Facility E IWPP Project, Qatar

Environmental and Social Impact Assessment (ESIA)

April 2025

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Environmental and Social Impact Assessment (ESIA)

April 2025

Mott MacDonald Limited. Registered in
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Registered office: 10 Fleet Place, London,
EC4M 7RB, United Kingdom

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	22.04.25	Various	HD	DE	First submission to MOECC

Document reference: 403100049-C001-MML-RP-EN-025

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Abbreviation Table

Abbreviation	Description
AoI	Area of Influence
BPEO	Best Practicable Environmental Option
BSA	Biodiversity Study Area
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
BWTC	Boom Waste Treatment Facility
CCGT	Combined Cycle Gas Turbine
CEMP	Construction Environment Management Plan
CIRIA	Construction Industry Research and Information Association
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CE	Critically Endangered
CRTN	Calculation of Road Traffic Noise
DROs	Diesel Range Organics
DSWMC	Domestic Solid Waste Management Centre
EHS	Environmental, Health, and Safety
EIA	Environmental Impact Assessment
EN	Endangered
EP	Equator Principles
EPA	Environmental Protection Agency
EPC	Engineering Procurement and Construction
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
GIS	Geographic Information System
GROs	Gasoline Range Organics
H&S	Health and Safety
HSE	Health, Safety, and Environment
HWTC	Hazardous Waste Treatment Centre
IBA	Important Bird Area
IEMA	Institute of Environmental Management and Assessment
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
IWPP	Independent Water and Power Plant
JBIC	Japan Bank for International Cooperation
KBA	Key Biodiversity Area
LA_{10}	Noise Level Exceeded for 10% of the Measurement Interval

Abbreviation	Description
LAeq	Equivalent Continuous Sound Level
LC	Least Concern
MARPOL	International Convention for the Prevention of Pollution from Ships
MIC	Mesaieed Industrial City
MIGD	Million Imperial Gallons per Day
MoECC	Ministry of Environment and Climate Change
MoH	Ministry of Public Housing
MSA	Membrane Supply Agreement
NDS	National Development Strategy
NE	Not Evaluated
NEPC	National Environment Protection Council
NT	Near Threatened
OECD	Organisation for Economic Co-operation and Development
OEMP	Operational Environmental Management Plan
OSHA	Occupational Safety and Health Administration
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PS	Performance Standard
QCS	Qatar Construction Specifications
QEZ	Qatar Economic Zone
QNV	Qatar National Vision
RAF	Ras Abu Fontas
RCP	Representative Concentration Pathway
RFI	Request for Information
ROPME	Regional Organization for the Protection of the Marine Environment
SEP	Stakeholder Engagement Plan
SSP	Shared Socioeconomic Pathway
TCFD	Task Force on Climate-related Financial Disclosures
TPH	Total Petroleum Hydrocarbons
UNCCD	United Nations Convention to Combat Desertification
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VOCs	Volatile Organic Compounds
WMP	Waste Management Plan

Executive Summary

Provided separately as Facility E IWPP Project, Qatar – Environmental and Social Impact Assessment (ESIA) Executive Summary (403100049-C001-MML-RP-EN-014)

1 Introduction

1.1 Project Background

1.1.1 A Consortium of International Sponsors comprising of Sumitomo Corporation, Shikoku Electric Power Company Incorporated, Korea Overseas Infrastructure & Urban Development Corporation and Korea Southern Power Company, was awarded the project of Facility E Independent Water and Power Plant (IWPP) (the Project) as a result of the Tender process launched in September 2023, by the Qatar General Electricity and Water Corporation (KAHRAMAA).

1.1.2 The Project is to be built on behalf of KAHRAMAA on the former Ras Abu Fontas (RAF) A site, to the north of Al Wakrah/Ras Abu Fontas, Qatar. The Project will consist of electricity and water generation units. KAHRAMAA will act as an offtaker under a 25-year Power and Water Purchase Agreement (PWPA) supported by a Government Guarantee from the state of Qatar. It will be located at the centre of the RAF Complex with existing and operational RAF plants A1, A2 and A3 to the north and plants B and B2 to the south. The Ras Abu Fontas facility is located 15km south-east of central Doha on the coast between Al Wakrah and Hamad International Airport (HIA). Access to the site is through public roads however, site roads for construction and operations shall be constructed under the Project.

1.1.3 The Project will consist of 2,415 MW of electricity generation using Combined Cycle Gas Turbine (CCGT) technology and 110 MIGD of potable water production utilising reverse osmosis technology. To comply with the Ministry of Environment and Climate Change (MoECC) requirements in Qatar and anticipated requirements of lender banks for the Project, an Environmental and Social Impact Assessment (ESIA) of the Project is required.

1.1.4 The following articles in the Executive By-Law for the Environmental Protection Law, issued vide the Decree Law No. 30 for the Year 2002 outlines the importance of conducting an ESIA for the Project:

- Article 12 – emphasises the submission of the development plans of industrial, agricultural and construction projects to the relevant Council after planning and before execution for revision, evaluation and assurance of compliance with the scientific methodologies of proper environmental planning based on specifications preceded in the Article.
- Article 13 – states the Project may not be allowed to operate if an ESIA is not conducted and consequently Council approval obtained.
- Article 15 – outlines the importance of the Project, whether new or existing, uses the best available and economically feasible technology to control and avoid environmental degradation. Upon renewal of the Project license, the authorised department must confirm its commitment to use the appropriate technology and follow environmental protection set in the executive regulations.

1.1.5 Further details on the requirements for ESIA including relevant laws and standards is outlined in Chapter 3.

1.2 ESIA Objectives and Scope

1.2.1 The primary purpose of this ESIA is to identify, evaluate, and manage the environmental and social impacts associated with the Project in Qatar. Given the size of the development and the interaction with the marine environment, of which there is anticipated to be critical habitat present, the Project is considered, at this stage, to be a Category A project as defined by the International Finance Corporation (IFC); that is: '*Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented*'.

1.2.2 This category of project requires the most extensive environmental and social impact assessment. It is recognised, however, that lending institutions may have their own internal criteria for categorisation of projects. Notwithstanding this uncertainty, it is anticipated that by undertaking the assessment with the assumption that the Project will be classified as a Category A project, should individual banks subsequently lower the categorisation, the assessment will still be of sufficient detail.

1.2.3 This process ensures compliance with local Qatari legislation, the Equator Principles (EPs), and the International Finance Corporation (IFC) Performance Standards (PS) on Environmental and Social Sustainability. In addition, the ESIA aligns with guidance from the Organisation for Economic Cooperation and Development (OECD) and incorporates the Dhaka Principles to safeguard labour rights.

1.2.4 Given that the Project Company is seeking financing from international financial institutions (IFIs) such as the IFC, World Bank, and Japan Bank for International Cooperation (JBIC), the ESIA follows recognised international best practices. It covers the full project lifecycle, including construction, operation, and decommissioning, and examines both positive and negative impacts on the surrounding environment and local communities. Details on specific legal and institutional requirements, including local Qatar regulations and Good International Industry Practice (GIIP), are provided in Chapter 3.

1.3 ESIA Methodology and Approach

1.3.1 The ESIA will follow relevant Qatari standards and guidelines, along with international best practices like the World Bank Safeguard Policies and IFC Performance Standards. If there are differences between requirements, the most stringent standard will be applied.

1.3.2 More specifically, the ESIA will comply with:

- Qatari national legislation and regulations
- The Equator Principles and associated IFC Performance Standards
- Relevant IFC Environmental, Health, Safety (EHS) Guidelines and applicable World Bank Safeguard operational policies
- JBIC guidelines
- Organisation for Economic Cooperation and Development (OECD) standards, including the Dhaka Principles for labour rights.

1.3.3 The main steps of the ESIA are:

- Scoping
- Baseline Studies
- Stakeholder Engagement

- Impact Identification and Assessment
- Mitigation and Management Measures

1.3.4 This approach ensures the ESIA follows GIIP, meets local rules, and includes stakeholder input to deliver balanced and sustainable results.

1.4 Structure of the ESIA Report

1.4.1 The ESIA findings and related materials are presented in three main volumes, with additional standalone documents offering more detailed information where needed:

- Volume I: Non-Technical Summary
- Volume II: ESIA Main Report
- Volume III: Technical Appendices

1.4.2 Specialised field studies and detailed data supporting the ESIA Main Report (e.g., survey methodologies, modelling results, ecological assessments, and others) which are provided as standalone documents include the following:

Standalone Documents:

- **Environmental and Social Management and Monitoring Plan (ESMMP) Framework**: Guidance for implementing, supervising, and revising the proposed mitigation and monitoring measures over the life of the Project.
- **Construction Environmental Management Plan (CEMP)**: Outlines how the potential environmental impacts associated with the construction of the Project will be managed and mitigated.
- **Operational Environmental Management Plan (OEMP)**: Outlines how the potential environmental impacts associated with the operation of the Project will be managed and mitigated.
- **Waste Management Plan (WMP)**: Outlines how any construction, demolition and excavation waste, from the Project, will be handled. This plan will focus on the appropriate handling, separation, reuse, recycling, recovery or safe disposal of inert, hazardous and non-hazardous waste. The **Hazardous Materials Management Plan (HMMP)** is also included within the WMP.
- **Stakeholder Engagement Plan (SEP) and Grievance Mechanism**: Establishes a framework for ongoing communication with stakeholders and a formal process for addressing project-related concerns.
- **Field Survey Report**: Summarises field data collection methods and findings of the specialised field studies.

1.4.3 This structure provides clarity and transparency, enabling stakeholders to navigate quickly to the level of detail they need, whether it’s a non-technical overview, in-depth analysis, or supporting technical documentation.

1.5 Environmental Consultant Information

1.5.1 Table 1.1 provides the details of the Environmental Consultant preparing the ESIA.

Table 1.1: Environmental Consultant

Mott MacDonald Limited
Dr Dila Ersenkal – Project Director
Doha, Qatar Office
Al Asmakh Tower (13th Floor) Majlis Al Taawon St. West Bay PO Box 22574 Doha, Qatar
Phone: +974 4402 6300
Hannah Dodd Sachdev – Project Manager
Dubai, UAE Office
Festival Tower Dubai Festival City PO Box 11302 Dubai United Arab Emirates
Phone: +44 1134 263599

Source: Mott MacDonald, 2025

1.5.2 One-page CVs of Mott MacDonald's specialists are provided within Appendix K (403100049-C001-MML-RP-EN-019) and all technical leads responsible for their individual assessments are summarised below:

- Marine – Michael Thompson
- Air Quality – James Brookes
- Climate Resilience and Greenhouse Gas (GHG) Emissions – Lisa Terry
- Social and Human Rights Impact Assessment – Mustafa Islek
- Noise and Vibration – Andrew Monk-Steele
- Cultural Heritage and Archaeology – Mathew Reynolds
- Terrestrial Ecology – Reena Griffiths
- Soil, Hydrology and Contamination – Alison Carruthers
- Solid Waste and Material Management – Anita Manns
- Landscape and Visual Impact – Paul Wyeth
- Transport – Mark Taylor

2 Project Description

2.1 Project Justification and Objectives

2.1.1 The Project is of strategic importance as it will meet the forecasted energy development for Qatar. The Project is being delivered for the ultimate target of achieving Qatar National Vision 2030 in terms of sustaining developments and high living standards for all occupants.

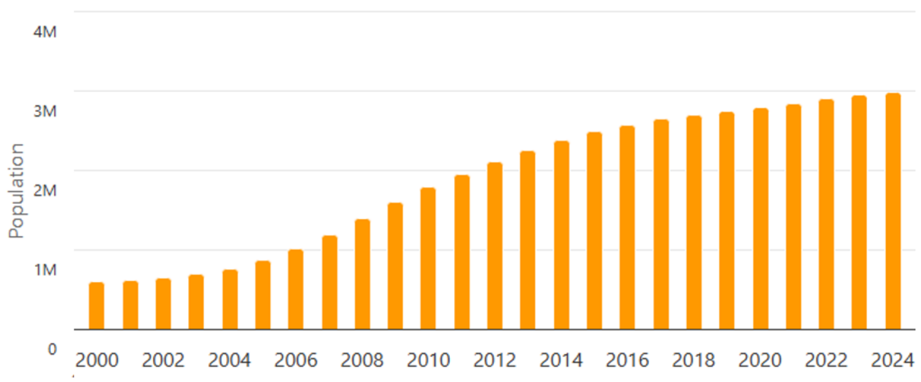
2.1.2 Part of Qatar's National Vision 2030 is Qatar's decarbonisation strategy. This commits to a 25% reduction in greenhouse gas (GHG) emissions by 2030. This Project supports Qatar's decarbonisation strategy by:

- Providing flexibility and complementing the available intermittent renewable energy sources.
- Enabling more efficient water and power production through the use of latest technologies, thereby reducing natural gas consumption.

2.1.3 The Project is designed to allow for future implementation of carbon capture and includes provisions in the plant layout to accommodate a connection to future carbon capture facilities, linked with Qatar Energy's (QE) carbon capture and storage infrastructure.

2.1.4 Moreover, the increase in the population from the most recent census conducted in 2020 until 2024 is noticeable, where the population in 2020 was 2,846,1181 (National Planning Council, 2020) and is currently 3,173,024 (National Planning Council, November 2024) as can be seen in Figure 2.1. This increase in population will naturally lead to an increase in demand for electricity and water supply.

Figure 2.1 Population growth in Qatar 2000-2024



Source: Population of Qatar (2025), National Planning Council: National Planning Council Home

2.2 Site Location and Condition

2.2.1 The proposed site for the Project will be located approximately 15km south-east of Doha city on the east coast of Qatar and less than 1km north of Al Wakrah town. The site will be immediately to the south of the Qatar Metro Depot.

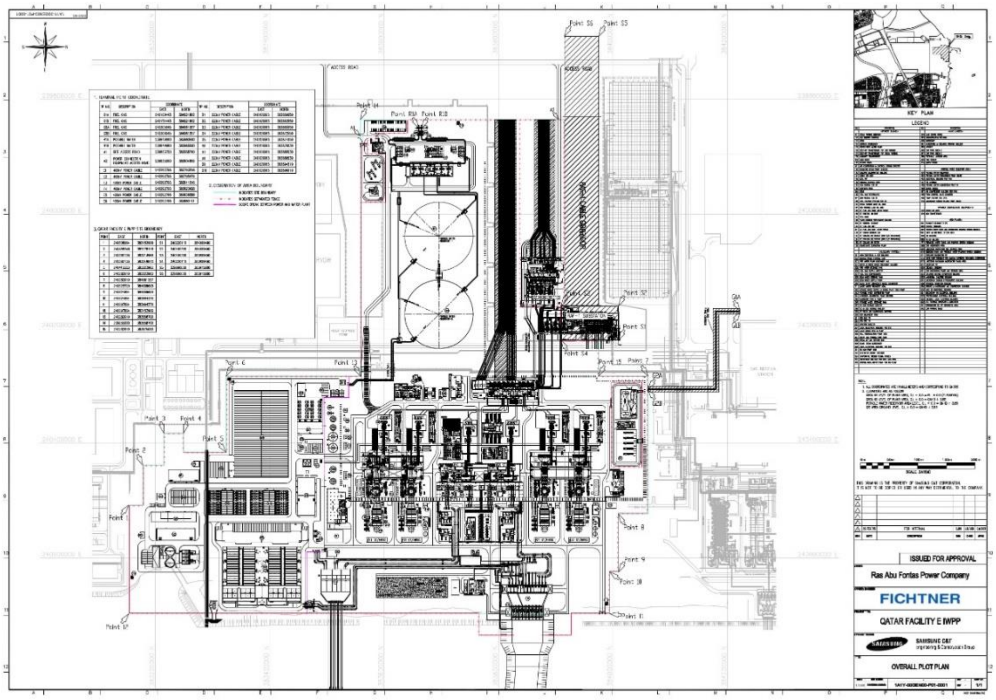
2.2.2 The Project will be established at the centre of the Ras Abu Fontas (RAF) Complex with existing and operational RAF plants A1, A2 and A3 to the north and plants B and B2 to the south. The RAF facility is located 15km south-east of central Doha on the coast between Al Wakrah and Hamad International Airport (HIA). Access to the site is through public roads; however, site roads for construction and operations shall be constructed under the Project. Figure 2.2 and Figure 2.3 show the Project location and boundaries, respectively.

Figure 2.2: Project location

Facility_E_ESIA_Scoping | Project Overview A | 22 Nov 2024

Source: Mott MacDonald, 2024

Figure 2.3: Project boundaries



Source: Sumitomo Corporation, 2024

2.2.3 The site was the previous location for the RAF A power plant, built in 1977-1993 with 500 MW power capacity and 55 MIGD (MSF) water capacity. The structures have since been demolished by the site owners.

2.2.4 The site currently comprises of muddy and sandy areas, on which clear salt crystals are visible. As the Project site has been largely cleared several years back, a certain amount of vegetation (presented on the pictures below) can be observed mainly in the area located in-between the RAF A1 and RAF B complexes that is designated as a future water reservoir area. Footprints of animal species were found which reflect that the area could be a potential habitat.

2.2.5 Figure 2.4 shows the current site as of October 2024. Figure 2.5 shows the Project location within the RAF complex.

Figure 2.4 Project area facing main road

Source: Mott MacDonald Site Visit (08 October 2024)

Figure 2.5: Project area facing seaside

Source: Mott MacDonald Site Visit (08 October 2024)

2.3 Project Components and Design

2.3.1 The Project consists of the development, financing, design, engineering, procurement, construction, testing and commissioning of a gas-fired combined cycle power plant and a seawater reverse osmosis desalination plant, including the power connection equipment and the seawater intake and discharge equipment.

2.3.2 The expected number of workers during the construction phase is 6,000 where they will be accommodated off-site.

2.3.3 The plant will have a capacity for power generation and potable water production of 2,415MW and 110MIGD.

2.3.4 The plant will require a seawater intake of 5,945,695 m^3/day, which will be sourced through the existing RAF A intake, which may require modification to ensure its appropriate.

2.3.5 The Project site was previously used for the RAF A facility, which has since been substantially decommissioned, demolished and any remaining structures and sub structures removed from site.

2.3.6 The Project will include, but is not limited to, the provision of the following elements:

- Combined cycle, gas turbine and steam turbine generators with auxiliary plant
- On-site fuel handling (including gas reducing station) and metering for fuel with redundant supply lines from facility limit
- Substation/ busbar for the export of power at the delivery point
- Potable water production equipment based on reverse osmosis technology
- Seawater discharge system
- Chemical plant, re-mineralization plant
- Potable water disinfection systems using ClO_2, produced on-site
- Potable water forwarding pumps sized for supply to the KAHRAMAA Primary Water Network
- Surge vessels sized for the supply to the KAHRAMAA Primary Water Network
- On-site receipt, storage and utilisation of ammonia, as may be required, for the mitigation of NO_x emissions
- In situ reservoirs for potable water
- Connection equipment
- Metering systems
- Fully automated net output billing system, together with the supporting fuel demand model
- Control and instrumentation
- Balance of plant mechanical
- Balance of plant electrical
- Civil works
- Spares, tools and manuals
- Telecommunications, SCADA interconnection and required configurations
- Environmental monitoring systems
- Black start facility.

2.3.7 As a part of the Project, the following are requirements of the water facility:

- Performance of hydraulic study for all water piping, pumping station, and reservoir systems
- Performance of surge and transient analysis for the complete piping system

- Building a new pump-house and control building along with all necessary civil, mechanical, electrical, control, fire alarm & protection, and instrumentation works to accommodate and operate six (6) VFD pumps: with 1450 lps at 88 meters' head
- Building two potable water reservoirs with 25 MIG capacity including necessary piping, electrical, instrumentation, inlet flow controls system and metering, landscaping, drainage, among other associated works.

Associated Facilities

2.3.8 The Project area includes power and desalination plants, RAF A1, RAF A2, RAF A3, RAF B, RAF B1, and RAF B2 stations at RAF complex.

2.3.9 The first phase of the RAF A facility was commissioned in 1977, and the station was finally completed in 1993 with an electricity generating capacity of 497 MW and a desalination plant capable of producing 55 MIGD.

2.3.10 RAF B facility comprises the existing RAF B, RAF B1, and RAF B2 plants. The Raf B station was designed to be capable of an extension to 1,000 – 1,100 Mega Watts (MW) and 60 MIGD total production Capacities.

