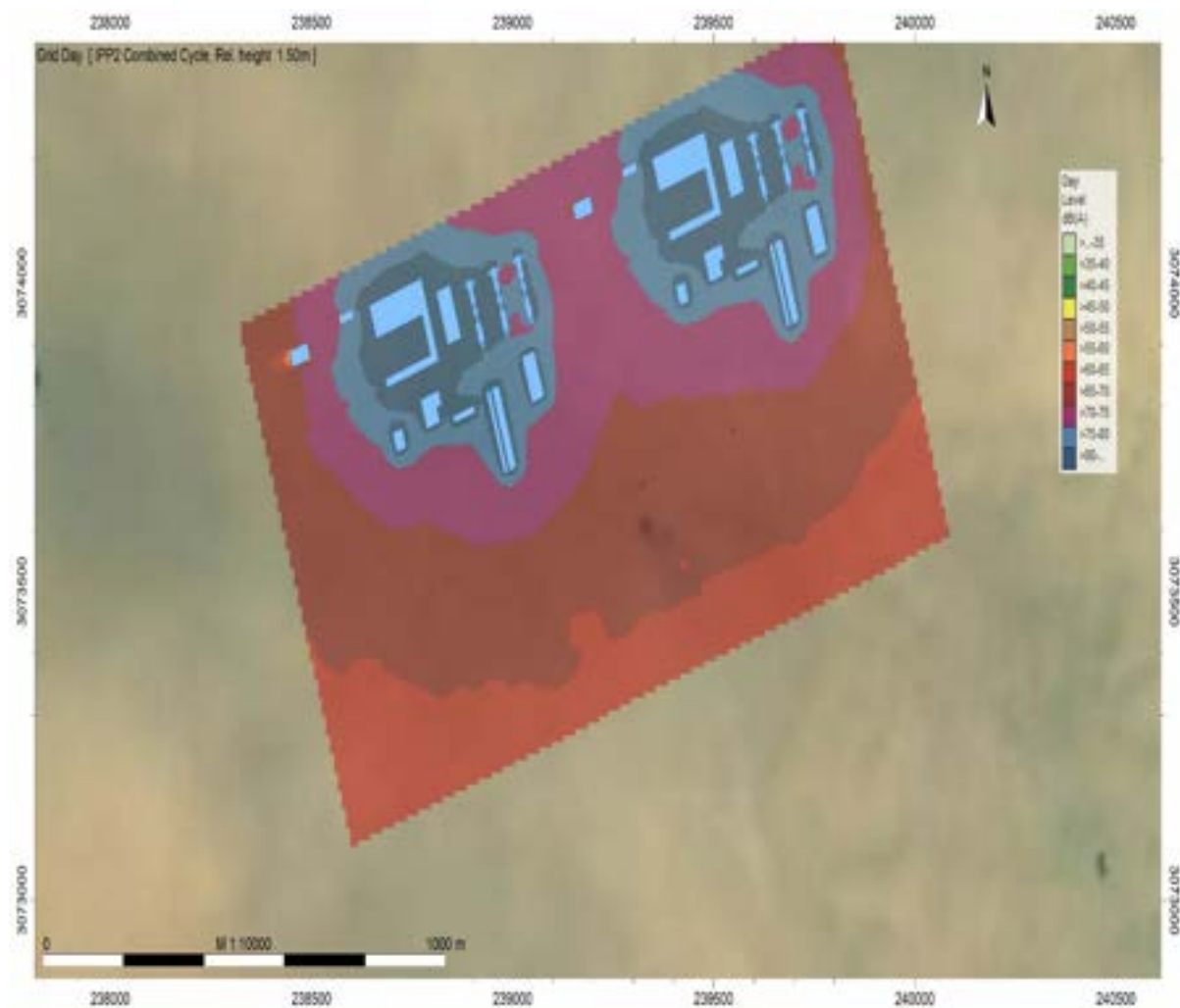
Receptor	Noise Levels, LAeq,T dB (rounded)	IFC Noise Limits		KSA Noise Limits	
	Combined Cycle Operation	LAeq,T dB		LAeq,T dB	
		Day	Night	Day	Night
HR-1	40	55	45	55	45
HR-2	41	55	45	55	45
HR-3	51	55	45	55	45
HR-4	43	55	45	55	45
HR-5	54	55	45	55	45
HR-6	51	55	45	55	45

Note: Bold text shows exceedance

Similar to the predicted noise levels from the operation of the Project alone, receptor HR-5 does not comply with the standards during the simple cycle mode, and receptors HR-3, HR-5, and HR-6 exceed the standards during the combined cycle mode in terms of cumulative effects from both the IPPs.

The noise contour maps illustrating cumulative noise is shown in following figure.

Figure 6-9 Noise Propagation Contours for Cumulative Effects (Combined Cycle Operation)



NOISE IMPACTS TO OPERATIONAL WORKERS

Operational staff workers will be exposed to varying levels of noise depending on their specific roles and activities being conducted. This may relate to exposure to noise in areas that are considered 'high' (e.g. above occupational health and safety guidelines). Type of staff that are more likely to be affected as a result of elevated noise levels will include technicians and supervisors working in open areas of the Plant.

Without mitigation, noise impacts to the workforce could result in health impacts, for example hearing damage. However, it is expected that the operational Health and Safety requirements will stipulate strict adherence to the use of PPEs for hearing protection, especially at high noise areas. As such, magnitude of potential impacts on operational workers have been qualitatively assessed to be moderate.

Table 6-41 Operation Phase – Noise and Vibration Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Noise from operation of Nairyah IPP various Plant equipment and operational units	Minor	HR-3	High	Moderate	- Physical mitigation measures such as the use quieter plant and noise barriers around specific plant. - At this stage the developer has committed to developing mitigation measures to meet the allowable noise levels, however the specific methods for doing so are yet to be finalised. It is recommended to utilise appropriate technological measures and barriers close to noise sources which will reduce noise levels at HR-3, HR-5 and HR-6 to acceptable levels. - An operational Noise Management Plan to be implemented to monitor noise levels at nearby receptors and follow a hierarchy of measures to reduce the noise levels by, for instance, switching off unnecessary plant/operations at night.	Minor
	Moderate	HR-5	High	Moderate		Minor
	Moderate	HR-6	High	Moderate		Minor
Noise impacts to operational workers	Moderate	Operational workers	Medium	Moderate	- Ensure operational workers are aware of the risks from exposure to noise via appropriate training programs. - Appropriate use of hearing protection PPEs by workers operating at high noise areas. - Where noise levels exceed 80dB(A) noise protection devices will be provided to personnel on-site and the area marked as a high-noise zone where ear protection is mandatory.	Minor

6.3.5 Soil, Geology and Groundwater

Based on the Geotechnical report developed by ACES, from the borehole test, there was no groundwater encountered at the location of all drilled boreholes at the time of the investigation. No cavities were encountered in any of the boreholes to the drilled depths during the drilling activities. Depth of the borehole were between 15 – 15.5 meters.

Considering the Project depth of excavation is $\pm 5\text{m}$ for certain parts of the facility, direct interaction with ground water is not expect and then dewatering is unlikely to be required. Therefore, dewatering impacts have not been considered in the assessment.

Construction of the Project may result in impacts to soil and groundwater due to the activities discussed below.

6.3.5.1 Construction Phase Impacts and Mitigation

EXCAVATION AND SOIL EROSION AND COMPACTION

The Project's construction phase will entail excavation, backfilling and grading in order for the construction of access roads and foundations for buildings and containment structures. Mass excavation activities could result in the destabilization of erosion-prone soils and loss of soil fertility from the displacement of topsoil. Similarly, the presence of heavy loads, construction equipment and compaction activities in particular to provide soil structural stability for the structures and the access roads after the removal of soils will have direct impacts to surface soils thereby changing soil characteristics within the Project site.

It is expected that majority of the soil excavated within the site will be used within the Project site for backfilling and levelling purposes. The EPC contractor will ensure that excavated soil is stockpiled in a way to separate topsoil from deep soil and backfilled in order to maintain original conditions.

In the absence of mitigation, this impact can be characterized as negative, direct and minor, as the effects of soil compaction, soil erosion and topsoil displacement will be localized and fall mainly within the Project area, and no steep slopes are present on site.

POLLUTION FROM ACCIDENTAL LEAKS OR SPILLAGE

Soil and groundwater will be susceptible to contamination from various sources during construction activities. Storage and usage of fuel, chemicals and temporary sanitary provision will introduce risks associated with spills and leaks to ground. Improper methods of storing, transferring, and handling of these products can result in spillage to the ground and result in soil contamination. The risk of accidental spillage and leakage of such liquids are often attributable to the site and temporary compounds and storage areas of the construction site, as well as during the transportation of such materials on and off the site. If contamination reaches groundwater, the spread of pollution could occur rapidly and prove difficult to control due to groundwater migration.

Construction of the Project will involve activities that generate solid and some hazardous waste, as well as liquid wastes including concrete washout wastewater. If not managed properly, waste and wastewater generated during these activities pose a threat to the quality of site soils. Of particular concern is the management of liquid hazardous waste streams generated during the construction phase

and its handling. This includes substances such as concrete washout, paint, used oils, expired chemicals and/or other residues.

In addition, it is expected that the volumes of chemicals and fuels that could be spilt/leaked during construction will be very limited and would typically be restricted to single containers. If the temporary storage and handling of such waste on the construction site is inadequate prior to being removed for disposal, the risk of soil and groundwater contamination increases.

The soil and ground water are considered to be of low sensitivity and the impact of minor magnitude as it is expected to be restricted to the Project area.

Table 6-42 Construction Phase - Soil and Groundwater Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Land degradation due to soil erosion or compaction	Minor Adverse	Soil integrity	Low	Minor	- Vehicle movements and parking will be restricted to defined access routes, demarcated working areas and parking bays. - Design and establishment of storm-water drainage systems and erosion control measures to maintain the function of working areas in high rainfall and flash flood conditions. - Prevention of engineering-induced flooding and gullies by avoiding impeding flow of any natural surface water drainage. - Ensure an erosion risk assessment is carried out and the necessary control measures are implemented. This may include locations where soil compaction may be a particular consideration, measures for construction through soft ground, considering the use of load-bearing materials, measures for working in areas of fragile and sensitive soils etc. - Soil-handling activities will be suspended when it is anticipated that further handling will damage the soil and seedbed, e.g., due to any persistent heavy rain.	Negligible
Pollution from Accidental Leaks or Spillage	Minor Adverse	Soil and groundwater quality	Low	Minor	- Storage of all hazardous liquid materials such as fuels and chemicals on an impermeable base with liners and/or secondary containment bund with enough capacity to hold 110% of the bulk storage container and 25% of the total volume of the multiple containers. - No storage of hazardous chemicals, oils or fuels is permitted within 100m of wadis or water drainage. - The EPC Contractor will maintain an inventory of all potentially hazardous materials and chemicals used and stored on-sites and maintain Material Safety Data Sheets (MSDS) at point of material storage. - Store all chemicals/materials according to manufacturer's instructions and MSDS. This includes consideration/assessment of compatibility with other substances. - The chemical storage areas will have effective ventilation and be sheltered from rain/sun. Segregated storage areas will be provided to allow for separation of any incompatible chemicals. - All mobile equipment using oils or fuels will have drip trays underneath to capture any oil leaks or drips. - The EPC Contractor and sub-contractors will provide induction training and Toolbox Talks (TBTs) relating to the management, transportation and handling of hazardous materials. - The Contractor will develop and implement an Emergency Response Plan (ERP) and Spill Response and Contingency. - Relevant personnel to be trained on emergency and spill response, containment, material handling and storage procedures. - All spills and leaks will be reported promptly to the Construction Manager and investigated to confirm the cause and put in place appropriate corrective/preventative actions. The spill or leaks incidents will be documented with evidence of investigation and close out. - Spill kits shall be available at chemical storage areas and fully stocked with appropriate absorbent materials.	Negligible

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
					• Availability of suitable containment and spill clean-up materials/equipment at specific locations within the project site (e.g. where refuelling is to take place). • No vehicle or machinery maintenance or repair will be carried out on sites. • Refuelling and maintenance of vehicles/equipment will be within a dedicated and approved area, on impermeable surface and with drip trays and spill clean-up materials. • Any fuel transport vehicles and its equipment to be maintained and routinely inspected to ensure the tank, pumps, pipe work and the vehicle itself are free from leaks and fit for purpose-No equipment will be placed in service until deficiencies are corrected. • Emergency drills will be held with staff to practice timely and effective spill response. • Implement regular maintenance program of vehicles and equipment to minimise leaks or mechanical failures and keep document evidence. • Washing equipment, machinery and vehicles will only be permitted in designated areas, with impermeable surfaces and dedicated drainage systems that lead to separate treatment facilities and/or lined evaporation ponds. • Washout of concrete trucks will be performed in designated areas only at the batching plant or any other approved concrete washout areas. Such areas will be away from the Project sites and will otherwise be designed with adequate holding capacity and located away from storm water drainage or other storm water flow paths. • The Contractor will obtain applicable permits to store hazardous materials in accordance with national regulations. • The implementation of the project CESMP and associated Waste Management Plan and Procedures to ensure that solid and liquid waste are stored properly to prevent spills and leaks. • Implementation of good housekeeping practices during construction activities including procedures and requirements for proper handling, storage, and transport of hazardous materials and waste. • The EPC Contractor and sub-contractors will provide induction training and Toolbox Talks (TBTs) relating to the management, transportation and handling of wastes. • Wastewater storage tanks shall be installed above ground for visual inspection withing bunding of 110% the capacity of the wastewater tank. • Wastewater storage tanks will be regularly inspected and will be equipped with a level gauge to monitor any leaks and ensure the tanks are emptied to avoid over-flowing.	

6.3.5.2 Operational Impacts and Mitigation

Specific direct impacts to soil and groundwater are not expected during the operational phase as the Project will be static and will not have direct interactions with these environmental parameters i.e. geology, soil integrity and groundwater. Potential risks of concern during the operational phase are expected to in the absence of proper management and storage of hazardous materials/wastes/wastewater, chemicals and fuels and sanitary provision.

SOIL AND GROUNDWATER CONTAMINATION

During the operational phase the potential for uncontrolled releases to soils from a number of sources is possible. Such releases have the potential to occur during transportation, handling, and storage as well as during cleaning activities and accidental spillages to the ground. Potential contamination sources will likely include:

- Bulk storage of diesel for the emergency generator;
- Stored operational phase chemicals;
- Waste oils (e.g. oily sludge, spent maintenance oils);
- The use of solvents/cleaning fluids;
- Potentially contaminated stormwater;
- Accidental release of untreated wastewater;

Additionally, natural and unplanned hazards such as extreme rainfall events and fire can lead to the generation of excessive stormwater and spill-over of contaminated water, which can result in the pollution of exposed soil.

Potential operational impacts have been assessed taking into account that majority of the area within the Plant will be paved limiting the chances of seepages to soil or below ground. The Plant will be designed with dedicated areas for storage of potential sources of contaminants such as fuel and chemicals. Drainage systems with collection sumps will be in place to collect spilled materials without causing risk of pollution to the environment.

Impacts to soil and groundwater quality from the wastewater evaporation pond is unlikely to take place under normal conditions considering the pond will be lined with geomembrane covering the entire area, including slopes, to prevent leakage and to enhance protection, blinding concrete will be poured over the geomembrane, and a reinforced concrete foundation will be constructed for the entire pond, including slopes.

In the absence of mitigation, the impact can be generally classed as minor adverse. With the application of mitigation measures specified in following table, the impact will be reduced to a negative negligible significance.

Table 6-43 Operation Phase – Soil and Groundwater Impacts Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Pollution from Accidental Leaks or Spillage	Minor Adverse	Soil and groundwater quality	Low	Minor	- O&M Company shall develop and implement an Emergency Response Plan (ERP) to include or link to a Spill Response and Contingency Plan. - Appropriate training of staff in regard to the handling and response to spill/leak events. - Define a designated area of storage of hazardous materials (including fuel) and ensure secondary containment (110% capacity bunding) to contain any spills and adequate security. - Fuel tanks monitoring system shall be operational at all times and any leak detected shall be immediately stopped with applicable correction measures implemented. - Storage of all hazardous materials such as fuels and chemicals on an impermeable base with liners and/or secondary containment bund with enough capacity to hold 110% of the bulk storage container and 25% of the total volume of the multiple containers. - All spills and leaks will be reported promptly and investigated to confirm the cause and put in place appropriate corrective/preventative actions. The spill or leaks incidents will be documented with evidence of investigation and close out. - Restrict access to hazardous materials. - Availability of complete spill kits in all hazardous material storage areas. - Availability of MSDS on-site for any chemicals in use (to be made available at the chemical storage area). - Availability of a chemical register for all the hazardous chemicals on site. - The chemical storage area will have proper ventilation and cover from the elements (i.e., rain, sun) and different storage areas to allow for segregation of incompatible chemicals. - O&M Company shall obtain relevant permits to transport and dispose any hazardous waste from operational processes. - Undertake training for emergency scenarios with the relevant authorities. - Evaporation ponds and associated pipes will be inspected for any leaks or overflow. - Implement a monitoring program to regularly inspect the condition of the evaporation pond liner, geomembrane, and other components. This may include visual inspections during cleaning. - Consider incorporating leak detection systems, such as sensors and monitoring wells, to promptly identify and address any potential leaks. - If used in landscaped areas, the application of fertilisers and pesticides must be limited and monitored. Use of any toxic/non-biodegradable pesticides will be prohibited in accordance with the Stockholm Convention on banned chemicals. Only organic, chloride free and environmentally friendly fertilizers will be applied. - The implementation of the OESMP and associated Waste Management Plan and Procedures to ensure that solid and liquid waste are stored properly to prevent spills and leaks. - The implementation of good housekeeping practices during maintenance including procedures and requirements for proper handling, storage, and transport of hazardous materials and waste.	Negligible

6.3.6 Hydrology, Surface Water Drainage and Flood Risk

6.3.6.1 Construction Phase Impacts and Mitigation

WATER RESOURCE USE

An estimated 350 m³/day of water will be required for the construction activities such as dust suppression and domestic use by the construction workers (accommodation camp, temporary welfare facilities etc.). Water will not be sourced from wells but will be purchased from the nearest suppliers, transferred via tanker trucks and stored in designated storage tanks on site. Due to the short-term duration of the construction activities, impacts on water resources are not considered significant. However, where the water is sourced from the neighbouring towns, the EPC Contractor will be required to engage licensed suppliers and obtain relevant permits (if required) to ensure that the Project demand for water does not create a shortage for local communities or an increase in the price of water. Therefore, mitigation is required to reduce the pressure on this scarce resource and water infrastructure in the area.

IMPACT TO WATER FLOW AND CONTAMINATION OF RUN OFF AREAS

As part of the construction activities the site will be graded for levelling to facilitate building structures and foundations and utilities. This will result in altering the existing natural drainage in the site and change the water runoff and flow to the surrounding area.

During construction, the presence of fuels and chemical storage areas could introduce the risk of pollution to the runoff/downstream drainage areas in the event of a significant rainfall events, where a pathway for runoff is directed to these areas and a pathway for drainage to underlying aquifer. Instances of pollution could potentially result from the wash off-of surface pollutants, particularly during the first flush of rainfall. Based on the presence of wadi within the Project site, the potential impacts to runoff areas can be significant without mitigation measures. Considering the absence of any permanent surface water features at the site and the frequency of rain events which is rare, the short-term nature of the construction works, the localised extent of the potentially contaminated run off, and the volumes of liquids used during the construction process on site (mainly fuel, oils., greases etc.) the magnitude of impact is considered minor.

ALTERATION OF SITE DRAINAGE AND FLOOD RISK

A detailed hydrological and hydraulic assessment study has been conducted by Worley which is included in **Appendix F**. Hydraulic modelling was undertaken to understand the flood behaviour at the site and develop mitigation options to protect infrastructure from the impacts of flooding. TUFLOW HPC software was used to compute the hydraulic behaviour of rainfall-runoff within the model domain. A 10% increase in rainfall was applied to the estimate to account for increased rainfall intensity due to Climate Change.

The 2% and 1% Annual Exceedance Probability (AEP) design storms were applied to the model to characterise the regional flow paths, typical wadi depths, and velocities, and identify contributing design flows to the site area under baseline conditions. The 1% AEP depth and velocity results are presented in following figures.

Figure 6-10 1% AEP Flood Depth Results (source: Worley)

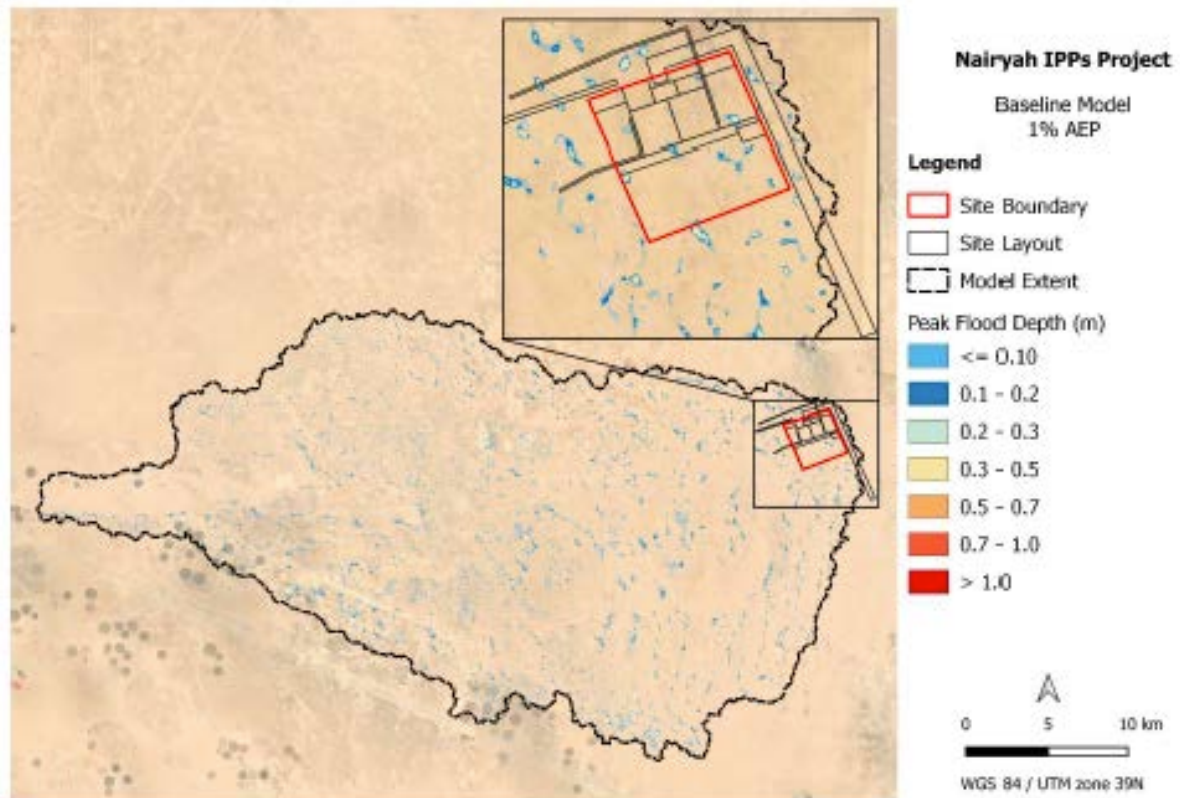
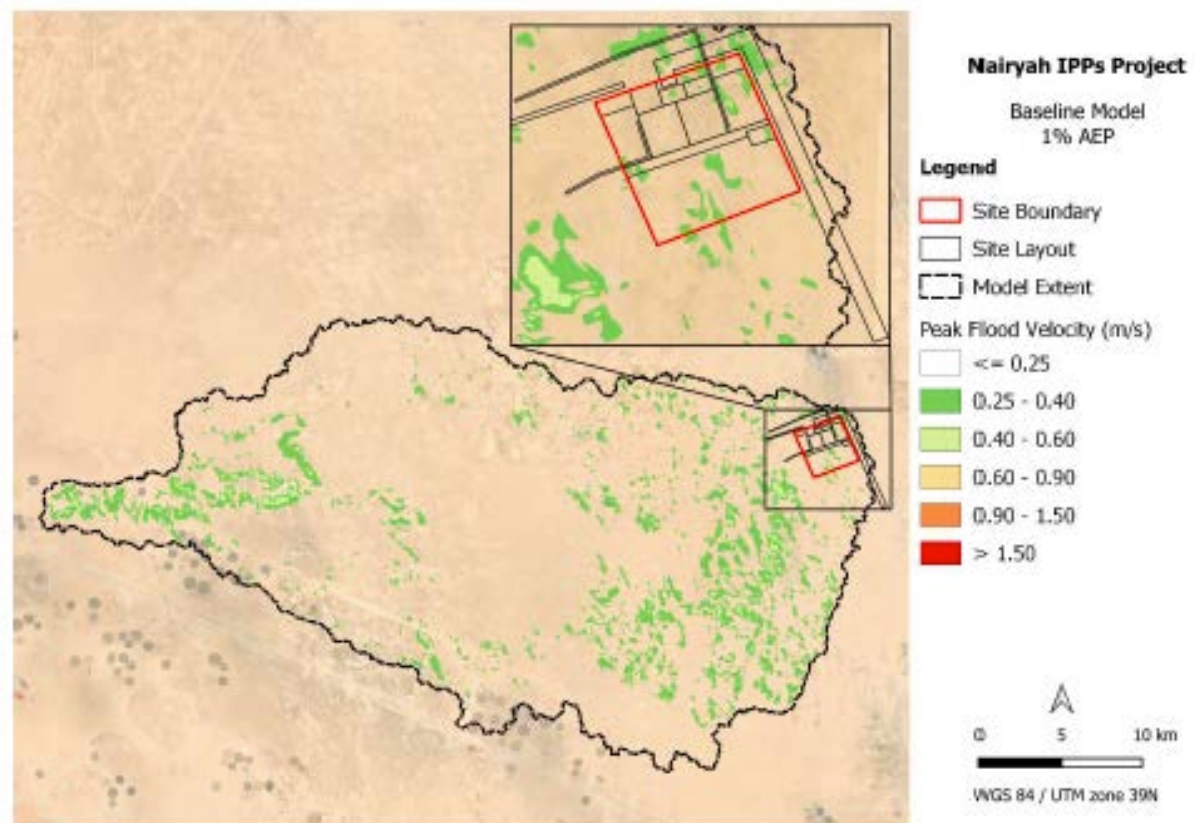


Figure 6-11 1% AEP Flood Velocity Results (source: Worley)



Modelling results indicate that flow is impeded by undulating terrain and collects in depressions located in both the upstream catchments and within the site. As such, there are no continuous external wadis/flow paths to the site. Within the site, results indicate flood depths reach 0.5 m and flood velocities reach 0.4 m/s. The maximum recorded depth under the 1% AEP event in IPP1 is approximately 0.15 m and for IPP2 platform <0.10 m. The model was simulated with zero infiltration losses to test the impact of the infiltration on runoff to the site. Results indicated that with zero infiltration losses there are higher ponding depths however still no connection of external flow through to the site. As such, the flood risk from external sources at the site is considered to be low and therefore mitigation measures proposed are limited to managing local runoff which are:

- Nominal cut-off drain/bunds around facilities with rock protection lining where needed;
- Culverts where the cut-off drains intersect the proposed access roads; and
- Managing direct rainfall by filling depressions and regrading pads.

Further details are provided in the hydrological modelling report which is included in **Appendix F**.

Table 6-44 Construction Phase - Hydrology and Surface Water Drainage and Flood Risk Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Water resource use	Minor Adverse	Water resource	High	Moderate	- The EPC Contractor will engage licensed water suppliers and obtain relevant permits to ensure that the Project demand for water does not create a shortage for local communities or an increase in the price of water. - Use water-efficient equipment and machinery at the accommodation and welfare facilities that minimize water consumption while maintaining performance. - Install water meters to monitor water usage on-site. Regularly review and report water consumption data to identify areas for improvement and track progress in reducing water usage. - Regularly inspect and maintain water-related systems to ensure their proper functioning and prevent leaks or inefficiencies. - Raise awareness among construction workers about the importance of water conservation and the specific measures being implemented to reduce water consumption. - Ensure dust suppression is carried out through spraying water and prevent overuse and ponding of water.	Minor
Contamination of run off areas in the event of a significant rain events	Moderate Adverse	Runoff areas	Medium	Moderate	- No storage of hazardous chemicals, oils or fuels is permitted within 100m of the wadi and areas prone to flooding. - Stockpiles, raw materials and laydown areas to be located away from the wadi and areas prone to flooding. - Implement the mitigation measures discussed under the soil and groundwater impact assessment - Ensure appropriate site drainage when undertaking groundwork to avoid risk of contaminated run off. - Construction ESMS will include a Spill Response Plan. - Use barriers (e.g., drip trays) to minimise impacts from spills or other potential leaks. - All chemicals, fuels, and oils are stored at the construction camps and laydown area to be in designated areas in a secure and bunded facility. - Do not refuel except at a dedicated refuelling area with the provision of spill kits. - Works with hazardous liquids must be performed over an area of hardstanding to avoid seepage to groundwater in the event of a spill.	Minor
Flood Risk	Minor Adverse	Project	Medium	Low	- The Project Company will coordinate closely with the relevant stakeholders to ensure all the mitigation required by the flood risk study are implemented while taking into account climate change risk. - Ensure the flood risk mitigation are implemented prior to the Project construction activities, if possible, to avoid risks to the Project during the construction phase.	Negligible

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
					- Design the access road to consider short-term, extreme weather events (e.g., support infiltration). - Establish the stormwater and drainage system prior to construction activities to safeguard equipment and workers as well as to reduce soil erosion and sedimentation impacts from rainfall events.	