2.3.11 In 1981, the Qatari government installed eight desalination units in RAF A, with each individual unit possessing a daily capacity of 4 million gallons. This capacity was eventually raised to 55 million gallons per day. The introduction of RAF A1 saw daily capacity increased by 45 million gallons. RAF A2 desalination plant had a daily capacity of 36 million gallons. In September 2016, RAF A3 desalination plant became operational with a capacity of 22 million gallons per day. However, after being expanded in April 2017, its capacity was raised to 36 million gallons per day.

2.4 Project Phases (Construction, Operation and Decommissioning)

Construction

2.4.1 The site preparation and development include the clearance of all waste, stones and metals, followed by excavation, backfilling, grading and levelling (+3.85m QNHD).

2.4.2 A laydown area of 87,500m^2 exterior to the IWPP plant will be required to perform the works of the water island.

2.4.3 The Engineering Procurement and Construction (EPC) Contractor is responsible for the permanent access roads to the Power Generation Area and Potable Water Reservoir Tank from the main road as well as temporary access to Power and Water Areas.

2.4.4 The associated systems to the power plant are stormwater drainage system, wastewater treatment system and the sanitary drainage system.

2.4.5 Approximately 6,000 workers are expected during the construction phase of the Project and there will be no accommodation on site.

2.4.6 Main waste generated will be excavation spoil and this will be disposed off-site, appropriate storage will be provided on site to avoid air quality and marine impacts. Watering down may be necessary during strong wind periods.

Operation

2.4.7 The Project Company will be the 'Owner-Operator' of the facility and will have the fully responsibility on the operation and maintenance under the 25-years power water purchase agreement (PPA). All scheduled and minor maintenance for the Power Plant, Seawater Reverse Osmosis (SWRO) and balance of plant including 400kV Gas Insulated Switchgear (GIS) will be in-house. The Project Company will have a Long-Term Service Agreement (LTSA) with the Gas Turbine Original Equipment Manufacturer (OEM) for planned and unplanned maintenance required for the Gas Turbines. Whereas for the SWRO facility, the operation and maintenance will be undertaken in-house too supported with an initial (five years) Membrane Supply Agreement (MSA).

2.4.8 The Project's operational and maintenance team will have approximately 150 workers, and no on-site accommodation will be required.

2.4.9 The expected concentration of liquid wastes and gaseous emissions is provided below:

- **Liquid wastes** – 15m^3/ day, will be disposed through direct connection with municipality/ road tanker
- **Industrial discharge** – 5,470,879 m^3/ day, will be disposed directly to municipal system through direct connection with the municipality/ road tanker
- **Gaseous Emissions (Air Pollutants)** – NO_x emissions (51.3 mg/ Nm^3)
- **Pollutants from Stationary Sources** – CO_2 emissions (563 mg/ Nm^3), SO_2 emission (4.4mg/ Nm^3), Smoke Density (2 Bacharach).

Decommissioning

2.4.10 At this current stage of the Project, no information on decommissioning is available.

2.5 Resources Requirements and Emissions

Water Requirements

2.5.1 The Project requires a seawater intake of 5,945,695 m^3/day, sourced through the existing RAF A intake system. Outfall discharge is estimated at 5,470,879 m^3/day, with 110 MIGD of potable water production capacity. Supporting infrastructure includes a new pump-house, control building, and reservoirs with a capacity of 25 MIG each, along with necessary piping, electrical, and instrumentation systems.

Energy Requirements

2.5.2 The combined cycle power plant has a generation capacity of 2,415 MW and will rely on on-site fuel handling systems, including redundant gas supply lines and a gas reducing station.

Emissions

Air Emissions

2.5.3 Mitigation of NO_x emissions will be achieved using ammonia-based systems stored and utilised on-site. The Project includes environmental monitoring systems to ensure compliance with air quality standards.

Water Discharges

2.5.4 The seawater discharge system will manage outfall at a rate of 5,470,879 m^3/day. Discharges will be monitored and treated to ensure minimal marine impacts.

2.6 Project Schedule

2.6.1 The Project will be developed for net capacities equal to 2,415 MW of power and 110 MIGD of potable water. Table 2.1 provides an overview the Project schedule and the target milestones:

Table 2.1 Project Capacity Requirements and Target Milestones

No.	Phase	Capacity	Tentative Date
1	Target PWPA Signing Date	-	25 November 2024
2	Target Financial Close	-	25 August 2025
3	Start of Construction	-	21 August 2025
4	Start of Certificate, Commissioning and Testing	-	19 June 2027
5	End of Construction	-	20 August 2027
6	Connection Equipment Preliminary Milestone Date	-	29 November 2027
7	First Power Date	847.1MW	25 April 2028
8	Final Water Date	110MIGD	01 August 2028
9	Target Facility Date	110MIGD and 2,415MW	01 June 2029

**Source: 'Schedule 15 Part 1. Primavera Initial Construction Programme/QFE Bidding Schedule' dated on 04th October 2024*

3 Policy, Legal and Institutional Framework in Qatar and Internationally

3.1 Qatari National Regulations and Standards

3.1.1 Law No.30 of 2002 on Environmental Protection sets out the objective of the ESIA report where it states the requirement of evaluating the environmental impact of projects. Following the law, Decree No. 4 of 2005 issues the executive environmental regulations including Sections on *Environmental Protection Against Pollution including Environmental Impacts of Projects, Protection Against Air Pollution* and *Marine Environment Protection Against Pollution.*

3.1.2 Furthermore, subject-specific laws that will be considered are:

- Law No. 4 of 1983 on the Exploitation and Protection of Living Aquatic Resources in Qatar
- Law No. 1 of 1993 on the Prevention of Dredging Agricultural Land and Beach Sand
- Law No. 32 of 1995 on the Prevention of Damage to the Plant Environment and its Component
- Law No. 31 of 2002 on Radiation Protection
- Law No. 19 of 2004 on the Protection of Wildlife and Natural Habitats
- Resolution No. (37) of 2010 on the Preservation of Turtles and Seabirds from Extinction
- Resolution of the Minister of Municipality and Environment No. (310) of 2020 on Air Quality
- Qatar Construction Specifications (QCS) (2024).

3.2 Marine environment

Marine water quality and water pollution

Qatari legislation

3.2.1 The standards issued by MoECC under the authority of the Environment Protection Law applicable to the process wastewater and cooling water discharges from thermal power and desalination plants include:

- Standards for Process Wastewater from Thermal Power and Thermal Desalination Plants as shown in Table 3.1
- Standards for Seawater Cooling Discharges as shown in Table 3.2
- Standards for Sea Water Quality as shown in Table 3.3

Table 3.1 Qatar standards for process wastewater from thermal power and thermal desalination plants

Parameter	Limit
pH	6 - 9
Total Suspended Solids (TSS)	50 mg/l
Oil and Grease	10 mg/l
Chromium (total)	0.2 mg/l
Chromium (hexavalent)	0.1 mg/l
Copper	0.5 mg/l
Iron	1.0 mg/l
Nickel	0.5 mg/l

Source: MoECC Environmental Protection Standards, 2009.

3.2.2 Table 3.2 below presents the standards for cooling water discharges as stated in the Executive By-Law to Law No. 30 of 2002. Additionally, these regulations set the requirement to establish the area of mixing zone via the undertaking of three-dimensional hydrodynamic modelling.

Table 3.2 Qatar standards for seawater cooling discharges

Parameter	Symbol	Limit
Difference in Temperature	Δ°C	3°C
Daily Free Residual Chlorine	Cl_2	< 0.05 mg\L

Source: Executive By-Law to Law No. 30 of 2002

Notes:

The difference in the temperature is to be measured at the point where the water current enters the facility and at the edge of the point for water discharge and blending.

The cooling water is to be tested for the concentration of free residual chlorine at least (4) times daily using samples collected by grab at the point of discharge into the water.

As an alternative to this, the facility may set out a fixed discharge limit at the site using the same dispersal form used to measure the temperature (-3 degrees centigrade) and the boundary of the water blending area. The effect of the chlorine in the water surrounding the facility should be limited to 0.05 mg/litres.

Table 3.3 Permissible limits outlined in Executive By-Law Law No. 30 (Annex ¾) – The standards for seawater quality

Parameter	Unit	Maximum permissible limit
pH	N/A	8.3-6.5
Salinity	PSU	33-45
Dissolved Oxygen (DO)	mg/l	> 4
Total Suspended Solids (TSS)	mg/l	30
Phosphorus	µg/l	30
Nitrates	µg/l	100
Silica	µg/l	900
Nitrites	µg/l	35
Ammonia (Nitrogen)	µg/l	15
Total Petroleum Hydrocarbons	mg/l	5
Cadmium	µg/l	0.7
Nickel	µg/l	20
Mercury	µg/l	than less 0.4
Iron	µg/l	90
Copper	µg/l	15
Lead	µg/l	12
Vanadium	µg/l	10
Chlorinated Phenols	N/A	Not permissible
Chlorophyll a	µg/l	1

Source: Executive By-Law to Law No. 30 of 2002

International guidance

3.2.3 IFC General EHS Guidelines and IFC EHS Guidelines for Thermal Power Plants set out monitoring requirements for marine water quality. These guidelines state that monitoring parameters should be selected for pollutants of concern from the process and regulated under compliance requirements. They also state that frequency should reflect seasonal variation in discharges and that locations should be selected to provide representative monitoring data. The effluent of the proposed Project will also be assessed against the indicative levels presented in Table 3.4, which should not be exceeded by an undiluted state 95% of the discharge time though any deviation from this would be justified in the environmental assessment where applicable. Intake guidelines also note that impingement and entrainment should be minimised through a maximum intake structure velocity of 0.15m/s.

3.2.4 IFC EHS Guidelines for Thermal Power Plants includes the following criteria for thermal discharges in order to prevent negative impacts to the receiving water:

- The elevated temperature areas due to thermal discharge from the project should not impair the integrity of the water body as a whole or endanger sensitive areas (such as recreational areas, breeding grounds, or areas with sensitive biota).
- There should be no lethality or significant impact to breeding and feeding habits of organisms passing through the elevated temperature areas.
- There should be no significant risk to human health or the environment due to the elevated temperature or residual levels of water treatment chemicals.

3.2.5 In addition, IFC EHS Guidelines for Water and Sanitation will be referred to particularly the aspects relating to use of RO. It should be noted that other international guidelines relating to the environmental fate and effect of discharges on the ecological community are likely to be applicable to the environmental assessment and these are outlined separately.

Table 3.4 World Bank thermal power plant effluent operational guidelines

Parameter	Threshold (units mg/L; except for pH and temperature)
pH	6-9
Total suspended solids (TSS)	50
Oil & grease	10
Total residual chlorine	0.2
Chromium – Total (Cr)	0.5
Copper (Cu)	0.5
Iron (Fe)	1.0
Zinc (Zn)	1.0
Lead (Pb)	0.5
Cadmium (Cd)	0.1
Mercury (Hg)	0.005
Arsenic (As)	0.5
Temperature increase by thermal discharge from cooling system	Site specific requirement to be established by the Environmental Authority Elevated temperature areas due to discharge 1of once-through cooling water (e.g., 1 Celsius above, 2 Celsius above, 3 Celsius above ambient water temperature) should be minimized by adjusting

Parameter	Threshold (units mg/L; except for pH and temperature)
	intake and outfall design through the Project specific Environmental Assessment depending on the sensitive aquatic ecosystems around the discharge point.

Source: World Bank 2007 – Note Applicability of heavy metals should be determined in the Environmental Assessment. Guideline limits in the table above are from various references of effluent performance by thermal power plant and may not be analogous to other systems.

Marine sediment

Qatari legislation

3.2.6 The standards issued by MoECC under the authority of the Environment Protection Law do not currently include environmental standards for marine sediment; therefore, relevant international marine sediment standards will be adopted for this Project.

International guidance

3.2.7 Assessment of marine sediment will be undertaken using the following internationally recognised standards:

- Australia and New Zealand Environment and Conservation Council (ANZECC)
- UK & Canadian Interim Sediment Quality Guidelines
- UN Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) Guidance on Assessment of Sediment Quality
- United States National Oceanic and Atmospheric Administration chemical aquatic fate and effects (CAFE) database.

3.2.8 In addition, marine sediments in intertidal or flood risk areas will be assessed in line with Soil, Hydrology and Contamination guidelines detailed in Section 3.9. Reference will also be made to IFC EHS Guidelines for Ports, Harbours, and Terminals as is the most relevant international guidelines for marine coastal construction.

Marine ecology

Qatari legislation

3.2.9 The standards issued by MoECC under the authority of the Environment Protection Law applicable to impacts on marine ecology include:

- The Maritime Law promulgated by Law No (15) of the year 1980.
- Decree No (55) of the year 1978; Qatar is a signatory to the Kuwait Regional Convention for Cooperation on the Protection of the Marine Environment from Pollution and the Protocol on Regional Cooperation to combat pollution caused by oil and other harmful substances in emergencies.

International guidance

3.2.10 Assessment of impacts to marine ecology will be undertaken using the following internationally recognised standards:

- Regional Organization for the Protection of the Marine Environment (ROPME), 1978 and associated Protocol on the Control of Marine Transboundary Movements and Disposal of Hazardous Wastes and Other Wastes, 1998
- Protocol for the protection of the Marine Environment Against Pollution from Land Based Sources, 1990
- United Nations Environment Programme, & World Health Organization (2008). Desalination: Resource Guidance Manual for Environmental Impact Assessments
- ROPME Protocol for the protection of the marine environment against pollution from land-based sources, 1990
- ROPME Protocol concerning regional cooperation in combating pollution by oil and other harmful substances in cases of emergency, 1978
- ROPME Protocol on the control of marine transboundary movements and disposal of hazardous wastes and other wastes, 1998
- ROPME Protocol concerning the conservation of biological diversity and the establishment of protected area
- IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- IFC Performance Standard 3: Resource Efficiency and Pollution Prevention
- IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Charter of the United Nations, 1945
- Convention on Biological Diversity (CBD), 1992
- United Nations Framework Convention on Climate Change, 1992
- Kyoto Protocol to the Framework Convention on Climate Change, 1998
- Paris Agreement to the Framework Convention on Climate Change, 2016
- Cartagena protocol on biosafety, 2000 (joined 2007)
- Convention on International Trade in Endangered Species of World Fauna and Flora (CITES), 1981
- International Plant Protection Convention, 1951
- Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1994
- Convention Concerning the Protection of World Cultural and Natural Heritage (UNESCO), 1946
- The United Nations Convention to Combat Desertification (UNCCD), 2000

- The International Treaty on Plant Genetic Resources for Food and Agriculture, 2001
- The Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for Ecological Impact Assessment
- United States National Oceanic and Atmospheric Administration chemical aquatic fate and effects (CAFE) database.

3.3 Air quality

Qatari legislation

3.3.1 The Ministry of Environment and Climate Change (MoECC) has issued a set of emission limits and ambient standards under the authority of the Environment Protection Law. Industry-specific air emission standards have been developed and published under Executive By-Law. These standards, revised in 2005, comprise industry specific emission limit values and national thresholds for the concentration of pollutants in ambient air. Appendix J (403100049-C001-MML-RP-EN-018) provides a description of the key pollutants assessed.

3.3.2 The primary fuel of the proposed Project will be sweet natural gas; therefore, nitrogen dioxide (NO_2) will be the main pollutant of concern with regards to the Project during operation as indicated by the IFC[1] and the European Commission Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for Large Combustion Plants[2]. However, as requested by MoECC at the scoping stage, emissions of other pollutants have also been considered in Appendix J (403100049-C001-MML-RP-EN-018).

3.3.3 The emission limit values for nitrogen oxides (NO_x) for 'Power plants, desalinisation plants and all power generating facilities more than 25MW (thermal input)' are summarised in Table 3.5.

3.3.4 Qatar also has a policy ambition of limiting emissions of NO_x from stationary sources to 9ppm (approximately 18mg/Nm^3). The Project will meet the emission limit value of 9ppm during normal operation with emissions from the heat recovery steam generator (HRSG) stack.

3.3.5 Relevant national ambient air quality standards for PM, NO_2 and SO_2 are presented in Table 3.6.

Table 3.5: Qatar emissions standards for power plants, desalinisation stations and power generating facilities

Pollutant	Emission limit
Oxides of nitrogen (NOx)	27 ppm or 55 mg/Nm^3
NOx	9 ppm or 18 mg/Nm^3 (a)

Source: Executive By-Law to Law No. 30 of 2002 as amended by Resolution No. 4 of 2005

Note: Reference conditions: dry, 0^{o}C, 1 atmosphere, 15% O_2

(a) The emission limit of 9 ppm is a Qatari policy ambition

[1] Environmental, Health and Safety Guidelines for Thermal Power Plants, IFC 2008.

[2] The European Commission Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for Large Combustion Plants (2006)

Table 3.6: Qatar ambient air quality standards (μg/m^3)

Pollutant	Averaging period	Limit
Nitrogen dioxide (NO_2)	1-hour average	400[c]
	24-hour average	150[a]
	Annual average	100[b]

Source: Executive By-Law to Law No. 30 of 2002

Note: [a] 99.7th percentile of daily (24-hour) averages

[b] Average for all the daily measurements for one year of evaluation

[c] 99.9th percentile of hourly (1-hour) averages

International guidance

3.3.6 The IFC provide a portfolio of standards and guidelines. The IFC Performance Standard 3: Resource Efficiency and Pollution Prevention aims:

3.3.7 *'To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities.'*

3.3.8 To achieve this, the IFC provides both industry-specific and general guidance on Good International Industry Practice with respect to ambient air quality and emissions to air. The Project will need to comply with the IFC Performance Standards, the standards set out in the IFC Environmental Health and Safety (EHS) Guidelines for Thermal Power Plants and those specified in the IFC General Environmental Health and Safety (EHS) Guidelines.

Emissions to air

3.3.9 Table 3.7 presents the IFC's emission limit guidelines for NO_x from gas turbines with a thermal input greater than 50MW operating on natural gas. The IFC does not set emission limit guidelines for other pollutants, including PM and SO_2, from natural gas combustion in gas turbines as they typically emit negligible amounts of these pollutants.

3.3.10 The IFC EHS Guidelines advise that, with respect to emission limits, when host country regulations differ from the levels presented in the Guidelines, projects are expected to achieve whichever is more stringent. Table 3.7 presents the relevant emission limits applicable to the Project.

3.3.11 When operating in open cycle mode the Project would meet a NOx emission concentration of 55mg/Nm^3 (27ppm), which is slightly higher than the IFC EHS emissions guidelines of 51mg/Nm^3 (25ppm). Once the Project is fully operational, it will normally run in closed cycle mode with NO_x emissions meeting 18mg/Nm^3 (9ppm).

3.3.12 This air quality assessment has included two scenarios with the Project operating in open cycle mode (emissions from bypass stack) at 55mg/Nm^3 and two scenarios with the Project operating in closed cycle mode (emissions from HRSG stack) at 18mg/Nm^3 (see paragraph 6.3.33 to 6.3.36 for more information on modelled emissions). The model results (see from paragraph 6.3.62) demonstrate that the impacts from all scenarios do not exceed 25% of the relevant national ambient air quality standards and are not significant. On this basis, it is considered that an emission concentration of 55mg/Nm^3 when operating in open cycle mode is appropriate for this Project.

Table 3.7: Pollutant emissions guideline for natural gas fired turbine above 50MWth input

Pollutant	Emission guideline[a]
Nitrogen oxides (NO_x)	51mg/Nm^3

Source: Environmental, Health and Safety Guidelines for Thermal Power Plants, IFC 2008.

Note: [a] Reference conditions: dry, 0ºC, 1 atmosphere, 15% O_2

Ambient air quality

3.3.13 The General EHS Guidelines advise that ‘relevant standards’ with respect to ambient air quality are national legislated standards or, in their absence, the current World Health Organisation (WHO) Air Quality Guidelines or other internationally recognised sources such as the EU or US EPA. Where a host country’s legislated standards are less stringent than either the WHO or other internationally recognised sources, the IFC acknowledge that it is acceptable to use the national legislated standards as the principal standards that the Project is assessed against.

3.3.14 As described above, national legislated ambient air quality standards are available and have therefore been used within the assessment to determine air quality impacts. However, for comparison purposes only, Table 3.8 also presents the current WHO and EU ambient NO_2 air quality guidelines/standards as these are relevant to the combustion of natural gas.

3.3.15 The current WHO Guidelines are provided in the Global Air Quality Guidelines 2021 (shown in the comparison table in Table 3.8). These guidelines are intended to support actions for air quality at the optimal achievable level for public health protection in different contexts. The WHO does not formally prescribe how guidelines should be used in air quality management.

3.3.16 The General EHS Guidelines specifically refer to the European Union Directives as being an ‘internationally recognised source’ of ambient air quality standards. The EU legislation introduces a threshold of tolerance to account for exceptional, worst-case short-term episodes. This translates as a limit not to be exceeded more than a certain number of times and can be expressed as a ‘percentile’. In an assessment of human health effects, which takes account of a relevant exposure period, this approach is considered more appropriate.

3.3.17 The comparison illustrates that the international standards are more stringent than the current Qatari standards and as such the Qatar ambient standards are applicable and form the basis of which the Project is assessed against which is summarised in Table 3.8.

Table 3.8: Summary of international ambient air quality standards for protection of human health (µg/m^3)

Pollutant	Averaging period	WHO guidelines[a]	European Union limit values [b]
Nitrogen dioxide (NO_2)	1-hour average	-	200[d]
	24-hour average	25[c]	-
	Annual average	10	40

Notes [a] WHO global air quality guidelines, 2021

[b] Current limit values from Directive 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe

[c] 99th percentile of daily (24-hour) averages

[(d)] 99.79th percentile of hourly (1-hour) averages

3.4 Climate resilience and Greenhouse Gas (GHG) emissions

GHG emissions

3.4.1 The GHG emissions assessment approach to be adopted in the ESIA is informed by the relevant lender requirements and international guidance. This includes:

- Equator Principles (EP)
- IFC Performance Standard (PS)
- World Bank Group EHS Guidelines
- JBIC Environmental Guidelines, which additionally refer to:
  - Recommendation of the Council on Common Approaches for Officially Supported Export Credits and Environmental and Social Due Diligence (The "Common Approaches")
- World Bank Environmental and Social Standards (ESS)
- Export – Import Bank of Korea (KEXIM), which refer to:
  - Common Approaches
- Economic Development Cooperation Fund (EDCF) Safeguard Policy

3.4.2 The relevant requirements for the assessment of GHG emissions are provided in Table 3.9 below:

Table 3.9: GHG reporting requirements from relevant standards and guidance

Standard / Guidance	Version reviewed	Relevant section	Reporting threshold	Scope of emissions to be assessed	Other relevant GHG requirements (paraphrased where needed)
Equator Principles	EP4 (2020)	Principle 10: Reporting and transparency	100,000 tCO_2e annually (required) 25,000 tCO_2e (encouraged)	Scope 1 and 2 emissions during operational phase	Climate Change Risk Assessment (including physical and transition risk) for Category A and, as appropriate, Category B projects Alternatives analysis requiring the evaluation of technically and financially feasible and cost-effective options available to reduce Project related GHG emissions during the design, construction, and operation of the Project For Scope 1 emissions, analysis to ascertain the best practicable environmental option, will

					include consideration of alternative fuel or energy sources if appliable (and evidence/justification if not selected)
IFC PS	2012	PS 3 Resource Efficiency and Pollution Prevention	25,000 tCO_{2e} annually	Direct emissions and indirect emissions from offsite production of energy	Implement technically and financially feasible and cost-effective measures for improving resource efficiency
JBIC Guidelines for the Confirmation of Environmental and Social Considerations	May 2022	(3) Scope of impact to be examined	N/A – refer to the Common Approaches, ESS and IFC PS	N/A – refer to the Common Approaches, ESS and IFC PS	Ascertain whether a Project complies with environmental laws and standards of the host nation and local governments concerned, as well as whether it conforms to their environmental policies and plans
EDCF Safeguard Policy	2020	h. Climate Change	25,000 tCO_2e annually	Not specified	Apply pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognised standards such as the World Bank Group's Environment, Health and Safety Guidelines
Common Approaches	2024	N/A	0 tCO_{2e} (fossil-fuel power plant projects) 25,000 tCO_{2e} annually (other projects)	Direct emissions and indirect emissions from offsite production of energy and/or direct emissions by carbon intensity (gCO_{2e}/kWh)	Reporting of any specific actions taken to avoid, minimise and/or offset CO_2 emissions for all high carbon intensity fossil fuel power projects exceeding 700g/kWh, taking into account the context of the low carbon growth framework of the country where the Project is located, the use of best appropriate technology to reduce carbon emissions
World Bank ESS	2017	ESS3 Resource Efficiency and Pollution Prevention and Management	None (subject to some exclusions)	Gross emissions resulting from the Project	Consider alternatives and implement technically and financially feasible and cost-effective options to avoid or minimise Project-related air emissions Implement technically and financially feasible

					measures for improving efficient consumption of energy, water, and raw materials, as well as other resources
World Bank EHS Guidelines	2008 (Power) 2007 (General)	Power – Energy efficiency and GHG emissions General – air emissions and ambient air quality	N/A – mitigation focused	N/A – mitigation focused	Includes various requirements for mitigation measures to be implemented by the Project

Source: Mott MacDonald, 2024

3.4.3 Based on Table 3.9, the ESIA will require the assessment of gross Project emissions, including direct emissions and indirect emissions from the offsite production of energy. The Project developers will need to demonstrate they have considered alternatives to implement technically and financially feasible methods to reduce Project related GHG emissions and improve resource efficiency.

3.4.4 The Project may also require a transition risk assessment as per the Equator Principles (as part of a wider Climate Change Risk Assessment; if the Project's annual scope 1 and 2 emissions exceed 100,000tCO_{2e}.

3.4.5 The ESIA will additionally need to comply with local laws and legislation. While there are no specific GHG reporting thresholds identified in the Environment Protection Law, implemented through Decree No. 30 of 2002 and its Executive By-Law of 2005, it nevertheless requires the consideration and implementation of appropriate measures to reduce environmental impact. This will be demonstrated via the assessment of GHG emissions and the identification and implementation of appropriate mitigation actions.

Climate resilience

3.4.6 The climate resilience assessment approach to be adopted in the ESIA will also be informed by the relevant national requirements, lender requirements and international guidance. This includes:

- Qatari National Laws and Regulations (including but not limited to Executive By-Law for The Environmental Protection Law, Decree Number 30 and other national or regional policies around climate change)
- OECD Common Approach Requirements which may include the following where relevant:
  - IFC Performance Standards
  - World Bank Environmental and Social Standards
  - World Bank Group EHS Guidelines
- JBIC Guidelines for Confirmation of Environmental and Social Considerations.

3.4.7 The requirements are summarised in Table 3.10.

Table 3.10: Relevant climate change provisions mentioned in the above listed documents:

Standard/guidance	Version reviewed	Relevant section(s)	Relevant climate change requirements
Qatari Executive By-Law for The Environmental Protection Law, Decree Number 30	Decree 30 (2002)	N/A	None found
Equator Principles	EP4 (2020)	Principle 2	Human Rights risks and impacts assessment, and the Climate Change Risk Assessment should be aligned with UNGPs3, Climate Physical Risk and Climate Transition Risk categories of the Taskforce on Climate-related Financial Disclosures (TCFD).
IFC Performance Standards on Environmental and Social Sustainability	2012	Performance Standard 4 Community Health, Safety, and Security – Section 8: Ecosystem Services	The diminution or degradation of natural resources, such as adverse impacts on the quality, quantity, and availability of freshwater, may result in health-related risks and impacts. Where appropriate and feasible, the client will identify those risks and potential impacts on priority ecosystem services that may be exacerbated by climate change. Adverse impacts should be avoided, and if these impacts are unavoidable, the client will implement mitigation measures in accordance with paragraphs 24 and 25 of Performance Standard 6.
IFC Performance Standards on Environmental and Social Sustainability	2012	Performance Standard 1 Assessment and Management of Environmental and Social Risks and Impacts – Section 7: Identification of Risks and Impacts	The risks and impacts identification process will consider the emissions of greenhouse gases, the relevant risks associated with a changing climate and the adaptation opportunities, and potential transboundary effects, such as pollution of air, or use or pollution of international waterways.
World Bank ESS	2017	ESS1 Assessment and Management of Environmental and Social Risks and Impacts – Environmental and Social Assessment Section 28	The environmental and social assessment, informed by the scoping of the issues, will take into account all relevant environmental and social risks and impacts of the Project, including: (a) Environmental risks and impacts, including: (i) those defined by the EHS Guidelines; (ii) those related to community safety (including dam safety and safe use of

			pesticides); (iii) those related to climate change and other transboundary or global risks and impacts; (iv) any material threat to the protection, conservation, maintenance and restoration of natural habitats and biodiversity; and (v) those related to ecosystem services and the use of living natural resources, such as fisheries and forests.
World Bank ESS	2017	ESS1 Assessment and Management of Environmental and Social Risks and Impacts – Environmental and Social Assessment Section 35	The environmental and social assessment will consider potentially significant Project-related transboundary and global risks and impacts, such as impacts from effluents and emissions, increased use or contamination of international waterways, emissions of short- and long-lived climate pollutants, climate change mitigation, adaptation and resilience issues, and impacts on threatened or depleted migratory species and their habitats.
World Bank ESS	2017	ESS4 Community Health and Safety	"To promote quality and safety, and considerations relating to climate change, in the design and construction of infrastructure, including dams" is listed as one of the objectives of ESS4.
World Bank ESS	2017	ESS4 Community Health and Safety – Infrastructure and equipment design and safety Section 6	The Borrower will design, construct, operate, and decommission the structural elements of the Project in accordance with national legal requirements, the EHSGs and other GIIP, taking into consideration safety risks to third parties and affected communities. Structural elements of a Project will be designed and constructed by competent professionals and certified or approved by competent authorities or professionals. Structural design will take into account climate change considerations, as appropriate.
World Bank ESS	2017	ESS4 Community Health and Safety – Ecosystem Services Section 14	The Project's direct impacts on ecosystem services may result in adverse health and safety risks to and impacts on affected communities. With respect to this ESS, ecosystem services are limited to provisioning and regulating services as defined in ESS1. Where appropriate and feasible, the Borrower will identify the

			project's potential risks and impacts on ecosystem services that may be exacerbated by climate change. Adverse impacts will be avoided, and if they are unavoidable, the Borrower will implement appropriate mitigation measures.
World Bank ESS	2017	ESS6 Biodiversity Conservation and Sustainable Management of Living Natural Resources – Section 8	The environmental and social assessment as set out in ESS1 will consider direct, indirect and cumulative project-related impacts on habitats and the biodiversity they support. This assessment will consider threats to biodiversity, for example habitat loss, degradation and fragmentation, invasive alien species, overexploitation, hydrological changes, nutrient loading, pollution and incidental take, as well as projected climate change impacts. It will determine the significance of biodiversity or habitats based on their vulnerability and irreplaceability at a global, regional or national level and will also take into account the differing values attached to biodiversity and habitats by project-affected parties and other interested parties.
World Bank EHS Guidelines	2008 (Power) 2007 (General)	N/A mitigation focused	Includes various requirements for mitigation measures to be implemented by the Project.
JBIC Guidelines for the Confirmation of Environmental and Social Considerations	May 2022	N/A to climate resilience	Assesses whether a project complies with environmental laws and standards of the host nation and local governments concerned, as well as whether it conforms to their environmental policies and plans.

Source: Mott MacDonald, 2025

3.5 Social

Qatari legislation

3.5.1 The socioeconomic development of Qatar is shaped by several key laws and regulations that aim to protect the welfare of its population and promote sustainable growth. These regulations are set to make sure that project developments consider their impacts on local communities, employment, and the overall economy.

3.5.2 Although existing legislation in Qatar addresses aspects of health and safety issues, there is no single comprehensive piece of legislation solely applicable to health and safety.

3.5.3 Key laws and guidance documents including components of health and safety regulations include:

- Labour Act No. 3 of 1962
- Law No. 14 of 2004 the Labour Law
- Civil Defence Law No. 9 of the Year 2012
- The Civil Defence Department – Fire Safety Handbook
- Worker Rights Booklet 2009 (National Human Rights Committee)
- Qatar Construction Specifications 2014, note that although not officially released, the 2024 version was also reviewed - Section 11
- Law No. (17) of 2018 on Establishing Workers' Support and Insurance Fund
- Law no. (17) of 2020 on the Determination of Minimum Wage for Workers and Domestic Workers
- Decision of the Minister of Administrative Development, Labour and Social Affairs No. (17) for 2021 specifying measures to protect workers from heat stress
- Ministerial Decision No. 20 of 2005 outlines requirements and conditions to be observed in workplaces to protect workers, employees, and visitors from occupational hazards
- Law No. 2 of 2004 concerns the rights of persons with special needs and aligns with the International Convention on the protection of the rights of persons with disabilities.

3.5.4 Under mandate No. 5 of 2005 the HSE Regulations and Enforcement Directorate was established. Under Cabinet Resolution No. 16 of 2011 the National Committee of Occupational Health and Safety at the Ministry of Labour was established.

3.5.5 In 2011 the HSE Regulations and Enforcement Directorate issued a HSE Framework document, which aimed to consolidate the relevant HSE provisions of the various Qatari laws and regulations and assembled them into a single document.

3.5.6 Qatar has ratified six of the eight core International Labour Organisation (ILO) labour conventions, namely the core ILO Convention on Discrimination, the Convention on the Worst Forms of Child Labour, the Convention on Forced Labour, the Convention on Labour Inspection, the Convention on Minimum Age and the Convention on Abolition of Forced Labour.

3.5.7 Law No. 14 of 2004 the Labour Law expands and protects workers' rights in some areas. One hundred and forty-six articles address the following areas in relation to workers' rights:

- Definition and general provisions
- Vocational training
- Employment of workers
- Individual labour relationships
- Disciplinary power of the employer
- Wages
- Working hours and leave
- Employment of juveniles
- Employment of women
- Safety, vocational health and social care
- Work injuries and compensation
- Workers' organisations
- Joint committees, negotiation, and collective agreements
- Collective disputes
- Inspection of work
- Penalties.

3.5.8 Other key socioeconomic considerations include:

- **Qatar National Vision 2030 (QNV 2030) -** QNV 2030 outlines Qatar long term development goals, focusing on economic, social, and environmental sustainability. This framework stresses the need for balanced socioeconomic development and the well-being of residents through improved public services, infrastructure, and a diversified economy.
- **Third National Development Strategy (NDS) 2024-2030 -** The NDS translates the goals of QNV 2030 into actionable projects and policies. It prioritizes economic diversification, social welfare programs, and infrastructure development, all of which must be considered in any socioeconomic impact assessment for development projects.

International Guidelines

3.5.9 For the socioeconomic part of the ESIA, several key international guidelines will be followed to ensure the Project meets high standards for social and labour conditions.

3.5.10 The OECD Common Approach will guide how the assessment of social risks and impacts will be carried out. This includes using the IFC Performance Standards, including Performance Standard 2, which ensures fair treatment of workers, non-discrimination, and safe working conditions. The World Bank ESS, particularly ESS 5, which focuses on land acquisition and resettlement, will also be adopted, which helps to ensure that communities are fairly compensated and that vulnerable groups are protected.

3.5.11 The following subsections describe additional guidelines and international standards considered for the Project.

Equator Principles (2020)

3.5.12 Principle 2 states that Project owner should conduct a detailed environmental and social assessment to identify Project risks, including labour and working conditions, in alignment with the International Labour Organisation (ILO) core labour standards.

International Finance Corporation (IFC) (2012)

3.5.13 The IFC Environmental, Health, and Safety (EHS) Guidelines for Thermal Power Plants contains specific measures for mitigating occupational and community health and safety risks during construction, operation, and decommissioning of thermal power plants and are considered the most appropriate standards for the proposed Project to reference. The IFC General EHS Guidelines for occupational and community health and safety will also apply.

3.5.14 There are three IFC Performance Standards that are also relevant to this Project (IFC PS1 (2012); IFC PS2 (2012), IFC PS4 (2012):

Performance Standard 1 - Assessment and Management of Environmental and Social Risks and Impacts: Performance Standard 1 focuses on managing environmental and social risks throughout a project's lifecycle. It emphasizes the need for an effective Environmental and Social Management System (ESMS), which is a continuous process involving management, workers, affected communities, and other stakeholders. The ESMS follows a methodological approach of "plan, do, check, act" to handle risks systematically. A well-structured ESMS enhances sustainable environmental and social performance, leading to better financial, social, and environmental outcomes.

Performance Standard 2 - Labor and Working Conditions: This standard emphasizes that economic growth through job creation and income should protect workers' fundamental rights. A company's workforce is a valuable asset, and maintaining a positive worker-management relationship is crucial for sustainability. Poor worker-management relations can harm worker commitment and retention and jeopardize projects. Conversely, fair treatment and safe working conditions can enhance efficiency and productivity.

Performance Standard 4 – Community Health, Safety and Security: This standard aims to safeguard the health, safety, and security of communities affected by business activities. It emphasizes the importance of identifying and managing risks and impacts on community health, safety, and security throughout the project lifecycle. The standard includes guidelines for emergency preparedness and response, managing security forces, and ensuring the safety of project design and infrastructure.

Japan Bank for International Cooperation (JBIC)

3.5.15 JBIC requires that environmental and social aspects of a project to be considered through conducting an ESIA that covers all environmental matters related to the project in addition to social matters including human rights, forced settlements, working conditions, and community health, safety and security.

Dhaka Principles

3.5.16 The Dhaka Principles, developed by the Institute of Human Rights (IHRB), are a set of 10 human-rights based principles to enhance respect for the rights of migrant workers from the moment of recruitment, during employment, and through to safe return (IHRB, 2017). They are intended for use by all industry sectors and in any country where workers migrate either inwards or outwards. The Dhaka Principles for Migration with Dignity will be implemented for evaluating and managing the social aspects of the Project in relation to labourers.

3.5.17 The importance of these principles lies in two key points, which are ensuring that:

- All workers are treated equally and without discrimination
- All workers enjoy the protection of employment law.

3.5.18 Principles are on the fee charged on workers, their contracts, inclusivity, personal documents retention, wages on time, all forms of respect, working conditions, living conditions, ease of access to remedy, freedom of change.

The World Bank Group ESS and EHS Guidelines

The World Bank Group ESS 1: This standard requires conducting an overarching environmental and social impact assessment study covering several social aspects as relevant to the Project, including ESS 2 Labour and Working Conditions, ESS 4 Community Health and Safety, ESS 5 Land Use and related Restrictions and Resettlements in addition to ESS 10 on Stakeholder Engagement and Information Disclosure.

ESS2 - Labor and Working Conditions: This standard focuses on fair treatment, safe working conditions, and promoting sound worker-management relationships. It recognizes the importance of employment creation and income generation in the pursuit of poverty reduction and inclusive economic growth.

ESS4 - Community Health and Safety: This standard addresses the health, safety, and security risks and impacts on project-affected communities. It ensures the safety and health of communities affected by projects, with special attention to vulnerable groups.

ESS5 - Land Acquisition, Restrictions on Land Use and Involuntary Resettlement: This standard aims to avoid or minimise involuntary resettlement and mitigate its adverse impacts. It ensures that displaced persons are provided with opportunities to improve, or at least restore, their livelihoods and living standards.

ESS10 - Stakeholder Engagement and Information Disclosure: This standard emphasizes the importance of open and transparent engagement between the Borrower and project stakeholders. It ensures that stakeholders are informed and consulted about project activities and potential impacts.

3.5.19 The World Bank Group EHS guidelines are more of a technical and industry-specific guidelines to address and manage environmental, health and safety issues. By adopting these guidelines in addition to Qatar's local regulations, the ESIA will meet international standards for protecting workers and communities.

3.6 Noise and vibration

Qatari legislation

3.6.1 The standards issued by MoECC under the authority of the Environment Protection Law define noise limit values for residential, commercial and industrial zones. The regulation states that: "Noise criteria values are designed to protect the general public onshore from physiological impairment resulting from excessive levels of noise."

3.6.2 The Qatari national noise standards are summarised in Table 3.11.

Table 3.11: Qatari noise standards

Zones	Maximum noise level at property line (dB(A)) (10-minute time-weighted average)	
	Daytime[1]	Night-time[2]
Residential and institutional[3]	55	45
Commercial[4]	65	55
Industrial[5]	75	75

Notes:

1. The daytime standards would be applicable for the period from 04:00 to 22:00

2. The night-time standards would be applicable for the period from 22:00 to 04:00

3. A residential zone is an area where more than 50% of the properties are for accommodation, this includes schools, hospitals and mosques

4. A commercial zone is an area where more than 50% of the properties are shops, offices, garages and trading premises

5. An industrial zone is an area where more than 50% of the properties are for manufacturing facilities

Source: Executive By-Law to Law No. 30 of 2002

3.6.3 MoECC standards also highlight the requirement for the use of a noise monitoring device of a type and model that meets the requirements of international standards such as Type 1 noise level meter with an octave band analyser and a model that has been approved by the U.S. Environment Protection Agency, ANSI or equivalent.