6.3.6.2 Operational Phase Impacts and Mitigation

WATER USE

The estimated water quantities required for the operation and maintenance activities is approximately 400,000 m³ per year. SPPC will be responsible for supplying the Project with service water sourced from the discharge of the National Water Company sewage treatment plant. The service water will be supplied to the plant by a new pipeline constructed by SPPC.

Considering the water is a treated sewage effluent, impact on natural water resources is not expected during the Project operation. In addition, the Project design considers recirculating second stage RO reject water, cycle blowdown water as well as evaporative cooling blowdown, providing up to 40% reduction of raw water consumption.

Therefore, this impact is not assessed any further. General good industrial practice will be implemented:

- The O&M employees will be trained on how to minimise water consumption and ensure they have an understanding of the water issues in the region.
- Mechanisms and management practices to further reduce the volume of water required in the plant will be explored, if possible.

ALTERATION OF SITE DRAINAGE AND FLOOD RISK

It is generally not expected that the operational phase of the Project will result in significant impacts to hydrology or flow rates as a result of the hardstanding surfaces, as the Project stormwater drainage design will consider flood risk with 1% and 2% AEP with climate change risk.

The internal drainage will be designed to manage a Zero Liquid Discharge (ZLD) from the internal areas. As such, there will be no increase in flood risk to outside areas following development. The design will also ensure that stormwater from areas with potential contamination is directed towards the wastewater impermeable evaporation pond. Therefore, stormwater drainage systems will be designed to withstand the maximum discharge in the most extreme foreseeable precipitation events.

The Project OESMP will include measures for ensuring drainage components such as the culvert are regularly maintained and are clear of any debris that may block the water flow.

6.3.7 Solid Waste and Wastewater

6.3.7.1 Construction Phase Impacts and Mitigation

The construction phase can often be the most environmentally damaging phase of a project, particularly in regard to the volumes of waste that are generated, if not properly managed. Construction activities such as site preparation, civil works, electrical and mechanical works, materials delivery, operation of labour camps will generate construction, domestic and hazardous waste streams in both solid and liquid form.

The Project will require excavation activities in order to establish a base at suitable level and design elevation for construction which will result in some rubble, rock or soil. Topsoil and excavated material

will be stored for cut and fill re-use where suitable. Where it is deemed unsuitable, excavated material will be removed from site to a licensed disposal facility or a designated fill site.

Building works will necessitate concrete use, bricks, cement, some wood, metals and glass. Conceivably there may be some waste materials from such activities, such as offcuts and any damaged items. The civils works (relating to internal roads, stormwater and sewage systems etc.) may also generate some concrete, asphalt and masonry wastes.

Packaging wastes (such as cardboard, paper and plastic) can be easily windblown around sites and may be dispersed to areas off-site or interact with fauna, causing ecological impacts.

Wastewater generated from construction activities at the project site will include the following:

- Sanitary and domestic wastewater generation;
- Wastewater from any vehicles or equipment washing/cleaning;
- Concrete washout water generated during washing the concrete trucks.
- Liquid hazardous waste such as lubricants, solvents, waste oil, hydraulic fluid, waste solvents etc.; and
- Commissioning wastewater.

The construction site will be equipped with on-site temporary sanitation facilities to cater to the needs of construction workers. These facilities are expected to include toilets, basins, and ablution facilities. These facilities will require regular maintenance, including emptying and removal of wastewater from the Project site. This should be carried out by licensed contractors who will ensure the proper transport and disposal of the wastewater at a wastewater treatment plant.

The table below provides a framework²⁰ for classifying construction waste on the basis of their source and level of potential hazard to human and ecological receptors.

Table 6-45 Classification of Construction Waste Streams

Category	Origin	Description
Non-hazardous construction waste	This waste stream typically originates from site preparation, excavation, civil works, and mechanical and electrical installations.	This waste category generally poses minor risks to the environment and human health, as it is not characterized by the distinct properties of hazardous waste (presented below). It can thus be disposed of at regular municipal facilities after waste minimisation options are exhausted and before obtaining approval. Solid non-hazardous construction waste will include: • Discarded aggregates (concrete, asphalt, excavation spoils etc.); • Scrap metals; • Glass, plastic, rubber, cardboard and wooden refuse from construction materials and packaging; • Organic waste from vegetation clearance.
Non-hazardous domestic waste	On construction projects, general domestic waste is generated by the operation of labour	This waste category poses negligible to minor risks to the environment and a biohazard to human receptors, mostly comprising of spent/ processed domestic materials. Solid non-hazardous domestic waste will include:

²⁰ This framework has been developed with reference to the IFC, US Environmental Protection Agency (EPA) and Federal Motor Carrier Safety Administration (FMCSA).

Category	Origin	Description
	campes, offices and welfare facilities.	- Discarded foodstuffs; - Discarded clothing articles; - Discarded sanitary materials and household items; - Wastepaper from deskwork and packaging; - Sludge from any domestic wastewater. Liquid non-hazardous domestic waste will include grey-water and black-water.
Hazardous waste	On construction projects, such waste typically derives from spills and leaks of hazardous chemicals or concentrated chemical mixtures, damage or wear of equipment components containing hazardous materials, and clean-up of equipment or materials contaminated by hazardous materials.	This waste category poses risks which can be detrimental to human health or the environment and/or may cause an increase in acute, chronic and/or irreversible impacts on health and/ or contribute to an increase in mortality. Waste can be classed as hazardous provided it contains toxic, explosive, flammable, combustible, oxidizing, corrosive, radioactive or infectious materials. Solid hazardous construction and domestic waste will include: - Used batteries; - Discarded chemical containers; - Used oil filters; - Contaminated clean-up materials; - Soil contaminated with spilled chemicals; - Spent machinery/ equipment components containing or contaminated by hazardous materials; and - Medical waste. Liquid hazardous construction and domestic waste will include: - Used oils including lubricants and hydraulic fluids; - Concrete wash-out water; - Wastewater from vehicle wash bays; - Contaminated stormwater and/or floodwater.

The surge in waste due to construction Projects can strain existing waste management facilities and systems due to increased load or limited capacity. The EPC Contractor will make arrangements for the establishment of waste management facilities for the Project's construction phase.

In the absence of mitigation, this impact is assessed as negative, direct and of moderate magnitude. With the application of mitigation measures specified in following table, the impact will be reduced to a minor significance.

Table 6-46 Construction Phase – Solid Waste and Wastewater Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Strain on existing waste and wastewater management facilities	Moderate Adverse	Waste management facilities	Medium	Moderate	- The EPC contractor will identify waste and wastewater management companies including recycling companies in Nairyah or nearest towns in order to promote the recycling of waste especially packaging materials, wood, metal waste & hazardous materials. - The EPC Contractor will coordinate with the local government authorities (e.g., municipalities) with regards to licensed and appropriate waste management facilities fit to accommodate project waste types and quantities. - A construction stage Waste Management Plan will be prepared and implemented following GIIP measures. - The EPC Contractor will ensure that only licensed waste transporters and waste management facilities will be engaged. Non-hazardous waste - Domestic solid wastes to be segregated and identified from the other waste streams into separate waste containers/skips clearly to facilitate recycling and reuse. - Waste containers/skips should be clearly labelled and placed in designated waste storage locations. Labels will be waterproof, securely attached, and written in English and other languages as required for the workforce. - For litter (food waste, domestic waste), an adequate number of covered bins should be strategically placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area. - Food waste must be stored within a sealed metal or plastic skip or bin, in order to prevent pests gaining access. - On-going housekeeping training should be provided to all staff on the importance of the need to avoid littering. - Heavy waste may be contained within an open skip, provided that segregation occurs effectively enough to remove all lightweight material that could be blown away. - Waste generated during construction will be recycled and reused until reduced to as low as practicable prior to collection for disposal by an appropriately licensed waste contractor. - The EPC contractor will develop and maintain a waste inventory to document and track domestic solid wastes generated, segregated, reused and consignments. - Completed waste manifests are required to show the chain of custody of the waste generated on site, its transportation and treatment/disposal. All records will be maintained on site. - Specifically recycling of packaging waste will be promoted, which will require site-based segregation of cardboard, wood/pallets, metals and plastics. Hazardous waste - Develop and maintain a hazardous waste inventory to document and track hazardous wastes generated, segregated, reused and consignments.	Minor

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
					- Segregate and identify hazardous waste from the other waste streams into separate waste containers/skips clearly signed and labelled. - Store hazardous waste in allocated impervious hard standing areas in sealed containers stored with impermeable bases, sufficient containment and separation capacity, sun/rain shelter, separate drainage system, good ventilation and equipped with spill kits & spill response procedures. This area must be placed away from any sources of ignition. - Hazardous waste storage area should be constructed away from drainage system and a rain shelter to avoid any potential instance of runoff, or leakage of runoff. - Waste containers should be clearly marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, securely attached, and written in English and other languages as required for the workforce. Wherever possible, chemicals will be kept in their original container. - Hazardous waste storage areas will be located away from any ignition sources or fire hazards. Wastewater - Develop and maintain a wastewater inventory to document and track sanitary waste generated and disposed. - Sanitary wastewater tanks should be placed in allocated impervious hard standing areas with bonding capacity to hold 110% volume of the maximum volume stored. - Sanitary wastewater tanks to be properly maintained and inspected to ensure tanks do not overflow. - Sanitary wastewater tanks to be equipped with a gauge to monitor wastewater levels and to ensure tanks do not leak or overflow. - Washing of equipment, machinery and vehicles will only be permitted in designated areas, with impermeable surfaces and dedicated drainage systems that lead to separate sumps or, treatment facilities and/or lined evaporation ponds. - Concrete washout areas will be located away from storm drainage and will be designed with adequate holding capacity. The wastewater will be contained within the designated impervious bund. - Site inspections will be carried out regularly by the EPC contractor to ensure that all wastewater generated is properly managed, and no leakages or spill occur. In the event of a spill or overflow, immediate action will be taken in accordance with spill containment procedures and clean up procedures. - Engage a licensed waste contractor for the periodic removal of septic tanks. - Commissioning wastewater to be treated onsite or collected and transferred offsite by a licensed contractor to an authorized wastewater treatment plant. - In line with the IFC EHS Guidelines, effort will be made in training construction personnel to minimise water consumption for ablutions and to ensure an understanding of water resource and wastewater issues.	

6.3.7.2 Operation Phase Impacts and Mitigation

The operation of the Project will generate small amounts of non-hazardous domestic waste from the administration facilities and from activities of the employees. This waste can be classified as both recyclable and non-recyclable. Recyclable waste includes paper, tin cans, plastics, cartons, rubber, and glass, while non-recyclables will consist mainly of food residues and other organic wastes. The quantity of domestic waste will be small given that only a few personnel are required to operate the Plant. Other solid non-hazardous waste generated during operation will be landscaping waste and uncontaminated replacement parts and packaging.

The operation of the Project may also result in the generation of small quantities of the following hazardous waste streams:

- Used chemical containers and drums;
- Used oil;
- Miscellaneous wastes such as batteries, waste cables, oily rags, etc.; and
- General clean-up materials and solvents from general maintenance of on-site plant and machinery.

Inappropriate handling of hazardous waste streams through lack of personnel training on site may lead to accidental release of hazardous waste contaminating soil or groundwater. Contamination may also arise as a result of unlicensed and poor-quality waste transporters and waste management facilities. These risks may consequently result in illicit waste disposals (e.g., fly-tipping, or waste disposal at unlicensed locations).

During the operational phase, the project will have a wastewater treatment facility onsite and there will be zero discharge of wastewater streams to the environment. All effluents will be treated onsite by neutralization and directed to an evaporation pond or sent outside the plant boundary via trucks. The accumulating sludge in the evaporation ponds will regularly be disposed.

The clean storm water shall be discharged to the evaporation pond for 1 in 100 years return period with an infiltration capacity allowing water to percolate into the ground.

All sanitary wastewaters will be treated at the onsite sanitary wastewater treatment plant prior to discharge of the treated effluent into the evaporation ponds.

Other wastewater will be collected for treatment including any rainwater. The wastewater streams will be separated according to their origin and/or type of pollution and the type of treatment that they require.

Oily water and waste drainage will be collected in local sumps and then forwarded to an oil-water separator that will be periodically emptied via suction pump to a mobile vacuum truck, and subsequent disposed off-site by a licensed waste contractor.

Other wastewater streams include chemical waste, HRSG blowdown water, evaporative cooler blowdown water and wastewater from raw water treatment ultrafilters will be collected in the ETP for further treatment before discharge into the process wastewater evaporation pond.

Sludge from the sanitary treatment plant and the ETP will be collected and removed from the site by a licensed contractor to an authorised management or disposal site.

The table below outlines the estimated quantities of clean water and sludge that will be generated after wastewater has been treated at the onsite wastewater treatment facility.

Wastewater Type	Clean Water Quantity (m ³ /hr)	Sludge Quantity (m ³ /hr)
Sanitary wastewater	0.1568	0.00320
Industrial and RO wastewater	14.4	-
Industrial sludge wastewater	3.87	0.20
Oily wastewater	2.27	-

Considering the quantity of sludge and the significance of potential impacts on waste management facilities, in the absence of mitigation, is assessed to be of minor adverse magnitude.

Table 6-47 Operation Phase – Solid Waste and Wastewater Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Strain on existing waste management facilities	Minor Adverse	Waste management facilities	Medium	Minor	- The O&M Company will identify waste and wastewater management companies including recycling companies in Nairyah or nearest towns in order to promote the recycling of waste especially packaging materials, wood, metal waste & hazardous materials. - The O&M Company will coordinate with the local government authorities (e.g., municipalities) with regards to licensed and appropriate waste management facilities fit to accommodate project waste types and quantities. - An operation stage Waste Management Plan will be prepared and implemented following GIIP measures. - The O&M Company will ensure that only licensed waste transporters and waste management facilities will be engaged. Non-hazardous waste - Domestic solid wastes to be segregated and identified from the other waste streams into separate waste containers/skips clearly to facilitate recycling. - Waste containers/skips should be clearly labelled and placed in designated waste storage locations. Labels will be waterproof, securely attached, and written in English and other languages as required for the workforce. - For litter (food waste, domestic waste), an adequate number of covered bins should be strategically placed throughout the site at locations where construction workers and staff consume food. These will be regularly collected and taken to the main waste storage area. - Food waste must be stored within a sealed metal or plastic skip or bin, in order to prevent pests gaining access. - Heavy waste may be contained within an open skip, provided that segregation occurs effectively enough to remove all lightweight material that could be blown away. - Paper cardboard, metal cans, plastic, glass to be collected for recycling by a licensed waste contractor. - The O&M Company will maintain copies of the waste management licenses on site (of licensed transporters and disposal/treatment facilities). - Develop and maintain a waste inventory to document and track domestic solid wastes generated, segregated, reused and consignments. - Completed waste manifests are required to show the chain of custody of the waste generated on site, its transportation and treatment/disposal. All records will be maintained on site. Hazardous waste - Develop and maintain a hazardous waste inventory to document and track hazardous wastes generated, segregated, reused and consignments. - Segregate and identify hazardous waste from the other waste streams into separate waste containers/skips clearly signed and labelled.	Negligible

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
					- Store hazardous waste in allocated impervious hard standing areas in sealed containers stored with impermeable bases, sufficient containment and separation capacity, sun/rain shelter, separate drainage system, good ventilation and equipped with spill kits & spill response procedures. This area must be placed away from any sources of ignition. - Waste containers should be clearly marked with appropriate warning labels to accurately describe their contents and detailed safety precautions. Labels will be waterproof, securely attached, and written in English and other languages as required by the workforce. Wherever possible, chemicals will be kept in their original container. Wastewater - The Project Company will ensure due diligence in the operation and maintenance of the sanitary wastewater treatment plant, the ETP and the evaporation ponds (process wastewater and stormwater pond). - Regular maintenance will be carried out to ensure these facilities are managed according to manufacturers' instructions. - Zero discharge of wastewater streams to the environment will take place. - Quality of treated effluent (of sanitary WWTP and ETP) will comply with permit requirements by the authorities and the project environmental standards. The following parameters should be tested as a minimum: - Treated sanitary wastewater to be tested for parameters including BOD, turbidity, total suspended solids and ammonia. - pH to be tested in treated chemical wastewater. - De-oiled wastewater to be tested for oil & grease. - Solid wastes from the wastewater treatment plant will be managed as per the waste management plan. - Sludge from these facilities will be emptied and managed as per the waste management plan and requirements of national regulations and laws. - Evaporation ponds and associated pipes will be inspected for any leaks or overflow. - Implement a monitoring program to regularly inspect the condition of the evaporation pond liner, geomembrane, and other components. This may include visual inspections during cleaning. - Consider incorporating leak detection systems, such as sensors or monitoring wells, to promptly identify and address any potential leaks.	

6.3.8 Traffic and Transportation

6.3.8.1 Construction Impacts and Mitigation

Construction will result in additional vehicles on main highways and roads and temporary construction roads on-site. The number of vehicles will vary due to the phasing of works and the timing of vehicular movements. Construction vehicles will include a variety of vehicle classifications, e.g., HGV's, LDV's, trucks, pick-up trucks, excavators and other heavy/light equipment. The works will also require numerous vehicles to be mobilised to transport workers, components and equipment.

Heavy construction vehicles can cause accelerated wear and tear on road infrastructure, leading to potholes, cracks, and road degradation. This can result in nuisance to road users and the local communities, increase accidents risk and require more frequent maintenance. In addition, increase in the number of vehicles along the access road as a result of the Project's development has the potential to result in road traffic accidents affecting humans and livestock.

The local community may not be used to increased traffic including HGVs along the local roads traditionally and therefore, the magnitude of potential impacts to road infrastructure is considered minor and the magnitude of road safety incidents is assessed to be moderate.

Table 6-48 Construction Phase – Traffic and Transportation Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Increased vehicular flow impact to road infrastructure	Minor Adverse	Road infrastructure	Medium	Minor	- Prepare a Traffic and Transportation Management Plan outlining control measures to reduce impacts of vehicles movement. - The local police and other relevant authorities will be consulted during the development of the Traffic Management Plan. - Construction access roads to be clearly marked, with routes, parking, directions, speed limits, unloading area (amongst others). - Minimise the number of construction road movements as much as practicable, i.e., maximize the capacity of vehicles - Buses should be used and carpooling should be encouraged. - Stagger deliveries to the site will ensure that congestion on local and site roads is minimised, whilst reducing waiting times for drivers and over demand on receiving staff at the site. - Drivers to be fully competent and authorised to drive heavy loads vehicles and to receive specific training. - All site vehicles shall have audibled and visual warnings when reversing. - Off-road driving outside of dedicated roads and active work sites shall be prohibited.	Negligible
Road Safety Incidents	Moderate Adverse	Farms and herders in the Project area	High	Moderate	- Vehicle speeds on all non-public site access and internal site roads will be restricted to 30km/h. - Driving awareness to be provided to workforce. - Ensure escorts, flag persons and other safety measures are employed where necessary (e.g., entering and exiting the site) - The EPC Contractor will notify the local communities on delivery of wide/heavy loads and how it could potentially impact their road use. - All traffic incidents and near misses will be recorded and investigated with any necessary corrective actions taken including reporting to local police. - Prompt repair and maintenance works will be ensured to rectify any damages caused by construction traffic, in coordination with the relevant local authorities. - Compensation of any livestock injured by Project vehicles will be conducted in coordination with local officials. - A grievance mechanism will be established to allow local communities to make complaints relating to Project traffic nuisance or drivers.	Negligible

6.3.8.2 Operation Impacts and Mitigation

Transportation impacts during operations are not expected to be significant, as the operation of the Project will not require continuous delivery of materials, or other equipment to operate. There will be operational staff daily commute and occasional deliveries and waste removals from the site, which will not result in a significant amount of traffic on the main roads in the area. Therefore, the traffic and transportation impact assessment during operation has been scoped out and is not discussed any further in the report.

6.3.9 Terrestrial Ecology

6.3.9.1 Construction Phase Impacts and Mitigation

The presence of construction equipment, workers, temporary facilities and environmental externalities resulting from construction processes (i.e., noise, vibration, waste and wastewater) have the potential to impact upon terrestrial ecology during the construction phase. Such impacts may include the partial or direct loss of habitat and flora species as well as disturbance to fauna.

HABITAT LOSS

Based on preliminary observations made during the site visit conducted in January 2024, the site is mostly considered "Natural Habitat" with sparse vegetation. Areas of 'Modified Habitat' are present outside the project boundary due to the presence of infrastructure (i.e., existing OHTL, existing road etc.

Site preparation works will include levelling and clearance resulting in the removal of the limited vegetation within the Project site and related working areas, including the temporary installation area. This will result in the loss of existing habitats and adversely impact the flora onsite. However, majority of the Project site is covered with homogenous seasonal grass with limited number of flora species. Magnitude of potential impacts on habitat is assessed to be minor.

DIRECT IMPACT TO FAUNA

Other than the camels observed along the access road, no mammal species were observed during the preliminary site visit. The impact will be updated if required based on findings from terrestrial ecological survey that will be conducted at a later stage.

Any ground dwelling fauna and smaller invertebrates that could be present may be directly impacted by earthworks during construction and will be impacted by removal of flora habitat for refuge. However, significant impacts are not anticipated.

INDIRECT IMPACTS TO FAUNA AND AVIFAUNA

Fauna and avifauna species that may be present (to be confirmed during baseline ecological survey) within the Project footprint and local areas may be disturbed due to the loss of the habitat, increased human presence, and temporary effects of dust, noise, waste as well as lighting during construction. This may result in a flight response from the Project area and such fauna species will be required to migrate away from the work area to find suitable alternative habitat in the surrounding area. However, given the availability of other similar habitat off-site the impact is not expected to be significant.

Table 6-49 Construction Phase – Terrestrial Ecology Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Direct loss of habitats	Minor Adverse	Sandy areas, gravel plains and common flora species	Low	Minor	- The temporary installation area will avoid the wadi and be limited to the required space. - Areas within the Project boundary that will not be of use will be delineated and demarcated to prevent access to it and retain its natural characteristics. - Where possible, optimize the construction areas to avoid areas of vegetation, wadi area and demarcate these areas. - A pre-construction survey to identify the presence of trees or shrubs within the Project footprint will be undertaken by an appropriately qualified person. Should any trees or shrubs be identified, a tree survey will be undertaken, and the result shared with NCVC to determine the requirement for translocation. A Tree Translocation Plan will then be produced and issued to NCVC for approval. - Select fencing that allows the free movement of small fauna onto and across the site (through a gap of circa 20 cm under the fence) to support habitat (and soil) restoration goals and limit biodiversity impacts. Clearly demarcate all work areas and site access routes to limit risk of clearance of non-designated areas. - Land clearance (or grading) is to be limited within the boundaries of the Project area. - As part of the Project design and layout, establish habitat corridors that connect fragmented areas around the Project. - No unauthorised off-road driving outside of approved haul roads and active work sites. - There will be no encroachment to land outside of the Project footprint, or defined laydown areas, site access roads, or designated construction access routes. - To aid re-vegetation, topsoil from the vegetated sand sheets (containing the most nutrient rich soils) should be stripped/removed and stored safely to be reinstalled and spread over any Project disturbed areas including temporary installation areas once construction has been completed. - For any landscaping activities, the planting pallets to be native species. - Prevent introduction of any alien or invasive flora species. - Any required soil imports will be taken from approved local quarry or borrow pit as close to the site as reasonably practical to avoid risk of foreign seeds and invasive species. - Plant and machinery will require a certificate of inspection before coming onto site and this will include necessary cleaning to reduce risks of importing invasive species.	Negligible
Direct Impact and loss of Mammals, Reptiles and Invertebrates	Moderate Adverse	Common fauna species	Low	Minor	Any sightings of fauna and avifauna species on-site (including nesting) during construction activities must be reported to the Environmental Manager.	Negligible

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Indirect Impact to Fauna and Avifauna	Minor Adverse	Common fauna and avifauna species	Low	Negligible	- Where lizard & small mammal burrows are encountered on the project site the contractor will make efforts to ensure that they vacate their burrows prior to excavation works. - A 30km/h speed limit will be imposed across the construction site in order to minimise risk of direct mortality of fauna. - Lighting to be minimised at all work areas and all lighting shall be switched off when not in active use. - Lights should be shielded to prevent spill and glare beyond site boundary. - Nests of breeding birds, or similar and dens of animals shall not be disturbed. - Implement the mitigation measures to reduce dust emissions, noise, manage waste etc. included in the applicable chapters of this ESIA. - Avoid creating conditions that will attract birds, animals, pests within the construction areas and immediate surroundings (e.g. artificial water bodies, accumulation of waste etc.). - Implement strict controls forbidding the gathering, poaching or otherwise disturbance of any flora or fauna on site. - Contractor's staff, sub-contractors and visitors shall be provided with environmental awareness training which includes procedures in dealing with sightings of animals. Site inductions to cover the importance of minimising disturbance to habitat and wildlife, the importance of environmental protection and outline the locations where access is permitted. Even though spiny tailed lizards were not recorded during any of the site visits, the following mitigation measures have been included as a precautionary approach: - Staff induction and training such as toolbox talks on spiny tailed lizards (STL). - If a STL is recorded, clearly mark the identified STL active burrows and establish a minimum protection radius of 50m centred on the burrow entrance. These areas shall be considered as no-go areas for construction personnel and equipment. - Undertake removal and relocation from site prior to construction. Optimum times for relocation are between August - October and March – May. The relocation is to be undertaken by an experienced ecologist.	Negligible

6.3.9.2 Operation Phase Impacts and Mitigation

Due to the likely paving and hard standing surface over the majority of the Project site, it is anticipated that impacts during operational phase to any terrestrial ecology will be minimal. As such, the only activities that could negatively impact the terrestrial ecology of the site would be through indirect measures, relating to lighting, management of waste and wastewater and poor management practices of any designated landscaped areas. These impacts have been addressed in the applicable chapters of this report and have therefore not been assessed any further.

6.3.10 Archaeology & Cultural Heritage

6.3.10.1 Construction Phase Impacts and Mitigation

Based on the desk review, there are no international or national sites of cultural heritage significance listed in connection with the Project site.

During the visit, no above ground archaeological or cultural features were identified within the Project area or its close vicinity. However, the possibility that unexpected items of cultural heritage or paleontological significance are buried and undiscovered within the Project site cannot be completely discarded. The potential impacts of damage to unknown buried artefacts are not considered to be significant.

This will be further confirmed by stakeholder engagement that will be undertaken by SPPC on behalf of the Project as per the Project stakeholder engagement plan.

Table 6-50 Construction Phase – Archaeology and Cultural Heritage Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Damage to unknown buried artefacts	Minor Adverse	Buried artefacts	Medium	Minor	- An archaeological 'Chance Find Procedure' will be developed by the EPC Contractor prior to construction and the start of site earthworks, alongside the CESMP. This will include protocols and procedures to stop work and methods to preserve potential finds, as well as reporting requirements and coordination with the Ministry of Culture – Saudi Heritage Commission. - In the event of a discovery of any potential heritage items, all works shall stop in the immediate vicinity. - Removal of any archaeological artefacts from the site is strictly prohibited. - The finding shall be reported to the site supervisor, the Project management team and SPPC. - All direction concerning the management of potential archaeological finds must only be taken from the regulator. - Contractor's staff (particularly machinery operators) shall be trained on the Chance Find Procedure and informed of their responsibility and key processes to follow and report any suspected archaeological finds to avoid disturbance. - Where artefacts or archaeological remains are encountered, the site will be clearly signed/delineated with high visibility flagging to impede access and prevent any damage or loss of the artefacts which have just been found.	Negligible

6.3.10.2 Operational Impacts and Mitigation

The operational phase of the Project will not result in impacts to archaeology, as the site will be static and further excavations will not be required. Therefore, the operation impacts to archaeology and cultural heritage have been scoped out and are not discussed further in the report.

6.3.11 Landscape and Visual Amenities

6.3.11.1 Construction Phase Impacts and Mitigation

CHANGE IN LANDSCAPE CHARACTER

The construction of a new development, particularly those on a large scale have the potential to result in changes to the landscape character of the locality through land use and topographical changes.

One of the first stages of construction activities will result in the levelling, grading and preparation of the site prior to the commencement of construction. The proliferation of other activities such as the subsequent construction of the buildings and stacks which will take place steadily over the construction period will eventually further transform the landscape. Magnitude of potential impacts due to changes in its landscape character is assessed to be minor and adverse.

VISUAL NUISANCE

Project construction activities will introduce additional impacts in the form of visual nuisance to surrounding receptors as a result of the movement of heavy construction vehicles and equipment to and from the Project site. Earthworks and construction activities can potentially result in dust generation and a resulting temporary haze causing disturbance to the current visual envelope of receptors, by affecting their visual amenity and/or blocking their views.

Impacts to the visual envelope of surrounding receptors will also occur at night where the addition of lighting during construction will illuminate the Project area. The use of lighting across the site will result in a night-time light haze likely to be visible for several kilometres from the Project area.

The main receptors in the Project vicinity include the nearby herders and residents of the Dhulayát Al Khalilayn town, however as outlined earlier, the landscape in the area had already been slightly impacted by the existing road and the OHTL. The visual impacts during construction and the presence of vehicles and equipment, even though largely unavoidable are only temporary, and are not expected to result in significant impact to the receptors or motorists on the road. Therefore, the magnitude of potential impacts is considered minor.

Table 6-51 Construction Phase – Landscape and Visual Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Changes in landscape character	Minor Adverse	Landscape Character	Medium	Minor	- Land clearance will be limited to the area within the Project boundary of the Projects site. - Where appropriate, construction work areas will be screened with stockpiles to reduce the visual intrusion to the off-site receptors. - Cluster temporary facilities and storage areas together to minimise spread of influence in landscape. - All temporary construction facilities will be removed once this phase is complete unless there is an agreement between the Project Company for use during the operation phase. - The laydown areas will be restored to or close to their original condition after the completion of the construction phase. - Incorporate native planting where landscaping is planned to help reinstate the natural landscape.	Negligible
Visual nuisance	Minor Adverse	Farms and herders near the Project area	Medium	Moderate	- Construction laydowns and working areas of the site will be screened to reduce the visual intrusion to existing off site receptors. - Any temporary structures constructed along the access road into the site will be removed immediately after use. - Mitigation and management measures relating to the generation of dust shall be implemented to minimise visual impacts during construction activities on site and along the access road. - Minimise construction works at night-time to only those strictly required and approved by the relevant authorities through issuance of night permits. - Avoid excessive or unnecessary lighting. - Lights should be installed at low height and ideally should face towards the work area and not outwards from the Project site. - Light fittings shall be directional as deemed appropriate for their use and intended areas of illumination. - Lighting column and lighting head design will be chosen to limit back spill and any unwanted light spill to other site areas or, those areas off the site. If possible, the EPC contractor will plant decorative trees along the boundary of the Project site and access road.	Minor

6.3.11.2 Operation Phase Impacts and Mitigation

Those receptors affected by the visual impacts during the Project operation will be those that have direct (and partial) views across the existing site. It is inevitable that the Plant, once completed will result in further changes to the existing landscape and visual setting which is mostly an open desert landscape. Apart from the existing OHTL and road, the addition of new structures, power generating equipment, roads and stack structures, will impact the views onto the site from overlooking receptors.

Lighting will be required for, security lighting around site perimeter, lighting within the plant itself and that site entrances or along access roads. Impacts due to lighting may result in considerable changes to the night-time views of the site. This will be minimised through implementing the applicable measures to avoid unnecessary sky glow glare or light spill into dark areas.

Considering the existing landscape value of the Project area, the impacts are likely to have moderate magnitude and significance on the surrounding receptors.

Table 6-52 Operation Phase – Landscape and Visual Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residual Significance
Landscape and visual amenity	Moderate Adverse	Residents of Dhulayāt Al Khalilayn town Farms and herders in the Project area	Medium	Moderate	• Efforts will be made to soften the landscape character impacts by planting native trees and vegetation in appropriate areas such as the Project boundary and alongside the access road. • Utilise efficient low energy systems where appropriate in order to preserve intrinsically dark areas and the night sky. • Lighting during operations must be kept to a minimum required for security, health and safety • Light fittings will be directional as deemed appropriate for their use and intended areas of illumination. • Lighting column and lighting head design will be chosen to limit back spill and any unwanted light spill to areas outside of the Plant premises.	Minor

6.3.12 Socio-Economic

6.3.12.1 Construction Phase Impacts and Mitigation

EMPLOYMENT AND ECONOMICS

The primary economic impact during construction is likely to result from employment creation during this phase which will have a positive effect. This will include the direct monetary benefit to the families of those employed. Money paid to workers will also stimulate the local economy via the multiplier effect, whereby money earned on the project expended locally will re-circulate within the local economy.

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

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

BOOST TO LOCAL / REGIONAL ECONOMY

A secondary impact, also beneficial, is likely to arise from spending on local and foreign goods and services during the construction process. The nature of the development, and specialised nature of required materials, suggests that these will be sourced internationally, with the expectation for construction materials locally (e.g., concrete, masonry, cabling, piping).

LOSS OF ECOSYSTEM SERVICES

Herding and grazing activity was evident during the site visits surveys in the surrounding areas of the project, which suggests that the Project area may occasionally be utilized for grazing. The use of the land by local herders for grazing and browsing by domestic animals is a type of provisional ecosystem services. The development of the Project will result in reduced access to some herding areas.

Any impacts to the livestock herders due to the loss of grazing land will be minor given the availability of land within the immediate vicinity of the Project site.

While the grazing lands are open and the herders are mobile and transient in nature and only temporary users who are not limited to a specific location, the herds may be indirectly impacted due to air and noise emissions, or directly impacted by accidents. Accordingly, if not properly managed, the Project construction may potentially temporarily impact the local herders.

ECONOMIC AND PHYSICAL DISPLACEMENT

No formal land users were observed within the direct Project footprint during the site visit conducted in January 2024. The potential economic or physical displacement due to the Project is not anticipated.

INCREASED COST OF LIVING

The influx of workers due to construction activities can lead to an increase in demand for basic commodities within the local area. This increased demand, if not managed effectively, can potentially result in inflation or higher prices for essential goods and services. Some of the impacts of may include:

- The increased demand for basic commodities, such as food, housing, and transportation, can drive up prices due to limited local supply, and lead to price inflation. Nonetheless, labour accommodation and workers transportation will be provided which would help manage and control this impact.
- The surge in demand may strain local supply chains, causing shortages or limited availability of basic commodities. This can further exacerbate price inflation and create challenges for the local population to access necessary goods.
- Higher prices for basic commodities can disproportionately affect vulnerable populations with limited financial resources, leading to social and economic inequalities within the community.

Table 6-53 Construction Phase – Socioeconomic Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Provision of temporary jobs during construction	Negligible Beneficial	Local communities	High	Minor Beneficial	- The Project Company will employ qualified Saudi Arabia citizens to the maximum extent possible and in accordance with the law. - EPC Contractor will seek to employ local workers where possible, while ensuring equal employment opportunities. - Engaging with local labour offices, job centres, and community meeting location to prime job opening and facilitate recruitment. - Establish a fair and transparent recruitment process to ensure equal access to employment opportunities, while implementing procedures that prevent discrimination and promote diversity and inclusion in the workforce. - Establish a grievance mechanism to address concerns related to employment opportunities, such as unfair treatment, discrimination, or non-compliance with labour regulations, and ensure workers have a channel to voice their concerns and provide feedback. - The Project Company will develop an HR Policy that outlines key employment processes for the Project. This should include the prioritization of hiring local workers where possible and where skills are available locally. - The EPC and sub-contractor HR Procedures will be prepared to ensure alignment with the Project Company policy and consistent with local labour laws and international ILO and UN conventions. - The EPC Contractor is to ensure that this is applied as an overarching policy for all subcontractor company HR policy as part of their contractual arrangements.	Minor Beneficial
	Minor Beneficial	Employment market (local and regional)	Medium	Minor Beneficial		Minor Beneficial
Increase in skills sets of population	Minor Beneficial	Construction workers	Medium	Minor Beneficial	- All project workers will receive induction training at the project as well as vocational specific training for on-site construction works. - All workers will receive training in regard to health and safety as well as environmental awareness. Providing training programs and skill development opportunities to enhance the employability of local workers. - Toolbox Talks will be conducted before work each day to ensure workers are reminded of key topics. - Cultural awareness training for all foreign workers. Implement social integration programs for expatriates to support the smooth transition of workers into the local community.	Minor Beneficial
Positive indirect benefits and uplift to local economy from increased local spending	Minor Beneficial	Local/ Regional Economy	Medium	Minor Beneficial	Contractors and suppliers to prioritize local procurement, sourcing materials, goods, and services from local businesses whenever feasible	Minor Beneficial

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Loss of ecosystem services	Minor Adverse	Herders in the Project area	High	Minor	- Install warning signs to indicate any risk of falling in trenches for people and herders taking their herds to the Project area. - Implement early warning systems to inform herders about project activities, construction zones, and potential hazards. This allows herders to adjust their routes or grazing patterns accordingly to avoid potential conflicts or risks. - There will be no encroachment to land outside of the Project footprints, or defined laydown areas, or site access road. - All vehicles and equipment to be restricted to movements within the project boundaries and designated site access roads. - Design grievance mechanism to be implemented and disseminated in a culturally appropriate way to herders.	Negligible
Increased cost of living for local communities	Minor Adverse	Local Economy	High	Minor	- To meet the local content requirements, the Project must procure all goods included in the mandatory list of machinery, equipment and electrical devices as given in Annex 4.1-4 from local sources within KSA. - Implement policies that prioritize local employment and procurement, ensuring that a significant portion of the project's workforce and supply chain is sourced from the local community. This can help distribute the economic benefits of the project more evenly and reduce the impact of increased living costs on local populations. - Prioritize the procurement of goods and services from local suppliers and businesses, which can boost the local economy and create job opportunities, thereby offsetting the increased cost of living.	Negligible

6.3.12.2 Operational Phase Impacts and Mitigation

The Project will help address the escalating demand for electricity in the Project area. As population growth and economic activities surge, ensuring a stable and reliable power supply in KSA is paramount. At a strategic level the development of the Project not only mitigates the risk of energy deficits but also aligns with the KSA Vision 2030.

As with the construction phase, an economic impact during operation will result from any local employment created by the Project. Whilst the size of the required workforce is significantly small, the type of work and the increased timescales involved offer an opportunity for greater dissemination of skills. This will result in a small amount of job creation and monetary uplift. Although beneficial, this is not expected to be of particular significance.

Table 6-54 Operation Phase – Socioeconomic Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Provision of jobs opportunities	Negligible Beneficial	Employment market (local and regional)	Medium	Minor Beneficial	- O&M Company will seek to employ local workers where possible. - The projects recruitment policy will ensure a preference for employing workers from the local population where appropriately skilled workers are available locally (or if unskilled positions are available). - Establish a fair and transparent recruitment process to ensure equal access to employment opportunities, while implementing procedures that prevent discrimination and promote diversity and inclusion in the workforce. - Establish a grievance mechanism to address concerns related to employment opportunities, such as unfair treatment, discrimination, or non-compliance with labour regulations, and ensure workers have a channel to voice their concerns and provide feedback. - The Project Company will need to develop an HR Policy that outlines key employment processes for the Project. This should include the prioritization of hiring local workers where possible and where skills are available locally. - The HR Policy will ensure compliance with local labour laws and international ILO and UN conventions. - The HR Procedures will be prepared to ensure alignment with the Project Company policy and consistent with local labour laws and international ILO and UN conventions. - The O&M Company is to ensure that this is applied as an overarching policy.	Minor Beneficial
Increase in skills sets of population	Minor Beneficial	Operation workers	Medium	Minor Beneficial	- Workers will be encouraged to develop their careers and may be provided with opportunities to attend training courses and other career development processes. - Training plans to be developed and implemented to facilitate career development and advancement within the local workforce.	Minor Beneficial

6.3.13 Community Health, Safety & Security

6.3.13.1 Construction Impacts and Mitigation

WORKER INFLUX

During the construction phase of the Project, a dedicated labour force will be required, including site-based security personnel and staff for administration and accommodation areas. This will result in an increase in the local population size within the project area. To accommodate this workforce, suitable accommodation facilities will be needed.

Even though employment priority will be given to the local community, it is anticipated that the workers will also come from outside the project area and will most likely include expatriates. Therefore, the workforce will include workers from various regions of Saudi Arabia, as well as the Middle East and international workforce and experts.

As a result, there is a possibility that workers accommodated in the Project accommodation may interact with residents of major towns and villages within the area.

The influx of workers from diverse backgrounds and cultures could potentially lead to cultural conflicts with existing local communities. These conflicts may arise due to differences in ideals, behaviour, and cultural practices, and may lead to potential crime or security risks in extreme situations.

Throughout the construction phase of the Project, the arrival of a larger workforce can exert added stress on the local public infrastructure. This strain manifests in various areas including transportation systems, utilities, healthcare facilities, and other public services. The commute to and from the construction site may cause traffic congestion and longer travel durations, thereby impacting the overall efficiency of transportation networks. Moreover, local utilities such as water supply may face difficulties accommodating the heightened population, potentially resulting in service interruptions. Electricity is expected to be provided by onsite generators and therefore is not expected to increase the pressure to energy infrastructure. Healthcare facilities and emergency services might encounter challenges in meeting the increased demand for their services.

PUBLIC/COMMUNITY SAFETY

Considering the relatively low population in the surrounding area of the Project, the typical construction risks to external parties, such as the movement of high-powered equipment and vehicles, excavations, and the risks associated with fire and pollution releases, are not expected to impact the public/community. However, there is the potential that the Project could be accessed by the public, particularly herders in the vicinity of the Project area.

Such instances would only be expected in the event of public access to the site, which could have the potential to result in isolated incidents if the site is not properly managed to prevent unauthorised access by adults or children to areas of excavation, equipment and machinery.

While the use of hazardous materials or chemical and fuel storage on-site is limited, isolated incidents related to oil spills, dust dispersion, or other similar events may still occur in the Project area. These incidents, although not widespread, should be addressed through appropriate measures to prevent and mitigate their potential impact on the environment and external parties.

The introduction of workers in the vicinity of local communities has the possibility of increasing Gender Based violence (GBV) between workers and community members. However, this is considered to be unlikely due to the distance from the Project to the nearest communities.

SECURITY

The site is expected to be fenced and site-based security personnel are expected to be stationed at the project offices, laydown areas, and patrol the project area to prevent the public from trespassing onto the construction sites. Their presence will help maintain a secure environment and minimize the risk of construction site incidents.

It is understood that by law in KSA all security personnel have to be Saudi locals and are not allowed to be armed; in most cases of security issues, the security is required to directly inform and report to the police. This raises the risk that the security personnel who are mandated with providing protection to the workers can abuse their position of power and status and become perpetrators of the human rights of the members of the workforce or the community in case of conflict.

DISEASE AND ILLNESS

The nature of construction projects, involving workers from various regions and parts of the world, presents a potential risk for the transfer of communicable diseases and illnesses. The close interaction and mixing of workers on construction sites and in labour accommodations can facilitate the spread of such diseases, which may also impact the surrounding communities.

Furthermore, construction activities, including the presence of temporary facilities, can create environments conducive to the growth and spread of bacteria and parasites. Sanitation facilities, in particular, may serve as breeding grounds for these microorganisms, posing a potential indirect risk to local communities. Any potential contamination from the site such as spillage of raw sewage or hazardous materials could potentially result into water related and water borne diseases through contamination of surface and groundwater.

Table 6-55 Construction Phase – Community Health, Safety & Security Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Community disgruntlement with external staff (potentially including expatriate workers)	Minor Adverse	Local communities	High	Minor	- Develop and implement robust stakeholder engagement plan to foster open communication, transparency, and dialogue between the project team and the local community. - Prioritize local employment opportunities by actively recruiting and hiring from the local community. This demonstrates a commitment to supporting the local economy and provides a sense of ownership and involvement in the project. - Provide cultural sensitivity training to all external staff, including expatriate workers, to promote understanding and respect for local customs, traditions, and social norms. This helps to prevent cultural misunderstandings and promotes harmonious interactions with the community. - Develop community integration programs to facilitate positive interactions and relationships between external staff and the local community. - Establish a grievance mechanism that allows community members to voice their concerns, provide feedback, and seek resolution to any issues arising from the presence of external staff. This mechanism should be easily accessible, transparent, and responsive to community needs. - EPC Contractor will appoint a community liaison officer preferably from the local community who will maintain communication with the local leaders and community members.	Negligible
Community health risks	Minor Adverse	Local communities	High	Minor	- The Health and Safety teams on site will provide advice during training/inductions on exposure to disease including preventative measures. - During construction, staff will have access to medical professionals and suitable medical facilities, which will aim to prevent the spread of diseases internally and externally. Site personnel will only be cleared for work after with a medical fitness certificate from an authorized medical centre. - Any reportable disease will be diagnosed by the authorized occupation health centre doctor. Diagnosis includes identifying any new symptoms, or any significant worsening of existing symptoms. - Any external and internal spreading diseases will be diagnosed and taken the precautions as per the instructions from the national/ local medical authority. - The potential for exposure to water-borne, water-based, vector-borne diseases and communicable diseases as a result from project activities will be avoided or minimized. - Additional management and mitigation measures will be in accordance with the World Bank guidance note on Managing the Risks of Adverse Impacts on Communities from Temporary Project Induced Labour Influx (2016).	Negligible
Increased pressure on public infrastructure	Minor Adverse	Local communities	High	Minor	- Conduct an assessment of the existing public infrastructure to identify potential areas of strain. - Assess the capacity of existing utilities and services, such as water supply, electricity, and waste management, and plan for necessary expansions or upgrades to meet the increased	Negligible

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
					demand. Coordinate with local utility providers to ensure timely provision of additional services and prevent service disruptions. - Consider the construction of temporary infrastructure, such as temporary roads or utilities, to alleviate pressure on existing infrastructure during the construction phase. This can help to distribute the increased demand and prevent overburdening of the existing systems. - Implement effective traffic management measures to mitigate congestion and minimize disruptions to the local transportation system. This can include implementing alternative traffic routes, coordinating construction schedules to minimize peak traffic hours, and providing clear signage and communication to redirect traffic.	
Exposure of community to construction hazards	Minor Adverse	Local communities and herders	High	Minor	- The employees during the construction phase shall undergo a Code of Conduct training to ensure smooth coordination with the neighbouring community. - Risks to public safety will be appropriately addressed and prepared for in the construction phase 'Emergency Preparedness and Response Plan' and training. - The plan will include the appropriate procedure to respond to any such incidents, as well as site specific contact details and details of external agencies who may be required. - All high-risk areas including fuel storage areas will be secured with internal fencing and will be patrolled by security throughout the day. - Appropriate mechanisms for emergency control (e.g. firefighting equipment) will be placed at suitable positions around the site.	Negligible
Security risks to the Project and the community (including use of excessive force)	Minor Adverse	Local communities and herders	High	Minor	- The project will employ its own security staff who will provide 24/7 security control across the Project site and dedicated security staff at gatehouses. - The EPC will prepare a Security Plan consistent with its Security Risk Assessment. - The project will be fenced during enabling works stage. - All vehicles entering the site will require pre-approved clearance and will need to be registered. Project security will record all instances of incoming vehicles. - CCTV will be installed at key locations around the site and at gatehouses. - Appropriate lighting will be provided at gatehouses for security personnel to prevent unauthorized access. - Project personnel will only be provided access to the construction site with valid ID cards and permits to work in line with HSE requirements. - The security arrangements will require to be guided by UN Code of Conduct for law enforcement officials, the IFC's Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts IFC's and the Voluntary Principles on Security and Human Rights. - Security personnel will receive internal training in regard to receiving grievances, reporting such grievances and code of conduct for dialogue with any members of the local community and the workers.	Negligible

6.3.13.2 Operational Phase Impacts and Mitigation

PUBLIC/COMMUNITY SAFETY AND EMERGENCY SITUATIONS

The operation of the Plant is associated with various risks that could potentially result in impacts to public safety in the absence of required control measures. Depending on its nature and severity, such impacts could be transferred or received outside of the Project site. Such impacts will arise from hazards associated with the unloading, storage and handling of hazardous materials potentially leading to unforeseen incidents that may relate to fire, releases of toxic gases, explosions, spills of back up fuels, releases of untreated wastewater.

The extent of such impacts may range outside of the projects boundaries and require the involvement of outside agencies to help manage and abate such impacts (e.g. police, fire department etc). There are a few herders/farms within one kilometre radius of the Plant with the nearest community/residential area located more than 3km from the Project site.

Public risks during operation as a result of incidents could have a significant impact upon neighbouring communities and populations. However, the Plant will be equipped with advanced leak detection systems and alarms with remote operated emergency isolation valves and continuous emissions monitoring systems to detect fugitive emissions of gases which will avoid such risks. Storage of hazardous liquids such as fuel will be within secure areas and tanks with adequate secondary containment bunds and double walls as necessary. The firefighting system at the Plant will be routinely checked and maintained as required to ensure its efficiency for use in case of fire incidents. Storage volume of hazardous materials at the Plant will be reduced to the minimum required.

Risks to public safety will be appropriately addressed and prepared for in the operational phase 'Emergency Preparedness and Response Plan' and via appropriate training of staff.

SECURITY STAFF AND CLASHES

The development of the Project will also include security at the Project main entrance and on patrol around the site during operations. Although unlikely, this raises the risk that the security personnel who are mandated with providing protection to the Project can abuse their position of power and status and become perpetrators of the human rights of the members of the workforce or the community in case of conflict.

Table 6-56 Operation Phase – Community Health, Safety & Security Impacts and Mitigation

Impact	Impact Magnitude	Receptor	Sensitivity	Significance before Mitigation	Mitigation	Residuals Significance
Public/ community safety and emergency situations	Moderate Adverse	Local communities and herders	High	Moderate	- Risks to public safety will be appropriately addressed and prepared for in the operational phase 'Emergency Preparedness and Response Plan (EPRP)' and training. - The EPRP will be developed, also based on consultations with local authorities. - A Community Health and Safety Plan will be prepared for implementation which will also be based on consultation with local communities. - The EPRP will include the appropriate procedure to respond to any such incidents, as well as site specific contact details and details of external agencies who may be required. - The employees during the operational phase shall undergo a Code of Conduct training to ensure smooth coordination with the neighbouring community. - Appropriate mechanisms for emergency control (e.g., leak detection and alarm systems, firefighting equipment) will be placed at suitable positions around the site. - The project will implement an appropriate system to allow external parties to raise grievances in regard to the Project. - The Grievance Mechanism will be clearly defined, transparent and accessible to identified stakeholders. - EPC Contractor will appoint a community liaison officer preferably from the local community who will maintain communication with the local leaders and community members.	Negligible
Security staff and clashes	Negligible Adverse	Local communities and herders	High	Minor	- The project will employ its own security staff who will provide 24/7 security control across the Project site and dedicated security staff at gatehouses. - All vehicles entering the site will require pre-approved clearance and will need to be registered. Project security will record all instances of incoming vehicles. - CCTV will be installed at key locations around the site and at gatehouses. - Appropriate lighting will be provided at gatehouses for security personnel to prevent unauthorised access. - Project personnel will only be provided access to the construction site with valid ID cards and permits to work in line with HSE requirements. - The security arrangements will require to be guided by UN Code of Conduct for law enforcement officials, the IFC's Good Practice Handbook on the Use of Security Forces: Assessing and Managing Risks and Impacts IFC's and the Voluntary Principles on Security and Human Rights. - Security personnel will receive internal training in regard to receiving grievances, reporting such grievances and code of conduct for dialogue with any members of the local community and the workers.	Negligible

6.3.14 Labour & Working Conditions

6.3.14.1 Construction Impacts

CONTRACTUAL AGREEMENTS

KSA labour law includes clear guidelines for timely payment of salaries, working hours, breaks, rest days, paid leave, sick leave and end of service benefits. Salaries are protected by the Wage Protection System (WPS) in KSA, and all workers shall receive their salaries in local currency and bank accounts as per the Law. In addition, the IFC PS2 and ILO conventions provide clear requirements related to the working conditions.

However, contractors may violate the laws and regulations and workers potentially accept the unjust conditions they experience as they are not aware of their legal rights or afraid of the adverse outcomes expressing their concern may result in.

Local and migrant workers can be the most vulnerable to risks related to working conditions. However, such risks could affect all construction workers. Some possible risks for this project include no provision of a work contract or other relevant documentation, lack of payment or insufficient payment of overtime hours, or unsuitable accommodation, among others. In addition, workers that are new to construction work may be unaware of their rights in the workplace.

LABOUR RIGHTS, FORCED LABOUR AND CHILD LABOUR

Several parties will be involved in the construction process and there will likely be various internal processes and protocols related to worker management for each party. Certain parties will also engage contract staff (e.g. from agencies), where additional manpower is required. There will also be suppliers/service providers (e.g. for deliveries, waste management) who will have access to the site and will be exposed to certain risks of exploitation.

Discrimination based on gender, nationality, religion or as a result of different social status or work position is widespread within construction industries. Labour exploitation on construction sites, unfortunately, has become a reality in some parts of the world with history of contractors and recruitment agency exploitation of workers despite existing Labour Law articles that forbid such practices. Inequality in income, education and opportunities has led to opportunistic practices with labourers and site staff suffering as a consequence. All workers have a right to make a living through work they have chosen and accepted freely without coercion or intimidation. This also includes access to suitable work in safe working conditions.

Workers are also at risk (especially migrant workers) as they face the risk of debt bondage through unscrupulous recruitment agencies in their home countries. Even though the EPC Contractors will be responsible for covering the required expenses as per the Labour Law, there still remains a risk of engaging uncertified recruitment agencies who have human rights violations.

Child Labour is forbidden by law and compliance is regulated by KSA work permitting processes for foreigners and residents through the Ministry of Human Resources and Social Development (MHRSD). Illegal recruitment of minors may be observed in the absence of regular monitoring of the contractors' human rights practices and auditing the sites and the management systems in place. However, the

recruitment process in the KSA such as obtaining a work permit from the relevant government departments ensures that children are not exploited.

OCCUPATIONAL HEALTH AND SAFETY

Common activities undertaken during construction such as the movement of heavy machinery, excavation, handling of chemicals, etc. can all introduce significant risk to the health and safety for the associated work force. In particular, risks are more likely to be apparent for those who are not familiar with the type of works undertaken and/or the associated hazards.

There is also a likelihood of injury when different work processes are being undertaken. The type of hazards attributable to a construction site will vary significantly dependent on the construction methods employed and the degree of control implemented by the EPC and affiliated sub-contractor.

The close interaction and mixing of workers on construction sites and in labour accommodations can facilitate the spread of such diseases, which may also impact the surrounding communities.

In addition, climate related risks can impact worker welfare (e.g., dust storms, excessive temperature, high intensity rainfall etc.).

These impacts are expected to increase in the absence of awareness, proper management, and access to suitable medical care and health insurance provisions.

GENDER BASED VIOLENCE AND HARASSMENT

During the construction phase, workers will be vulnerable to various forms of harassment, exploitation and abuse, aggravated by traditionally male working environment. Gender based violence and harassment (GBVH) may be committed by co-workers or construction supervisors and can be attributed to gender stereotypes.

The construction workers are likely to be predominantly young male coming from outside of KSA. As such, these workers will be away from their families and removed from their normal social spheres. This could potentially result into peer pressure and involvement in unlawful behaviour such as harassment of local community members or co-workers. Such behaviour can lead to increase in unwanted aggressive advances and harassment.

Some of the male workers who will be transporting Project machinery and equipment, and goods will also be involved in long distance travel which in some cases may be between different countries. There is a risk that they can also be involved in GBVH on the routes they use and at track stops associated with the Project even if it is outside the Project boundary.

LABOUR ACCOMMODATION

The workers' rights to adequate living conditions may be potentially impacted during the project implementation especially for those living in shared worker accommodation camps. This can include a lack of welfare provisions on-site such as clean drinking water, hygienic and ample toilet and shower facilities, hand basins (with soaps/hand wash), temperate rest areas, food and other amenities necessary to the workers.

Part VIII of the KSA Labour Law requires employers to provide proper accommodation or pay of accommodation allowance in cash or as part of the wages. However, there is still a risk that companies

providing accommodation can significantly impact the lives of Project workers, not only in the choice of accommodation but the number of workers per room, facilities and amenities available to workers, maintenance accommodation areas and provisions of associated services (e.g., catering, waste management etc.).

To ensure the wellbeing of the staff associated with the project, the EPC Contractor and associated subcontractors will need to plan for necessary provisions relative to the requirement of the required workforce. This includes appropriate labour accommodation plans and mechanism for inspections and corrective actions.