International guidance

3.6.4 The World Bank Group (WB) has developed a thorough programme of pollution prevention and management techniques in order to ensure that projects funded by the organisation are environmentally and socially responsible. The IFC, a member of the WB, has produced EHS General Guidelines that apply to investment projects in various industry sectors. The limit values are given in Table 3.12. The IFC General EHS Guidelines state: "*Noise impacts should not exceed the levels presented in Table 1.7.1* [Table 3.12 below] *or result in a maximum increase in background levels of 3 dB at the nearest receptor location off site.*"

3.6.5 The guidelines values are far free field values measured outdoors and more 3m from reflective surfaces (e.g. walls) and are therefore 'free field' values.

Table 3.12: IFC/WB EHS noise level guidelines

	Noise level $L_{Aeq,1\ hour}$ dB	
Specific environment	**Daytime 07:00 – 22:00**	**Night-time 22:00 – 07:00**
Residential, educational or institutional	55	45
Industrial or commercial	70	70

Source: World Bank Group (2007). Environmental, Health and Safety (EHS) Guidelines: Noise Management.

3.7 Cultural heritage and archaeology

Qatari legislation

3.7.1 Qatar Law No. 2 on Antiquities (1980, amended 2010) defines and states the legal framework surrounding archaeological sites and antiquities. It:

- Defines movable and immovable antiquities and specifies the state's ownership of antiquities
- Outlines protection and reporting requirements for archaeological sites and antiquities
- Defines the role of the Qatar Museums Authority (QMA) in relation to the management of archaeological sites and antiquities.

3.7.2 Qatar is also a signatory to the international Convention Concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention 1984).

International guidance

3.7.3 Consideration of the archaeological and cultural heritage aspects has been written in line with the IFC Performance Standard 8: Cultural Heritage (2012). These performance standards and guidance have a focus on cultural heritage which specifically include consideration of unique features that embody cultural values. The following summarises the objective of the IFC Guidelines on cultural heritage:

- Protect cultural heritage from adverse impacts of proposed activities
- Support conservation of cultural heritage in context of project financing
- Promote awareness of and appreciation of cultural heritage, where possible

3.7.4 The JBIC environmental guidelines 2022 specify that cultural heritage is an environmental category upon which impacts must be examined. The guidelines also consider nationally protected areas for the conservation of cultural heritage, or their vicinity, to be sensitive areas.

3.8 Terrestrial ecology

Qatari legislation

3.8.1 The main legislation in place with relation to the protection of terrestrial ecology in Qatar comprises:

- Decree No (55) of the year 1992 approving the Protocol on the protection of the marine environment from pollution resulting from sources on land
- Law No (32) of the year 1995 prohibiting damage to flora, the greater environment and its components
- Decree No (90) of the year 1996 approving the Biological Diversity Agreement of the year 1992
- Law No (19) of the year 2004 Protection of wildlife and natural reserves.

3.8.2 In addition to these laws, Qatar has issued the Environmental Protection Law, No. 30 for the Year 2002 which, amongst other requirements, outlines the general requirements for the planning and application of project and environmental standards and the resulting Rules on Environmental Impact Assessment, 2003. The laws both implicitly and explicitly require the natural environment to be considered within ESIAs.

International guidance

- IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- IFC Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- The World Bank EHS Guidelines: General EHS Guidelines (2007).

International treaties and conventions

3.8.2.1 Qatar has also signed and/or ratified a number of international conventions with regard to ecology/biodiversity. These include:

- Convention on Biological Diversity (CBD), 1993
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1975
- Convention on the Conservation of Migratory Species of Wild Animals (CMS), 1983
- Ramsar Convention on Wetlands, 1971
- World Heritage Convention, 1972

- Convention Concerning the Protection of World Cultural and Natural Heritage (UNESCO), 1946
- International Treaty on Plant Genetic Resources for Food and Agriculture, 2004
- International Plant Protection Convention (IPPC), 1951
- The United Nations Convention to Combat Desertification (UNCCD), 2000

3.9 Soil, hydrology and contamination

Qatari legislation

3.9.1 Executive By-Law for the Environment Protection Law, Decree Law No. 30 (2002) outlines requirements for protection of the environment against pollution and to promote sustainable development. Guidance particularly related to contaminated land includes:

- Article 21 – Emergency Response Plans for Environmental Disasters
  - The guidance includes development and implementation of an emergency response plan, mitigation of impacts following a disaster, documentation of impacts and reviewing practices and procedures following a disaster.
- Articles 22-60 – Hazardous Wastes and Material
  - This outlines requirements for suitable transport, handling, storage, use treatment and disposal of hazardous materials and waste.
- Articles 73-93 – Protection of the Water Environment against Pollution, specifically protection of surface/groundwater (Articles 73-78) and protection of the marine environment (Articles 79-93)
  - This outlines requirements for prevention of pollution from land sources and guidance for protection of groundwater and surface waters from contamination. Annex 3 provides specific standards for environmental and human health protection including water quality guidance values for drinking water and sea water.
  - In accordance with Article 88-89, it is prohibited to discharge pollutants to the marine environment. This law provides standards for discharge of particular potential pollutants when discharged to the water environment, and a list of prohibited pollutants which cannot be discharged (Annex 4). Annexes 8 and 9 of Law No.30 also provide guidance on the handling of hazardous waste and hazardous materials, including handling, transport and disposal.
  - In accordance with articles 18 and 19 environmental records must be maintained by the facility. Environmental sampling and testing should be conducted to monitor the environmental impact of the facility. In case of violation of any of the environmental standards, immediate correction is required.

International guidance

3.9.2 Assessment of soil and groundwater baseline will be undertaken using the internationally recognised Dutch Intervention Values (DIV). Where these standards do not provide limits for certain parameters, other available international soil and groundwater guidelines and standards protective of the water environment and human health will be utilised. These include World Health Organisation (WHO), USEPA, Dutch, Australian, Ontario, and UK guidelines.

3.9.3 Key standards and documents on international best practice related to the assessment and management of contaminated land, and good practice for pollution prevention and control include the following:

- IFC Performance Standard 3: Resource Efficiency and Pollution Prevention, in Performance Standards on Social & Environmental Sustainability (IFC, 2012)
- IFC Guidance Notes: Performance Standards on Social & Environmental Sustainability (IFC, 2012), specifically Guidance Note 3: Resource Efficiency and Pollution Prevention
- IFC General EHS Guidelines: Environmental, Contaminated Land (IFC, 2007)
- IFC EHS Guidelines for Water and Sanitation (IFC, 2007)
- World Health Organisation (WHO)
- Dutch Soil Protection Act – Soil and groundwater standards of the Dutch Ministry of Public Housing, land use and environmental guidelines (Dutch Ministry of Public Housing (MoH), 2000) and circular published in 2013. These are hereafter referred to as the Dutch Standards.
- National Environment Protection Council (NEPC) – Australia - Schedule B (1) Guidelines on Investigation Levels for Soil, April 2011. These are hereafter referred to as the Australian Standards.
- Ontario Standards – Soil, groundwater and sediment standards for use under Part XV.1 of the Environmental Protection Act (effective July 1, 2011). These are hereafter referred to as the Ontario Standards.
- Construction Industry Research and Information Association (CIRIA)- Assessing risks posed by hazardous ground gases to buildings (CIRIA C665, 2007)
- USEPA (2024). National Recommended Water Quality Criteria-Human Health Criteria.

3.9.4 IFC guidance (IFC, 2012) outlines the requirement for impact and risk assessment for key stages of a project, before construction, during construction, during operation and during/after the decommissioning stage. It also provides guidance on pollution prevention and control, waste disposal, handling of hazardous materials and emergency response.

3.9.5 IFC guidance for contaminated land (IFC, 2007) gives a broad outline of the requirement for risk screening, risk management, detailed quantitative risk assessment and risk reduction measures, where risk factors: source, pathways and receptors are likely to co-exist. The risk screening involves identification of contamination, sampling and testing, evaluation of the results and verification of sensitive receptors and the exposure pathways. Where necessary, a detailed risk assessment builds on the risk screening and involves detailed ground investigation to identify the scope of contamination.

3.10 Solid waste and material management

3.10.1 The Project's materials use, and wastes generated during construction and operation will be managed in accordance with the State of Qatar's National environmental guidelines stipulated in Law No. 30 of 2002 and its Executive By-Laws.

3.10.2 The management of waste and materials for the Project will also take into consideration the international best practices such as:

- World Bank Safeguard Policies
- IFC Performance Standards
- The Equator Principles and relevant IFC EHS Guidelines
- Japan Bank for International Cooperation (JBIC)

Qatari legislation

3.10.3 In accordance with Qatari Decree Law No. 30 of 2002 (and its Executive By-Laws), it is prohibited, unless with the approval of the competent Administrative Authorities to import, export, handle or transport hazardous waste. Thus, Qatar manages their hazardous waste within its boundaries through incineration, recycling, recovery and storage at its respective management facilities.

3.10.4 Hazardous waste nationally defined by the State of Qatar is in accordance with the Basel Convention, is stated in Article No.1 of Law No. 30 of 2002: the wastes of different activities or operations, or ashes thereof, which retain the characteristics of the hazardous material and which are discarded, such as clinical wastes from the medication activities, and wastes resulting from manufacturing of pharmaceutical compounds, drugs, organic solvents, inks, paints or jellies and creams.

3.10.5 All waste in the State of Qatar requires the approval of respective City Authorities and the concurrence of the MoECC While there is no specific procedure for identifying hazardous waste in Qatar, waste management facilities have adopted the environmental guidelines provided by the MoECC in addition to following the United States' Environmental Protection Agency procedures. Both hazardous and non-hazardous wastes are managed in accordance with appropriate environmental guidelines and industrial cleaning services operating with high-end safety and environmental standards. In line with Qatari Decree Law No. 30 of 2002 (and its Executive By-Laws), mandatory weekly inspections, surprise or scheduled, are conducted at all hazardous waste storage facilities.

3.10.6 The MoECC has a dedicated Hazardous Chemicals and Waste Department that is responsible for establishing regulations and technical requirements for licensing, trading, importing, exporting, storing, transferring, and packing hazardous chemicals and waste in Qatar, in line with international standards. They also enact the relevant environmental standards, plans, and programs to treat hazardous chemicals and address their impact on the environment during their transfer, packing, storing, and production. The Department is also responsible for maintaining safety and prevention protocols in line with internationally applied standards. The ministry establishes and implements a system to track hazardous chemicals and waste in coordination and collaboration with the relevant administrative units and government agencies, while also submitting up-to-date reports and figures on those chemicals.

International guidance

3.10.7 In addition to Qatari Legislation the ESIA will follow international guidelines to ensure best practices in waste and materials management for the proposed Project.

3.10.8 IFC Performance Standard 3 on Pollution Prevention and Abatement stipulates that hazardous and non-hazardous waste materials need to be avoided where possible, when avoidance of waste generation cannot be done but was minimized instead, waste must be recovered and reused. The Project must treat, destroy and dispose of waste that cannot be recovered or reused in an environmentally sound manner. When hazardous waste is in consideration, its disposal must be done in an environmentally sound manner and limitations to its transboundary movement will be considered in accordance with the Basel Convention. When waste management is handled by third parties, the contractors used will be of good reputation and enterprises that are legitimate and licensed by the relevant regulatory agencies.

3.10.9 This ESIA has also taken into consideration IFC General EHS Guidelines for Waste Management (2007) which provide recommendations on hazardous and non-hazardous waste management and disposal. These guidelines provide advice on creating and following a Waste Management Plan which will include procedures for preventing waste, minimising waste, a plan to separate different types of waste, the proper storage, transportation and disposal of all wastes produced during the construction, operation and decommissioning of the proposed Project.

3.10.10 Since the Project is seeking financing from JBIC, their guidelines for Confirmation of Environmental and Social Considerations (2022) have also been taken into account. These guidelines require projects to assess and manage environmental impacts which include waste. They encourage waste reduction, recycling and pollution prevention in line with the World Bank Environmental and Social Standards (ESS) and IFC Performance Standards. The JBIC Guidelines (2022) have been formulated based on discussions in the international framework on environmental and social considerations and discussions held at the OECD.

3.10.11 The management of waste and materials during the Project lifecycle is framed based on these guidelines and thus the Project’s ability to meet GIIP will be greater.

3.11 Landscape and visual impact

Qatari legislation

3.11.1 Qatar’s regulations for landscape and visual impact assessments are embedded within broader ESIA frameworks.

3.11.2 Key aspects include:

- Environmental Protection Law (No. 30 of 2002): mandating the protection of natural landscapes and visual amenities, requiring assessments to consider the visual impact of projects on the surrounding environment.
- Qatar Construction Specifications (QCS 2024): These specifications include guidelines for mitigating visual impacts during construction and operation phases.

International guidance

3.11.3 The IFC's Performance Standards provide detailed guidelines for landscape and visual impact assessments:

- IFC Performance Standard 1 (PS1): This standard requires the identification and assessment of environmental and social risks and impacts, including those related to landscape and visual receptors.
- IFC Performance Standard 6 (PS6): This standard focuses on biodiversity conservation and sustainable management of living natural resources, which includes considerations for landscape and visual impacts.

3.12 Transport

Qatari legislation

3.12.1 Qatar's regulations for assessing transport impacts are embedded within the broader environmental legislation, including the following requirements:

- Mitigation Measures: Proposals to mitigate adverse impacts, such as improving road infrastructure or implementing traffic management plans.
- Public Consultation: Engaging with stakeholders, including local communities, to gather input and address concerns related to transport impacts.

International guidance

3.12.2 The IFC's Performance Standards, particularly Performance Standard 1 (Assessment and Management of Environmental and Social Risks and Impacts), outline the requirements for assessing transport impacts. This includes:

- Risk and Impact Identification: Identifying potential transport-related risks and impacts during the project lifecycle.
- Mitigation Hierarchy: Applying a hierarchy of mitigation measures to avoid, minimise, or compensate for adverse impacts.
- Stakeholder Engagement: Ensuring continuous engagement with affected communities and other stakeholders to address transport-related concerns.
- Monitoring and Reporting: Implementing systems to monitor transport impacts and report on the effectiveness of mitigation measures.

3.13 Relevant treaties and conventions

3.13.1 Qatar is signatory to a number of regional and international conventions and protocols concerned with environmental protection.

3.13.2 Table 3.13 notes the main relevant international and regional treaties, conventions, protocols, and agreements that Qatar are signatory to.

Table 3.13 International and regional conventions and treaties

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973
International Convention for the Prevention of Pollution from Ships (MARPOL), 1973 (amended 1978)
ROPME, 1978 and associated Protocol on the Control of Marine Transboundary Movements and Disposal of Hazardous Wastes and Other Wastes, 1998
International convention on maritime search and rescue, 1979 protocols relating to maritime navigation.
United Nations Convention on the Law of the Sea (UNCLOS), 1982
Vienna Convention for the Protection of the Ozone Layer, 1988 (signed 1996)
Montreal Protocol on Ozone Depleting Substances, 1989 (signed 1996)
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their disposal, 1989
Protocol for the protection of the Marine Environment Against Pollution from Land Based Sources, 1990
The Arab Declaration on Environment and Development 1991
United Nations Framework Convention on Climate Change, 1992 (signed 1996)
Convention on Biological Diversity, 1992 (signed 1996)
United Nations Convention to Combat Desertification, 1994 (signed 1999)
Kyoto Protocol to the Framework Convention on Climate Change, 1997 (signed 2005)
Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC), 1998
Stockholm Convention on Persistent Organic Pollutants (POPs), 2001 (signed 2004)
Convention on Conservation of Wildlife and its Natural Habitats in the GCC, 2003
ILO Convention on Discrimination
ILO Convention on the Child Labour
ILO Convention on Forced Labour
ILO Convention on Minimum Age
ILO Convention on Labour Inspection

ILO Convention on Abolition of Forced Labour
Minamata Convention on Mercury, 2013 (2020)
Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC), 2015
Doha Amendment to the Kyoto Protocol, 2012
International Convention for the control and management of ship's ballast water and sediments, 2004

Source: Mott MacDonald, 2025

4 Alternative Analysis

4.1 Methodology

4.1.1 This section explains the method used to analyse alternatives for the Project. The approach follows GIIP and ensures the best option is chosen based on sustainability, technical feasibility, and environmental responsibility.

4.1.2 The methodology for the alternatives analysis included the following steps:

1. Identification of Alternatives

- Various options were considered, including the "No Project Alternative", different site locations, and alternative technologies and designs.
- These alternatives were identified to ensure a comprehensive evaluation of all possible options.

2. Evaluation Against Selection Criteria

The alternatives were assessed using a structured framework based on:

- Technical Feasibility: Ability to achieve the required energy and water production targets.
- Economic Viability: Cost-effectiveness over the project's life cycle.
- Environmental Sustainability: Minimising negative impacts on natural resources, biodiversity, and communities.
- Safety Implications: Ensuring operational and public safety during all phases of the Project.

3. Stakeholder Consultation

- Engagement with stakeholders was a key component to ensure local needs, concerns, and expectations were incorporated into the decision-making process.

4.1.3 This approach ensures the alternatives analysis meets international standards like the IFC Performance Standards and the Equator Principles, as well as local Qatari regulations. It also ensures that the process is transparent, inclusive, and focused on long-term sustainability.

4.2 No project alternative

4.2.1 If the Project does not proceed, there would be no environmental or social impacts resulting from its construction or operation. However, several significant benefits would also be lost, including:

- **Unmet Energy and Water Demands**: Qatar's growing demand for electricity and potable water would remain unmet, leading to potential shortages that could hinder economic development and reduce the quality of life for residents.
- **Loss of Economic Benefits**: The economic stimulation provided by the Project, including the creation of employment opportunities for approximately 6,000 workers during construction, would be forgone.

- **Missed Environmental Advancements**: The use of advanced, low-impact technologies such as CCGT and Reverse Osmosis (RO) for desalination, which are designed to minimise emissions and conserve resources, would not be realised.
- **Reduced Government Revenue**: The revenue generated from the Project could contribute to Qatar's sustainability initiatives, infrastructure development, and national growth objectives. Without the Project, these contributions would be lost.
- **Continued Reliance on Older Infrastructure**: Existing systems at RAF A may not meet future demands or align with Qatar's sustainability goals, increasing dependence on less efficient and more environmentally impactful alternatives.

4.2.2 The lack of these benefits, combined with the risks of failing to address the country's growing energy and water needs, makes the "No Project" alternative unacceptable on economic, environmental, and social grounds. As a result, the decision was made to identify and implement the most suitable location and technology for the Project.

4.3 Site selection alternatives

4.3.1 Along the same outfall route (oriented 90 degree from North), several alternatives were explored, this included changing the length of pipelines (i.e. 2.6km 2.8km, 3.0km and 5.0km). These alternative locations of different lengths had also undergone several iterations including orientation to 135 degrees North at 2.2km and 120 degrees North at 2km long. The length and orientation were deemed to be the most suitable length, as this was the only length and orientation that fulfilled the requirements of not exceeding depth-average excess temperatures at the discharge by 3.0^{C}. Further details on this requirement are outlined within Table 3.2.

4.4 Technology and design alternatives

4.4.1 The technology selection for the Project focused on ensuring flexibility between power and water production. The following configurations were considered:

1. Power (CCGT) & Water (Thermal+RO)
2. Power (CCGT) & Water (Thermal)
3. Stand-alone Power (CCGT)
4. Stand-alone Water (RO)

4.4.2 Combined Cycle Gas Turbine (CCGT) technology was selected for power generation as it is efficient and produces and lower emissions that alternative technologies. For water production, Thermal and Reverse Osmosis (RO) desalination technologies were considered. Thermal desalination is ideal for large-scale water production, RO is more energy-efficient and can integrate with power generation. Therefore, the final selection of technologies taking CCGT for power and combining Thermal and RO for water production ensures operational flexibility, increased efficiency, and reduced environmental impact.

4.5 Justification for preferred alternative

Thermal and RO Desalination was selected because it features low energy demand and high efficiency, therefore significantly reducing the CO_2 footprint. It also achieves zero liquid discharge and minimises the use of chemicals. CCGT was selected because it reduces environmental emissions and enhances energy efficiency and has a low fuel consumption.

5 Baseline Environmental and Social Conditions

5.1 Definition of study area

5.1.1 Qatar is an independent state in the southern Arabian Gulf surrounded by Saudi Arabia, Bahrain, the United Arab Emirates and Iran. The country is situated midway along the western coast of the Arabian Gulf between latitudes 24.27° - 26.10° North and longitude 50.45° - 51.40° East. It is approximately 11,437km^2 on a low-lying limestone peninsula projecting northward about 160km into the Gulf. The coastline is 550km long and bounds the country to the west, north and east.