Due to the remote location of the Project and the use of a largely migrant workforce, it will be necessary for the EPC Contractor to provide suitable accommodation to their workers. The Client will develop and operate a dedicated temporary construction accommodation facility meeting the regulatory requirements in KSA and those of IFC & EBRD Workers Accommodation: Processes and Standards, 2009. Personnel during the construction phase of the project will have access to this facility.

SUPPLY CHAIN

The engagement of suppliers will present potential risks relating to labour and working conditions such as:

- Child labour, forced labour, gender- based violence and sexual abuse, exploitation and harassment;
- Lack of written contracts for workers;
- Labour rights violations including poor working conditions and poor terms of agreement for female employees, overtime work without pay etc;
- Health & safety issues for workers and local communities;
- Risks associated with the use of migrant labour and ethnic minorities;
- Risks to freedom of movement e.g., not being able to leave worker accommodation; and
- Impact on the environment relating to pollution of water supplies, soil, air etc.

In addition, risks arise from the involvement of suppliers in situations of armed conflict if they are located in areas or countries that are in conflict situations.

The Project Company is committed to upholding human rights in all aspects of the Project, including material sourcing and worker recruitment. Throughout the Project, the Project Company will implement strict policies and procedures that emphasize the importance of engaging with suppliers and subcontractors who adhere to ethical labour practices and prioritise human rights. It is noted that the EPC Contractor will be contractually obligated to follow ACWA Power's Chartered Institute of Procurement & Supply (CIPS) procurement system which requires that all contractors and suppliers engaged by the EPC are vetted and meet ACWA Power's procurement policies as well as national and lenders requirements. The EPC Contractor will be responsible for undertaking due diligence to ensure that its contractors and suppliers are in compliance with the applicable national and lenders requirements.

Table 6-57 Construction Phase – Labour and Working Conditions Impacts and Mitigation

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
Risk of poorly formed contracts and their implementation	Moderate Adverse	Workers	Medium	Moderate	- The wages to all the workers including unskilled workers will be enough to constitute for a living wage. - Wages, benefits and conditions of work offered should, overall, be comparable to those offered by equivalent employers in the relevant region of that country/region and sector concerned. - The Project Company, EPC Contractor and sub-contractors shall provide their workers with accommodation, transportation and food services or compensate with what will be enough taking into consideration the Project location and proximity to services. - The Project Company, EPC Contractor and sub-contractors shall comply with the KSA labour law requirements for timely payment of salaries, working hours, breaks, rest days, paid leave, sick leave and end of service benefits etc. - The Project Company, EPC Contractor and sub-contractors will document and communicate to all workers their working conditions and terms of employment including their entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity/paternity, or holiday). - The work schedule will follow the KSA labour law requirements with respect to maximum working hours, summer out of sun periods, Ramadan hours and overtime. - EPC and subcontractors to commit to having written work contracts available for all the Project employees that would clearly specify their terms of employment, consistent with the local labour law and the IFC PS2. - In the event that workers are required to work overtime, on weekends, holidays or planned leave days, the Contractor will ensure the workers are compensated in compliance with the KSA labour law. - Project Company, EPC Contractor and sub-contractors will only engage certified and registered recruitment agencies who are committed to human rights and have a good track record i.e., have no court cases. - Project Company, EPC Contractor and sub-contractors shall ensure workers are not liable for any expenses related to their recruitment process. They will ensure that recruitment agencies have not received payments from the workers and any recruitment expenses paid by the workers for getting employed by the Project will be reimbursed; these may be identified through consultations with workers during the early stages of recruitment. - To ensure the workers have a clear understanding of the content of the agreements and contracts (that they will receive in English and Arabic), it is recommended that the contracts' clauses are translated to the workers' native language or explained to them in their native language during the recruitment process by a staff member to ensure they are aware. - Monitor through performance reports and audits the WPS or bank statements of contractors and subcontractors to ensure workers are receiving their salaries on time as in line with the amounts agreed on in the contracts.	Negligible

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
					- A robust grievance mechanism will be provided to remedy for any victims without any retributions to workers who voice their concerns. - The workers will be informed of their legal rights and provided with the contact details of the internal grievance and the MHRSD local offices. - The right to work will be guaranteed by ensuring workers are not unfairly dismissed from their duties. Even where such dismissals may be legally permissible under local law, the Project will be expected to uphold higher international standards and good practice. - If the EPC contractor anticipates collective dismissals associated with the proposed project, the EPC contractor will develop a plan to mitigate the adverse impacts of retrenchment, in line with national law and good industry practice and based on the principles of non-discrimination and consultation. Without prejudice to more stringent provisions in national law, such consultation will involve reasonable notice of employment changes to the workers' representatives and, where appropriate, relevant public authorities so that the retrenchment plan may be examined jointly in order to mitigate adverse effects of job losses on the workers concerned. The outcome of the consultations will be reflected in the final retrenchment plan.	
Risks of violating labour rights and risks of forced and child labour	Moderate Adverse	Workers	Medium	Moderate	- EPC Contractor to hire a site HR Manager and HSE Officer (for site and accommodation). - The EPC contractor will provide a Labour and Working Conditions Management Plan detailing how working conditions and terms of employment are compliant with national labour, social security and occupational health and safety laws. - All EPC Contractor staff to be trained (as part of the induction) on labour terms and conditions (aligned with IFC PS2) - EPC to prepare a Local Hiring and Gender Management Plan to encourage employment of workers from local communities and women. - Special measures of protection or assistance to promote local employment opportunities or selection for a particular job based on the inherent requirements of the job which are in accordance with national law, will not be deemed discrimination. - The EPC contractor will not employ forced labour, which consists of any work or service not voluntarily performed that is exacted from an individual under threat of force or penalty. This covers any kind of involuntary or compulsory labour, such as indentured labour, bonded labour or similar labour-contracting arrangements. - HR policies and procedures will be adapted appropriately to the size of the workforce required for the Project. Policies and procedures must be prepared to demonstrate consistency with the requirements of national legislation and IFC PS 2. - The EPC contractor will comply with all relevant national laws' provisions related to the employment of minors. - In any event, the client will not employ children in a manner that is economically exploitative or is likely to be hazardous or to interfere with the child's education, or to be harmful to the child's health or physical, mental, spiritual, moral, or social development.	Negligible

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
					- Young people below the age of 18 years will not be employed in hazardous work and all work of persons under the age of 18 will be subject to an appropriate risk assessment. - Employees will be free to terminate their employment in accordance with the reforms to KSA Labour Law. It is recommended that SEC and the Contactors give the workers the freedom to transfer to another employer and not prevent them from leaving the country shall they have a valid reason for their request. - The workers will be informed of their legal rights and provided with the contact details of the internal grievance and the MHRSD local offices.	
Major Injury or fatality where key risks are not suitably managed	High Adverse	Workers	Medium	Major	- Ensure all workers receive worker induction and regular ongoing training (e.g., toolbox talks, setting to work briefings) on environment, H&S, labour and working conditions, worker code of conduct, GBVH, and other requirements. - EPC Contractor and subcontractors to hire HSE Managers and Officers (1:40 for construction workforce) - Subcontractors with more than 20 workers shall deploy a dedicated HSE Officer and an additional HSE Officer for each additional 50 workers deployed onsite. - Workers will be provided with a safe and healthy work environment, taking into account inherent risks and specific classes of hazards associated with the project construction activities as well as climate change risks including heat stress, dust storms, intense rainfall etc. - Chemicals and Hazardous materials should only be handled by trained personnel and personal protection equipment (gloves, face mask, nose mask, etc.) will be provided. - Workers to receive correct PPE, free of charge and to be replaced when needed. - Workers will be informed of the chemicals that are hazardous to health or flammable and must be trained on handling such chemicals. - The EPC Contractor will implement and maintain an OHS management system taking into account specific risks associated with the project, legal requirements and duty of care. - The EPC Contractor will be responsible for ensuring that all affiliated sub-contractors comply with the OHS management system. The OHS management system will be in-line with recognised international best practice and as a minimum, this plan will include: - Means of identifying and minimising, so far as reasonably practicable, the causes of potential H&S hazards to workers. - Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. - Provision of appropriate equipment to minimise risks and requiring and enforcing its use. - Training of workers, and provision of appropriate incentives for them to use and comply with H&S procedures and protective equipment. - Documentation and reporting of occupational accidents, diseases and incidents. - Emergency prevention, preparedness and response arrangements.	Minor
Occupational health and safety including minor injury to workers	Moderate Adverse	Workers	Medium	Moderate		Minor

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
					- The Project Company will ensure that regular labour audits are undertaken on the contractors and sub-contractors including suppliers. - All workers will be entitled to health insurance and sick leaves in accordance with KSA Labour Law. - Hospital & Medical bills will be covered under the Medical Insurance Scheme, and additional items will be reimbursed. - The availability of medical facilities and camp nurses as well as transport for medical emergencies shall be provided in the labour accommodation. First aid will be always available on every project site. - Identify shelter locations for workers in the event of a dust storm. - Prohibit work in wind conditions more than 15 km/hr. - Ensure sufficient shelter/shade during summer months and erect temporary shade at all work fronts for all workers. - Where possible, ensure workers have access to cooled resting areas for lunch breaks. - Ensure sufficient supply of potable water at the work fronts (>3.5 L per worker per day). - Provide extra rest periods for workers when temperatures exceed 35 °C (as applicable by law or periods between 12:00pm and 3:00 pm as minimum). - Change the shift hours in line with the cooler hours. - Ensure workers are not penalised for taking extra rest breaks during periods of extreme heat. - Monitor weather forecast and halt work in any expected events of extreme weather conditions (i.e., dust storms, intensive rain, extreme heat waves etc.)	
Gender based violence & harassment and discrimination	Moderate Adverse	Workers	Medium	Moderate	- Employment relationship will be on the principle of equal opportunity and fair treatment and will not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. - The EPC contractor will not make employment decisions on the basis of personal characteristics, such as gender, race, nationality, ethnic origin, religion or belief, disability, age or sexual orientation, unrelated to inherent job requirements. - Promote transparency in pay structures by disclosing salary ranges for different positions within the organization. This helps identify any existing pay gaps and encourages equal pay for equal work. - Implement and enforce clear policies that emphasize pay equity and prohibit wage discrimination based on gender. - The workers will be provided with information regarding worker code of conduct in local languages as part of their employment contract which will include provisions for reporting, investigations, termination and disciplinary action against those who perpetrate gender violence and harassment. - The EPC Contractor shall conduct mandatory regular training and awareness raising for the workforce about gender-based violence and harassment towards	Negligible

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
					local community members and their colleagues especially women and the availability of a grievance mechanism to report any GBVH cases. - The workers shall be made aware of the laws and regulations that make sexual harassment and gender-based violence a punishable offence which is prosecuted. - As applicable, ensure inclusion of a balanced representation of women on the HSE team who will be easily relatable and approachable to female workers (if any). - Project personnel in charge of receiving GBVH grievances will be provided with appropriate training on how to handle such complaints. It is recommended that the personnel are trained in coordination with any GBVH organisations working in the Project area where available. - As applicable, female workers will be included in the grievance redress committee to help female workers and host community members raise their grievances. - The grievance mechanism will be confidential and provide referral and support system for any workers reporting cases of GBVH. - The EPC shall provide safe, secure and separate living spaces and sanitary facilities for the male and female workers (lockable sanitary facilities will be mandatory for women). - The EPC Contractor will work to identify a suitable labour pool locally in order to minimise the need for bringing large number of workers from other regions or countries. This could also help the EPC Contractor in cutting cost associated with provision of accommodation facilities if the majority of the workers are sourced locally. - Provision of opportunities for the workers to regularly return to their families who may be located far from the Project site. - The EPC Contractor will provide opportunities for workers to have access to entertainment opportunities away from the host communities. - EPC Contractor will allow submission and investigation of anonymous harassment complaints by workers and host community members and protect the confidentiality of the complainants. - The EPC Contractor will work in close coordination with the local authorities in investigating any complaints relating to gender violence and harassment in the host communities where it relates to Project workers. - The EPC Contractor will provide targeted training (including in life skills such as leadership and decision-making) and awareness raising to vulnerable workers such as women.	
Poor quality housing and lack of welfare facilities and working amenities	Moderate Adverse	Workers	Medium	Moderate	- Employees should be provided with suitable accommodation and worker accommodation areas will be managed in accordance with the EBRD and IFC Workers' Accommodation: Processes and Standards. - Establish clear and enforceable housing standards for labour accommodations during the construction phase. These standards should include requirements for living space, ventilation, lighting, cleanliness, sanitation facilities, and basic amenities.	Minor

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
					- Ensure that laborers have access to safe and decent accommodation. Provide weather-resistant and structurally sound shelters with proper insulation and ventilation to protect them from harsh environmental conditions. - Ensure that labour accommodations have adequate sanitation facilities, including clean toilets, washrooms, and bathing facilities. Regular maintenance and cleanliness should be ensured to promote hygienic living conditions. - Provide access to clean and potable drinking water within the labour accommodations. Install water filtration systems or ensure a regular supply of safe drinking water. - Provide proper ventilation systems to maintain good air quality and reduce heat stress. Additionally, in areas with high temperatures, consider installing cooling systems or providing fans to mitigate extreme heat conditions. - Ensure that labour accommodations provide sufficient living space to accommodate the number of residents comfortably. Overcrowding should be avoided as it can lead to health and safety hazards. - Conduct regular inspections of labour accommodations to ensure compliance with housing standards and identify any issues or deficiencies. Address identified concerns promptly and take necessary corrective actions. - Implement measures to ensure the safety and security of labour accommodations. This includes having secure entry and exit points, adequate lighting in common areas, and measures to prevent theft or unauthorized access. - Ensure the availability of a robust grievance mechanism to record concerns related to accommodation and address the grievances and close them out in a timely manner. - Project Company shall carry out regular inspections and audits (directly and through independent third-party auditors) of the accommodation facilities, identify nonconformance, and ensure the contractors close-out these non-conformances especially those that have an impact on the H&S of the workers.	
Violations to workers' rights in the supply chain	Moderate Adverse	Workers	Medium	Moderate	- The Project company will carry out a screening of its suppliers and contractors to ensure the selected companies do not record of human rights violations. - The EPC Contractor will devise a supply management plan to ensure the measures above are implemented by any sub-contractors. - The EPC Contractor will mandate its suppliers and sub-contractor to provide GBVH training to their workers in accordance with the code of conduct.	Negligible

6.3.14.2 Operational Impacts and Mitigation

CONTRACTUAL AGREEMENTS

Similar to the construction phase, local and migrant workers can be the most vulnerable to risks related to unjust working conditions. Some possible risks for this project include no provision of a work contract or other relevant documentation, lack of payments or insufficient payment of overtime hours, unsuitable accommodation, among others.

In addition, any violations of the laws and regulations and if workers accept the unjust conditions they experience if they are not aware of their legal rights or afraid of the consequences of expressing their concern may result in adverse impacts.

OCCUPATIONAL HEALTH AND SAFETY

Workers may be exposed to chemicals utilized in maintenance activities, encompassing the handling and management of fuels, lubricants, and cleaning agents. Certain areas of the plant will generate elevated noise levels, potentially jeopardizing workers' hearing and well-being in the absence of proper PPE. The gas turbine operation involves high temperatures, posing the risk of burns or heat-related illnesses for workers engaged in maintenance or repair tasks. In addition, dealing with electrical systems and equipment, entry into confined spaces, and working at heights, exposes workers to the hazards of electrical shocks or burns, inadequate ventilation or physical constraints and risk of falls.

In addition, emergency situations such as fires, electrical issues, or fuel/gas leaks that may occur due to equipment, fuel supply or other system components malfunctions pose a significant risk to the Project and the operational employees.

These impacts are expected to increase in the absence of awareness, proper management, emergency plans and procedures and access to suitable medical care and health insurance provisions. In the absence of mitigation, this impact can be classed as negative, direct and major. With the application of mitigation measures specified in following table, the impact will be reduced to a negative minor significance.

WORKERS LIVING CONDITIONS

Long-term accommodation requirements are not being established specifically for the Project. The operational staff will potentially be housed in existing housing areas in the area and provided with transportation to the site. However, this is yet to be confirmed by the Project Company.

As with construction, operational activities will need to plan for and enforce just and fair treatment of operation and maintenance staff (including any engaged sub-contractors) in accordance with lender requirements and relevant national requirements. The O&M workers accommodation or housing will require compliance with KSA requirements and the IFC & EBRD Workers Accommodation: Processes and Guidelines (2009). Allowance will also need to be made for site staff welfare facilities including sanitation, rest, recreational and medical facilities.

Table 6-58 provides a summary of the impact assessment and applicable mitigation.

Table 6-58 Operation Phase – Labour and Working Conditions Impacts and Mitigation

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
Risk of poorly formed contracts and their implementation	Moderate Adverse	Workers	Medium	Moderate	- The wages to all the workers including to any unskilled workers will be enough to constitute for a living wage. - Wages, benefits and conditions of work offered should, overall, be comparable to those offered by equivalent employers in the relevant region of that country/region and sector concerned. - The Project Company, O&M Company and sub-contractors shall provide their staff with accommodation, transportation and food services or compensate with what will be enough taking into consideration the Project location and proximity to services. - The Project Company, O&M Company and sub-contractors shall comply with the KSA labour law requirements for timely payment of salaries, working hours, breaks, rest days, paid leave, sick leave and end of service benefits etc. - The Project Company, O&M Company and sub-contractors will document and communicate to all workers their working conditions and terms of employment including their entitlement to wages, hours of work, overtime arrangements and overtime compensation, and any benefits (such as leave for illness, maternity/paternity, or holiday). - In the event that workers are required to work overtime, on weekends, holidays or planned leave days, the O&M Company will ensure the workers are compensated in compliance with the KSA labour law. - Project Company, O&M Company and sub-contractors will only engage certified and registered recruitment agencies who are committed to human rights and have a good track record i.e., have no court cases. - Project Company, O&M Company and sub-contractors shall ensure workers are not liable for any expenses related to their recruitment process. They will ensure that recruitment agencies have not received payments from the workers and any recruitment expenses paid by the workers for getting employed by the Project will be reimbursed; these may be identified through consultations with workers during the early stages of recruitment. - To ensure the workers have a clear understanding of the content of the agreements and contracts (that they will receive in English and Arabic), it is recommended that the contracts' clauses are translated to the workers' native language or explained to them in their native language during the recruitment process by a staff member to ensure they are aware. - Monitor through performance reports and audits the WPS or bank statements of contractors and subcontractors to ensure workers are receiving their salaries on time as in line with the amounts agreed on in the contracts. - A robust grievance mechanism will be provided to remedy for any victims without any retributions to workers who voice their concerns. - The workers will be informed of their legal rights and provided with the contact details of the internal grievance and the MHRSD local offices.	Negligible

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
					- The right to work will be guaranteed by ensuring workers are not unfairly dismissed from their duties. Even where such dismissals may be legally permissible under local law, the Project will be expected to uphold higher international standards and good practice. - Employment relationship will be on the principle of equal opportunity and fair treatment and will not discriminate with respect to any aspects of the employment relationship, including recruitment and hiring, compensation (including wages and benefits), working conditions and terms of employment, access to training, promotion, termination of employment or retirement, and discipline. - The O&M Company will not make employment decisions on the basis of personal characteristics, such as gender, race, nationality, ethnic origin, religion or belief, disability, age or sexual orientation, unrelated to inherent job requirements. - Promote transparency in pay structures by disclosing salary ranges for different positions within the organization. This helps identify any existing pay gaps and encourages equal pay for equal work. - Implement and enforce clear policies that emphasize pay equity and prohibit wage discrimination based on gender. - If the O&M Company anticipates collective dismissals associated with the proposed project, the O&M Company will develop a plan to mitigate the adverse impacts of retrenchment, in line with national law and good industry practice and based on the principles of non-discrimination and consultation. Without prejudice to more stringent provisions in national law, such consultation will involve reasonable notice of employment changes to the workers' representatives and, where appropriate, relevant public authorities so that the retrenchment plan may be examined jointly in order to mitigate adverse effects of job losses on the workers concerned. The outcome of the consultations will be reflected in the final retrenchment plan.	
Major Injury or fatality where key risks are not suitably managed	High Adverse	Workers	Medium	Major	- Ensure all workers receive worker induction and regular ongoing training (e.g., toolbox talks, setting to work briefings) on environment, H&S, labour and working conditions, worker code of conduct, GBVH, and other requirements. - Workers will be provided with a safe and healthy work environment, taking into account inherent risks and specific classes of hazards associated with the Project operation activities as well as climate change risks including heat stress, dust storms, intense rainfall etc.	Minor
Occupational health and safety including minor injury to workers	Moderate Adverse	Workers	Medium	Moderate	- Chemicals and Hazardous materials should only be handled by trained personnel and personal protection equipment (gloves, face mask, nose mask, etc.) will be provided. - Workers will be informed of the chemicals that are hazardous to health or flammable and must be trained on handling such chemicals. - The O&M Company will implement and maintain an OHS management system taking into account specific risks associated with the project, legal requirements and duty of care. - The O&M Company will be responsible for ensuring that all affiliated sub-contractors comply with the OHS management system. The OHS management system will be	Minor

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
					in-line with recognised international best practice and as a minimum, this plan will include: - Means of identifying and minimising, so far as reasonably practicable, the causes of potential H&S hazards to workers. - Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. - Provision of appropriate equipment to minimise risks and requiring and enforcing its use. - Training of workers, and provision of appropriate incentives for them to use and comply with H&S procedures and protective equipment. - Documentation and reporting of occupational accidents, diseases and incidents. - Emergency prevention, preparedness and response arrangements. • All workers will be entitled to health insurance and sick leaves in accordance with KSA Labour Law. • Hospital & Medical bills will be covered under the Medical Insurance Scheme, and additional items will be reimbursed. • Ensure the availability of medical facilities and nurses as well as first aid and transport for medical emergencies. • Prohibit outdoor work or maintenance activities in wind conditions more than 15 km/hr. • Ensure sufficient shelter/shade during summer months and erect temporary shade at all work fronts for maintenance workers. • Ensure sufficient supply of potable water (>3.5 L per worker per day). • Provide extra rest periods for outdoor maintenance workers when temperatures exceed 35 °C (as applicable by law). • Monitor weather forecast and halt outdoor maintenance work in any expected events of extreme weather conditions (i.e., dust storms, intensive rain, extreme heat waves etc.).	
Gender based violence & harassment and discrimination	Moderate Adverse	Workers	Medium	Moderate	• Employees should be provided with suitable accommodation and worker accommodation areas will be managed in accordance with the EBRD and IFC Workers' Accommodation: Processes and Standards. • Ensure that laborers have access to safe and decent accommodation. Provide weather-resistant and structurally sound shelters with proper insulation and ventilation to protect them from harsh environmental conditions. • Ensure that labour accommodations have adequate sanitation facilities, including clean toilets, washrooms, and bathing facilities. Regular maintenance and cleanliness should be ensured to promote hygienic living conditions. • Provide access to clean and potable drinking water within the labour accommodations and work areas and offices. • Provide proper ventilation and cooling systems in working and living areas to maintain good air quality and reduce heat stress.	Negligible

Impact	Magnitude	Receptor	Sensitivity	Significance Before Mitigation	Mitigation	Residual Significance
					- Ensure that labour accommodations provide sufficient living space to accommodate the number of workers comfortably. Overcrowding should be avoided as it can lead to health and safety hazards. - Conduct regular inspections of labour accommodations to ensure compliance with housing standards and identify any issues or deficiencies. Address identified concerns promptly and take necessary corrective actions. - Ensure the availability of a robust grievance mechanism to record concerns related to accommodation and address the grievances and close them out in a timely manner. - Project Company shall carry out regular inspections and audits (directly and through independent third-party auditors) of the accommodation facilities of its direct workers and sub-contractors where possible, identify nonconformance, and ensure the contractors close-out these non-conformances especially those that have an impact on the H&S of the workers.	
Poor quality housing and lack of welfare facilities and working amenities	Moderate Adverse	Workers	Medium	Moderate	- Employees should be provided with suitable accommodation and worker accommodation areas will be managed in accordance with the EBRD and IFC Workers' Accommodation: Processes and Standards. - Ensure that laborers have access to safe and decent accommodation. Provide weather-resistant and structurally sound shelters with proper insulation and ventilation to protect them from harsh environmental conditions. - Ensure that labour accommodations have adequate sanitation facilities, including clean toilets, washrooms, and bathing facilities. Regular maintenance and cleanliness should be ensured to promote hygienic living conditions. - Provide access to clean and potable drinking water within the labour accommodations and work areas and offices. - Provide proper ventilation and cooling systems in working and living areas to maintain good air quality and reduce heat stress. - Ensure that labour accommodations provide sufficient living space to accommodate the number of workers comfortably. Overcrowding should be avoided as it can lead to health and safety hazards. - Conduct regular inspections of labour accommodations to ensure compliance with housing standards and identify any issues or deficiencies. Address identified concerns promptly and take necessary corrective actions. - Ensure the availability of a robust grievance mechanism to record concerns related to accommodation and address the grievances and close them out in a timely manner. - Project Company shall carry out regular inspections and audits (directly and through independent third-party auditors) of the accommodation facilities of its direct workers and sub-contractors where possible, identify nonconformance, and ensure the contractors close-out these non-conformances especially those that have an impact on the H&S of the workers.	Minor

6.4 Summary of Impacts Prior to Mitigation

Table 6-59 Summary of Project Construction and Operation Impacts by Before Mitigation

Topic	Beneficial	No change	Negligible	Minor	Moderate	Major	Total
Construction Phase							
Air Quality			2	5			7
Climate Change				2			2
Noise				4			4
Soil and Groundwater				2			2
Hydrology, Surface Water, and Flood Risk				1	2		3
Solid Waste and Wastewater					1		1
Traffic and Transportation				1	1		2
Terrestrial Ecology			1	2			3
Archaeology and Cultural Heritage				1			1
Landscape and Visual Amenity				1	1		2
Socio-economic	4			2			6
Community Health, Safety & Security				5			5
Labour & Working Conditions					6	1	7
Total	4	0	3	25	10	1	45
Operation Phase							
Air Quality				3			3
Climate Change			1	1	1		3
Noise					4		4
Soil and Groundwater				1			1
Solid Waste and Wastewater				1			1
Landscape and Visual Amenity					1		1
Socio-economic	2						2

Topic	Beneficial	No change	Negligible	Minor	Moderate	Major	Total
Community Health, Safety & Security				1	1		2
Labour & Working Conditions					4	1	5
Total	2	0	1	7	6	1	22

6.5 Cumulative Impacts

6.5.1 Introduction

An assessment of potential cumulative impacts of the Project together with other projects that will also have impacts within the Project's area of influence was conducted to align with the requirements of IFC PS1. According to the IFC's Good Practice Handbook (2013), a cumulative impact is defined as, '....those that result from the successive, incremental, and/or combined effects of an action, project, or activity when added to other existing, planned, and/or reasonably anticipated future ones'.

Cumulative Impacts Assessment (CIA) is therefore the process of:

- Analysing the potential impacts and risks of proposed developments in the context of the potential effects of other human activities and environmental and social external drivers on the chosen Valued Environmental and Social Components (VECs) over time; and
- Proposing concrete measures to avoid, reduce, or mitigate such cumulative impacts and risk.

The purpose of a CIA is to determine how the potential impacts of a proposed development might combine cumulatively, with the potential impacts of other projects or human activities. The objectives and expected outcomes of a CIA process are as follows:

- Identification of VECs such as air, water, soil etc. that may be affected by the Project and the selected VECs the assessment will focus on;
- Identification of existing and reasonably anticipated and/or planned developments, as well as natural environmental and external social drivers, that could affect the selected VECs;
- Assessment and/or estimation of the future condition of selected VECs, as the result of the cumulative impacts that the development is expected to have, when combined with those of other reasonably predictable developments;
- Evaluation of the future condition of the VECs relative to established or estimated thresholds of VEC condition or to comparable benchmarks;
- Avoidance and minimisation of cumulative impacts of the Project on the VECs and
- Monitoring and management measures to ensure the VEC viability over the life span of the development or its impacts.

6.5.2 Identification of Other Activities and Environmental Drivers

For the purpose of this ESIA and in light of the Projects that will be developed simultaneously, the cumulative impacts assessment will be undertaken to establish whether there are barriers to both ongoing and future development within the Projects AoI, such as:

- Is there sufficient environmental carrying capacity available for future development?
- Are there any factors that may restrict ongoing or future development?
- Are there any key factors of concern that may relate to the development/operation of other projects in tandem with the Project?

The ongoing and planned developments that are considered in the cumulative impacts assessment include the Nairyah IPP (1 or 2, depending on project award by SPPC) which will be developed adjacent

to the other phase of Nairyah IPP Project. Assuming that Nairyah 1 IPP is awarded to ACWA Power, the next phase i.e., Nairyah 2 IPP will have the same capacity and similar specifications as Nairyah 1 IPP Project and their construction and operation are expected to run parallel to each other.

6.6 Identification of Valued Environmental and Social Components (VECs)

Considering the Projects will be adjacent to each other and are of the same industry and operational activities, the majority of the environmental and social environmental components or aspects that were considered within this ESIA have the potential to be impacted by the construction & operation of the planned Nairyah 2 IPP within the Project's AoI.

6.7 Assessment of Cumulative Impacts on VECs Due to Development of Project Area

A qualitative assessment of the potential cumulative impacts has been undertaken considering the project information available and assuming the Nairyah 2 development will have very similar activities to the Project. Quantitative assessments were carried out for operational air emissions by conducting modelling studies.

Table 6-60 Summary of Cumulative Impacts and General Management Requirements

Environmental & Social Aspects	Construction	Operation
Air Emissions & Ambient Air		
Nairyah 1 IPP impacts	During construction, local ambient air quality may potentially be affected by increased dust and exhaust fumes from construction vehicles, equipment and temporary power generators including emission of VOCs from fuels, paints and other volatile substances Residual impact assessed as Negligible or Minor with the implementation of mitigation and management measures.	The maximum predicted concentration of modelled gases at all the receptors and for all operational scenarios are compliant with the KSA air quality standards and IFC WBG standards and the WHO guidelines. The maximum predicted annual mean ground-level NO₂ concentration at a receptor location is 2.2% of the WHO guideline value. The predicted CO, NH₃ and SO₂ impacts at sensitive receptor locations are insignificant for all modelled scenarios. The area is devoid of any major pollution sources and therefore existing baseline pollutant concentrations are expected to be low. On this basis, the risk of an annual mean exceedance is considered negligible.
Impacts from Nairyah 2 IPP	Increases in dust and gaseous emissions due to construction plant, equipment and vehicles. Residual impacts likely to be Negligible or Minor following the implementation of the mitigation and management measures.	Considering Nairyah 2 is in adjacent to Nairyah 1 and assuming it has similar design specifications, impacts to the surrounding receptors are not considered to be significant. Residual impact assessed as Negligible with the implementation of mitigation and management measures.
Cumulative Impacts	The construction of the Project will likely run parallel to the construction of Nairyah 2 IPP. Therefore, cumulative impact on air quality with respect to dust generation and gaseous emissions from construction activities is anticipated to be minor. Impacts significance will be reduced by the implementation of the mitigation measures outlined in section 6.3.2.1 and the implementation of a robust grievance mechanism. The residual significance of cumulative impacts is Negligible or Minor.	The cumulative air quality impacts of operating both Nairyah 1 and Nairyah 2 facilities were assessed to evaluate their combined effects on nearby sensitive receptors. While the residual air emissions from Nairyah 1 alone during operation are considered negligible, the potential for cumulative impacts prompted a detailed quantitative assessment, summarized below, with further details provided in Appendix E. The assessment indicates that the maximum predicted cumulative concentrations of NO₂, CO, NH₃, and SO₂, emissions from both facilities, under all operational scenarios using natural gas and backup diesel, comply with KSA air quality standards, IFC/WBG standards, and WHO guidelines. The results show that these concentrations are less than 25% of the respective air quality standards, therefore resulting in insignificant impacts. The highest predicted annual mean ground-level concentration of NO₂ emissions is 3.9% of the WHO guideline value at the receptor location. Additionally, the maximum predicted 99th percentile values for the 24-hour and 1-hour mean NO₂ concentrations are 18.5% and 12.6% of the standards, respectively.

Environmental & Social Aspects	Construction	Operation
		Given the nature of the project area, the absence of significant anthropogenic influences, and the existing baseline conditions, the risk of an exceedances is considered unlikely. The residual significance of cumulative impacts is Negligible.
Climate Change		
Nairyah 1 IPP impacts	The construction phase of the Project will necessitate the use of generators and an amount of mobile equipment/plant and vehicles to facilitate works. This will result in GHGs emissions and therefore contributing to climate change. Residual impact assessed as Negligible or Minor with the implementation of mitigation and management measures.	The annual emissions of ~4 MtCO ₂ e/year significantly exceed the IFC threshold for GHG quantification (25,000tCO ₂ /year), for emissions that are within direct control of the facility within the study period. Residual impact is assessed as Moderate.
Impacts from Nairyah 2 IPP	Construction activities of will result in increase in GHG emissions due to operation of construction plant, equipment and vehicles. Residual impact assessed as Negligible or Minor with the implementation of mitigation and management measures.	Considering the Nairyah 2 Project is of the same capacity and similar specifications, it will likely generate similar GHG emissions. Residual impact assessed as Minor with the implementation of mitigation and management measures.
Cumulative Impacts	The construction of Nairyah 1 IPP and Nairyah 2 IPP will coincide. Therefore, cumulative impact of GHG emissions from is anticipated to be minor. With the adoption of good management practises (mitigation measures) outlined in section 6.3.3.1, the cumulative impacts significance will be reduced. The residual significance of cumulative impacts is Negligible or Minor.	The operation of Nairyah 1 IPP and Nairyah 2 IPP will run parallel. Therefore, cumulative impact of GHG emissions from is anticipated to be moderate to major. The residual significance of cumulative impacts is Moderate. The GHG emissions are inevitable and the reduction of the significance of this impact will be through the proper implementation and operation of the decarbonisation system. While both Projects will be decarbonisation-ready with measures implemented to allow for the addition of carbon capture and sequestration technology, the operation date of this system has not been confirmed yet and therefore GHG emissions will remain significant until its operation.
Noise		
Nairyah 1 IPP impacts	Construction activities will result in temporary and short duration increases in the noise levels emanating from the project sites, access road and the laydown area. Residual impact assessed as Negligible or Minor with the implementation of mitigation and management measures.	The noise emissions prediction modeling conducted for the Project indicates that most of the identified receptors will meet the IFC and KSA noise limits for both day and nighttime without requiring specific mitigation measures. However, receptor HR-5 does not comply with the standards during the simple cycle mode, and receptors HR-3, HR-5, and HR-6 exceed the standards during the combined cycle mode.

Environmental & Social Aspects	Construction	Operation
Impacts from Nairyah 2 IPP	Increases in noise due to construction plant, equipment and vehicles. Residual impacts likely to be Negligible or Minor following the implementation of the mitigation and management measures.	Considering Nairyah 2 is in adjacent to Nairyah1 and assuming it has similar design specifications, noise impacts to the surrounding receptors are expected to be similar.
Cumulative Impacts	The construction of the Project will coincide with the construction of Nairyah 2 IPP. Therefore, cumulative impact on noise from construction activities is anticipated to be minor. Impacts significance will be reduced by the implementation of the mitigation measures outlined in section 6.3.4.1 and the implementation of a robust grievance mechanism. The residual significance of cumulative impacts is Minor	Similar to the predicted noise levels from the operation of the Project alone, receptor HR-5 does not comply with the standards during the simple cycle mode, and receptors HR-3, HR-5, and HR-6 exceed the standards during the combined cycle mode in terms of cumulative effects from both the IPPs.
Soil and Groundwater		
Nairyah 1 IPP impacts	Potential impacts to groundwater are not anticipated during the construction activities.	Assuming that groundwater is unlikely to be encountered at the Project area, potential impacts to groundwater are not anticipated during the operational activities. Similar to the construction phase, the effect of any spills or leaks on soil will be localized within the Project boundaries, with very limited potential for cumulative effects.
Impacts from Nairyah 2 IPP	Project related impacts on soil quality would be those related to the potential contamination of soil during construction. However, the effect of these impacts will be localized within the Project boundaries, with very limited potential for cumulative effects.	
Cumulative Impacts	Furthermore, no extraction of local groundwater resources is envisaged during the construction and operation of the Project.	
Hydrology and Flood Risk		
Nairyah 1 IPP impacts	The construction of the Project is not anticipated to impact the surrounding area and potentially increase the flood risk of the area. The presence of fuels and chemical storage areas could introduce the risk of pollution to the wadi runoff/downstream areas in the event of a significant rain event, where a pathway for runoff is directed to these areas and a pathway for drainage. In addition, water resource may result in pressure to existing services and infrastructure.	Cumulative impacts to hydrology and flood risk are not anticipated during operation. Regular coordination between both Projects will be required to ensure the wadi diversion components are regularly maintained.
Impacts from Nairyah 2 IPP	The construction of the Project is not anticipated to impact the surrounding area and potentially increase the flood risk of the area. The presence of fuels and chemical storage areas could introduce the risk of pollution to the wadi runoff/downstream areas in the event of a significant rain event, where a pathway for runoff is directed to these areas and a pathway for drainage. In addition, water resource may result in pressure to existing services and infrastructure.	

Environmental & Social Aspects	Construction	Operation
Cumulative Impacts	Considering the proximity of both Projects, the potential exists for cumulative impacts to develop due to increased risk of contamination of downstream areas due to runoff as well as impacts to the surrounding area and water resources and services due to water consumption for construction activities and workers accommodation. Therefore, cumulative impact on hydrology and water resources from construction activities is anticipated to be moderate. However, the impact will be reduced with the implementation of the flood risk study design measures for the wadi diversion and the adoption of the mitigation measures presented in section 6.3.6.1. The residual significance of cumulative impacts is Minor	
Solid Waste & Wastewater		
Nairyah1 IPP impacts	The construction phase can often be the most environmentally damaging phase of a project, particularly in regard to the volumes of waste that are generated, if not properly managed. During construction, waste will be generated during the earthworks and construction activities. Residual impact assessed as Minor with the implementation of mitigation and management measures.	The Project's operational domestic waste and wastewater generation is expected to be minimal. Wastewater will be treated in a sewage treatment facility onsite while process wastewater will be treated in a dedicate effluent treatment facility before being discharged to an evaporation pond. However, screening waste and sludge are expected to be generated regularly which can increase pressure on existing waste infrastructure, particularly in regard to the volumes, if not properly managed. Residual impact assessed as Negligible with the implementation of mitigation and management measures.
Impacts from Nairyah 2 IPP	The impacts are similar to those of the Nairyah 1 Project. Residual impact assessed as Minor with the implementation of mitigation and management measures.	The impacts from waste and wastewater are subject to the waste management practices applied by Nairyah 2 and whether Nairyah 2 will follow a similar approach of onsite wastewater treatment and evaporation ponds or treatment by third party. In the absence of detailed information, the residual impacts are assessed as Minor with the implementation of mitigation and management measures.
Cumulative Impacts	Sufficient waste management infrastructure is lacking in the Region. The construction of multiple developments and projects will result in a strain on existing waste management facilities in the area due to volumes of waste. The cumulative impacts are expected to be moderate.	Sufficient waste management infrastructure is lacking in the Region. The construction of multiple developments and projects will result in a strain on existing waste management facilities in the area due to volumes of waste. Considering the volumes of solid waste other than sludge are not expected to be significant and considering the Project will treat

Environmental & Social Aspects	Construction	Operation
	The Projects' EPC contractors will identify waste and wastewater management companies including recycling companies in Nairyah or nearest towns in order to promote the recycling of waste especially packaging materials, wood, metal waste & hazardous materials. Coordination will also be required with the local government authorities (e.g., municipalities) with regards to licensed and appropriate waste management facilities fit to accommodate project waste types and quantities. The impact significance will be reduced with the adoption of mitigation measures presented in section 6.3.7.1. The residual significance of cumulative impacts is Minor	wastewater onsite rather than by third-party contractor, the cumulative impacts are expected to be Minor. The Projects' O&M Companies will identify waste and wastewater management companies including recycling companies in nearest towns in order to promote the recycling of waste and management of sludge. Coordination will also be required with the local government authorities (e.g., municipalities) with regards to licensed and appropriate waste management facilities fit to accommodate project waste types and quantities. The impact significance will be reduced with the adoption of mitigation measures presented in section 6.3.7.2. The residual significance of cumulative impacts is Negligible
Traffic and Transportation		
Nairyah1 IPP impacts	Construction will result in additional vehicles on the main roads leading to the site, resulting in increased traffic and accident risks to the communities along these roads. In addition, heavy construction vehicles can cause accelerated wear and tear on road infrastructure, leading to potholes, cracks, and road degradation. Residual impact assessed as Negligible with the implementation of mitigation and management measures.	Significant traffic and transportation impacts are not expected during normal operation of the Project; as such, cumulative impacts are not anticipated.
Impacts from Nairyah 2 IPP	The impacts are similar to those of the Nairyah 1 Project. Residual impact assessed as Negligible with the implementation of mitigation and management measures.	
Cumulative Impacts	Both Projects are expected to utilize the same roads to reach the Project area. considering construction activities will run parallel, the increase in traffic is expected to result in cumulative impacts of moderate significance. The implementation of traffic management plans and mitigation in section 6.3.8.1 will reduce the impact significance. The residual significance of cumulative impacts is Minor.	
Terrestrial Ecology		
Nairyah 1 IPP impacts	Construction activities will result in the loss of habitats and flora within the Project footprint. The construction activities may also result in direct impacts (injuries or mortality) and indirect impacts (disturbance) of fauna.	Significant impacts to terrestrial ecology are not expected during normal operation of the Project; as such, cumulative impacts are not anticipated.

Environmental & Social Aspects	Construction	Operation
	The residual impact is assessed as Minor with the implementation of mitigation and management measures.	
Impacts from Nairyah 2 IPP	Nairyah 2 site is characterized with similar habitat and species as Nairyah 1 and therefore, the construction activities will likely result in habitat loss as well as direct and indirect impacts to the fauna and avifauna similar to those identified for the Nairyah 1 Project. Residual impact assessed as Minor with the implementation of mitigation and management measures.	
Cumulative Impacts	Given that the project construction will coincide with the construction of Nairyah 2 cumulative impacts to terrestrial ecology are anticipated to be Minor. However, the impact will be reduced with the adoption of mitigation measures presented in section 6.3.9.1. The residual significance of cumulative impacts is Minor.	
Archaeology & Cultural Heritage		
Nairyah 1 IPP impacts	Project related impacts in relation to archaeology and cultural heritage would mainly be those related to the excavation, earthworks and clearance of the Project asset site and the potential for encountering unknown buried archaeological remains. The risk is considered low and unlikely as it is limited to the Project area and therefore it is not envisaged that cumulative impacts to archaeology and cultural heritage will take place. A Chance Find Procedure will ensure that any unexpected finds are not damaged and reported to the authorities.	The operational phase of the Project will not result in impacts to archaeology, as the site will be static and further excavations will not be required. Therefore, cumulative impacts are not anticipated.
Impacts from Nairyah 2 IPP		
Cumulative Impacts		
Socioeconomic		
Nairyah 1 IPP impacts	Project impacts would be mainly those related to creation of employment and dissemination of skills during construction (beneficial impact). On the other hand, the construction of the Project will result in the loss of ecosystem service that may potentially impact herders in the area. In addition, the influx of workers due to construction activities can lead to an increase in demand for basic commodities within the local area. No formal land users were observed within the direct Project footprint. While the potential economic or physical displacement due to the Project	Positive cumulative impacts are anticipated during operation due to the provision of employment opportunities and the dissemination of skills during construction

Environmental & Social Aspects	Construction	Operation
	is not anticipated, this will require further validation and documentation provision by SPPC. Residual impact is assessed as Minor prior to mitigation and will be reduce to negligible with the implementation of mitigation and management measures.	
Impacts from Nairyah 2 IPP	Impacts are similar to those of the Project. The residual impact is assessed as Minor prior to mitigation and will be reduce to negligible with the implementation of mitigation and management measures.	
Cumulative Impacts	Positive impacts in terms of cumulative increase in local employment and dissemination of skills. This can be enhanced further by prioritising local recruitment where possible. Negative impacts in terms of cumulative reduction of available grazing areas. However, open lands that herders can utilise are available in the area. It will be important for the projects to ensure the safety of the herders. In addition, potential economic or physical displacement due to the Project is not anticipated, however, this will require further validation and documentation provision by SPPC through ACWA Power and Nairyah 2 Project Company. A grievance mechanism shall be developed and implemented throughout the construction phase. However, the impact will be reduced with the adoption of mitigation measures presented in section 6.3.11.1. The residual significance of cumulative impacts is Negligible.	
Community Health, Safety & Security		
Nairyah 1 IPP impacts	Project related impacts would mainly be those associated with construction: influx of workers, public trespassing, security concerns, strain to public social services as well as incidents (accidents) from the presence of vehicles, heavy plant and machinery. The residual impact is assessed as Negligible with the implementation of mitigation and management measures.	Impacts related to operations will be mainly due to emergency situations (unplanned events) such as fire, explosion and release toxic materials as well as incidents (accidents) from equipment operation and the Project vehicles and public trespassing. The Project is expected to be fenced and with security guards to ensure that there is no unauthorised access into the site. Likelihood of cumulative impacts from unplanned events are unlikely.
Impacts from Nairyah 2 IPP	Impacts are similar to those of the Project. The residual impact is assessed as Negligible with the implementation of mitigation and management measures.	

Environmental & Social Aspects	Construction	Operation
Cumulative Impacts	Given that the project construction will coincide, the influx of workers during the construction phase could lead to outbreak of diseases and illnesses, strain the public social services and result in security risks etc. Construction works could also increase the risk relating to public safety. The cumulative impacts are considered to be moderate and can be reduced by the implementation of the relevant mitigation provided in section 6.3.12.1. The residual significance of cumulative impacts is Minor.	
Labour and Working Conditions		
Nairyah 1 IPP impacts	Project impacts would mainly be those associated with poor working conditions, gender-based violence and harassment, health and safety hazards etc. which will need to be safeguarded through implementation of dedicated management systems and policies. Significance of residual impacts are assessed to be minor or negligible depending on the impact.	Impacts during operations are Project-specific and therefore cumulative impacts are not expected.
Impacts from Nairyah 2 IPP	The construction activities are expected to result in similar impacts identified for the Project. Significance of residual impacts are assessed to be minor or negligible depending on the impact.	
Cumulative Impacts	Impacts associated with poor working conditions, gender-based violence and harassment, health and safety hazards etc. are Project-specific and therefore cumulative impacts are not expected. Cumulative impacts may occur if the workers for Nairyah1 and Nairyah 2 are accommodated in the same facilities; however, this is not confirmed. The cumulative impacts can be managed by ensuring the labour camp is in compliance with the IFC/EBRD Worker Accommodation Guidelines. The residual significance of cumulative impacts is Minor	

7 Environmental and Social Mitigation and Management

7.1 Environmental and Social Mitigation and Management Plan

Detailed project-specific mitigation is presented in Section 6.2 of this ESIA report. These mitigation measures will be outlined in the Project specific CESMP and OESMP.

7.2 Proposed Environmental Monitoring Plan

The following Table 7-1 outlines the monitoring requirements related to the construction and operation of the Project for the topics assessed in the Chapter 6. Considering impacts during the operation phase are limited, the majority of the monitoring required will be for the occasional maintenance activities. These should be validated and updated as required by the O&M Company based on the risk assessments when maintenance is required.

The EPC Contractor and the O&M Company will be responsible for undertaking and reporting on the required monitoring during construction and operation respectively. An Environmental Monitoring Plan for construction and operation of the Project will be developed by the EPC Contractor and O&M Company respectively, which will detail the monitoring methodologies and specific detail on location, frequencies, duration, monitoring parameters etc.

Table 7-1 Construction Monitoring Requirements

Topic	Impact	Parameter	Description	Frequency	Monitoring Location
Air Quality	Dust Generation	Dust	Visual observation for dust emissions	Daily	Access Roads to all construction sites. Construction sites and temporary facilities areas.
			Visual observations of any off-road driving	Daily	Throughout Project area.
			Quantitative dust monitoring	If dust generation is considered to be excessive or complaints are received	At source of excessive dust emissions (if any).
	Emissions from engines	Vehicle Emissions	Authorisation checks on vehicle conditions, including associated emissions	Before granting site access and following maintenance of vehicles	All construction vehicles and engines.
			Visual check for black smoke being emitted from equipment	Daily	Access Roads to all construction sites. Construction sites and temporary facilities areas.
			Quantitative air emissions monitoring	If complaints are received	Plant or stationary equipment used on site.
	Hazardous Material storage areas	VOCs	Olfactory observations – as part of inspection checks (for hygiene, safety and appropriate storage/containment).	Daily	All hazardous material, chemical and fuel storage areas.
	Sanitary Facilities	Odour	Olfactory observations – as part of inspection checks (for hygiene, safety and appropriate storage/containment).	Daily	All sanitary facilities available within the laydown areas, labour camps and work areas.
Noise	Construction Noise	Leq(A)	Quantitative noise monitoring	Weekly for 1-hour periods; daytime and night-time if construction is carried out	At Project boundary and near baseline receptor locations (section 5.2.2.1)
Soil Quality	Pollution from Accidental Leaks or Spillage	Soil quality	Visual inspection of work areas to record any visible spills & leaks	Daily	Throughout construction areas.
			Visual inspection of storage areas to record any visible spills & leaks	Daily	Hazardous material, chemical and fuel storage areas. Waste and sanitary wastewater storage areas.
			Review records of spill response drills and training provided to workers handling hazardous material, waste, and wastewater.	Monthly	Records and documentation
Hydrology	Risk of pollution to the	Stormwater run-off areas	Visual inspection of storage areas to ensure they are outside stormwater drainage areas	At beginning of construction and continuously after it	Natural drainage areas

Topic	Impact	Parameter	Description	Frequency	Monitoring Location
	runoff/downstream areas in the event of a significant rain events		Inspection of temporary stormwater infrastructure	Weekly and following a rain event	Stormwater infrastructure areas
Solid Waste and Wastewater	Inappropriate/uncontrolled handling, storage, transport and/or disposal of non-hazardous, hazardous or sanitary wastewater	Solid waste and wastewater	Visual inspection of segregation, handling, storing, and collection of waste materials	Daily	Wastewater and waste segregation, handling, storage and collection areas
		Waste contractors	Ensuring engaged contractors, their vehicles and waste management facilities have applicable registrations/ licenses at time of procurement	At beginning of construction and continuously after it	Records and documentation
		Waste transfer records	Records of waste to be monitored; waste manifests are required to show the chain of custody of the waste generated on site, its transportation and treatment/disposal.	On-going as and when there is waste collection from site	Records and documentation
		Waste reduction	Monitor waste records to identify targets to reduce waste generation	Monthly	Records and documentation
Landscape and Visual	Light spill	Visual Amenity	Visual inspection of suitability of lighting and limitation of light spill outside of working areas	Anytime night-time construction is carried out	Where lighting is installed
Traffic and Transportation	Increased vehicular flow and traffic on local roads	Speed limit	Records of traffic related issues, incidents, and near misses	On-going (as encountered)	Records of traffic incidents and near misses (on highways, main roads and access routes)
Archaeology and Cultural Heritage	Damage to unknown buried artefacts	Unknown buried artefacts	Records of any archaeological chance finds	Continuously during intrusive ground works	Records and documentation
Terrestrial Ecology	Impacts to flora and fauna	Training on terrestrial ecology	Inspection of training records to ensure environmental issues are incorporated into site induction.	At beginning of construction and when induction material is updated	Induction materials
	Impacts to fauna	Fauna	Records of fauna encounters, injuries or mortality of fauna and avifauna	On-going (as encountered)	Records and documentation
	Impact to habitats	Habitats	Visual checks of events of off-roading or activities utilising areas outside those clearly demarked	On-going (as encountered)	Project active area and surroundings
Socio-economic	Provision of temporary jobs during construction	Local employment	Number of persons employed from the local population	At recruitment	Human Resources (HR) department
	Loss of livelihood due to restrictions on herding	Third party grievances	Grievances received from herder	On-going (as encountered)	Grievance Management System

Topic	Impact	Parameter	Description	Frequency	Monitoring Location
Community, Health, Safety and Security	All community, health, safety and security risks	Conflicts, incidents, grievances etc.	Record of any conflict between the workers and community members including any cases relating to harassment.	On-going (as encountered)	Security department/ HSE department
			Record of human rights violation/complaints from the local communities	On-going (as encountered)	Record keeping system/HSE department
			Record of any communicable diseases on site that could pose a risk to the local communities	On-going (as encountered)	Project site clinic or HSE department
			Records of any health and safety accidents of near misses with the community	On-going (as encountered)	Project site clinic or HSE department
			Records of any security incidents	On-going (as encountered)	Security department/local police
			Number of grievances closed out	Monthly	Grievance Management System
			Average time for grievance processing and close out and trends	Monthly	Grievance Management System
			Number of grievances still open, method to submit the grievance and trends	Monthly	Grievance Management System
			Topics raised in grievances and trends	Monthly	Grievance Management System
Labour and Working Conditions	Risk of poorly formed contracts and their implementation	Worker contracts	Records of contracts, payments, receipt of benefits, leave entitlements, retrenchment etc.	On-going (as encountered)	Human Resources (HR) department
	Risks of violating labour rights and risks of forced and child labour	workers grievances	Human rights complaints/violations as reported by Project workers including workers hired through third-parties or in the supply chain	On-going (as encountered)	Grievance Management System Supply Chain Management Process
	Major Injury or fatality	Health of the workers	OH&S emergency situations and incidents	On-going (as encountered)	Project site clinic or HSE department
	Occupational health issues, and minor injury to workers	Health of the workers	Near misses, injuries or illnesses the workers are suffering from and an analysis of top diseases.	On-going (as encountered)	Project site clinic or first aid facility
	Poor quality of accommodation	Health of the workers	The workers accommodation camp compliance with KSA requirements and the IFC & EBRD Workers Accommodation: Processes and Guidelines (2009).	Once before operating the accommodation and monthly after that	All accommodation facilities provided to direct and sub-contracted labour.

Table 7-2 Operation Monitoring Requirements

Topic	Impact	Parameter	Description	Frequency	Monitoring Location
Air Quality	Emissions from natural gas combustion	Gas emissions	Combustion emissions (NO _x , NO ₂ , CO)	Continuous Emissions Monitoring System (CEMS). Manual testing if the CEMS is not calibrated at the start of commissioning stage.	CCGT main stacks and bypass stacks.
			Combustion emissions (NO _x and CO)	Annual manual stack emissions monitoring	CCGT main stacks and bypass stacks.
	Emissions from engines	Vehicle Emissions	Authorisation checks on engines conditions, including associated emissions	Before purchase and following maintenance	All road and non-road vehicles, plant and equipment.
			Visual check for black smoke being emitted from equipment	During operation of these equipment	All road and non-road vehicles, plant and equipment.
	Odour emissions from wastewater treatment and evaporation ponds	Odour	Olfactory observations – as part of inspection checks (for hygiene, safety and appropriate storage/containment).	Daily	Wastewater treatment and evaporation ponds
Noise	Operation Noise	Leq(A)	Quantitative noise monitoring	Quarterly and in case of complaints or change in operation for 15-minute periods; daytime and night-time	At Project boundary and near baseline receptor locations (section 5.2.2.1)
Soil Quality	Pollution from Accidental Leaks or Spillage	Soil quality	Visible spills & leaks of hydrocarbons and other potentially hazardous or chemicals	Daily during operations	The entire project area
			Visual inspection of storage areas and evaporation ponds to record any visible spills, leaks or overflows	Daily	Hazardous material, chemical and fuel storage areas. Waste and evaporation ponds areas
			Review records of spill response drills and training provided to workers handling hazardous material, waste, and wastewater.	Monthly	Records and documentation
Hydrology	Risk of pollution to the runoff/ downstream areas in the event of a significant rain events	Wadi and run-off areas	Inspection of temporary stormwater infrastructure	Weekly and following a rain event	Stormwater infrastructure areas
Solid Waste and Wastewater	Treated wastewater quality (sanitary and process)	Treated wastewater quality	Treated sanitary wastewater to be tested for parameters including BOD, turbidity, total suspended solids and ammonia.	Daily	Effluent of each treatment process before discharge into the evaporation pond

Topic	Impact	Parameter	Description	Frequency	Monitoring Location
			- pH to be tested in treated chemical wastewater. - De-oiled wastewater to be tested for oil & grease.		
	Strain on resident waste public management facilities during operations	Solid waste and wastewater	Number of grievances from waste management service providers and/ or affected communities and commercial/ industrial establishments with regards to disruption of waste management services	Monthly	Records and communication with waste management facilities
	Risk of contracting unlicensed third-party waste contractors and disposal facilities	Waste contractors	Ensuring engaged contractors, their vehicles and waste management facilities have applicable registrations/ licenses	At the time of procurement and upon their license or Project contract renewal	Records and documentation
	Improper waste management and disposal	Waste transfer records	Records of waste to be monitored; waste manifests are required to show the chain of custody of the waste generated on site, its transportation and treatment/disposal.	On-going	Records and documentation
	Waste quantities	Waste reduction	Monitor waste records to identify targets to reduce waste generation	Monthly	Records and documentation
Landscape and Visual	Light spills	Visual Amenity	Visual inspection of suitability of lighting	On-going	Where lighting is installed
Traffic and Transportation	Increased vehicular flow and traffic on local roads	Speed limit	Records of traffic related issues, incidents, and near misses	on-going (as encountered)	Records of traffic incidents and near misses (on highways, main roads and access routes)
Terrestrial Ecology	Impacts to flora and fauna	Training on terrestrial ecology	Inspection of training records to ensure environmental issues are incorporated into site induction.	At beginning of operation and when induction material is updated	Induction materials
	Impacts to fauna	Fauna	Daily visual observations for sightings of fauna within the Project site.	Daily	Project site
Socio-economic	Provision of jobs during	Local employment	Number of persons employed from the local population	At recruitment	Human Resources (HR) department
	Issues concerning socio-economic factors	Third party grievances	Grievances received from local community	On-going (as encountered)	Grievance Management System
Community, Health, Safety and Security	All community, health, safety and security risks	Conflicts, incidents, grievances etc.	Record of any conflict between the workers and community members including any cases relating to harassment.	On-going (as encountered)	Security department/ HSE department

Topic	Impact	Parameter	Description	Frequency	Monitoring Location
			Record of human rights violation/complaints from the local communities	Continuously	Record keeping system/HSE department
			Record of any communicable diseases on site that could pose a risk to the local communities	Continuously	Project site clinic or HSE department
			Records of any health and safety accidents of near misses with the community	Continuously	Project site clinic or HSE department
			Records of any security incidents	Continuously	Security department/local police
			Number of grievances closed out	Monthly	Grievance Management System
			Average time for grievance processing and close out and trends	Monthly	Grievance Management System
			Number of grievances still open, method to submit the grievance and trends	Monthly	Grievance Management System
			Topics raised in grievances and trends	Monthly	Grievance Management System
Labour and Working Conditions	Risk of poorly formed contracts and their implementation	Worker contracts	Records of contracts, payments, receipt of benefits, leave entitlements, retrenchment etc.	Continuously	Human Resources (HR) department
	Risks of violating labour rights and risks of forced and child labour	workers grievances	Human rights complaints/violations as reported by Project workers including workers hired through third-parties or in the supply chain	Continuously	Grievance Management System Supply Chain Management Process
	Major Injury or fatality	Health of the workers	OH&S emergency situations and incidents	Continuously	HSE department Medical records
	Occupational health issues, and minor injury to workers	Health of the workers	Near misses, injuries or illnesses the workers are suffering from and an analysis of top diseases.	Continuously	HSE department Medical records
	Poor quality of accommodation	Health of the workers	The O&M workers accommodation camp compliance with KSA requirements and the IFC & EBRD Workers Accommodation: Processes and Guidelines (2009).	Once before operating the accommodation and monthly after that	All accommodation facilities provided to direct and sub-contracted labour.