5.1.2 The Project will be located immediately to the north/east of the Qatar Economic Zone 3 (QEZ-3). QEZ-3 covers an area of 44km^2, the largest of Qatar's economic zones. This zone is part of Qatar's broader strategy to diversify its economy with petrochemical, building material, maritime, logistics and food processing industries.

5.1.3 Each topic has specified its own study area under the following section headings below.

5.1.4 The baseline assessment methodology comprised two main components which were a desktop study, followed by baseline survey.

5.1.5 The desktop study established the initial baseline and was derived from previous ESIAs, reputable desk-based data, and peer-reviewed literature. In addition, the applicable regulatory frameworks relevant to the Project area were reviewed. The outputs were a list of the key surveys that were required to supplement the baseline, as well as the methodology and scope for the wider environmental and social chapters. This was informed by the following previous studies of the area:

Previous studies in the area include:

- QEWC RAF A, Environmental Impact Assessment Study Report (Rev 01) (January 2022)
- Petroltecnica Environmental Services- Terrestrial Ecology Survey Report (February 2025) (Petroltecnica Environmental Services, 2025a)
- Petroltecnica Environmental Services- Mangrove Survey Report (February 2025) (Petroltecnica Environmental Services, 2025b)
- RAF A2 Desalination Project - Environmental and Social Impact Assessment (June 2013) (Mott MacDonald)
- Facility D IWPP - Environmental Impact Assessment, (July 2015) (Mott MacDonald)
- Ras Abu Fontas (A) Station - Dismantling, Demolition, Excavation, Removal and Disposal -Environmental Impact Assessment (January 2022) (Petroltecnica Environmental Services)

5.1.6 This was further supported by the following publicly available information (further information including citations is within the topic specific sections):

- Published Scientific Papers
- Bathymetric Data/Admiralty Charts
- Google Earth and Satellite Imagery

5.1.6.1 Following the desktop study, a series of site surveys were undertaken to further inform the environmental baseline of the Project and are summarised in the sub-sections below (note that the full survey reports which include further desktop information, the methodology, site locations and results are all provided within Appendix J (403100049-C001-MML-RP-EN-018) and so are not repeated here):

- Ambient Air Quality Monitoring
- Marine Survey (including seawater and sediment sampling and analysis)
- Terrestrial Ecology and Habitat Survey
- Ambient Noise Level Monitoring
- Ground Gas Sampling and Analysis
- Groundwater Level Monitoring
- Soil Sampling

5.2 Marine environment

Overview

5.2.1 This section presents a summary of the survey methodologies and baseline characterisation of the marine environment of the Project area, with focus on biodiversity to enable comparison of the current situation with changes anticipated to biodiversity receptors as a result of the Project. It includes legally protected and internationally recognised habitats and species.

Study area

5.2.2 For the purposes of this ESIA, different areas of influence (AOI) are defined based upon the potential pathways of effects and the different ecology of biodiversity receptors. These are presented in Table 5.1 and will be used to search for different receptors that could feasibly be impacted by the Project. The table also includes justification for the distances selected and where pertinent the nature of features.

Table 5.1: Marine environmental areas of influence to inform marine baseline

Pathway of effect/Ecology of potential receptors	Area of Influence	Justification
Direct construction effects	1km	This is the distance at which direct effects from construction are most likely to occur where plant use and infrastructure directly change the marine environment through temporary or permanent habitat loss.
Construction hydrological connection	5km	Given the natural entrainment by the existing pipelines either side of the proposed outfall it is likely that construction dispersion is more restricted than the open ocean. As a precaution the zone of influence is based upon satellite maximum monthly mean surface current velocity between June 2022 and February 2025 (4.87cm s^{-1}) applied in all direction from the outfall for 1 day (~4.208km) rounded up to the nearest 1km.
Operational hydrological connection	15km	A recirculation study by HR Wallingford was conducted to determine the likely recirculation of the Project operation would potentially result in maximum temperature changes in combination with existing plants greater than 2°C under typical winds within ~4.5km (HR Wallingford., 2024).

Pathway of effect/Ecology of potential receptors	Area of Influence	Justification
		The study also showed maximum salinity changes in the benthic environment greater 5PSU were predicted within approximately 7.5km from the proposed discharge though lower concentrations of salinity changes were projected beyond the edge of the modelling output. As a precaution double the larger extent has been considered appropriate to capture receptors to potentially hydrological effects at far smaller changes in salinity and temperature. However, it is should be noted that the study was of cumulative effects and that mean differences under both calmer winds and typical winds were restricted to 5km from the discharge location at both surface and seabed.
Underwater noise propagation	2km	It is assumed that the main marine construction activities would comprise dredging and rock dumping to both level the bed for the outfall pipeline and secure it in place. A study by Sveegaard et al (2024) of underwater noise disturbance of very high frequency marine mammals from rock dumping for the creation of artificial reefs indicated that disturbance would occur within 1.2km (Sveegaard, Teilmannand Tougaard., 2024). The source levels for dredging have been reported to generate much quitter levels than estimated by the rock dumping study with little known disturbance effects published (Suedel et al., 2019).
Mobile and transitory species	30km	This is the range at which mobile species are likely to transit into areas influenced by the project. Based upon baseline information hawksbill turtle are known in the gulf from a study by Pilcher et al (2014) to have a maximum home range of 166.1km^2 which equates to a circle with a radius of ~7.3km (Pilcher et al., 2014). Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) also have been shown by Sprogis et al. (2016) to have a similar home range of 187km^2 which equates to a circle with a radius to ~7.7km (Sprogis et al., 2016). Therefore, if the approximate radii are applied as a coastal buffer the linear range equates on average to a 29.4km stretch of coast. To allow for variation in potential receptors this coastal stretched distance is applied as radius to capture potential species that could frequently visit the site.

Source: Mott MacDonald, 2025

Methodology

5.2.3 Baseline data collection consisted of a desk study and field surveys as described below. Given the breadth of species within the marine environment and often the paucity of information on thresholds of effect and baseline conditions that receptors inhabit, receptors will be grouped based upon their potential sensitivity, ecological importance, and relative ecological importance.

- Petroltecnica Environmental Services- Mangrove Survey Report (February 2025) (Petroltecnica Environmental Services, 2025b)
- RAF A2 Desalination Project - Environmental and Social Impact Assessment (June, 2013)

Desk study

5.2.4 At the time of writing, the 2025 surveys were yet to be completed and therefore this baseline has been established using publicly available data and data shared by the client. Once the 2025 data has been received, the baseline and impact assessment will be reviewed to ensure no changes are required and the results will be summarised in the Marine Environment Addendum Report (Appendix N).

5.2.5 The assessment involved establishing a baseline understanding of habitats, environmental conditions, and associated biodiversity present within the mBSA. This was undertaken through a desk study of national and international secondary data sources, which included:

- IBAT (https://ibat-alliance.org/) – purchase of a 30km buffer 'GIS Download' in February 2025 ("IBAT GIS data" presented in Appendix F)
- IUCN. 2025. The IUCN Red List of Threatened Species. Version 2025-1. https://www.iucnredlist.org. Accessed on [March 2025]
- WoRMS. 2025. World Register of Marine Species (taxonomy standardization). Version 2025. WoRMS - World Register of Marine Species. Accessed on (March 2025)
- FishBase. Version 2024-10. Search FishBase. Accessed on (March 2025)
- Local Ecological Footprint Tool – Qatar South of Doha (October 2024)
- EU Copernicus Marine Service information (2025)
- Monitoring data from the Musaimeer Pumping Station and Outfall (MPSO) Project shared with approval of Ashgal

5.2.6 The list of reviewed sources for this ESIA also includes:

- Environmental Consultancy Services – EIA Techno Commercial Proposal (October 2024)
- Facility E IWPP Project, Qatar – Environmental Scope of Works (SoW)/Terms of Reference (ToR) (December 2024)
- Environmental Impact Assessment Study Report (Rev 01) (January 2022)
- TCarta satellite derived bathymetry (2025)
- Mangrove Survey Report. Petroltecnica Environmental Services (PES). March 2025.

5.2.7 In addition, peer reviewed academic literature pertinent to the region or species has been reviewed and is as cited throughout the document.

Field survey methodology

5.2.8 Due to poor prevailing weather conditions the field surveys have been delayed and will be submitted as an appendix to this report. Assumptions on a precautionary basis have been made on baseline information which will be validated by the results of the field survey. In addition, where the assessment identifies potential impacts on potential features, contingent mitigation measures will be discussed should the assumptions prove invalid from evidence in the survey results.

5.2.9 Seawater and sediment quality monitoring are undertaken in ten locations across the area where the discharge could potentially disperse to and a site located outside of the potential dispersion area to act as a control site. These are located around each of the existing intakes and outfalls for the RAF A1/A2, RAF A3, and RAF B/B2 sites, at 500m from the RAF A1/A2 and RAFA3 outfall locations, at the closest known seagrass location and at control sites to the north and south of the potential dispersal area. Water quality profiling measurements are conducted before the water quality sample collection comprising in-situ temperature, salinity, conductivity, dissolved oxygen, turbidity, and pH measurements. Seawater samples are collected from each depth profile: three (3) depths: 1m below the surface, mid-column depth, and 1m above the seabed. The seawater samples are analysed for physicochemical properties (See full list in Table 5.2 including pollutants, nutrients, turbidity, temperature, salinity, conductivity, pH, and dissolved oxygen).

Table 5.2: Water and sediment quality parameters of interest

Medium	Parameter	Acquisition type
Water	Conductivity	Sonde
	Colour	Sonde/visual comparison to munsell chart or equivalent
	Temperature	Sonde
	Dissolved Oxygen	Sonde and samples*
	Conductivity	Sonde
	Turbidity	Sonde and samples*
	Salinity	Sonde and samples*
	Fluoresces	Sonde as Chlorophyll α equivalence
	Chlorophyll α	Samples*
	Secchi depth	Discrete test
	Total suspended solids	Samples*
	Total dissolved solids	Samples*
	Dissolved organic carbons	Samples*
	Total inorganic carbon (carbonate, bicarbonate, and dissolved carbon dioxide)	Samples*
	Fluorides	Samples*
	Free chlorine	Samples*
	Trihalomethanes	Samples
	Cyanide compounds	Samples
	Sanitary determinants (Faecal coliforms, egg and worm parasites, and Escherichia coli)	Samples*
Water and Sediment	Nitrogenous compounds (Nitrates, ammonia, Urea and total nitrogen)	Samples*
	pH	Sonde and samples*
	Biological oxygen demand	Samples*
	Chemical oxygen demand	Samples*
	Oxidative redox potential (ORP)	Sonde
	Microplastics	Samples
	Phosphates	Samples*
	Sulphate and sulphides	Samples*
	Total hydrocarbons (subtotals for tar & tar oils, oils, greases, and petroleum hydrocarbons)	Samples
	Phenol	Samples
	Dioxin/Furans	Samples
	Polycyclic aromatic hydrocarbons (PAHs)	Samples or sonde
	Benzene, Toluene, Ethylbenzene and Xylenes (BTEX)	Samples
	Halogenated hydrocarbons (including Poly- and perfluoroalkyl substances (PFAS), Polychlorinated Biphenyls (PCBs))	Samples

Medium	Parameter	Acquisition type
	Organochlorine and organophosporous pesticides (Dimethoate, Malathion, Alrdin, Dieldrino, DDT, Chloridane, and Endrine)	Samples
	Trace and heavy metals (Al, As, Ag, B, Ba, Cd, Co, Cr, Cu, Fe, Hg, L, Mo, Mn, Ni, Pb, Se, Zn)	Samples
Sediment	Total Organic carbon	Samples
	Total organic matter (Loss on ignition)	Samples
	Particle size distribution	Dry sieved over 0.5 intervals (0 to -6Phi)

Source: Mott MacDonald, 2025

*Water samples for these compounds are acquired at three depth horizons ideally near surface, mid water depth/base of significant clines and near bottom.

5.2.10 Zooplankton and phytoplankton are collected using a bongo net from the exact sampling locations as the water. These are collected as vertical trawls from mid depth to surface to understand discrete communities at that local. Further sampling of the general plankton community are undertaken using an oblique trawl (from mid depth to surface) towed over a set distance horizontally depending upon site conditions though a minimum of 10 minutes will be conducted at the control site and the two sites 500m from the RAF A1/A2 and RAFA3 outfall location. Upon completion of the field survey, all samples are fixed (using formalin or Lugol's iodine) then transferred to a plankton taxonomist for identification and enumeration.

5.2.11 Sediment samples are also collected from within the Project area, in the same sampling locations as seawater (excluding any unsamplable rocky habitats). Sediment samples are collected using a van Veen grab, handled, stored, and analysed following applicable APHA (American Public Health Association) and US EPA extraction and test methods for the parameters of interest (See full list in Table 5.2). In addition, a separate sample is taken then sieved over a 0.5mm meshed sieve, with the retained infauna preserved in 5% formalin solution with rose-bengal stain for the taxonomical analysis. The content of the sieve is recorded photographically, and taxonomic classification of the benthic organism is carried out.

5.2.12 Short 100m transects by 1m width is conducted using a drop-down camera at each of the water and sediment sampling locations to determine the habitats. The camera is used to determine substrate type, dominant habitat, any ecologically significant features (corals) along with its condition, any debris or litter or evidence of contamination (Areas of anoxic sediment or eutrophic conditions).

5.2.13 Within the previously identified Northern Seagrass Habitat, there will be seven permanent monitoring sites at different distances from the discharge (including one control outside of the potential dispersion area). Quantitative scuba and drop-down camera investigation of habitats are undertaken along with in-situ temperature, salinity, conductivity, dissolved oxygen, turbidity, and pH measurements at each sampling location. A further 11 locations of rapid assessment are undertaken using drop down cameras to confirm the wider seagrass bed quality across the expanse of the bed. Three rapid assessment transects via towed video is conducted to look a bed consistency at smaller spatial scales and quantify associated sensitive species. These transect will be 100m in length and 1 m wide.

5.2.14 In addition, eight rapid assessments via drop down camera is completed within the sea grass habitat along the RAF A3 intake pipeline alignment.

5.2.15 Up to 12 further transects are selected to the east and south of the outfalls in line with the modelled dispersion gradient to characterise the wider habitats.

5.2.16 Throughout the survey notes are taken of any observations of marine megafauna such as turtles or marine mammals, detailing their number, position and their behaviour.

Marine environmental conditions

Marine water quality

5.2.17 Previous baseline data for the decommissioning of the existing RAF A site collected water samples weekly from the RAF A intake between 3rd April 2018 and 2nd April 2019. These were analysed for the following parameters in a laboratory: Oil and Grease, petrogenic hydrocarbon fractions (including gasoline range organics (GRO), Diesel hydrocarbon range (DHR) , and heavy fractions), Boron, Bromide, Sulphate, Fluoride, Phosphorus (Total), Orthophosphate, Phosphate, Nitrate, Total Organic Carbon, Algae, Aluminium, Barium, Calcium, Phosphorus, Nickel, Potassium, Strontium, and Total Petroleum Hydrocarbons. All parameters with values above the laboratory limits of detection are summarised in Table 5.3. The majority of samples were recorded below the limits of detection and those measurable were within the limits of applicable Qatar Seawater Quality Standards and no exceedances of the Qatar Seawater Quality Standards were observed from the test results.

Table 5.3: RAF A decommissioning intake seawater samples monitored between April 2018 and April 2019

Parameter Monitored	Minimum concentrations reported (mg/l)	Mean (mg/l)	Maximum concentration reported (mg/l)	Number of concentrations reported above limits of detection
Oil and Grease	5.5	5.7	6.3	8
DHR (C_{11}-C_{28})	<50	<50	<50	0
Heavy fractions (C_{29}-C_{40})	<0.050	<0.050	<0.050	0
GRO (>C_4-C_8)	0.085	0.085	0.085	1
Boron	0.8	6.0	7.4	25
Bromide	0.08	69.06	80	53
Sulphate	2990	3056	3180	5
Fluoride	2.78	3.88	5.5	5
Phosphorus (Total)	0.01	0.02	0.03	4
Orthophosphate as PO4	0.02	0.02	0.02	1
Phosphate	0.02	0.035	0.05	2
Nitrate	0.4	1.5	2	5
Total Organic Carbon	0.8	1.26	2.2	38
Aluminium (Al)	0.0017	0.0017	0.0017	1
Barium (Ba)	0.016	0.016	0.016	1
Calcium (Ca)	440	548.8	866	5
Phosphorus (P)	<0.02	<0.02	<0.02	0
Nickel (Ni)	0.0007	0.0007	0.0007	1
Potassium (K)	438	564	957	5

Parameter Monitored	Minimum concentrations reported (mg/l)	Mean (mg/l)	Maximum concentration reported (mg/l)	Number of concentrations reported above limits of detection
Strontium (Sr)	4.74	10.668	15.5	5

Source: Previous baseline data for the decommissioning of the existing RAF A intake between 3rd April 2018 and 2nd April 2019

5.2.18 Monitoring data shared with approval of Ashgal for the Musaimeer Pumping Station and Outfall (MPSO) Project cover the parameter listed in **Table 5.4** monthly from September 2022 to January 2025. A total of 44 samples were acquired over this period: the majority below limit of detection including for one or more samples for total organic carbons (TOC) Cadmium, Calcium, Copper, Iron, Magnesium, Nickel, Sodium, Vanadium, Chromium, Zinc, Aluminium, Cobalt, Selenium, Molybdenum, Barium, Manganese, and Arsenic. The exception were Sulphate, Chloride, Zinc and Lithium which were detectable in all samples. Given these waters are likely to form part of the project intake, the only potential point of concern is that Selenium exceeded MoECC Annex ¼ standards for substances discharged in the water environment (limit of 0.02mg/l).

Table 5.4: Monitored seawater samples from Musaimeer Pumping Station and Outfall (MPSO) Project September 2022- January 2025

Parameter Monitored	Minimum concentrations reported (mg/l)	Mean (mg/l)	Maximum concentration reported (mg/l)	Number of concentrations reported above limits of detection
Oil and Grease	<5.0	<5.0	<5.0	0
Total Ammonia	<10	<10	<10	0
Sulfide	<0.005	<0.005	<0.005	0
Total Nitrogen	<10	<10	<10	0
Total Suspended Solid	<5	<5	<5	0
Nitrate	<40	<40	<40	0
Sulphate	2960	3073	3250	44
Chloride	2400	24036	25400	44
Orthophosphate as PO_4	<0.02	<0.02	<0.02	0
Chemical Oxygen Demand	<5	<5	<5	0
5 Day Biological Oxygen Demand	<2	<2	<2	0
TOC	1.0	1.5	3.0	27
Fecal Coliform	<1.8	<1.8	<1.8	0

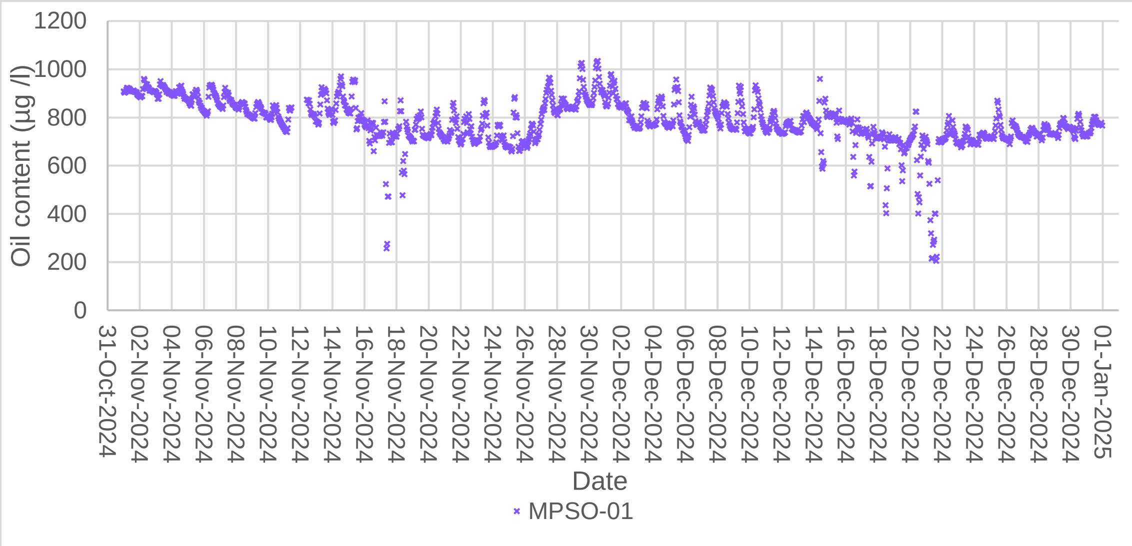
Parameter Monitored	Minimum concentrations reported (mg/l)	Mean (mg/l)	Maximum concentration reported (mg/l)	Number of concentrations reported above limits of detection
E-Coli	<1.8	<1.8	<1.8	0
Enterococci	<10	<10	<10	0
Cadmium	0.11	0.19	0.27	7
Calcium	457	512	608	26
Copper	0.80	2.17	3.60	9
Iron	5.82	5.82	5.82	1
Lead	<0.10	<0.10	<0.10	0
Magnesium	1450	1678	2230	26
Nickel	0.19	1.33	7.60	18
Phosphorus	<20	<20	<20	0
Sodium	1500	14130	17000	27
Vanadium	1	2.5245	4.7	40
Chromium	0.0001	0.0011	0.0043	10
Zinc	0.01	0.04	0.07	2
Boron	4.66	6.35	8.03	44
Aluminium	0.008	0.050	0.135	3
Cobalt	0.0006	0.0015	0.0037	34
Selenium	0.0026	0.0234	0.0553	34
Molybdenum	0.0120	0.0148	0.0187	27
Lithium	0.172	0.252	0.637	44
Barium	0.01	0.01	0.02	7
Manganese	0.0001	0.0014	0.0034	29
Arsenic	0.0008	0.0056	0.0220	28

Source: Mott MacDonald, 2025

5.2.19 In addition to samples, continuous monitoring has also been undertaken which has monitored oil contents, temperature, conductivity, total dissolved solids, dissolved oxygen and chlorophyll. To compliment and validate the findings over a wider area, a review of satellite derived data was also undertaken where parameters were measurable.