7.3 Summary of Residual Impacts

The significance of the residual impacts is shown in Table 7-3.

Table 7-3 Summary of Project Construction and Operation Residual Impacts

Topic	Beneficial	No change	Negligible	Minor	Moderate	Major	Total
Construction Phase							
Air Quality			6	1			7
Climate Change			2				2
Noise			3	1			4
Soil and Groundwater			2				2
Hydrology, Surface Water, and Flood Risk			1	2			3
Solid Waste and Wastewater				1			1
Traffic and Transportation			2				2
Terrestrial Ecology			3				3
Archaeology and Cultural Heritage			1				1
Landscape and Visual Amenity			1	1			2
Socio-economic	4		2				6
Community Health, Safety & Security			5				5
Labour & Working Conditions			4	3			7
Total	4	0	31	8	0	0	45
Operation Phase							
Air Quality			2	1			3
Climate Change			2		1		3
Noise				4			4
Soil and Groundwater			1				1
Solid Waste and Wastewater			1				1
Landscape and Visual Amenity				1			1

Topic	Beneficial	No change	Negligible	Minor	Moderate	Major	Total
Socio-economic	2						2
Community Health, Safety & Security			2				2
Labour & Working Conditions			2	3			5
Total	2	0	10	4	1	0	22

7.4 Emergency Preparedness and Response Plan

The likelihood of an incident can be minimised by effective preparedness and planning of reasonably foreseeable emergency situations. Given the nature of the project, construction risk assessments and Method Statements will include consideration of the potential for environmental incidents.

The Executive Regulations for Preparedness and Response to Emergencies and Environmental Disasters specify the controls for preparing and implementing these plans. The project must commit to preparing and updating its own plan for preparedness and response to potential environmental emergencies and disasters. The NCEC may request that the plan be submitted for review based on the results of the environmental inspection, periodic follow-up, or classification of the activity as a sensitive facility.

The Project will prepare certain complimentary plans/procedures associated with potential emergency situations (such as the material handling and storage plan). Such complimentary plans will be outlined in the Framework Environmental and Social Management Plan (FESMP) that will be prepared as part of the ESIA. The plans will identify procedures for reasonably foreseeable emergency situations considering the following:

- The most appropriate method for responding to an emergency situation.
- Internal and external communication process (with stakeholders and responders).
- Action required to prevent or mitigate health and safety, community and environmental impacts.
- Mitigation and response actions to be taken for different types of emergency situations.
- The need for post-emergency evaluation to determine and implement corrective and preventative actions.
- Periodic testing/drills related to planned emergency response actions.
- Training of emergency response.
- A list of key personnel and aid agencies, including contact details (such as fire department, spillage clean-up services).
- Evacuations routes and assembly points.
- The possibility of the need for mutual assistance from neighbouring organisations/projects.

In addition, when the Project includes the use of chemicals, the following information should be included in the plan:

1. Cases that require the use of chemicals (amount and type of leak that requires its use).
2. Type and components of the required chemicals.
3. Storage sites (locations, nature of the sites, depths, environmentally sensitive areas, environmentally sensitive receptors, etc.).
4. The expected environmental impacts of its use and how to address those impacts.

The project shall implement the plan, controls and requirements set by NCEC, and provide qualified human resources, equipment and necessary devices that ensure readiness to implement the plan. To increase readiness to implement the plan, the Project Company can contract a service provider approved by the NCEC. The plan shall include programs for periodic maintenance of equipment, to respond to environmental emergencies and disasters. It is also necessary to commit to conducting an internal audit to assess the project preparedness - at least once a year - provided that the relevant reports are submitted to the NCEC within a period not exceeding 30 days from the completion of the audit.

The NCEC determines the reporting mechanisms. In the event of an environmental incident, regardless of its size or type, the EPC Contractor through the Project Company must inform the NCEC and relevant authorities.

7.5 Environmental Rehabilitation and Remediation Plan

The baseline information and assessments outlined in Chapter 5 and Chapter 6 of this Report have not identified any specific instances of existing contamination or potential for degradation from the Project that would necessitate the requirement for a rehabilitation or remediation plan.

In the instance that the rehabilitation and remediation of the Project sites including all temporary laydown areas and yards are required, the related plan will be produced by the Project Company and issued to NCEC for approval. Those responsible for the production of the plan will assume responsibility for its implementation to ensure its objective are met.

A Decommissioning Plan will be prepared at least 12 months prior to planned decommissioning and submitted to the Regulator (currently NCEC) for review and approval. No decommissioning works can be commenced without a permit from the Regulator. The Plan will detail the site and surrounding environment and receptors and may require new baseline studies to assess the condition of the site, adjacent areas and the overall area of influence including designated sites. Based on the details outlined in this Report, the measures will likely relate to the following:

- Removal of all Project related components and wastes and appropriate disposal method that adopts the waste hierarchy and maximises re-use and recycling of materials;
- Restoration of the terrestrial ecology habitats within the Project footprint including access roads e.g. re-seeding and re-vegetation using local indigenous species; and
- Remediation and/or sclarification of any compacted soils.

7.6 Framework Environmental and Social Management Plan

The Framework Environmental and Social Management Plan (ESMP) provides a framework for the effective implementation of the mitigation and monitoring measures outlined in Chapters 6.2 and 7.2 of this Report. This framework ensures alignment with applicable elements of the established ACWA Power corporate level E&S Policy and ESMS Implementation Manual.

The framework ESMP will provide a framework for the development of both CESMP and OESMP by the EPC Contractor and O&M Company respectively. The intention is that the Framework ESMP will

be used by both the EPC Contractor and O&M Company for the development of specific environmental and social management plans, based on the specific findings and recommendations of the ESIA. The following sections outline the Framework ESMP as required by NCEC for the environmental permitting of the Project.

7.6.1 Objectives and Scope

The production and implementation of a Framework ESMP provides the mechanism by which to implement the findings of the ESIA. This Framework ESMP sets out specific objectives and targets defining a 'framework' for the way in which the ESIA and its recommended mitigation and monitoring measures should be addressed in the next stages of the Project development.

This Framework ESMP is intended to be adopted by the EPC Contractor who will develop and author their own detailed CESMP with supporting activity and topic specific management plans and method statements to cover the construction of the Project. A future OESMP will be developed by the O&M Company which will closely align with the FESMP in terms of structure but will provide operations specific detail.

This Framework ESMP will also contribute to the development and implementation of the ESMS. The Project ESMS will align with applicable elements of the established ACWA Power corporate level E&S Policy and ESMS Implementation Manual.

7.6.2 Intended Users

This Framework ESMP aims to clearly communicate to the Project Company, their EPC Contractor, O&M Company and all sub-contractors the Project's environmental and social commitments. The Project Company holds primary responsibility for the production and implementation of the CESMP by their EPC Contractor and all sub-contractors and the OESMP by the O&M Company and all sub-contractors.

7.6.3 Legislative Requirements

Chapter 2 and **Appendix B** of this ESIA outlines the national, regional, and lenders commitments that are applicable to the Project. Other applicable requirements are included to each section in Chapter 6.

7.6.4 Organisational Structure

An overview of the organisational structure of all parties involved in the implementation of the ESMP is outlined below:

- **NCEC:** As the Competent Authority in KSA, NCEC is responsible for issuing the required Environmental Permit and ensuring all construction and operational conditions related to the Environmental Permit are met. Other general responsibilities include:
 - Enforcement of KSA laws and regulations;
 - Provision of guidelines on compliance with environmental requirements;
 - Strategic overview of environmental issues;
 - Review and approval of the ESIA Report;
 - Issue of the Environmental Permit and any associated conditions; and

- Undertake inspections, audits etc. to ensure compliance with the Environmental Permit.
- **Project Company:** The Project Company is responsible for the financing and development of the Project and will assume all responsibility for ensuring all environmental and social commitments of the Project are met. The Project Company will adopt a Project E&S Policy and work under a construction ESMS and operational ESMS.
- **EPC Contractor:** The EPC Contractor is responsible to the Project Company for ensuring all environmental and social commitments of the Project construction phase are met. The EPC Contractor will produce and implement the detailed CESMP.
- **O&M Company:** The O&M Company is responsible to the Project Company for ensuring all environmental and social commitments of the Project operation phase are met. The O&M Company will produce and implement the detailed OESMP.
- **Sub-Contractors:** All sub-contractors undertaking works on behalf of the EPC Contractor/O&M Company will be responsible for undertaking works in line with the CESMP/OESMP and all approved method statements and management plans.

7.6.5 Key Roles and Responsibilities

The key roles and responsibilities related to the implementation of the CESMP or OESMP (when applicable) are outlined in the following table. Further details will be provided in the Project CESMP and OESMP.

Table 7-4 CESMP/OESMP Roles and Responsibilities

ROLE	KEY RESPONSIBILITIES
Project Company – Project Manager	• Review and approve environmental and social management budgets, resourcing and staffing. • Attend and actively input to environmental and social management review meetings. • Formal sign off and approval of all ESMS documentation produced by the EPC Contractor/O&M Company, including the CESMP/OESMP. • Ensure the project adheres to all applicable environmental laws, regulations, and standards. This includes obtaining necessary permits, licenses, and approvals. • Continuously seek opportunities to improve the project's environmental performance through exploring alternative technologies, materials, and practices that are more environmentally friendly, as well as evaluating the effectiveness of implemented mitigation measures. • Promote environmental awareness among project team members and stakeholders. • Manage applicable stakeholder engagement with local communities, regulators, and SPPC, to address their concerns, gather input, and ensure transparency in environmental decision-making processes.
Project Company – HSE Manager	• Follow up, review and internal approval off ESMS documentation produced by the EPC Contractor/ O&M Company, including the CESMP/OESMP. • Inspect and audit EPC Contractor/O&M Company. • Liaise with the Project manager, the regulators and/or other authorities on environmental and social matters. • Be responsible for communications regarding environmental and social reporting and third-party audits. • Implementing a system for monitoring and tracking the project's environmental performance.
EPC Contractor/O&M Company Project Director	• Review and approve environmental and social management budgets, resourcing and staffing.
EPC Contractor/O&M Company HSE Manager	• Review and approve EPC Contractor/O&M Company environmental and social management budgets, resourcing and staffing. • Ensure sufficient resources for the management of environmental and social matters. • Undertake regular site inspections. • Monitor and report on environmental management and performance, including compliance with the CESMP/OESMP.

ROLE	KEY RESPONSIBILITIES
	- Undertaken regular inspections and audits to assess compliance and manage implementation of corrective and preventative actions. - Stop operations that may adversely impact the environment. - Attend and actively input to environmental and social management review meetings. - Set and review environmental objectives and targets for the Project. - Promote environmental and social awareness and provide induction, trainings and drills at all levels. - Follow-up and close out any grievances. - Inspect and audit welfare facilities and labour camps of contractors and sub-contractors. - Stop any health and safety risk tasks and ensure corrective action is implemented.
EPC Contractor/O&M Company HSE Engineer / Environmental Engineer	- Monitor and report on environmental management and performance, including compliance with the CESMP/OESMP. - Prepare and monitor site bulletin boards. - Undertake daily site walkovers and inspection of works. - Prepare daily reports on findings including non-conformance and liaise with the responsible parties to rectify and close-out outstanding findings. - Escalate pending non-conformances during management meetings to ensure these are addressed as required. - Maintain applicable environmental and social records - Act as point of contact for any sub-contractor with regard to environmental issues. - Follow-up and close out any grievances.
Subcontractors	- The subcontractors shall at all times comply with the requirements outlined in the Project ESMS. - Where required, and based on the number of workers, subcontractors will deploy dedicated HSE Officers onsite. - The subcontractors E&S responsibilities are similar to those of the EPC Contractors/O&M Company for the activities under their scope.

7.6.6 Environmental Capacity Building, Training and Awareness

All Project staff must be fully competent to perform their tasks based on appropriate education, training or experience. To minimise potential impacts of the Project on the environment, all Project Company, EPC Contractor/O&M Company and sub-contractor staff will be adequately trained to understand and comply with the environmental requirements and commitments of the Project.

All site-based Project Company, EPC Contractor/O&M Company and sub-contractor staff will be required to undertake a site-specific Environmental Induction prior to commencing any works. The aim of the Environmental Induction is to raise awareness of environmental issues identified in the ESIA and the associated mitigation and management measures detailed within the CESMP/OESMP and to ensure all Project staff are informed of their responsibilities and duties.

Outside of the Environmental Induction, the level of training will vary depending on staff roles and responsibilities. Example training requirements are outlined in the table below. As part of the ESMS, a tailored Training Plan will be developed which include all training requirements. The CESMP/OESMP will provide further detail on the training requirements.

Table 7-5 Example Training Requirements

EXAMPLE TRAINING	PROJECT STAFF	CONTENT	TIMING
Environmental Induction (Site Induction)	All Project Staff and Visitors	• Site layout; • Safety procedures and use of PPE; • Environmental Policy; • Legal commitments and requirements; • Overview of the CESMP/OESMP including environmental aspects and impacts associated with construction activities; • Role and responsibilities of site environmental management; • Communication procedures; • Grievance mechanism; • Emergency Procedures and contacts; and • Incident reporting procedure.	Prior to involvement in any construction activities.
Environmental Induction for Supervisors	Site Supervisors/ HSE Managers/ Environmental Managers	• As per the above, in addition: - Importance of toolbox talks and how to conduct toolbox talks; - Management of training records and grievances.	Prior to involvement in any construction activities.
Spill and Emergency Response Training	All Project Staff	• Detailed training on the response and procedures in the event of a spill of emergency.	Prior involvement in any construction activities.
Toolbox Talks	All Project Staff	• Toolbox Talk environmental training sessions may be focused on the following subjects: - Dust control and dust mitigation; - Air quality emissions and control measures; - Hazardous materials management, handling and transportation; - Spill prevention and response for personnel involved in the storage of fuel and other hazardous materials. Including use of spill kits and refuelling. - Storage, handling and use of chemicals; - Ecologically significant fauna and mitigation measures; - Noise control and mitigation measures; - Traffic control and mitigation; - Chance Find Procedure; - Waste management; and - Emergency incident response.	Weekly – additional bulletins and alerts as required.

Records of training delivered by internal and external providers shall be maintained by the EPC Contractor/O&M Company. These records should include a training register which details the name and date of the training and list of all attendees.

7.6.7 Internal and External Communications

The CESMP/OESMP will be required to establish, implement, and maintain processes needed for internal and external communications relevant to the environmental and social performance of the Project.

All Project staff, including Project Company, EPC Contractor/O&M Company and sub-contractors will be responsible for the communication of any potential environmental issues to the appropriate person.

The CESMP/OESMP will develop a communication plan which will establish:

- What will be communicated;
- When it will be communicated;
- With whom to communicate; and
- How to communicate.

Formal modes of internal communications relevant to the environmental and social management of the Project may include:

- Management meetings;
- Progress meetings; and
- Monthly reports (e.g. monitoring, inspection, incident reports).

7.6.8 Control and Reporting

The EPC Contractor/O&M Company shall be responsible for ensuring that throughout the construction phase, monitoring reporting requirements provided in this CESMP/OESMP are implemented. Monitoring reporting should be in line with the regulatory requirements (if any). The EPC Contractor/O&M Company is required to report, as a minimum, the following:

- Incident and relevant investigation reports;
- Weekly/Biweekly environmental reports including inspections, incidents, accidents etc.;
- Monthly environmental reports, including monitoring, inspections, incidents, accidents, internal audits highlighting non-conformances, grievances, environmental performance, etc.;

In addition, the CESMP/OESMP is intended to be an evolving 'live' document, which is regularly reviewed, revised and developed, to ensure the depth of environmental management is compliant and complete.

It is recommended that the detailed CESMP/OESMP is reviewed throughout the construction of the Project at regular intervals. Reviews of the detailed CESMP/OESMP should be undertaken in collaboration between the Project Company, EPC Contractor/O&M Company and their Environmental Advisor and should consider the following as a minimum:

- Any additional responses / comments from NCEC;
- Updated construction activity details;
- Outcomes of any environmental monitoring;
- Recorded incidences and non-conformances;
- Recorded enquiries and complaints;
- Changes in organisation structure and responsibilities; and
- Changes in environmental standards and legislation.

7.6.9 Data Management

All environmental & social management documentation including ESMS documents and generated records including meeting minutes, work method statements, toolbox talks/ inductions/training material and evidence records, site inspections, system audits, monitoring records, incident investigations etc. shall be retained on site. These will be managed under the EPC Contractor/O&M Company document management plan and document control system. Such provisions should as a minimum include:

- All documentation will be uniquely identifiable (e.g. by a file name, date, revision number and have page numbers), stored and readily retrievable (either on a local area network or in hardcopy files) for use by personnel.
- The document control procedure shall ensure that applicable documentation has been reviewed and approved before finalisation.
- Documentation and Records arising from the implementation of the ESMS shall be retained for the project lifecycle.

There are certain requirements in Saudi Arabia for environmental documentation to be maintained for five years.

7.6.10 Auditing and Inspection

7.6.10.1 Internal Audits

Internal audits will be undertaken to assess the compliance and conformance of the Project Company and the EPC Contractor/O&M Company with the CESMP/OESMP. Internal audits will involve the observation of construction activities, meetings with key Project staff and a review of records i.e. monitoring reports, management meetings, complaints etc.

Should any non-compliances or opportunities for improvement be identified during the internal audit, corrective action requests will be issued to the responsible party. These requests will take the form of a short document / form setting out the following information, as a minimum:

- The nature of the non-compliance (date, location, description);
- The nature of the recommended / investigative / remedial / corrective action;
- The individual responsible for the action;
- The timeframe for undertaking and completing the action; and
- A record and sign-off of the action undertaken.

The CESMP/OESMP will detail the frequency, scope and personnel responsible for the internal audits.

7.6.10.2 External Audits

As the Project is seeking finance from lenders who may (or may not) be signatories of the EP or have investment policies that are consistent with the IFC Performance Standards, the Project will be required to comply with lenders requirements.

In accordance with Equator Principle 9, an Independent Environmental & Social Consultant shall undertake monitoring and reporting activities on behalf of the lenders for the period of the project loan.

7.6.10.3 Inspections

Daily inspections will be undertaken by the HSE Manager and/or Environmental Manager to monitor and record the general environmental performance of the Project. The daily walkover inspection will include of key areas i.e. construction activity locations, site offices, site compound / laydown/ storage areas and will cover the following as minimum:

- General site housekeeping;
- Dust management and air quality;
- Ecological observations;
- Noise and vibration;
- Runoff and spill management;
- Waste storage and management;
- Chance Find Procedure;
- Lighting management; and
- Traffic management.

All site inspections will be documented via an Environmental Inspection Record which will be submitted to the HSE Manager on a monthly basis.

In addition to the above, a more formal walkover with the HSE Manager and/or Environment Manager and the Construction Manager will be undertaken and documented.

7.6.11 Environmental and Social Plan, Procedures and Monitoring

7.6.11.1 E&S Management Plans (CESMP and OESMP)

The key E&S management plans will be the CESMP and OESMP; respective to construction and operations. The CESMP and OESMP will comprise stand-alone documents structured to detail how environmental and social risks, impacts, opportunities and compliance will be managed and monitored. This shall be the top-level management plan document prepared by the EPC Contractor and O&M Company respectively. Chapter 6 of this Report has delineated the environmental and social mitigation required for the Project and to be incorporated in the CESMP/OESMP.

The typical content of a CESMP/OESMP has been outlined below. This is not mandatory to be structured in this manner, but it is expected that the headings and sub-headings as a minimum are captured within the respective CESMP/OESMPs.

- Introduction
 - Background of Environmental Permitting
 - Objectives of the CESMP/OESMP
 - Scope of the CESMP/OESMP
 - Limitations
 - Structure of the CESMP/OESMP

- Project Description
 - Project Rationale and Background
 - Project Location
 - Land Use
 - Sensitive Receptors
 - Overview of Project Components
 - Overview of Associated Facilities
 - Overview of Construction/Operational Works and Workforce Requirements
 - Overview of Construction/Operational Facilities
 - Project Schedule (for CESMP)
- Regulatory Framework
 - Overview of Regulatory Framework and Compliance Obligations
 - o Regional and International Treaties and Conventions
 - o KSA Legislation
 - o Lenders Requirements
 - o Environmental Standards
- Environmental and Social Management
 - Summary of Environmental and Social Management System (ESMS)
 - Reference to E&S Policies
 - o Applicable Project Company E&S Policy
 - o EPC Contractor/O&M Company E&S Policy
 - Statement of other supporting/complementary Plans and Procedures
 - Organisational Structure
 - o NCEC
 - o Lenders
 - o Project Company
 - o EPC Contractor/O&M Company
 - o Sub-contractors
 - HSE Roles and Responsibilities
 - Environmental Awareness and Training
 - o Environmental & Social Induction Training
 - o Toolbox Talk Environmental & Social Training Sessions
 - o CESMP/OESMP Training
 - Competency Needs and Records
 - Internal and External Communications
 - o Internal Communication
 - o External Communication
 - o Liaison with Regulator
 - Inspections and Audits
 - o Daily and Weekly Inspections
 - o Internal Audits
 - o Annual Internal Audits

- External Audits
- Non-conformity, Corrections and Corrective Action
 - Non-Conformity, Investigation and Response
 - Incident Definition, Reporting, Investigation and Response
 - Corrections and Corrective Actions
- Control of Records
- Mitigation, Management and Monitoring
 - Air Quality
 - Climate Change
 - Noise & Vibration
 - Soil, Geology, Groundwater
 - Hydrology and Flood Risk
 - Terrestrial Ecology
 - Traffic & Transportation
 - Archaeological and Cultural Heritage
 - Landscape and Visual Amenity
 - Socio-Economic
 - Solid Waste & Wastewater Management
 - Community Health, Safety & Security
 - Labour & Working Conditions
- Monitoring Summary
- Emergency Preparedness and Response Overview
- Appendices.

7.6.11.2 Supporting/Complimentary Plans & Procedures

Complimentary plans and procedures will be required to developed alongside the CESMP/OESMP. Such supporting/complimentary management plans/procedures include those linked to specific activities that carry environment and social risks, for which defined and documented management processes need to be specified. The plans will include SMART (specific, measurable, achievable, relevant and time- based) targets and, where applicable, Key Performance Indicators (KPIs) with distinct milestones. The plans will also specify who is responsible for achieving these targets.

The implementation of each management plan is led by one designated party (Company or EPC Contractor/O&M Contractor), as specified in Table 7-6 below. The Project Company ESMS (construction and operation) and the EPC-ESMS (construction) will be designed to implement the requirements of these plans. ESMS implementation tools, including forms, templates, checklists, and other documentation, will be used to implement the Project requirements.

Table 7-6 Required Complimentary Plans and Procedures

PLAN / PROCEDURE	Project Phase	PURPOSE AND KEY REQUIREMENTS	LEAD IMPLEMENTATION
Environmental and Social Monitoring Plan	Construction & Operation	Monitoring is required to demonstrate compliance to KSA environmental standards and lender requirements. The monitoring plan is to specify monitoring requirements for all ESIA parameters (as specified in section 7.2 of this ESIA). The plan will therefore need to include: - What parameters need to be monitored and measured and at what locations. - The methods for monitoring measurement, analysis and evaluation to ensure valid results. - The criteria against which compliance and performance will be measured. - When and at what frequency monitoring needs to be performed. - How the results from monitoring and measurement will be analysed and evaluated (independent or internal).	EPC Contractor / O&M Contractor
Hazardous Material Handling and Storage Procedure	Construction & Operation	To identify locations for material storage, storage requirements (specifications of bunds and buildings/warehouses to ensure environmental and H&S protection, segregation requirements etc.) and handling procedures to minimise environmental and OH&S risks. The plan will outline record keeping as per chain of custodies, requirements for MSDS and roles & responsibilities. Specific method statements regarding the handling of materials will be detailed, as well as training requirements for staff involved in such activities.	EPC Contractor / O&M Contractor
Traffic Management Plan	Construction	The plan will identify specific requirements for heavy, or oversize loads, including timings of deliveries, specific routes (to minimise disruption), engagement mechanisms with external transport authorities (as per the SEP, e.g. local government and stakeholders). To include measures to minimise congestion, fuel use and risks to the public and site staff.	EPC Contractor
Water Management Plan	Construction	The Water Management Plan identifies sources of water supply for the Project, estimation of required quantities, and procedures for the sustainable use and management of water resources used throughout the construction phase of the Project. This includes management of any impacts on community water availability.	EPC Contractor
Waste Management Plan	Construction & Operation	To identify site specific requirements for waste & wastewater management, containment of wastes (segregation, storage area specifications and locations), collection methodologies & transport (identification of licensed contractors including recycling and hazardous waste facilities, their capacity to handle waste and the process to engage), treatment/disposal (identification of licensed treatment and disposal sites), record keeping and reporting requirements related to waste.	EPC Contractor / O&M Contractor
Biodiversity Management Plan	Construction	The Biodiversity Management Plan ensures the protection of biodiversity resource. The plan will identify specific issues relating to biodiversity impacts and risks arising during the construction and operation phases. The plan will provide a framework within which the terrestrial ecology species including habitat, fauna, flora, and avifauna will fit. The plan shall consider the areas which are cleared and in which order to minimise ecological impacts. Clear instructions and benchmarks on the quality of land post-construction for rehabilitation (i.e. in temporary construction areas or on other land that may be affected) shall be established; to return land as close as practical to the pre-construction condition.	EPC Contractor
Chance Finds Procedure	Construction	An archaeological 'Chance Find Procedure' will be developed prior to construction and the start of site earthworks, alongside the CESMP. This will include protocols and procedures to stop work and methods to preserve potential finds, as well as reporting requirements and co-ordination with SPPC and the regulator.	EPC Contractor
Emergency Preparedness and Response Plan	Construction & Operation	To identify the contingencies put in place for a variety of potential emergency situations relevant to the commissioning or operational phases. The plan will outline the response mechanisms, roles and responsibilities, training requirements, internal communication, equipment and relevant engagement with external stakeholders.	EPC Contractor / O&M Contractor

PLAN / PROCEDURE	Project Phase	PURPOSE AND KEY REQUIREMENTS	LEAD IMPLEMENTATION
		Requirements for on-site equipment shall be established based upon the potential emergency risks, including training provisions for site personnel regarding such equipment. The plan will identify site specific requirements for response to pollution incidents. To include the identification of high-risk areas on a plan and the location of spill kits (and contents of spill kits).	
E&S Training Plan	Construction & Operation	To identify specific staff members for training and the type (i.e. classroom, practical, toolbox talks) how/when this is to be delivered, the frequency of training and whether follow up training provisions are required. The training will be linked to the specific content of the listed plans and procedures, or key risk activities that may be identified from on-site method statements.	EPC Contractor / O&M Contractor
Stakeholder Engagement Plan (SEP)	Construction & Operation	To identify project stakeholders, identify communication protocols for engagement with stakeholders. To identify frequency or event-based communication with stakeholders (i.e. for emergencies and specific grievances). To detail the workers grievance mechanism or provide a reference to a separate grievance mechanism.	Project Company
Grievance Mechanism (stakeholder)	Construction & Operation	To be included within or be linked to the SEP. To develop and identify the process for external parties to raise grievances regarding the project. The mechanism shall be easily accessible (including for any vulnerable groups), non-discriminatory and provide a transparent process to raise concerns or complaints, which may be issued in an anonymous nature. The mechanism shall specify the roles and responsibilities of internal staff about the grievance mechanism and the procedure for responding to received grievances, including the timeline for response, engagement mechanisms and recording of records.	Project Company
Site Inspection and Audit Plan & Procedure	Construction & Operation	To specify the timing and frequency of inspections (e.g. daily, weekly walkovers) and audits (including internal & external independent audits for the lenders as appropriate). To detail the methodology of such inspections and audits to ensure applicable Environmental and Social requirements are included as criteria within the scope of the inspection/audit. For internal audits, the procedure will identify the audit scope (site, laydown areas, accommodation areas, sub-contractor areas etc.), audit criteria (e.g. CESMP, OESMP, ESMS), selection process for audit evidence, reporting format and auditor competence requirements. The Procedure will specify definitions of non-conformance, observations and best practices, as well as detailing the mechanisms for issuance and follow up of Non-Conformance reports, including time periods for action and the implementation of corrective and/or preventative measures.	EPC Contractor / O&M Contractor
Security Management Plan	Construction & Operation	A security plan will be developed based on the outcomes of a security risk assessment. It is noted that security arrangements will be guided by UN Code of conducts for law enforcement. Security personnel will follow a strict code of conduct and will be trained in weapons handling (if applicable), human rights and receipt of grievances.	EPC Contractor / O&M Contractor
Occupational Health & Safety Plan	Construction & Operation	Identify the required controls for worker health and safety during the commissioning and operational phases. As a minimum, this plan shall include: - Means of identifying and minimising, so far as reasonably practicable, the causes of potential hazards to workers. - Provision of preventive and protective measures, including modification, substitution, or elimination of hazardous conditions or substances. - Provision of appropriate equipment to minimise risks and requiring and enforcing its use. - Training of workers, and provision of appropriate incentives for them to use and comply with health and safety procedures and protective equipment. - Documentation and reporting of occupational accidents, diseases and incidents.	EPC Contractor / O&M Contractor

PLAN / PROCEDURE	Project Phase	PURPOSE AND KEY REQUIREMENTS	LEAD IMPLEMENTATION
		Emergency prevention, preparedness and response arrangements.	
Human Resources Policies and Procedures	Construction & Operation	Human resource policies and procedures will be adapted appropriate to the size of the workforce required for the Project. Policies and procedures must be prepared to demonstrate consistency with the requirements of national legislation and IFC Performance Standard 2.	EPC Contractor / O&M Contractor
Recruitment Plan	Construction & Operation	The EPC contractor and O&M Company will provide a plan detailing how working conditions and terms of employment are compliant with KSA labour, social security and occupational health and safety laws. This plan will provide set of actions for the recruitment of the workforce. The plan will detail the procedure for effective recruitment of local staff (where available), the positions that could be filled by unskilled, semi-skilled and skilled local workforce, mechanisms that will be in place to ensure there is non-discrimination of women in assessing recruitment procedures and the training to be provided for each job role. The plan will also specify how working conditions and terms of employment are compliant with national labour, social security and occupational health and safety laws. The EPC Contractor and O&M Company will ensure that the following documents are prepared prior to the employment of workers. - Employment agreements and recruitment policies; - Equal opportunities and non-discrimination policy (incorporating maternity policies and policies associated with GBVH); and - Child and forced labour policies / procedures (covering recruitment fees and arrangements, as well as document (e.g. passport) retention).	EPC Contractor / O&M Contractor
Local Content Plan	Construction	This plan will clearly identify the Project commitment to purchasing goods and services (where practicable without compromising on the quality and standard requirements for the Project). It will also set expectations with regards to the extent goods and services can be purchased from the local market in order to benefit local businesses without potentially leading to higher prices for local consumers. This plan will be shared with local businesses interested in providing goods and services to the Project.	EPC Contractor
Workers Accommodation Plan	Construction	This plan will outline the process and standards for the accommodation for the Project workforce. It will include accommodation areas directly managed by the Project or rented/shared to accommodate direct Project employees and/or temporary or other contract staff (dedicated to the project). Accommodation areas in use by sub-contractor companies/staff (where staff are dedicated for the Project) will also be included.	EPC Contractor /
Decommissioning Management and Monitoring Plan	Decommissioning	Decommissioning phase plan (with supporting subplans) for managing E&S risks with supporting procedures, forms and method statements as per the requirements of this ESMP.	Project Company

8 Conclusion

8.1 The Environmentally, Socially and Economically "Preferred" Alternative

The Project will help increase the stability of electricity supply and further ensure the efficient use of scarce natural resources.

Not implementing the Project would be a missed opportunity for a secure and reliable electricity generation and supply system which would have significant social and economic development implications including the realisation of the KSA vision 2030. In addition, the no project alternative would hinder KSA's efforts to transition from liquid-based fossil fuels to natural gas power generation.

The current Project location and technology described in this report were selected based on an assessment of their technical performance and environmental and social considerations. The site is also relatively away from sensitive receptor communities and towns. In addition, using the selected proposed site, also prevents the need to disturb any critical habitats since the Project site has limited flora and fauna species that are common in KSA.

This approach ensures that the Project will be efficient, sustainable, and able to meet the long-term needs of the communities it serves.

8.2 Summary of the Environmental, Social and Economic Losses and Gains that Justify the Establishment of the Proposed Business Activity

The development of the Nairyah 1 IPP is in line with the KSA Vision 2030 which aims to diversify the national energy mix used in electricity production, increase the share of natural gas (and renewable energy sources) to approximately 50% while reducing the use of liquid fuel. In addition, the power industry is a strategic industry in the KSA which has ensured its continued economic development and industrial diversification. The Project also aligns with KSA climate change strategy which includes transition from liquid-based fossil fuels to natural gas power generation. The Project will help increase the stability of electricity supply and further ensure the efficient use of scarce natural resources.

The main impact of the Project will be the GHG emissions that significantly exceed the IFC threshold for GHG quantification (25,000tCO₂/year). The Project will be decarbonisation-ready with measures implemented to allow for the addition of carbon capture and sequestration technology at a later date without major modifications to the Plant. If this is implemented and operated, the impact from GHG emissions will be reduced to acceptable levels.

Additionally, the air quality modelling indicated that the Project will not result in significant impacts. The Project will result in other E&S impacts that will require proper mitigation and monitoring. The implementation of the ESIA mitigation measures and a robust ESMS by the EPC Contractor and the O&M Company that aligns with ACWA Power Corporate E&S Policy and ESMS Implementation Manual and the continuous monitoring, reporting and supervision will ensure that adverse impacts of the Project are minimised to acceptable levels.

8.3 Summary of How the Negative Impacts Are Addressed and to What Extent They Will Be Mitigated, Improved or Controlled

The Project design and construction and operation methods detailed in Chapter 3 of this report has been identified as the preferred Project. Chapter 6 of this report has identified the potential environmental and social impacts and the required mitigation measure of the Project based on the detail described in Chapter 3.

As summarised below, the ESIA has identified the following:

- 60 environmental and social impacts associated with the development and operation of the Project. During the construction phase of those assets, 43 impacts have been identified, of which four (4) are positive and 38 are negative. During construction one (1) impact was assessed to be of major significance, 10 as moderate significance while the rest are minor or negligible. There is a total of 17 operational phase impacts, of which two (2) are positive and 15 are adverse of which one (1) is major significance and six (6) are of moderate significance impacts while the rest are minor or negligible. The major impacts are related to labour major injury or fatality where key risks are not suitably managed, while this is unlikely to happen, the significance of this occurring would be major.
- Through the application of the appropriate mitigation and management measures, the significant impacts that were identified (i.e. major or moderate) have been reduced/improved to an acceptable level of significance or magnitude. The only remaining moderate impact would be the impact of GHG emissions. These emissions are inevitable and the reduction of the significance of this impact will be through the proper implementation and operation of the decarbonisation system. While the Project will be decarbonisation-ready with measures implemented to allow for the addition of carbon capture and sequestration technology, the operation date of this system has not been confirmed yet and therefore GHG emissions will remain significant until its operation.

8.4 Summary of the Environmental Management Plan

To ensure that mitigation measures and management plans set out in this ESIA are implemented, a Project ESMP will be developed.

A Framework ESMP has been provided in the ESIA to guide the development of the Project Construction ESMS and Operation ESMS by the EPC Contractor and O&M Company respectively. The Project policies and plans will set out the mitigation and monitoring requirements which need to be effectively implemented. These will be developed by the appointed EPC Contractor and O&M Company, based on the ACWA Power Corporate E&S Policy and ESMS Implementation Manual as well as their existing procedures and management systems, method statements and the requirements set out in this ESIA and overseen by the Project Company.

It is assumed that no works will commence until the Environmental Permit is obtained and an ESMP is in place and implemented for each phase.

8.5 Roles of the Various Relevant Authorities

8.5.1 Ministry of Environment, Water and Agriculture

MEWA is a government ministry in KSA responsible for overseeing environmental protection, water resources management, and agricultural development in the country. MEWA is responsible for developing and implementing policies and regulations to protect the environment, conserve biodiversity, and mitigate the impact of human activities on ecosystems. The ministry works towards preventing pollution, managing waste, and promoting sustainable practices in various sectors, including industry, agriculture, and transportation.

8.5.2 National Centre for Environmental Compliance

The NCEC has been the regulator for preventing the deterioration of environmental environments in KSA since 1st January 2021. NCEC is responsible for the issuing and renewal of environmental licenses for Category 1, 2 and 3 projects in accordance with the KSA Environmental Law and applicable MEWA Executive Regulations.

8.5.3 National Centres of Environment

In addition to the NCEC, the following National Centres have also been established and have their own policies and standards, each in its field and must be taken into account during the construction, operation and decommissioning of the project.

- **NCM:** monitors weather and climate condition;
- **NCW:** supervises programmes related wildlife and biological diversity and protected areas;
- **NCVC:** regulates habitat loss and vegetation cover, combats desertification, conducts studies and supports research related to vegetation; and
- **MWAN:** organizes the waste management sector and issuing licenses to waste management service providers, including transportation, storage, recycling, treatment and disposal of hazardous and non-hazardous waste.



9 Appendices

Appendix A – References

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Appendix B – Environmental Standards

The applicable environmental standards for the Project as per the national regulations and lender guidelines are outlined below. Where there is contradiction in limits between Saudi standards and lender guidelines, the most stringent will apply.

In accordance with lender requirements, where specific national standards do not exist, a best practice standard should be applied.

1. Air Quality

A. National Requirements

Air Emissions

The table below presents the applicable air emissions standards for combustion facilities (constructed on or after 1st September 2005), specific to the Project technology, as per the Executive Regulations for Air Quality of the Environmental Law issued by Royal Decree No. (M/165) as of 19/11/1441 AH.

Table A-0 KSA Air Emissions Standards

#	Source	Pollutant	Emission Standard
13.14	Stationary gas turbines with heat input > 100 MW	NO _x	9 ppmv at 15% O ₂ dry basis
13.15		SO ₂	0.015% by vol. at 15% O ₂ dry basis
13.16		Sulfur contents of turbine fuel	<0.8% Sulphur by weight

Ambient Air Quality Standards

The table below presents the national ambient air quality standards (MEWA, 2020) as per the Executive Regulations for Air Quality of the Environmental Law issued by Royal Decree No. (M/165) as of 19/11/1441 AH.

Table A-1 KSA Ambient Air Quality Standards (µg/m³ unless otherwise specified)

Pollutant	Average Period	Executive Regulations (2020)*	
		Standards	Permitted Allowances
Sulphur Dioxide (SO ₂)	1 Hour	441	24 times per annum
	24 Hours	217	3 times per annum
	Annual	65	-
Nitrogen Dioxide (NO ₂)	1 Hour	200	24 times per annum
	Annual	100	-
Carbon Monoxide (CO)	1 Hour	40,000	Once per annum
	8 Hours	10,000	Twice per annum
Ozone (O ₃)**	8 Hours	157	25 days per annum, average calculated over 3 years
	24 Hours	340	12 times per annum ***

Pollutant	Average Period	Executive Regulations (2020)*	
		Standards	Permitted Allowances
Suspended Particulate Matter (<10µm) PM ₁₀	Annual	50	-
Suspended Particulate Matter (<2.5µm) PM _{2.5}	24 Hours	35	12 times per annum ***
	Annual	15	-
Lead (in suspended particulate Pb) (in TSP)	3 Months	0.15	Average is over 3 months

Notes:

* The values are at a standard temperature of 25°C and atmosphere pressure of 1atm.

** To calculate the ozone (O₃) value for 8 hours and to allocate it to the appropriate day, the following rule shall be applied: The maximum daily concentration of eight hours must be determined by examining the eight-hour operating averages, and it shall be calculated from the data every hour and updated every hour. Each calculated eight-hour average is assigned to the day it ends with. That is, the initial calculation period for any day will be from 5 pm on the previous day to 1 am of the day; the last calculation period for any day is from 4 pm to 12 am.

*** Exceedances calculation: Contributions from natural sources can be assessed through measurements, modelling and remote sensing, then subtract these contributions from the air quality monitoring results. This is how the exceedances are calculated.

The table below provides the applicable standards for air emissions from 'stationary sources'.

Table A-2 Emission Limit Values for Emissions to Air from Stationary Sources

Source	Pollutant	Maximum Values for Emissions
All emissions sources	PM	Opacity level shall not exceed 20% over the normal levels
Stockpiles	PM	Opacity level shall now exceed 10% over the normal levels

B. RfP Requirements

In addition to compliance with the above Saudi Air Regulation and to meet the ground level concentrations, the Project is required to comply with the maximum permissible emission levels stipulated with the RfP Technical Specifications as set out in the table below.

These maximum permissible emission levels are to be met within the specified temperature range between minimum plant load and maximum continuous rating of each gas turbine in combined cycle mode.

Table A-3 Maximum Permissible Stack Emissions

Emission	Unit	Gas turbine and HRSG	
		Gas	Back-up Fuel
NO _x (as NO ₂)	mg/Nm ³ (dry, 3% O ₂)	18 ³⁾⁴⁾	18 ¹⁾³⁾⁵⁾
CO	mg/Nm ³ (dry, 3% O ₂)	50	50
SO ₂	mg/Nm ³ (dry, 3% O ₂)	2)	2)
Smoke Density	Bacharach	2	2
Reference – O ₂	Vol.-%	15	15

Notes:

- 1) NO_x emission for Back-up fuel is based on maximum fuel bound nitrogen content of 0.015% by weight.
- 2) According to sulphur content in the fuel
- 3) This value of 18 mg/Nm³ (or 9 ppmv) applies for combined cycle operation
- 4) In case open cycle is implemented, this value may be exceeded up to a value of maximum 50 mg/Nm³ subject to the approval by the competent authorities.
- 5) In case open cycle is implemented, this value may be exceeded up to a value of maximum 150 mg/Nm³ subject to the approval by the competent authorities.

C. Lenders Requirements

As per IFC requirements (and as outlined in the OECD Common Approaches) the WBG EHS Guidelines are applicable for the Project and establish emissions limits as detailed below for both air emissions and ambient air quality.

Air Emissions

Table A-4 IFC EHS Guidelines for Thermal Power Plants (Draft for Second Public Consultation - May/June 2017) - Air Emissions (mg/m³ or as indicated)

Pollutant	Combustion Turbine Natural Gas (Unit ≥ 50MWth)	
	Non-Degraded Airshed	Degraded Airshed
Nitrogen Oxides (NO _x)	50 (~25ppm)	30 (~15ppm)
Sulphur Dioxide (SO ₂)	n/a	n/a
Particulate Matter (PM)	n/a	n/a

Note: Excess Dry Gas O₂ Content (%) = 15

Ambient Air Quality

The WHO ambient air quality standards are adopted by the WBG General EHS Guidelines and are presented in the table below.

Table A-5 WHO Ambient Air Quality Standards (µg/m³ unless otherwise specified)

Parameter	24 hour	Annual
PM ₁₀	150 (Interim target 1)	70 (Interim target 1)
	100 (Interim target 2)	50 (Interim target 2)
	75 (Interim target 3)	30 (Interim target 3)
	50 (Interim target 4)	20 (Interim target 4)
	45 (guideline)	15 (guideline)
PM _{2.5}	75 (Interim target 1)	35 (Interim target 1)
	50 (Interim target 2)	25 (Interim target 2)
	37.5 (Interim target 3)	15 (Interim target 3)
	25 (Interim target 4)	10 (Interim target 4)
	15 (guideline)	5 (guideline)
NO ₂	120 (Interim target 1)	40 (Interim target 1)
		30 (Interim target 2)

Parameter	24 hour	Annual
	50 (Interim target 2) 25 (guideline)	20 (Interim target 3) 10 (guideline)
SO ₂	125 (Interim target 1) 50 (Interim target 2) 40 (guideline)	500 (10-minute guideline)
O ₃	100 (interim target 1) (8-hour daily maximum) 70 (interim target 2) (8-hour daily maximum) 60 (8 hour daily maximum guideline)	

Source: WHO Global Air Quality Guidelines, 2021

For new power plants, as per the IFC EHS Guidelines for Thermal Power Plants (2008), emissions from a single project should not contribute to more than 25% of the ambient air quality standards.

2. Climate Change Impacts & Adaptation

A. National Requirements

The Paris Agreement came into force on 4th November 2016. The KSA signed and ratified the Agreement on 3rd November 2016 (UNTC, 2020). Following the launch of Vision 2030 in 2016, the Kingdom of Saudi Arabia has taken several steps towards a more sustainable future with establishing a number of initiatives to address climate change issue. In 2021, the government inaugurated the Saudi Green Initiative (SGI) which unites environmental protection, energy transition and sustainability programs with the overarching aims of offsetting and reducing emissions, increasing the Kingdom's use of clean energy and addressing climate change.

To deliver KSA's sustainability goals, SGI strives to implement the following²¹:



SGI is steering the implementation of a sustainable long-term climate action plan with three (3) overarching targets to reduce emissions, achieve afforestation, and protect land and sea protection.

The Kingdom has committed to have 50% of its power generated from renewable sources by 2030. Beyond a domestic energy mix transformation, SGI is steering a range of ambitious initiatives that will reduce emissions including investing in new energy sources, improving energy efficiency, and developing a carbon capture and storage program.

Nationally Determined Contribution

²¹ <https://www.greeninitiatives.gov.sa/about-sgi/>

The KSA submitted their Nationally Determined Contributions (NDC) ²² to the United Nations Framework Convention on Climate Change (UNFCCC) outlining the actions that would be undertaken in reducing, avoiding and removing GHG emissions by 278 million tons of CO₂eq annually by 2030.

To achieve its sustainable development objectives, the KSA is engaging in actions and plans pursuit of economic diversification with the following co-benefits:

- Greenhouse gas emissions avoidance, reduction and removal;
- Climate adaptation; and
- Managing the impacts of response measures.

B. Lenders Requirements

EPFI's

Equator Principles IV establishes that impacts to climate should be avoided where possible, and in support of the 2016 Paris Agreement recognises that EPFIs have a role to play in improving the availability of climate-related information.

Factors including climate change are required to be incorporated into the Project Review and Categorisation (EP1), while a key element of EP IV (under EP2 for Environmental and Social Assessment) is that an assessment of climate change risks is required in an ESIA.

For projects that have Scope 1 & 2 GHG emissions of over 100,000 tonnes of CO₂ equivalent per annum, there are also other requirements linked to alternative analysis and client annual reporting on GHG emissions.

3. Noise & Vibration

A. National Requirements

The KSA standards in the tables below have been referenced from the Executive Regulation for Noise of the Environment Law issued by Royal Decree No. (M/165) as of 19/11/1441 AH, these standards relate to the following:

- Residential and commercial areas (Ambient Noise Standards);
- Roadsides;
- Industrial areas; and
- Construction sites.

The noise standards applied to residential and commercial areas are according to the following classifications:

²² <https://unfccc.int/sites/default/files/resource/202203111154---KSA%20NDC%202021.pdf>

- Class A: Low-density residential areas as well as attractions and theme parks, areas around hospitals, schools, nursing homes, nurseries and environmentally sensitive areas.
- Class B: Medium-density residential areas.
- Class C: High-density residential areas and areas that include a mix of residential and commercial activities.
- Class D: Commercial areas, including warehouses and financial centres.

It is prohibited to exceed the noise levels standards for residential and commercial areas shown below, except with a permit from NCEC. It should be noted that these standards are applied at the closest receptor location.

Table A-6 Noise Standards for Residential and Commercial Areas

Class	Daytime LAeq, T (dB)	Night LAeq, T (dB)
A – Low-Density Residential Areas	50	40
B – Medium-Density Residential Areas	55	45
C – High Density Residential Areas	60	50
D - Commercial Area	65	55

The table below presents the noise limits for roadsides.

Table A-7 Noise Standard for Roadside

Daytime LAeq, T (dB)	Night LAeq, T (dB)
70	65

The table below presents the noise limits are industrial areas (at the outer boundaries of activities).

Table A-8 Noise Standards for Industrial Area

Daytime LAeq, T (dB)	Night LAeq, T (dB)
70	65

The noise limits for construction sites are presented in the table below.

According to Article 7 of MEWA Executive Regulation for Noise, the noise limits outlined in the table above can be exceeded while carrying out construction works from 7am to 6pm. The exceedance shall be in accordance with the corrective limits presented in the table below.

Table A-9 Corrective Limits of Permissible Noise Levels at Construction Sites

Duration of Construction Activities	Correction of the Permissible Noise Limits LAeq,T (dB)
Up to 2.5 hours	10
2.5 to 8 hours	5
More than 8 hours	0

B. RfP Requirement

In addition to compliance with the above Saudi noise regulation, the Project is required to comply with the noise levels stipulated in the RfP as set out in the table below.

Table A-10 RfP Specified Noise Limits

Location	Limit
At 1 meter inside the Plant fence as well as at 1 meter outside the ESF fence (when all equipment running excluding background noise, which is noise emitted by others in the neighbourhood)	Max. 55dB(A)
At 1 meter distance from open air installations	Max. 85dB(A)
At 1 meter distance of each equipment inside turbine buildings	Max. 90dB(A)
At 1 meter distance outside of buildings	Max. 85db(A)
Within the Central Control Room (CCR)	Max. 50dB(A)
Within other machine rooms and workshops	Max. 85dB(A)

C. Lenders Requirements

In addition, the IFC General EHS Guidelines require that noise impacts from a project should not exceed the WHO noise standards which are presented in the table below or result in a maximum increase in background levels of 3dB at the nearest off-site point of reception.

Table A-11 WHO Noise Standards (At off-site receptors)

Receptor	One Hour LAeq (dB(A))	
	Daytime (07:00 – 22:00)	Night-time (22:00 – 07:00)
Residential, Institutional, Educational	55	45
Industrial, Commercial	70	70

Furthermore, the following requirements have also been specified in the IFC EHS noise guidelines:

- No employee should be exposed to a noise level greater than 85 dB (A) for duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140dB(C).
- The use of hearing protection should be enforced actively when the equivalent sound level over 8 hours reaches 85dB (A), the peak sound level reaches 140dB(C), or the average maximum sound level reaches 110dB (A). Hearing protective devices provided should be capable of reducing sound level at the ear to at least 85dB (A).
- For every 3dB (A) increase in sound levels, the allowed exposure period or duration should be reduced by 50%.
- Where feasible, use of acoustic insulating materials isolations of the noise source and other engineering controls should be investigated and implemented prior to the issuance of hearing protection devices as the final control mechanism.
- Medical hearing checks on workers exposed to high noise levels should be performed periodically.

4. Terrestrial Ecology

A. National Requirements

Under the Environmental Law and the creation of the National Centres of Environment, the NCW has been established as the responsible authority for the protection and development of wildlife and biodiversity and the planning and management of protected areas. The NCW supersedes the Saudi Wildlife Authority (SWA) and will work with NCEC to develop and implement the national policy for conservation and protection of species and reserve areas. NCEC and NCW has identified conservation areas that require protection and are working to protect and prevent damage to these areas.

Under the Environmental Law, the following Executive Regulations pertaining to flora and fauna have been released:

- Development of Vegetation Cover and Combating Desertification: sets out KSA's commitment to protecting vegetated areas in the Kingdom and promoting their development through the implementation of a greater level of regulation and sustainable management practises
- Logging: sets out KSA's commitment to the regulation of the import, collection (including felling), transfer, storage and commercial sale of firewood and charcoal.
- Hunting terrestrial wildlife species: sets out KSA's commitment to regulating hunting of wildlife animal species and migratory birds. It prohibits the hunting of:
 - The hunting of endangered wildlife animals such as Arabian Leopard, jackal, lynx, sand cat, honey badger, etc
 - The hunting of ungulates such as Arabian Oryx, Goitered gazelle, Idmi gazelle and Nubian Ibex.
 - The hunting of specific species of endemic birds such as Arabian Partridge, Asir Magpie, Yemen Warbler, Arabian Golden Sparrow, Sooty Gull, White eyed gull, etc.
 - The hunting of gestating wildlife animal species or their offspring or tampering with their nests, eggs or habitats are prohibited.

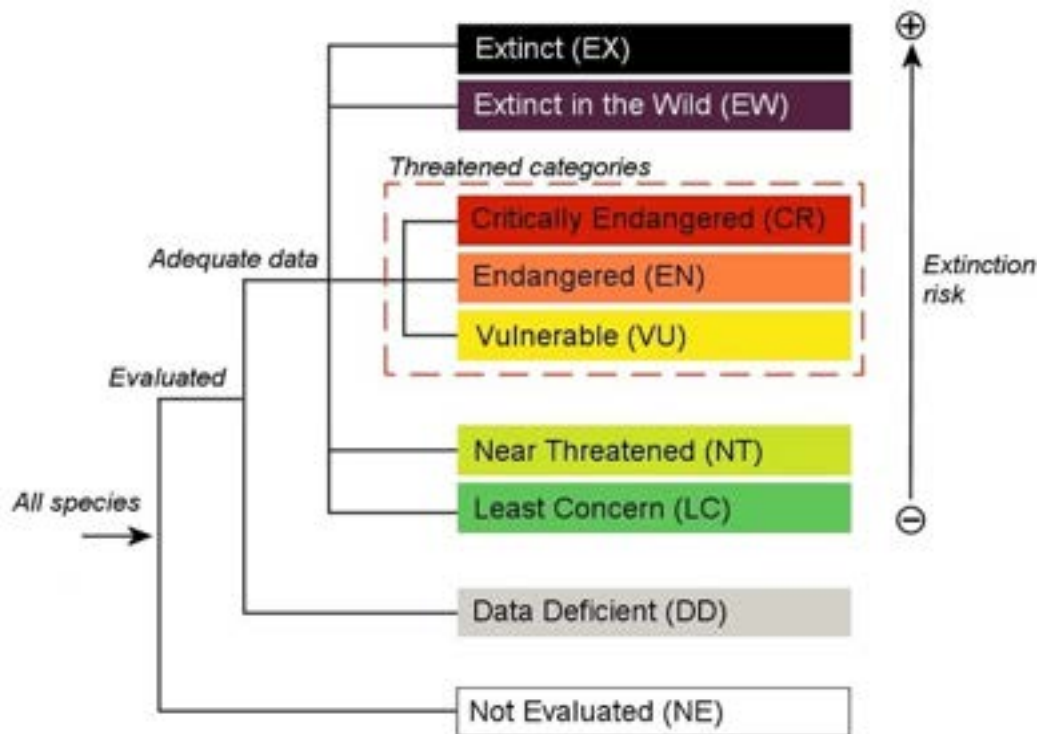
In its commitments to the United Nations Convention of Biological Diversity (UNCBD), KSA has produced a list of species considered to be of High Conservation Priority (HCP), these are commonly used as a de facto protected species list for the purpose of ESIA in KSA.

KSA has two policy documents related to biodiversity: The National Biodiversity Strategy and Action Plan (NBSAP) and the National Protected Area System Plan (NPAS), which together set national targets and a vision for Protected Areas in KSA. The NPAS is the guiding document for KSA to fulfil its obligations regarding in situ conservation under the Convention on Biological Diversity.