5.2.20 Over the period of deployment, the buoy monitoring nearby the Musaimeer Pumping Station and Outfall Project (Between 1st November 2024 and 31st December 2024) recorded oil contents using a sonde ranging between 204.7 to 1033.8 µg/l which is illustrated in Figure 5.1. .

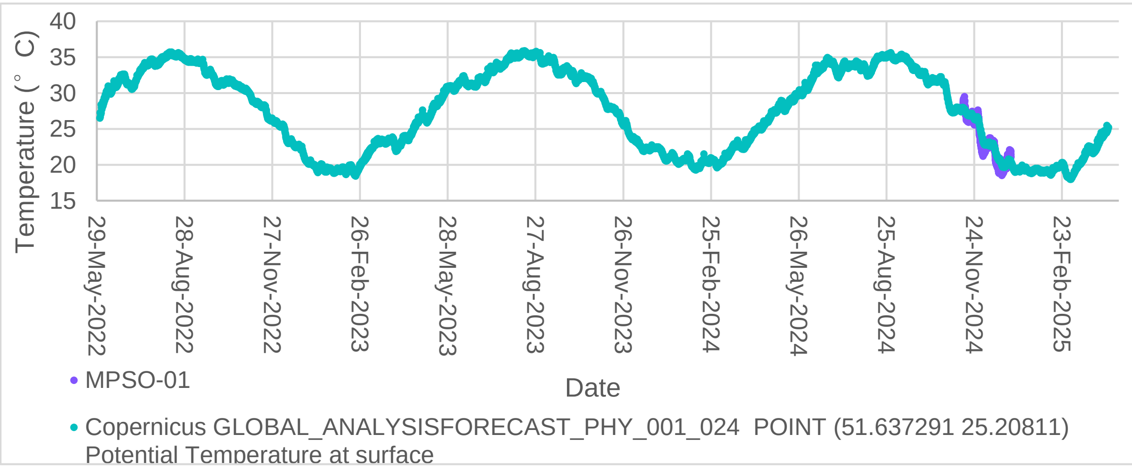
Figure 5.1: Monitored Seawater oil content between 1st November 2024 and 31st December 2024



Source: Mott MacDonald, 2025

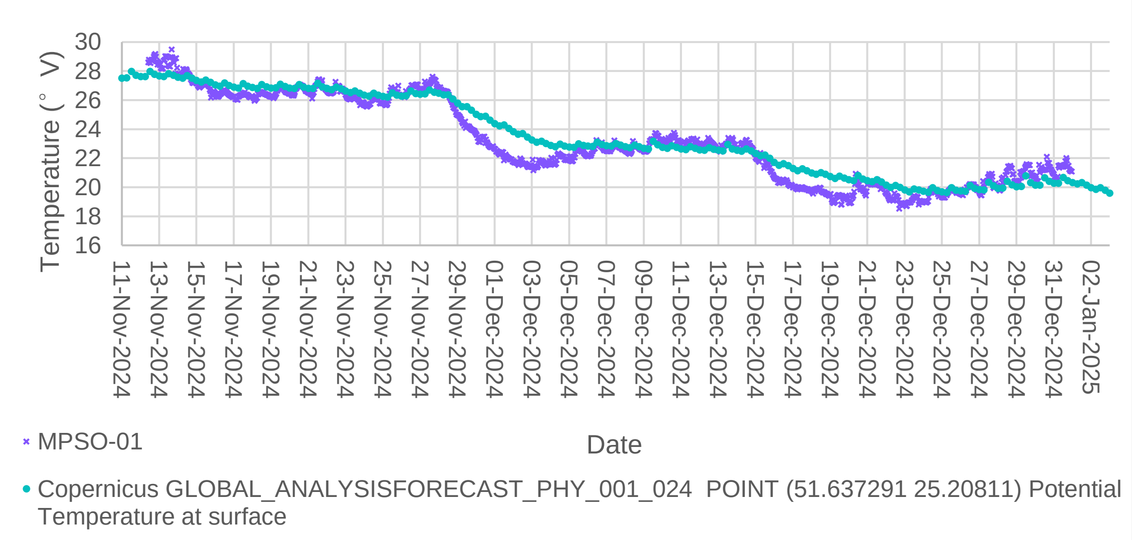
5.2.21 Surface seawater temperatures within the Arabian gulf ranges from highs of 37°C down to 13°C. Figure 5.2 illustrates how temperature varies overtime from two points within the marine zone of influence, one location close to the proposed intake and outfall derived from satellite-based information and one location north derived from buoy monitoring data from the Musaimeer Pumping Station and Outfall Project (Between 1st November 2024 and 31st December 2024). The data shows that the sea's surface temperatures range from 17.9°C in the winter to 35.9°C in the summer, the monitoring buoy generally matches the trend though slightly cooler than the satellite derived information for a few days at a time (as illustrated in the close up within Figure 5.3.

Figure 5.2: Sea surface temperature monitoring buoy and satellite derived information (Extract 1)



Source: EU Copernicus Marine Service Information, 2025

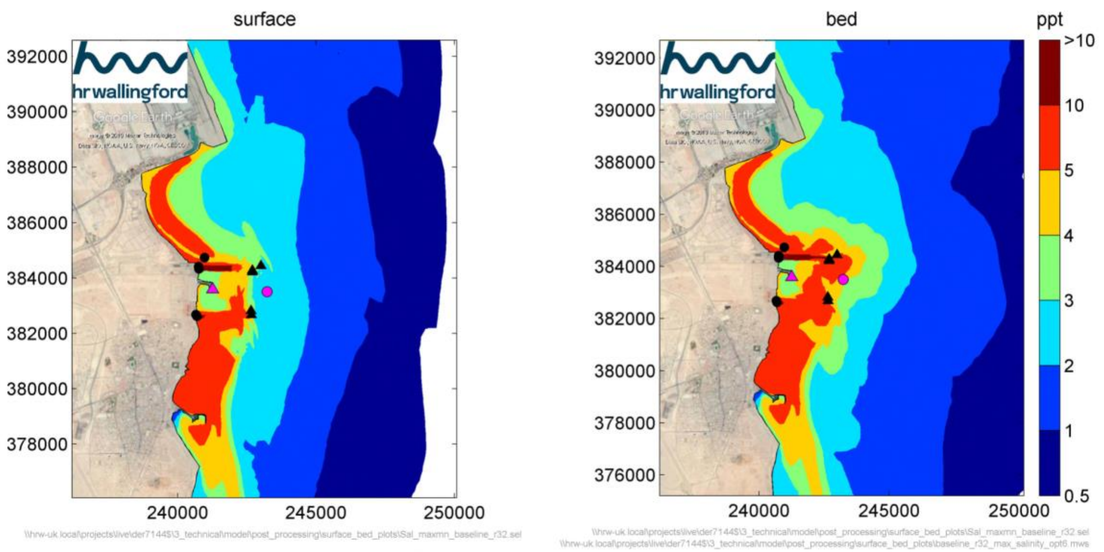
Figure 5.3: Sea surface temperature monitoring buoy and satellite derived information (Extract 2)



Source: Mott MacDonald, 2025

5.2.22 Salinity measurements illustrated in Figure 5.4 illustrate that satellite derived regional salinity generally ranges from 39.36 practical salinity units (PSU) to 40.00 PSU, however the monitoring buoy shows a more variable range between 37.44 to 42.06 PSU. The variability in the buoy will likely be resulting from the effects of variations in the existing desalination outfalls and potentially outfalls from the pumping station itself. A recirculation study conducted by HR Wallingford, indicated that salinities already could vary up to 10 parts per thousand (PPT) which are analogous to PSU as illustrated in Figure 5.4 depending upon the operation of the existing desalination plants (HR Wallingford, 2024).

Figure 5.4: Maximum salinity excess modelled baseline flows of existing RAF-A1, A2, A3, B & B2, and Umm al Houl IWPP desalination plants during typical winds



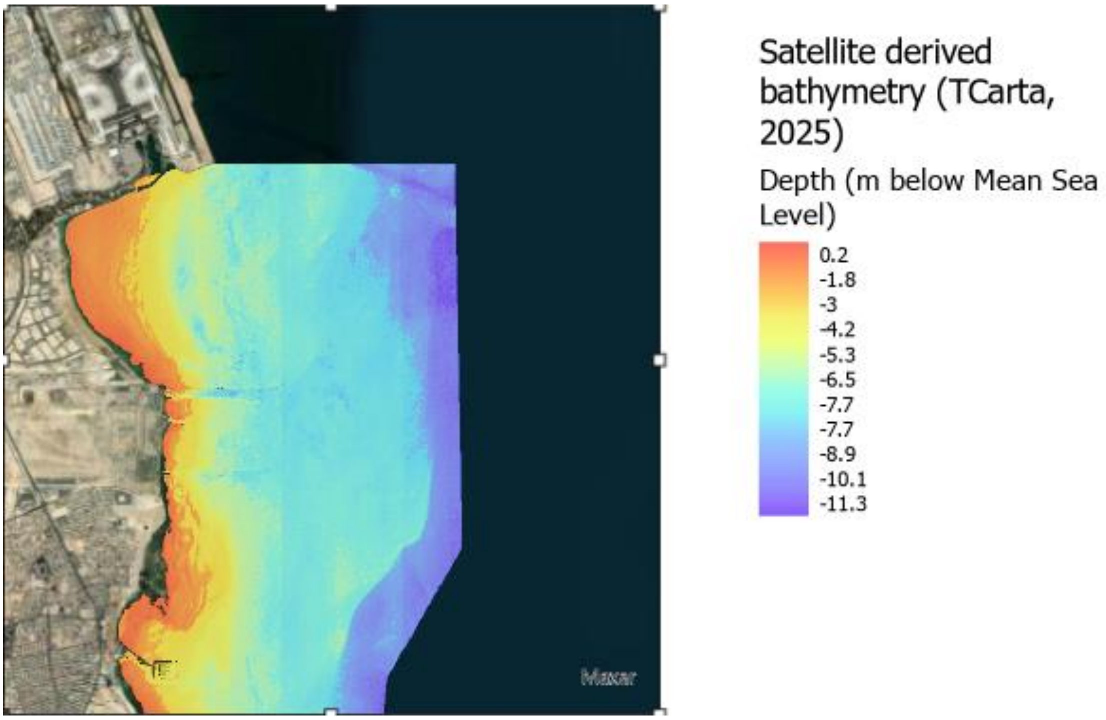
Source: HR Wallingford, 2024

Marine benthic geomorphology and sediments

5.2.23 A review of the broadscale geomorphology provides an indication of the sediment structures nearby the proposed project area and provide insight into potential habitats available for marine ecological features to inhabit.

5.2.24 A review of satellite derived bathymetry (TCarta, 2025) shows water depths from the coast to approximately 5km nearby the proposed project location are generally less than 12m below mean sea level (MSL), as illustrated in Figure 5.5. The bathymetry reveals trenches and ridges associated with the existing intake and outfall structures from the various developments along the coast suggesting the bay has been subject to a large degree of modification around the proposed outfall pipeline and intake structures.

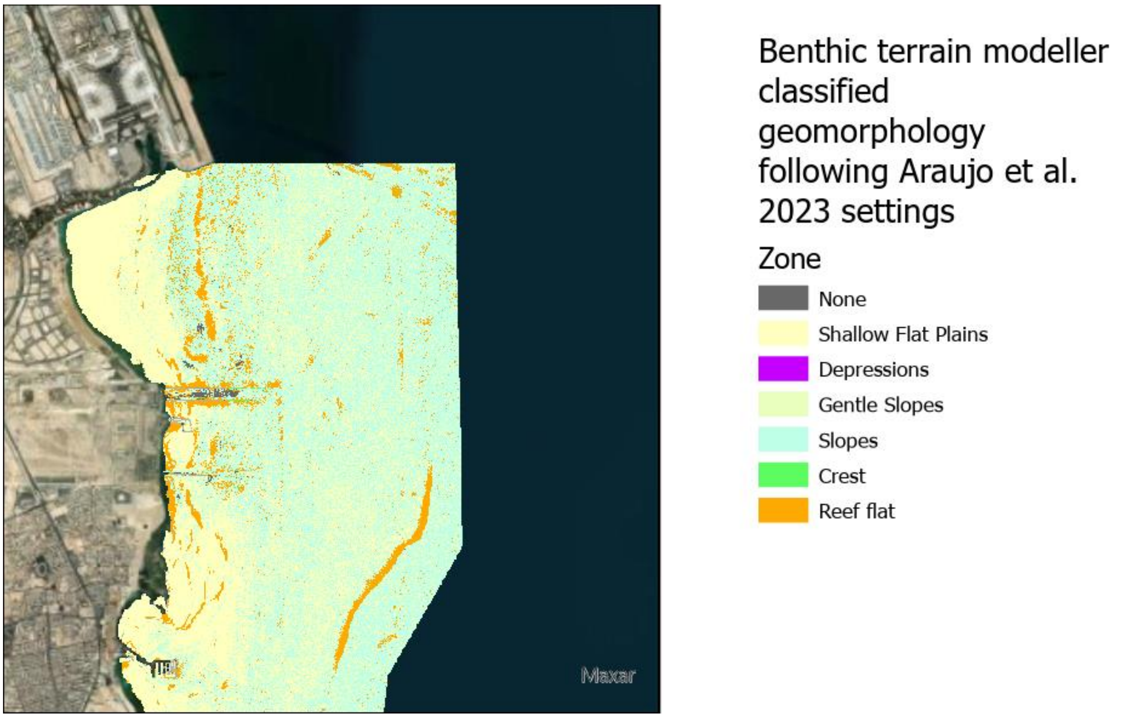
Figure 5.5: Satellite derived bathymetry



Source: TCarta, 2025

5.2.25 Using benthic terrain modeller on the satellite data following the settings outlined by Araujo et al (2023), provides a classification of the nearshore geomorphology that provides the physical structures supporting the marine biodiversity baseline. This is illustrated in Figure 5.6. Generally, the nearshore area is characterised as a shallow flat plain which as you move further offshore becomes a complex mixture of gradual and steep slopes which dominate most of the analysed seabed. A series of reef flats are identified running from the edge of Doha airport south towards the edge of the RAF A outfall. Other reef flats are interpreted around the outfalls those these are likely artificial associated with the construction of the outfalls. Smaller sickle shaped sets are seen off the point heading towards Al Wakrah which may also be natural. In addition, a larger continuous reef flat also thought to be natural is in the south-west of the satellite derived bathymetry dataset.

Figure 5.6: Seabed geomorphology classified using benthic terrain modeller following Araujo et al. 2023 descriptors



Source: Mott MacDonald, 2025

Marine biodiversity baseline

5.2.26 Qatar's marine ecosystems, including coral reefs, seagrass beds, and mangroves, support a variety of marine species. This section provides the marine biodiversity baseline desk study supporting the assessment of the potential environmental impacts. The baseline study provides a comprehensive overview of existing marine biodiversity, including species composition, habitat condition, and ecological functions.

Protected and key biodiversity areas

5.2.27 Qatar protects over 2.5% of its total area as a marine environment and is undertaking various projects to support biodiversity. These initiatives include expanding mangrove areas, surveying seaweed farming, and increasing coral reef habitats by creating Marine Protected Areas (MPAs) (The Peninsula Qatar, 2024, The Peninsula Qatar, 2025, Richer, 2018). The closest existing MPA is the Al Thakhira Reserve (>60km away) which is selected to protect seagrass beds that are essential for juvenile fish (Butler, S. et al., 2021, Erftemeijer and Shuail, 2012).

5.2.28 Although there are currently no protected areas within the marine areas of interest (AOI), the Ministry of Environment and Climate Change (MoECC) announced at the International Coastal Symposium in 2024 plans to update and establish marine protected areas (MPAs) in Al Wakra to conserve seagrass and mangroves in the region (Wong, 2024). In the Mesaieed and Al Wakra areas along Qatar's coastline, the mangrove species *Avicennia marina* was introduced in the 1980s to combat coastal erosion and habitat loss. The seedlings that were planted have since developed into thriving forests, contributing to a highly productive ecosystem along with the other habitats in the region including coral reefs and seagrass beds (Qatar e-Nature, 2025).

Habitats

5.2.29 The Qatar Marine Zone (QMZ) is approximately 35,000km^2, extending about 95 nautical miles seaward to the east and about 51 nautical miles to the north. The waters around Qatar are extremely shallow with an average depth of 30 m in the north and east, while on the western side, it is only 20 m deep. The QMZ, also catalogued under the Exclusive Economic Zone (EEZ), hosts unique ecosystems, including seagrass meadows and coral reefs, with fishing as a primary source of seafood. As the AOI lies within the QMZ this section reviews the potential presence of these unique ecosystems.

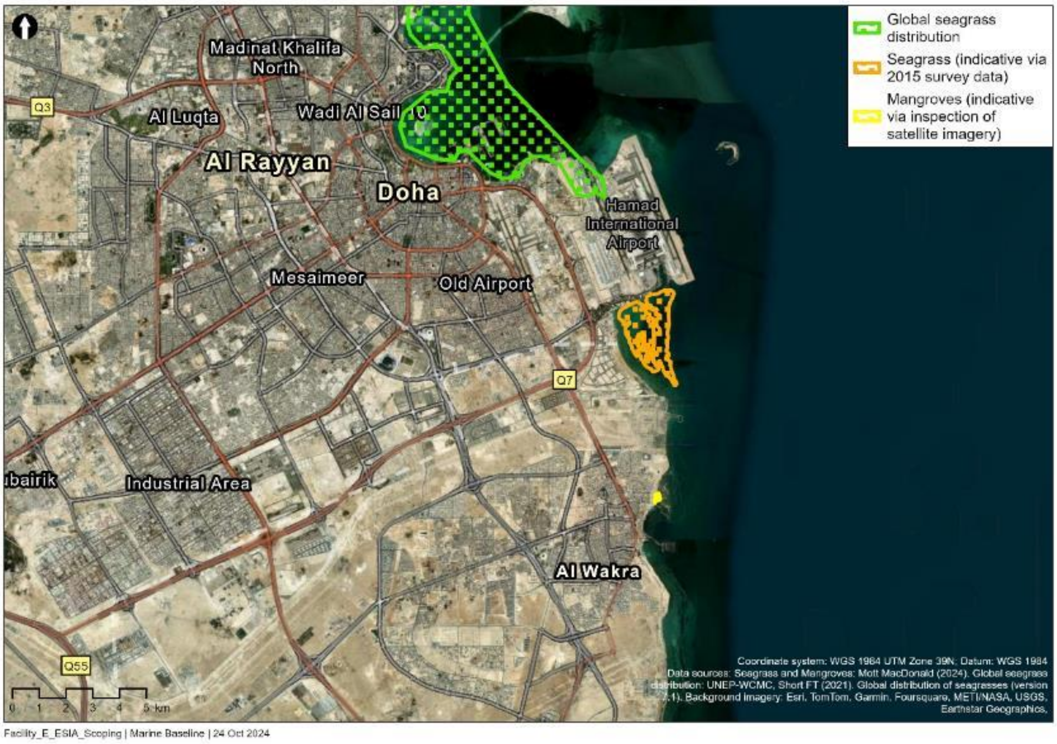
Seagrass beds

5.2.30 Most studies on seagrasses in Qatar focused on the eastern coastline, revealing varying species composition and dominance across locations. Studies show that seagrasses provide food for turtles, dugongs, and juvenile fish, as well as habitat for sponges, bivalves, ascidians, and various fish species. Three seagrass species are identified in the QMZ: *Halophila stipulacea*, *Halophila ovalis* (both from the family Hydrocharitaceae), and *Halodule uninervis* (from the family Cymodoceaceae). *Halodule uninervis* is the most common, followed by *Halophila stipulacea* (Jawad, L. A., 2021). These meadows act as biodiversity hotspots and are commonly found in Al Dhakira Bay and other coastal regions (Erftemeijer et al., 2012).

5.2.31 The seagrass areas in Qatar extend from the lower intertidal zone to depths over 10 m, with dense coverage typically found between 1–3 m. Deeper areas have patchy seagrass beds; width varies from 400 m to over 1 km. Also, the seagrasses in this area typically occur at depths of 1 to 5 m on sandy substrates (Jawad, L. A., 2021).

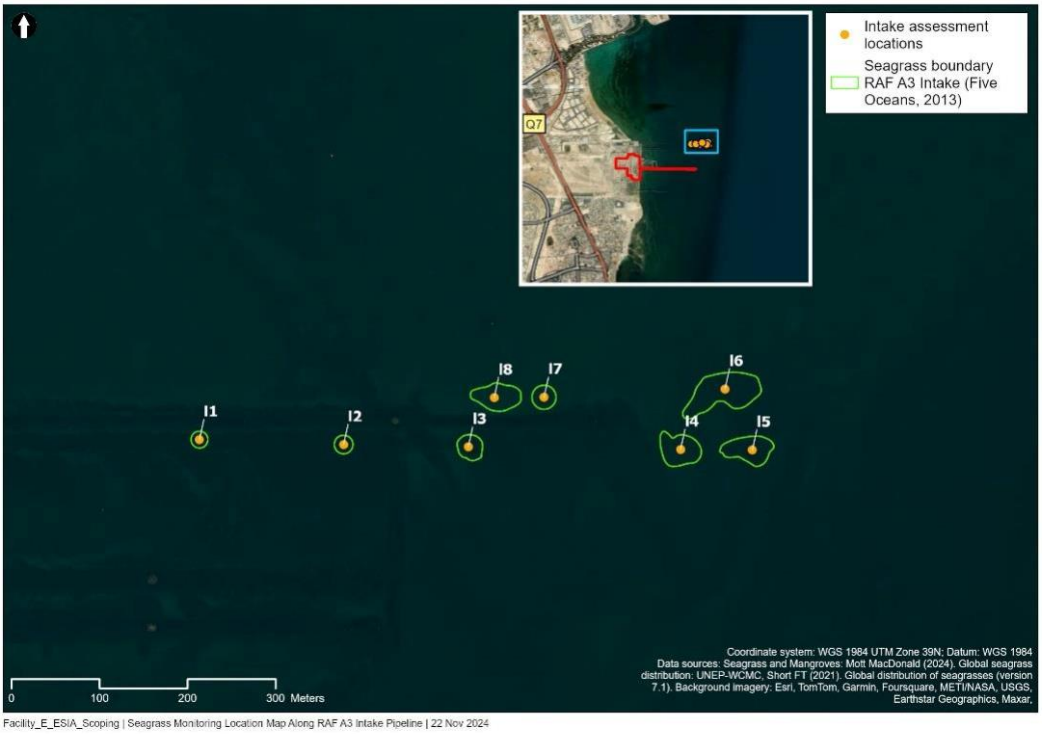
5.2.32 This ecosystem is facing pressure from pollution, coastal development, and climate change. A figure showing indicative extents of both seagrass and mangrove habitat is outlined in Figure 5.7. These habitats are not included in global distribution of seagrasses, nor other publicly available datasets and covered an area approximately 5km^2. In addition, small areas of seagrass have been noted along the existing RAF A3 intake pipeline which are illustrated in Figure 5.8, though only constitute approximately 0.87 hectares (0.0087km^2). As such it is likely that further seagrasses may be apparent further afield from the site location which are not yet surveyed not publicly available. The seagrass extents in the study area are likely to already have been impacted by coastal development including development of the New Port and QEZ, development of the airport as well as intakes and outfalls associated with the existing and former desalination facilities. Further to development marine habitats are vulnerable to the effects of continuing climate change pressures.

Figure 5.7: Seagrass and mangrove extent



Source: Mott MacDonald, 2025

Figure 5.8: Smaller seagrass areas along existing RAF A3 intake pipeline



Source: Mott MacDonald, 2025

Mangroves

5.2.33 Mangroves, comprising Avicennia marina within Qatar, are essential for sediment stabilisation and as nursery habitats for fish and invertebrates. They also play a role in carbon sequestration (Conservation in Qatar). However, the rapid urbanisation and pollution are leading to mangrove degradation (Hosseini et al., 2021). In the 1980s, the mangrove species Avicennia marina was planted along Qatar's coastline to combat coastal erosion and habitat loss. Seedlings were established in Mesaieed, Al Wakra, and other areas, resulting in established patches of mangrove that support the marine ecosystem, alongside coral reefs and seagrass beds.

5.2.34 There are no mangroves in the immediate vicinity of the Project. The closest are the Al Wakrah Mangroves approximately 3.5km south of the RAF Complex (see Figure 5.7). A dedicated mangrove survey was completed here on March 2025 and conducted by PES in 32 locations. The report is included in Appendix H and reports that some areas show signs of environmental stress, with evidence of chlorosis indicated throughout the perimeter of the mangrove stand. Other evidence of stress included a patch of decaying roots with anoxic sediments evident to northeastern edge, along with the presence of plastic waste across the area which can smother aerial roots. The survey also included crab species, such as *Metopograpsus messer* and *Grapsus sp.*, while live and dead gastropods were abundant. The only fish species noted was the Decorated Goby (*Istigobius decorations*), with juveniles seeking shelter among the mangrove roots, reinforcing the importance of mangroves as nursery grounds for marine life. Further information about terrestrial flora and fauna, are included separately in Section 5.8.

Coral Reefs

5.2.35 Coral reefs in the Arabian Gulf have a less complex three-dimensional structure compared to other regions, giving them the appearance of "coral carpets" (Villalobos et al., 2024) Though surveys for the current Project have yet to confirm these the potential natural reef flats, (Marine benthic geomorphology and sediment) might reflect suitable habitats that host such corals within the AoI north towards the north and south towards Al Wakra.

5.2.36 Coral reefs in the Arabian Gulf are among the most thermally tolerant ecosystems globally, providing critical habitats for reef fish and invertebrates (Burt, Feary and Van Lavieren, 2014). However, climate change and bleaching events have led to significant losses, with some regions experiencing over 90% coral mortality (Bouwmeester et al., 2021). Although coral diversity is lower due to environmental stress, some coral and fish species have adapted to survive in these harsh conditions (Rasul & Stewart, 2025). However, the corals in Qatar have the highest bleaching thresholds globally, with bleaching reported to occur only when temperatures exceed 34.5°C for consecutive days and lethal effects occurring above 35.5°C (Jawad, L. A., 2021). Moreover, quantifying bleaching effects in Qatar is challenging due to limited baseline surveys (Bouwmeester et al., 2021).

5.2.37 It’s likely that where any reefs are present in the region already subject to outfalls from the existing plants and the development of the associated with the new airport, the new port and the QEZ. Consequently, any corals are likely to form patch reefs at best or be former reefs dominated by algae.

Oyster beds

The *Pinctada radiata* reefs in the Arabian Gulf are historically significant and play a crucial role in water filtration and ecosystem diversity. These habitats enhance overall productivity. However, overfishing and habitat destruction have led to a decline in these habitats (Giraldes et al., 2023). Although there is an estimated 700 km^2 of hard-bottom habitat suitable for reef development within Qatar's EEZ, coral communities are currently limited to the northeastern tip of the peninsula and around offshore seamounts and islands (Fanning et al., 2021). However, it is important to highlight the natural reef flat area recognised in the geomorphological results

(Marine benthic geomorphology and sediments), might constitute such oyster beds. These might be either as potential areas for new settlement of juveniles or relic habitats given a lot of oyster beds ecosystems have changed significantly in the region (Qatar e Nature, 2025).

Intertidal species

5.2.38 The intertidal areas of Qatar have a record of 74 taxonomic groups across 14 phyla, Nematoda the most abundant, making up about 51% of the mean density, followed by Tanaididae (9.1%) and Harpacticoida (4.3%). Nematodes and rotifers generally show a positive correlation with silt and clay but negative correlations with sand, temperature, and salinity. Also, crustaceans, copepods, ostracods and molluscs are reported on intertidal areas, showing a positive correlation with carbonates, total organic matter, PO_4, and CO_3 (Rasul & Stewart, 2025).

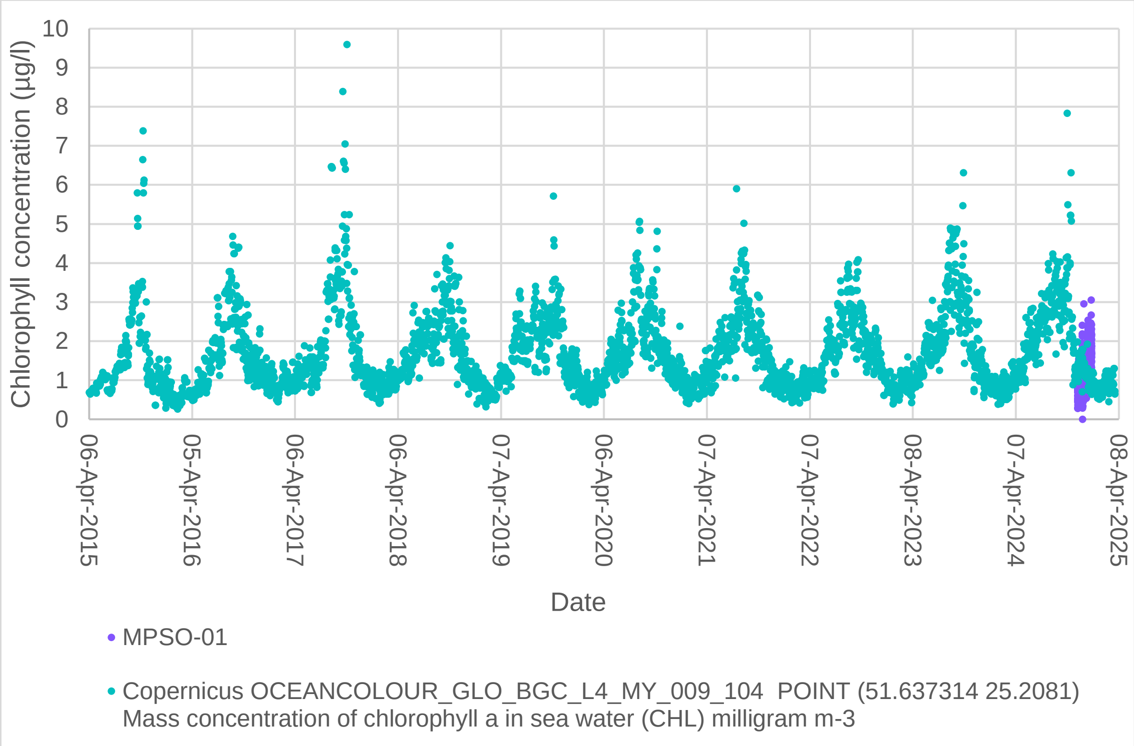
5.2.39 In the Al-Wakra area, south of the AoI, the sediment is recorded as 50% rock and 50% sand. This is split further by 30% of the area being tidal pools and 70% of dry substrate. Within this area, five species of gastropods were recorded, these were: *Clypeomorus persica, Planaxis sulcatus, Priotrochus kotschyi, Echinolittorina arabica* and *Cerithideopsilla cingulate* (Al-Maslamani et al., 2015). Other organisms commonly found in the intertidal zone are crabs, such as mud crab, violet crab (*Eurycarcinus orientalis*) (Qatar e-Nature, 2025), hermit crabs, fishes, rays, mussels, birds and algae. The characteristic of sandy beaches in the AoI area, can be considered as suitable habits for other organisms such as crabs (*Portunus segnis, Manningis arabicumi*), and sand hoppers (Qatar e-Nature, 2025). In addition, mangroves also provide suitable habitat for intertidal species which are mentioned in the Intertidal species section.

Plankton

5.2.40 The health of global marine ecosystems is heavily reliant on phytoplankton abundance, composition, and size, as they form the foundation of marine food webs. Regional variations in phytoplankton blooms reflect local meteorological and oceanographic conditions, affecting their frequency, severity, and composition across different sub-basins. The phytoplankton blooms have been monitored using satellite-derived chlorophyll-a concentrations, which offer advantages such as speed and broad coverage. In addition, the phytoplankton is crucial for supporting micro- and zooplankton that feed on fish larvae. Environmental factors, such as temperature and salinity influence zooplankton communities, significantly impacting larval recruitment during the warmer spring and summer months. Rising temperatures may also promote the growth of certain phytoplankton groups, like cyanobacteria (Rasul, & Stewart, 2025).

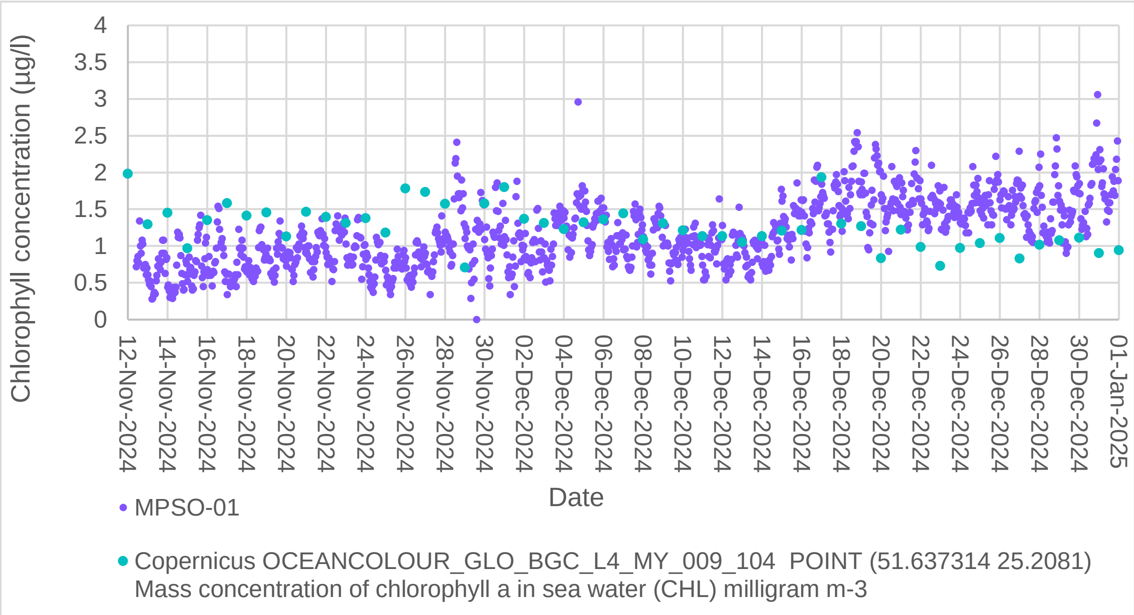
5.2.41 The biomass of plankton in the waters surrounding Qatar is generally low, with no significant seasonal variation in chlorophyll α (Chl a) (Rasul, & Stewart, 2025). This was corroborated when examining the available satellite data and buoy monitoring information shared with the approval of Ashgal for the Musaimeer Pumping Station and Outfall (MPSO) Project, which are illustrated in Figure 5.9. Satellite records show the expected seasonal variation with peaks in August to October and lows in January to February ranging from 0.26 to 14.33 µg/l of chlorophyll α. The monitoring buoy data (See closeup in Figure 5.10) appears to align generally with the satellite data, though shows diurnal fluctuations with peaks towards the end of the daylight period and lows at the end of the night/early morning, which matches patterns identified by Ahmed *et al*. 2022 in the wider Arabian Gulf.

Figure 5.9: Chlorophyll concentrations from monitoring buoy and satellite derived information (extract 1)



Source: Mott MacDonald, 2025

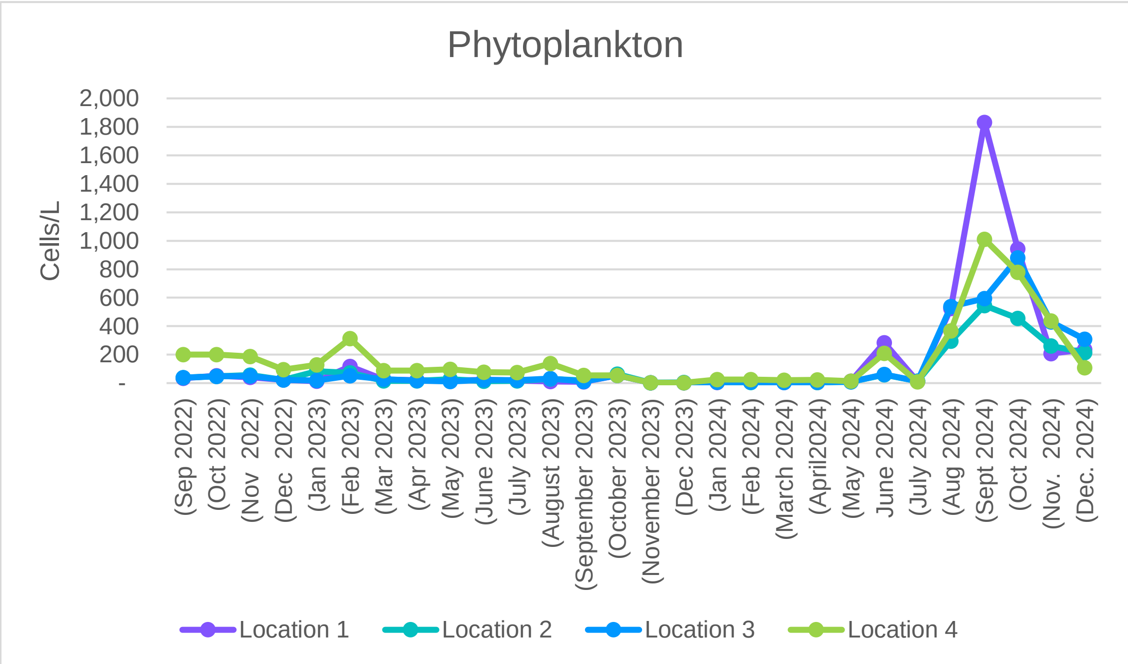
Figure 5.10: Chlorophyll concentrations from monitoring buoy and satellite derived information (extract 2)



Source: Mott MacDonald, 2025

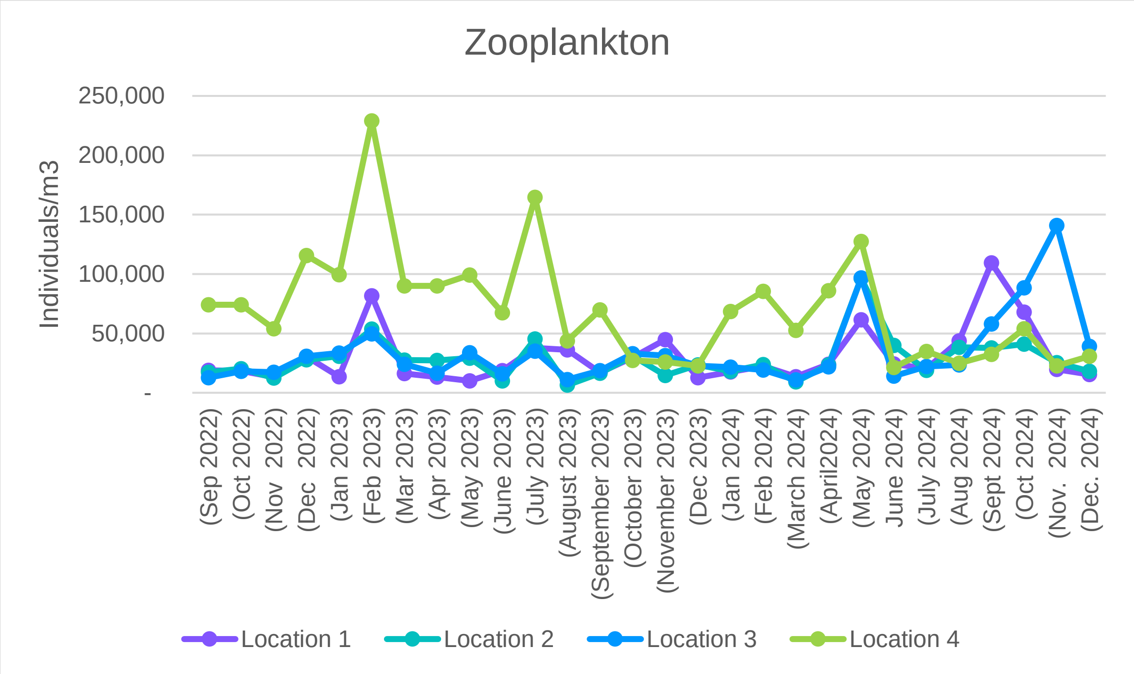
5.2.42 During monthly sampling (Sep 2022 - Dec 2024) from the Musaimeer Pumping Station and Outfall (MPSO) Project, differences in phytoplankton and zooplankton were observed in four different locations (See Figure 5.11). Phytoplankton levels show strong seasonal peaks, with notably high concentrations in August and September indicating major summer blooms. On the contrary, zooplankton concentrations are more stable overall and also show periodic increases, especially in August and September, often following or coinciding with phytoplankton surges. This interval aligns with expected predator-prey dynamics, where zooplankton populations grow in response to increased phytoplankton availability. Overall, the data suggests strong seasonal patterns and consistently high biological productivity at Location 3, particularly during the late summer months (Figure 5.12).