In the absence of any national protected species list, two (2) approaches are proposed to classify species of conservation concern for the ESIA; Global Red List published by the International Union for Conservation of Nature (IUCN) and the HCP species.

The IUCN Global Red List which classifies species in accordance with their risk of extinction on a global basis is used. The IUCN Version 3.1 Categories are shown in the figure below.

Figure A-1 IUCN System – Red List Categories



The table below provides further definition of each of the categories listed above

Table A-12 IUCN Extinction Risk Categories

IUCN Extinction Risk	Description
Extinct (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalised population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.

IUCN Extinction Risk	Description
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.
Not Evaluated (NE)	A taxon is Not Evaluated when it has not yet been evaluated against the criteria.

The HCP species are used in the absence of national legislation covering species protection in KSA, this list was produced in response to the requirements of UNCBD and set out in KSA's first letter to the UNCBD. This sets out a number of criteria which relate to both culture and conservation importance of species, as detailed below:

- Criterion 1: Genera, species, or subspecies that are Critically Endangered, Endangered, or Vulnerable (globally, regionally, or nationally); taxa which are locally extinct in the wild may be included, provided that there is an NCWCD policy to reintroduce them;
- Criterion 2 - Genera, species, or subspecies that are endemic to the Arabian Peninsula, the Red Sea, or the Gulf;
- Criterion 3 - Genera, species, or subspecies of which the conservation of populations within Saudi Arabia is essential to the conservation of the taxon (e.g. near-endemics and migrants for which Saudi Arabia represents a critical range);
- Criterion 4 - Relict genera, species, or subspecies that are of global, regional, or national significance;
- Criterion 5 - Genera or species of special ecological importance (i.e. fulfilling a vitally important function in an ecosystem such as providing a key habitat for other species, serving as indicator species, etc.);
- Criterion 6 - Genera or species of significant economic importance; and
- Criterion 7 - Genera or species that serve a "flagship" function (i.e. high-profile species of cultural value, the protection of which will also protect large numbers of other species that share their habitats).

A. Lenders Requirements

EPFI's

The assessment of impacts upon terrestrial ecology will be made with due consideration to IFC Performance Standard 6 on Biodiversity Conservation and Sustainable Natural Resource Management which establishes requirements for protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources.

5. Soil, Geology and Groundwater

A. National Requirements

Soil

The soil quality standards referenced in the table below are from the Executive Regulations for the Prevention and Remediation of Soil Pollution of the Environment Law issued by Royal Decree No. (M/165) as of 19/11/1441 AH. These standards set out the KSA limits of soil quality in terms of defining contamination and quality levels necessary for remediation.

It should be noted that the table below contains the most applicable soils standards from the Regulations based on the Project type. Other standards which are included in the Executive Regulations relating to aliphatic halogen compounds, other organic compounds and radioactive agents have not been included as they are not considered applicable to the Project.



Table A-13 Soil Quality Standards

Chemical substance	Units	Classification of the soil particles size										Remarks
		Coarse soil (>75 micron)					Fine soil (<75 micron)					
		Land use types										
		Natural area	Agricultural	Residential / parks	Commercial	Industrial	Natural area	Agricultural	Residential / parks	Commercial	Industrial	
		Action level										
pH (in 0.01M CaCl ²)	pH units	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	
Cyanide (free)	mg/kg	0.9	0.9	0.9	8	8	0.9	0.9	0.9	8	8	
Fluoride	mg/kg	2.0	2.0	2.0	2.000	2.000	200	200	200	2.000	2.000	
Sulphur (elemental)	mg/kg	500	500	500	500	500	500	500	500	500	500	
Metals												
Antimony	mg/kg	20	20	20	40	40	20	20	20	40	40	
Arsenic (inorganic) (As)	mg/kg	17	17	17	26	26	17	17	17	26	26	
Barium (non-barite) (Ba)	mg/kg	750	750	500	2,000	2,000	750	750	500	2,000	2,000	
Barite-barium	mg/kg	10,000	10,000	10,000	15,000	14,000	10,000	10,000	10,000	15,000	140,000	
Beryllium (Be)	mg/kg	5	5	5	8	8	5	5	5	8	8	
Boron (saturated phase extract) (B)	mg/kg	3,3	3,3	3.3	5	5	3,3	3,3	3,3	5	5	
Cadmium (Cd)	mg/kg	3,8	1,4	10	22	22	3,8	1,4	10	22	22	
Chromium (hexavalent) (Cr ⁺⁶)	mg/kg	0.4	0.4	0.4	1.4	1.4	0.4	0.4	0.4	1.4	1.4	
Chromium (total)	mg/kg	64	64	64	87	87	64	64	64	87	87	
Cobalt (Co)	mg/kg	20	20	20	300	300	20	20	20	300	300	
Copper (Cu)	mg/kg	63	63	63	91	91	63	63	63	91	91	
Lead (pb)	mg/kg	70	70	140	260	600	70	70	140	260	600	
Mercury (inorganic)	mg/kg	12	606	606	24	50	12	606	606	24	50	
Molybdenum (Mo)	mg/kg	4	4	4	40	40	4	4	4	40	40	
Nickel (Ni)	mg/kg	45	45	45	89	89	45	45	45	89	89	
Selenium (Se)	mg/kg	1	1	1	2.9	2.9	1	1	1	2.9	2.9	
Silver	mg/kg	20	20	20	40	40	20	20	20	40	40	
Thallium (Tl)	mg/kg	1	1	1	1	1	1	1	1	1	1	
Tin (Sn)	mg/kg	5	5	5	300	300	5	5	5	300	300	
Uranium (U)	mg/kg	33	23	23	33	300	33	23	23	33	300	



Chemical substance	Units	Classification of the soil particles size										Remarks
		Coarse soil (>75 micron)					Fine soil (<75 micron)					
		Land use types										
		Natural area	Agricultural	Residential / parks	Commercial	Industrial	Natural area	Agricultural	Residential / parks	Commercial	Industrial	
		Action level										
Vanadium (V)	mg/kg	130	130	130	130	130	1360	130	130	130	130	
Zinc (Zn)	mg/kg	200	200	200	360	360	200	200	200	360	360	
Hydrocarbons												
Benzene (C ⁶ H ⁶)	mg/kg	0.078	0.073	0.073	0.078	0.078	0.046	0.046	0.046	0.046	0.046	Topsoil
Benzene (C ⁶ H ⁶)	mg/kg	0.078	0.078	0.078	0.078	0.078	0.046	0.046	0.046	0.046	0.046	Subsoil
Toluene (C ⁷ H ⁸)	mg/kg	0.12	0.12	0.12	0.12	0.12	0.52	0.52	0.52	0.52	0.52	Topsoil
Toluene (C ⁷ H ⁸)	mg/kg	0.12	0.12	0.12	0.12	0.12	0.52	0.52	0.52	0.52	0.52	Subsoil
Ethylbenzene (C ⁸ H ¹⁰)	mg/kg	0.14	0.018	0.14	0.14	0.14	0.073	0.073	0.073	0.073	0.073	Topsoil
Ethylbenzene (C ⁸ H ¹⁰)	mg/kg	0.14	0.14	0.14	0.14	0.14	0.073	0.073	0.073	0.073	0.073	Subsoil
Xylenes (C ⁸ H ¹⁰)	mg/kg	1.9	0.003	1.9	1.9	1.9	0.99	0.99	0.99	0.99	0.99	Topsoil
Xylenes (C ⁸ H ¹⁰)	mg/kg	1.9	1.9	1.9	1.9	1.9	0.99	0.99	0.99	0.99	0.99	Subsoil
Styrene (C ⁸ H ⁸)	mg/kg	0.8	0.8	0.8	0.8	0.8	0.68	0.68	0.68	0.68	0.68	
F1: C6 to C10	mg/kg	210	24	24	270	270	210	210	2140	320	320	Topsoil
F2: C10 to C16	mg/kg	150	130	130	260	260	150	150	150	260	260	Topsoil
F3: C16 to C34	mg/kg	300	300	300	1,700	1,700	1,300	1,300	1,300	2,500	2,500	Topsoil
F4: C34 to C50	mg/kg	2,800	2,800	2,800	3,300	3,300	5,600	5,600	5,600	6,600	6,600	Topsoil
F1: C6 to C10	mg/kg	420	30	30	440	440	420	420	420	640	640	Subsoil
F2: C10 to C16	mg/kg	300	160	160	520	520	300	300	300	520	520	Subsoil
F3: C16 to C34	mg/kg	600	600	600	3,400	3,400	2,600	2,600	2,600	4,300	4,300	Subsoil
F4 C34 to C50	mg/kg	5,600	5,600	5,600	6,600	6,600	10,000	10,000	10,000	10,000	10,000	Subsoil

6. Groundwater

A. National Requirements

Under the MEWA standards for Protection of Aquatic Media from Pollution, the groundwater standards relate only for groundwater bodies that will be used for drinking water. In the absence of standards for non-drinking water groundwater bodies, the standards as outlined in Appendix B of the Ambient Water Quality Standards PME (2012) have been referenced in the table below.

Table A-14 Standards for Ambient Groundwater Quality

Parameter	Concentration Limit	Parameter	Concentration Limit
BOD	Not available	Carbon tetrachloride	0.005
COD	Not available	Chlorine (residual)	<0.0
Total Oil & Grease	0	Chlorinated hydrocarbons (total)	0.001
TKN (organic N)	5	Chloroform	-
TOC	-	Cyanide (free)	0.001
Phosphorus (total)	0.03	Fluoride	0.2
Phosphorus (PO ₄)	-	Furans	1x10 ⁻⁸
Ammonia (as NH ₃)	0.03	Hexachlorobenzene	0.007
Chloride (as Cl)	-	Lindane	0.0002
Total inorganic nitrogen (as NO ₂ & NO ₃)	30	Mirex	1x10 ⁻⁸
Sodium	150	MTBE	0.02
Sulphate	-	PAHs	0.0002
Sulphide	0.002	PCB	1.9x10 ⁻⁸
Aluminium	0.2	Pentachlorophenol	0.0005
Arsenic	0.005	Aldrin	2.2x10 ⁻⁸
Barium	1	Chlordane	0.002
Cadmium	0.005	DDT	1.7x10 ⁻⁵
Chromium (total)	0.1	Dieldrin	4x10 ⁻⁸
Chromium (hexavalent)	0.005	Endrin	0.001
Cobalt	0.05	Heptachlor	0.0004
Copper	0.05	Toxaphene	0.002
Iron	0.2	Phenols	0.005
Lead	0.005	Dioxins	3x10 ⁻⁸
Manganese	0.1	Toluene	0.002
Mercury	0.001	TPH	0.2
Nickel	0.02	Vinyl chlorides	0.001
Silver	0.1	Xylenes	0.005
Zinc	0.02	E coli	<10 (count / 100ml)

B. Lenders Requirements

EPFI's

IFC Performance Standard 3 on 'Resource Efficiency and Pollution Prevention' requires the client and/or the Project to:

- Avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; and
- Prevent the release of pollutants to water and land due to routine, non-routine, and accidental circumstances, or when not feasible, minimize and/or control the intensity and mass flow of their release.

7. Solid Waste and Wastewater

A. National Requirements

Wastewater

The table below presents the national standards for wastewater prior to discharge as outlined in the Executive Regulations for Protection of Aqueous Media from Pollution issued by Royal Decree No. M/165 dated 19/11/1441 AH. It also consists of the allowable effluent levels for treated sanitary wastewater as per the Project RfP.

Table A-15 Permissible Limits for Wastewater Discharges

Parameter	Unit	Average Period	Allowable Discharge Limit to Soils/Land
Physical Chemistry			
Floating Matter	-	-	None
Temperature	Δ°C	Sample	Normal Level**
pH	pH units	Sample	6 - 8.4
Turbidity	NTU	Sample	5
Total Suspended Solids (TSS)	mg/l	30 Days	35
Total Dissolved Solids (TDS)	mg/l	Sample	2000
Heavy Metals			
Aluminium (Al)	mg/l	Annual Average of Monthly Sample	5
Arsenic (As)	mg/l	Annual Average of Monthly Sample	0.1
Barium (Ba)	mg/l	Annual Average of Monthly Sample	-
Beryllium (Be)	mg/l	Annual Average of Monthly Sample	0.1
Boron (B)	mg/l	Annual Average of Monthly Sample	0.75
Cadmium (Cd)	mg/l	30 Days	0.1
Chromium (Cr)	mg/l	Annual Average of Monthly Sample	0.1

Parameter	Unit	Average Period	Allowable Discharge Limit to Soils/Land
Cobalt (Co)	mg/l	Annual Average of Monthly Sample	0.05
Copper (Cu)	mg/l	Annual Average of Monthly Sample	0.4
Iron (Fe)	mg/l	30 Days	-
Iron (Pb)	mg/l	Annual Average of Monthly Sample	5
Lead (Pb)	mg/l		0.1
Lithium (Li)	mg/l	Annual Average of Monthly Sample	2.5
Manganese (Mn)	mg/l		0.2
Mercury (Hg)	mg/l	Annual Average of Monthly Sample	0.001
Nickel	mg/l	Annual Average of Monthly Sample	0.2
Selenium	mg/l	30 Days	-
Selenium	mg/l	Annual Average of Monthly Sample	0.02
Vanadium	mg/l	Annual Average of Monthly Sample	0.1
Zinc	mg/l	Annual Average of Monthly Sample	2
Organics and Inorganics			
Chlorine (residual)	mg/l	Sample	(0.1 – 0.5)
Cyanide	mg/l	-	0.05
Fluoride	mg/l	Annual Average of Monthly Sample	1
Phenols (Total)	mg/l	Annual Average of Monthly Sample	0.002
Total Organic Carbon (TOC)	mg/l	-	50
Total Kjeldahl Nitrogen	mg/l	-	5
Biochemical Oxygen Demand (BOD)	mg/l	30 Days	25
Chemical Oxygen Demand (COD)	mg/l	30 Days	150
Dissolved Oxygen (DO)	mg/l	Sample	Normal Level
Oil & Grease	mg/l	Sample	0
Nitrate Nitrogen (NO ₃ , N)	mg/l	30 Days	15
Phosphate (PO ₄)	mg/l	30 Days	30
Ammonia (as NH ₃)	mg/l	30 Days	1
Total Chlorinated Hydrocarbons	mg/l	-	0.1
Microbiological			
Total Coliform Bacteria	Count/100ml	30 Days	2,000
Viable Nematode Egg	-	30 Days	1

* Temperature Differences:

- In cases of cooling water suction and discharge: It is the maximum temperature differences between the cooling water being drawn (suction) and discharged (discharge).
- In cases of discharging treated wastewater: It is the maximum temperature differences between the treated wastewater being discharged and the boundaries of the mixing zone in the ambient water, according to Annex (5) to this regulation. The Centre may propose standards for measuring temperature differences for treated wastewater according to coastal and marine water categories and their characteristics for approval by the Ministry.

** Temperature Differences:

- Normal level: The normal level of concentration of the component in the ambient nature, that is not affected by any human activity. Note: The normal level does not have to be lower than the levels considered safe for human life or wildlife.
- (1) Temperature Differences: It is the maximum temperature differences between the treated wastewater being discharged and the receiving water. The Center shall propose standards for measuring the temperature differences of treated wastewater according to the types of surface water (sewage, lakes, or others) and their characteristics for approval by the Ministry.

***Provided that the temperature does not exceed 40°C in any section of the water body within 15m from the discharge location.

Appendix 4 of the Executive Regulations outlines treatment levels dependent on the activity. The level of treatment based on the type of discharge to the soil and land are shown in the tables below.

Table A-16 Wastewater Treatment Techniques

Treatment Level	Parameters to be removed	Example of treatment Process
A – Pre-treatment	Solids	Filtering solids
B – Primary Treatment	Solids as well as easily precipitated materials	Primary filtration
C – Secondary Treatment	Most solids and Biological Oxygen Demand (BOD)	Biological treatment, chemical treatment, ponds
D – Removing Nutrients	Nutrients after removing solids	Biological and chemical treatment
E - Disinfection	Bacteria and viruses	The use of ultraviolet rays, chlorination treatment

Table A-17 Discharge of Injection Options for Treated Wastewater

Discharge or injection options for treated wastewater	Minimum level of treatment	Recommended Level of Treatment
Discharge of treated wastewater to the soil/ lands		
Evaporation Ponds	C	C
Irrigation:	C	C, E
- Agricultural Land		
- Irrigated green spaces		
- Injection into Groundwater		
Leak to:	C	C, D

Discharge or injection options for treated wastewater	Minimum level of treatment	Recommended Level of Treatment
- Natural Soil		
- Groundwater		

B. Lenders Requirements

Waste

International financial institutions providing project finance will require adherence with the WBG/ IFC General EHS Guidelines. With regard to waste, these guidelines require that projects:

- Establish waste management priorities at the outset of activities.
- Identify EHS risks and impacts with regards to waste generation and its consequences.
- Establish a waste management hierarchy that considers prevention, reduction, reuse, recovery, recycling, removal and finally disposal of wastes.
- Avoid or minimize the generation waste materials, as far as practicable.
- Identify where waste generation cannot be avoided but can be minimized or where opportunities exist for, recovering and reusing waste.
- Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner.

Where waste cannot be recovered or reused, identify means of treating, destroying, and disposing of it in an environmentally sound manner.

With regards to hazardous waste, IFC PS 3 requires the following:

- Adoption of GIIP for environmentally sound disposal while adhering to the limitations applicable to its transboundary movement; and
- When hazardous waste disposal is conducted by third parties, the PS requires the use of contractors that are reputable and legitimate enterprises, licensed by the relevant government regulatory agencies and obtain chain of custody documentation to the final destination. Also, the PS requires companies to ascertain whether licensed disposal sites are being operated to acceptable standards and where they are. Where this is not the case, companies should reduce waste sent to such sites and consider alternative disposal options, including the possibility of developing their recovery or disposal facilities at the project site.

Wastewater

The IFC/WBG General EHS Guidelines establish general requirements for direct or indirect discharge of wastewater from utility operations or storm water to the environment.

‘Projects with the potential to generate process wastewater, sanitary (domestic) sewage, or storm water should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety, or the environment’.

However, wastewater effluent pollutant limits are only established for sanitary wastewater for discharge to the sanitary sewer systems. The following table provides the indicative values for treated sanitary

wastewater effluent limits as established by the World Bank General EHS Guidelines (2007) (ref. Table 1.3.1 of IFC EHS Guidelines).

Table A-18 Indicative Values for Treated Sanitary Sewage Discharges

Pollutants	Units	Guideline Value
pH	pH Units	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total Nitrogen	mg/l	10
Total Phosphorus	mg/l	2
Oil and Grease	mg/l	10
Total Suspended Solids	mg/l	50
Total Coliform Bacteria	MPN/100ml	400

8. Archaeology & Cultural Heritage

A. National Requirements

The Ministry of Tourism is responsible for the protection of the Kingdom's tourism, archaeological and heritage resource. The Ministry is responsible for the preservation, development and maintenance of artefacts and for enabling tourism's contribution to cultural and economic development. The Ministry has an absolute right to conduct archaeological investigations and determine best approaches for protection of resources within project developments.

B. Lenders Requirement

In accordance with the Equator Principles, the assessment will refer to applicable IFC Performance Standards on Social and Environmental Sustainability, specifically with due consideration of Performance Standard 8 – Cultural Heritage. PS8 aims to protect the adverse impacts of project activities and support its preservation and to promote equitable sharing of benefits from the use of cultural heritage.

Cultural heritage in this standard refers to:

- Tangible forms of cultural heritage, such as tangible moveable or immovable objects, property, sites, structures, or groups of structures, having archaeological (prehistoric), paleontological, historical, cultural, artistic, and religious values;
- Unique natural features or tangible objects that embody cultural values, such as sacred groves, rocks, lakes, and waterfalls; and
- Certain instances of intangible forms of culture are proposed to be used for commercial purposes, such as cultural knowledge, innovations, and practices of communities embodying traditional lifestyles.

9. Landscape and Visual Amenity

Specific KSA and Lender legislation regarding landscape and visual conditions does not exist however it is proposed to undertake the impact assessment with reference to the guidelines set out by the UK Landscape Institute 'Guidelines for Landscape and Visual Impact Assessment 3rd Edition' (2013). As such, the 'Landscape and Visual Assessment' assessment will distinguish between:

- Effects on landscape as a resource in its own right; and
- Effects on specific views and general visual amenity experienced by people.

10. Traffic & Transportation

A. Lenders Requirements

The assessment will be undertaken with due consideration of the recommendations set out within the IFC General EHS Guidelines Section 3.4 Traffic Safety, within Section 3: Community Health and Safety.

11. Socio-economic

A. Lenders Requirements

Several of the IFC Performance Standards have elements that relate to socio-economics. Key requirements for the assessment of socio-economic impacts are outlined in IFC Performance Standard 1 on Assessment and Management of Environmental and Social Risks and Impacts, Performance Standard 2 on Labour and Working Conditions and IFC Performance Standard 4 on Community Health, Safety and Security.

IFC PS 1 standard establishes requirements for the assessment of social risk and impacts associated with the project while IFC PS 2 & 4 establish requirements for the safeguard of the workforce and local community from potential risks associated with the project including impacts associated with introduction of communicable disease, loss of ecosystem function, site access and operation, material use etc.

12. Community Health, Safety & Security

A. National Requirements

Chapter 7 of the new Environmental Law 2020 includes the provisions of the Ministry for emergency planning; 'The Minister may take the necessary procedures and measures in response to any environmental emergency disaster or imminent danger related to the environment, as well as taking the necessary procedures and measures to prevent any of them from getting worse, in coordination with the relevant authorities.'. In addition, the Implementing Regulations for Environmental Permits for the Construction and Operation Activities requires the preparation of a project-specific emergency preparedness and response plan.

B. Lenders Requirements

The project lenders will require compliance with IFC Performance Standard 4: Community Health, Safety and Security. The objectives of IFC PS4 are to:

- To anticipate and avoid adverse impacts on the health and safety of the Affected Community during the project life from both routine and non-routine circumstances.
- To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the Affected Communities.

The project will therefore need to ensure:

- Suitable design of the facility and related infrastructure to ensure safe operation.
- Minimising the potential for community exposure to hazardous materials and substances that may be released by the project.
- Consideration of any third-party impacts to project emergencies and disaster scenarios (or vice versa impacts from external sources to the project), including preparing emergency response plans.
- Appropriate training of security personnel employed by the projects, including appropriate consideration of hiring protocols, training of staff, code of conduct, provision of weapons and weapons protocols.

IFC PS4 also has considerations for impacts to ecosystem services, however the project is not expected to impact such ecosystem services.

Equator Principles Guidance on Implementation of the Equator Principles During the Covid-19 Pandemic

The guidance recommends that the borrower should:

- Review potential risks on local communities, including direct and indirect impacts of COVID-19 and other impacts relating to worker interfaces and how any Project changes during this period might affect the community.
- Assess its mitigation approach to Project-related impacts.
- Identify opportunities to support communities mitigate wider COVID-19 risks/impacts either through new initiatives or building on existing programmes i.e. provision of food for vulnerable people in isolation, test kits medical facilities and equipment etc.

13. Labour & Working Conditions

A. National Requirements

Saudi Labour law is governed by:

- Royal Decree No. M/51 (23 Sha'ban 1426 / 27th September 2005).

The labour law includes terms and conditions of employment in Saudi Arabia required by employers and includes details of worker rights.

The Ministry of Labour ("MOL") approved amendments to the Labour Law on 5th April 2015 (Resolution No. 258), which was first published in the official gazette on 24th April 2015.

Currently, the Ministry of Human Resources and Social Development is the governing ministry in Saudi Arabia responsible for providing development, support, and protection for the Kingdom's community at

large. It was established after the merging of the Ministry of Labour and Social Development with Ministry of Civil Service.

Human Rights

The Ministry of Human Resources and Social Development is the governing ministry in KSA responsible for providing development, support, and protection for the Kingdom's community at large. It was established after the merging of the Ministry of Labour and Social Development with the Ministry of Civil Service. Furthermore, the Kingdom established the Human Rights Commission, via Cabinet Resolution No. 207 of 8 Shaban 1426H (12 September 2005). The Human Rights Commission aims to protect and promote human rights in accordance with international standards.

Section 26 of the Basic Law of Governance states the Government is responsible for protecting human rights in accordance with the Shari'a Law that governs the country. Human Rights treaties ratified by the Kingdom include (according to Treaty Body Database, 2020 and the official website of the Kingdom's Human Rights Commission):

- Convention against Torture and Other Cruel Inhuman or Degrading Treatment or Punishment (23 September 1997);
- Convention on the Elimination of All Forms of Discrimination against Women (7 September 2000);
- International Convention on the Elimination of All Forms of Racial Discrimination (23 September 1997);
- Convention on the Rights of the Child (26 January 1996);
- Optional Protocol to the Convention on the Rights of the Child on the involvement of children in armed conflict (10 June 2011);
- Optional Protocol to the Convention on the Rights of the Child on the sale of children child prostitution and child pornography (18 August 2010);
- Convention on the Rights of Persons with Disabilities (24 June 2008);
- The Protocol to Prevent, Suppress and Punish Trafficking in Persons, Especially Women and Children, (2007) (the implementation of which is monitored by The Standing National Committee to Combat Trafficking in Persons, established pursuant to Council of Ministers Decision No. 244 of 20 Rajab 1430H (13 July 2009));
- The Cairo Declaration on Human Rights in Islam (1990);
- The Riyadh Declaration on Human Rights in Peace and War (2003);
- The Covenant on the Rights of the Child in Islam (2006);
- The Arab Charter of Human Rights (2009); and
- The Geneva Convention (18 May 1963).

In addition, KSA is an ILO member state and has ratified 16 ILO Conventions.

B. Lenders Requirement

The following applicable IFC Performance Standards aim to identify and ensure that social and economic impacts of a project are addressed in the relevant areas, in particular:

- Performance Standard 2: Labour and Working Conditions;

- Equal opportunity and non-discriminatory HR Policies and procedures appropriate to the size of the workforce.
- Provision of clearly documented terms of employment and worker rights to all staff; including sub-contractor staff.
- Provision of suitable labour accommodation (in accordance with the provisions of IFC & EBRD Guidelines on Worker Accommodation).
- Implementation of a robust Occupational Health & Safety plan; and
- Implementation of a grievance mechanism to ensure internal grievances can be raised in an easily accessible, understood and transparent process.

In accordance with IFC Performance Standard 2 (Labour and Working Conditions) there is a requirement to align with the following conventions:

- ILO Convention 29 on Forced Labour;
- ILO Convention 105 on the Abolition of Forced Labour;
- ILO Convention 138 on Minimum Age (of Employment);
- ILO Convention 100 on Equal Remuneration;
- ILO Convention 111 on Discrimination (Employment and Occupation); and
- UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families.

Human Rights Requirements

In line with EP IV requirements, the United Nations Human Rights Guiding Principles (HRGP) apply to the Project. HRGP II on “The corporate responsibility to respect human rights” recognises that it is the responsibility of businesses and corporations to respect human rights. It is a global standard of expected conduct for all business enterprises wherever they operate. It exists independently of a State’s ability and/or willingness to fulfil its human rights obligations and does not diminish those obligations. The foundational principles to take into consideration are (Guiding Principles on Business and Human Rights, 2011):

- Principle 11: Business enterprises should respect human rights. Business enterprises should avoid infringing on the human rights of others and should address adverse human rights impacts with which they are involved;
- Principle 12: The responsibility of business enterprises to respect human rights refers to internationally recognized human rights – understood, at a minimum, as those expressed in the International Bill of Human Rights and the principles concerning fundamental rights set out in the International Labour Organization’s Declaration on Fundamental Principles and Rights at Work;
- Principle-13: The responsibility to respect human rights requires that business enterprises avoid causing or contributing to adverse human rights impacts through their activities, and address such impacts when they occur;
- Principle-14: The responsibility of business enterprises to respect human rights applies to all enterprises regardless of their size, sector, operational context, ownership and structure. Nevertheless, the scale and complexity of the means through which enterprises meet that responsibility may vary according to these factors and with the severity of the enterprise’s adverse human rights impacts; and
- Principle-15: Business enterprises should have policies and processes appropriate to their size and circumstances in place.

The following Operational Principles should also be taken into consideration.

- Principle 16: Policy commitment;
- Principle 17 to 21: Human rights due diligence;
- Principle 22: Remediation; and

Principle 23: Issues of Context



Appendix D – Al Hartany NCEC Certificate



Appendix E – Air Quality Modelling Report

Appendix F – Hydrology Modelling Report

Appendix G – Nairyah IPP1 and IPP2 Plant Layout



Appendix H – Ambient Air Quality Baseline Survey Report



Appendix I – Baseline Noise Monitoring Report

Appendix J – Soil Analyses Report

Appendix K – Noise Modelling Report