Figure 5.11: Phytoplankton values in four locations



Source: MPSO Project, Mott MacDonald, 2025

Figure 5.12: Zooplankton values in four locations



Source: MPSO Project, Mott MacDonald, 2025

5.2.42.1 The waters around Qatar are characterised by moderate to strong currents, seafloor within the euphotic zone and an oxygenated water column, indicating the waters are well-mixed. One study suggests that this plays a role in the low phytoplankton biomass and gross production rates, but high species diversity measured (Quigg et al., 2013), which also identified 125 species, 66% were diatoms, 33% were dinoflagellates and the remaining 1% was cyanobacteria.

Fish

5.2.43 A study by Eagderi et al (2019) indicated that the Arabian Gulf has a total of 744 recorded fish species. Within Qatar coral habitats, total fish richness is highest in offshore coral assemblages; however, coral-dependent fish richness peaks on inshore coral reefs, which are typically more widespread (Bouwmeester et al., 2022). It should be noted that due to the extreme nature of the Arabian gulf that communities are generally at lower abundance than in the waters of the wider Arabian Peninsula due to the more extreme climate condition (Brandl et al., 2020). Unfortunately, the extensive loss of reefs in coastal areas of the Gulf, particularly in Bahrain and Qatar, has led to a decline in fish populations within these coastal coral assemblages (Buchanan et al., 2019, Bouwmeester et al., 2021). In addition, local extinction risk of up to 35% fish by 2090 across the Arabian Gulf was determined by Wabnitz et al (2019) with fisheries in Qatar with over a 26% decline (Wabnitz et al., 2018).

5.2.44 However, in Qatar, the diversity of fish remains relatively high, especially within families such as Acanthuridae, Lutjanidae, Scaridae, and Sparidae. Also, there are 498 species of native marine fish reported around Qatar (Eagderi et al, 2019). The record in the area also included shark species such as "Common Blacktip Sharks (*Carcharhinus limbatus*), Graceful Sharks (*Carcharhinus amblyrhynchoides*), and Spinner Sharks (*Carcharhinus brevipinna*) (Jabado and Ebert, 2015), which have been categorise as vulnerable (VU) under the International Union for Conservation of Nature and Natural Resources (IUCN). A list detailing the fish species identified within the mBSA along with their conservation and fisheries importance are included in Appendix N.

Marine mammals

5.2.45 The International Union for Conservation of Nature and Natural Resources (IUCN) has compiled a list of the conservation status and distribution of the mammals of the Arabian Peninsula (Mallon et al., 2023), including marine mammals within the Arabian Gulf where Qatar is situated. As the waters are shallow in depth, deep sea marine mammals are not usually spotted within this area. A full list of species reported to occur around Qatar can be seen in (Appendix O).

Table 5.5: Marine mammals in Qatar as compiled by the IUCN (Mallon et al., 2023)

Species name	Latin name	Range	Habitat and Ecology	IUCN Conservation Status
Bryde's Whale	*Balaenoptera edeni*	Arabian Gulf, Red Sea, Arabian Sea, Sea of Oman and Gulf of Aden. The Gulf of Masirah is an important habitat	Seen feeding in Arabian Sea, Sea of Oman and the Gulf of Aden. Observed as individuals and in pairs	Least Concern
Blue whale	*Balaenoptera musculus*	Arabian Gulf, Sea of Oman, Arabian Sea, Gulf of Aden. The Gulf of Aden as well as other upwelling areas such as the Gulf of Yemen are critical habitats	Mostly found in deep waters but also occur in coastal environments. Blue whales move from Sri Lanka to the Maldives, then to the Gulf of Aden and back. Observed in pairs and as individuals. The species is known to feed on krill and small schooling fish such as sardines	Endangered
Long-beaked common dolphin	*Delphinus capensis*	Red Sea, Sea of Oman, Arabian Gulf, Red Sea, Arabian Sea.	Mostly an offshore, deep-water species. Occurs in groups of 100 to over 3,000 individuals. Feeds on small pelagic fish	Least Concern
Indian Ocean humpback dolphin	*Sousa plumbea*	Arabian Gulf, Sea of Oman, Arabian Sea, Gulf of Aden and Red Sea. There are indications that the distribution is discontinuous, with fragmented and likely discrete populations in the Red Sea and Gulf of Aden. There is also a gap in their known distribution between Musandam and Ras al Had,	This species occurs in near-shore habitat, typically less than two km from shore and generally in water less than 30 m deep. In Oman, it can be found in channels, lagoons, shallow waters and even rocky shores. It is therefore exposed to high levels of human activity throughout its range (Reeves et al., 2008). The Indo-Pacific humpback dolphin is known to feed on small fishes from the Cyanadae family. Mostly found in groups of up to 35 individuals. In Oman, groups containing up to 100 individuals have been observed, though these may represent	Endangered

Species name	Latin name	Range	Habitat and Ecology	IUCN Conservation Status
			several groups swimming together	
Pantropical spotted dolphin	*Stenella attenuata*	Arabian Gulf, Sea of Oman, Arabian Sea, Gulf of Aden, Red Sea.	This species is commonly found in the offshore waters of the Gulf of Aden and the Red Sea where it hunts in the thermocline for small pelagic fish. Found in groups from 10 to 300 individuals. Mixes with the both the common bottlenose (*Tursiops aduncus*) and spinner dolphins (*Stenella longirostris*)	Least concern
Striped dolphin	*Stenella coeruleoalba*	Red Sea, Sea of Oman, Arabian Sea and the Gulf of Aden	Found in offshore waters	Least concern
Spinner dolphin	*Stenella longirostris*	Arabian Gulf, Arabian Sea, Sea of Oman, Red Sea and Gulf of Aden.	Mostly found offshore, around continental shelves and sometimes near the shore. Feeds in thermocline waters on migratory fish during the night. Occurs in groups of 10–400 individuals	Least concern
Indo-Pacific bottlenose dolphin	*Tursiops aduncus*	Arabian Sea, Sea of Oman, Red Sea, Arabian Gulf and Gulf of Aden.	More coastal than the common bottlenose dolphin (*T. truncatus*). It occurs in channels, lagoons and shallow waters. Known to feed on both benthic and pelagic fish as well as cephalopods such as squid and cuttlefish. Solitary in the Arabian Gulf but has been observed in groups of 40 individuals elsewhere. Calves are observed around winter and spring	Near threatened
Killer whale	*Orcinus orca*	Arabian Gulf, Sea of Oman, Gulf of Aden, Red Sea and Arabian Sea	Found inshore and offshore in both very shallow and deep waters. It is a mobile species (determined by the lack of repeated sightings of the same individual in the same area). Has been observed pursuing dolphins. Observed solitarily and in groups of up to 10 individuals. In the Arabian Gulf, groups usually consist of females	Data deficient

Species name	Latin name	Range	Habitat and Ecology	IUCN Conservation Status
			and calves. In the Sea of Oman and the Arabian Sea, however, groups containing a mix of both males and females have been observed	

Source: Mott MacDonald, 2025

5.2.46 According to stranding and sighting records around Qatar (Wong., 2023), the following species have been recorded:

- Humpback Whale (*Megaptera novaemgliae)* was found in Doha Port in 1959.
- A Bryde's whale was beached on the southeast shore in September 2022.
- Killer whales were recorded using video in the northeast water of Qatar in 2020.
- Two false killer whale (*Pseuocora crassidens*) have been recorded in Abu Dhabi shores. It is considered likely that this species can be present in Qatar but is considered rare.
- Bottlenose dolphins (*Tursiops aduncus*) have been sighted around all around Qatar. An old male was stranded on Al Thakira beach in July.
- Humpback dolphin (*Susa plumbea*) has been sighted off Fuwairit and off sea line.
- Long-beaked common dolphin has been reported near a wreck in southeast waters.
- Finless porpoise (*Neophocaena phocaenoides*) has been sighted east of Doha.
- Spinner dolphin (*Stenella longirostris*) has been found in offshore waters in the Arabian gulf.
- Two records of striped dolphin have been recorded south of the UAE border and is also likely to be found in Qatar.
- Dugongs (*Dugong dugon*) has been hunted for food in Qatar and its neighbours. Dugong remains had been found in an archaeological site on the west coast of Qatar. There has been stranding reports of Dugong in Qatar north-west and south-east coasts. Three newborn dugongs have been reported in the last 5 years (Wong., 2021). The latest one was a neonate, still with fur on its back and foetal folds found on the shallow water off a beach at south-east of Doha on 28/4/2020 (Wong., 2021). Dugongs use the south-west Arabian Gulf as nursery and feeding ground from November to April. Giving birth to calves in spring up to late April (Wong., 2021).

Turtles

5.2.47 Two marine turtle species nest within the Arabian Gulf; the hawksbill turtle (*Eretmochelys imbricata*) and the green turtle (*Chleonia mydas*) (Pilcher, et al., 2015). At a global level, hawksbill turtles are listed as critically endangered and green turtles are listed as endangered (IUCN, 2025). Both species are at risk of egg theft by humans, but hawksbills are exploited for their carapace as well and green turtles are also harvested for their fat and meat (Pilcher, et al., 2015). They have also been under pressure from recreational and commercial fishing (Verbiest., 2022).

5.2.48 Nesting turtles in Qatar have been under study and protection for the last decade. No green turtle nesting sites have been recorded in Qatar (Rees, et al., 2013). It is thought more than 100 hawksbill turtles nest on Qatar beaches every year (Verbiest., 2022). The main nesting sites in Qatar recorded by Verbiest (2022), which are outside of the AOI, are:

- Jazirat Ras Rekan
- Jazirat Umm Tais
- Fuwairit
- Al Maroona
- Ras Laffan
- Jazirat Halul
- Jazirat Sheraouh

5.2.49 Loggerhead turtles (*Caretta caretta*) may be foraging off the coast of Qatar (Pilcher, et al., 2015) and Oliver Ridley turtles (*Lepidochelys olivacea*) were reported in the IBATs data as having their range overlap the coast of Qatar. Further details on likelihood within the AOI and conservation statuses are provided in Appendix N.

Benthic epifauna

5.2.50 Epifaunal organisms like crabs, shrimp, and gastropods thrive in mangroves, seagrass beds, and reefs. However, coastal development, such as dredging and pollution (e.g., oil spills), disrupt epifaunal populations by altering their habitats and reducing water quality.

5.2.51 The epifauna in the area not only contribute to habitat structure and nutrient filtration (Ashrafi et al., 2020; Giraldes et al., 2023), also to understand the impact of human activities e.g. the pearl oyster (*Pinctada imbricata radiata*), serves as a model organism for assessing Polycyclic Aromatic Hydrocarbons (PAHs), Total Petroleum Hydrocarbons (TPHs), and trace metals in surface sediments around Al-Wakra (Khatir et al., 2020).

5.2.52 Also, species such as blue swimming crab (*Portunus segnis*) and *Manningis arabicum* have been recorded for Qatar in subtidal and mangrove ecosystems, respectively (Rasul, & Stewart, 2025). Furthermore, the Persian Gulf had reported 74 caridean shrimps, including 17 new records *(Alpheus balaenodigitus, Alpheus chiragricus, Alpheus mitis, Athanas dimorphus, Athanopsis cf. platyrhynchus, Pontocaris affinis affinis, Lysmatella prima, Conchodytes meleagrinae, Coralliocaris viridis, Cuapetes andamanensis, Palaemon pacificus, Palaemon semmelinkii, Periclimenaeus arabicus, Periclimenes diversipes, Periclimenes incertus, Cinetorhynchus cf. hendersoni, Thor cf. paschalis*) (Ashrafi et al., 2020) Appendix O.

5.2.53 In the case of corals, the distribution in the area of Al-Wakra is not clear, but some coral families have been recorded for Qatar area (Dendrophylliidae, Agariciidae, Siderastreidae, Fungiidae, Psammocoridae, Merulinidae, Lobophylliidae) (Bouwmeester et al., 2020). In addition, species of the genera such as *Acropora, Pavona, Anomastrea, Favia, Leptastrea, Cyphastrea, Favites, Platygyra, Acanthastrea, Madracis, Stylophora, Porites, Psammocora, Sderastrea*, have been reported (Rasul, & Stewart, 2025). More detail in Appendix O.

Benthic infauna

5.2.54 The composition and distribution of benthic infaunae, such as polychaetes, molluscs, and crustaceans, dominate sedimentary environments in the Arabian Gulf. These organisms contribute significantly to nutrient cycling and sediment stabilization, acting as vital components of marine food webs (Ashrafi et al., 2020). In addition, the factors influencing the biodiversity of the benthic epifauna are the salinity levels, temperature variations, and human activities such as pollution, in particular, habitat degradation linked to desalination discharge is a growing concern

(Hosseini et al., 2021). It's likely that the shallow sands are home to a variety of sand specialising infaunal species and the areas of slopes, reef flats and crest are more likely infaunal dominated (See broadscale benthic geomorphology details in the Marine benthic geomorphology and sediments section).

5.2.55 Specific habitats, such as mangroves, enhance sediment stability and providing an organic-rich environment that supports increased diverse infaunal species (Conservation in Qatar, 2008). The species include anphipodos of the families Gammaridae (*Elasmopus pectinicrus, Elasmopus rapax, Maera hemigera, Maera tenella*), Bodotriidae *(Eocuma affne, Eocuma sarsi, Eocuma taprobanicum, Cyclaspis picta, Cyclaspis hornelli, Bodotria siamensis*). Crustaceans from the family Diastylidae (*Paradiastylis brachyurus*), Pseudocumatidae (*Pseudosympodomma indicum*). Ostracodes from the family Polycopodae (*Polycope* sp.), Cypridinidae (*Cypridin*a sp.), Cylindroberididae, (*Parasterope* sp.), Philomididae (*Euphilomedes* sp.), Sarsiellidae (*Eusarsiella* sp.), and Mysidaceae (*Siriella brevicaudata* and *Gastrosaccus kempi*) (Rasul, & Stewart, 2025).

5.3 Air quality

Overview

5.3.1 This section provides an overview of the existing ambient conditions within the Project airshed. The existing baseline conditions have been determined by a Project-specific ambient air quality monitoring survey.

Study area

5.3.2 Given that the Project is located in a desert, and to ensure a conservative assessment, any receptors within 1000m of the construction site boundary have been identified for the purposes of the study area.

Sources of air emissions

5.3.3 The main sources of air emissions surrounding the Project is the operation of the existing Ras Abu Fontas industrial complex and natural wind-blown dust.

5.3.4 The existing Ras Abu Fontas industrial complex contains the operational Ras Abu Fontas plants A1, A2 and A3, B and B2. The Ras Abu Fontas facility is located 15km south-east of central Doha on the coast between Al Wakrah and Hamad International Airport.

5.3.5 Fugitive dust arising from natural lift and transport of particulate matter is a common phenomenon due to the nature of the ground and the arid sub-tropical desert climate in Qatar. As detailed in Section 5.4, sand and dust storms are common as Qatar as it is impacted by Shamal winds, which are strong northwestern winds that periodically blow across the Arabian Peninsula carrying desert sands and fine dust.

Monitored baseline conditions

5.3.6 Ambient air quality monitoring has been collected to characterise the existing pollutant concentrations in the Project airshed to determine if the airshed can be classified as degraded or non-degraded.

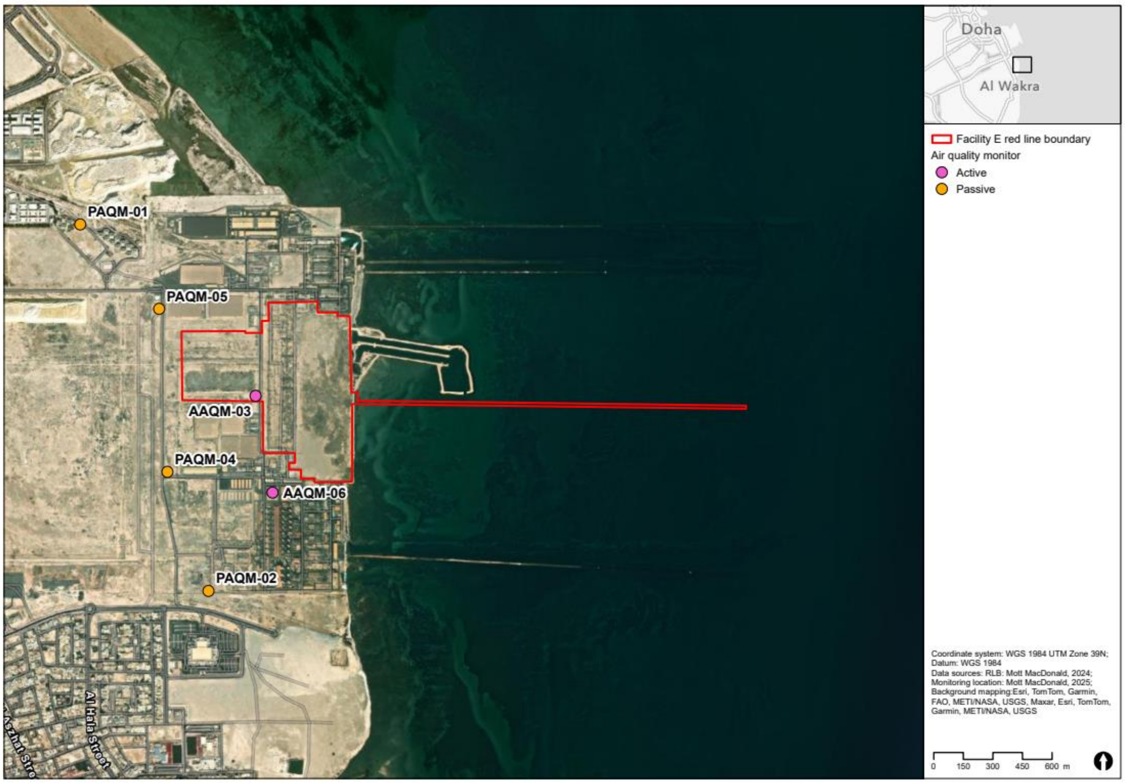
5.3.7 Monitoring has been undertaken for NO_2 for one month between 14 January and 13 February 2025 at six locations around the Project site, using four passive monitors and two active monitors. Both passive and active techniques meet United States Environmental Protection Agency and European Union quality standards. Active monitoring measured the pollutants NO_2, CO, O_3, SO_2, $PM_{2.5}$, PM_{10} and VOCs, whilst passive monitoring measured the pollutants NO_2,

O_3, SO_2 and BTEX (a group of VOCs consisting of benzene, toluene, ethylbenzene and xylenes).

5.3.8

5.3.9 Table **5.6** and Table 5.7 present the monitored concentrations at the active and passive monitors for NO_2, which is the main pollutant relevant to this Project. Figure 5.13 displays the location of each of the monitoring locations. Further detail on the monitoring undertaken, including monitoring data for the other pollutants (although no significant sources of any of these are anticipated during construction or operation), are presented in Appendix J (403100049-C001-MML-RP-EN-018).

Figure 5.13 Monitoring locations



Source: Mott MacDonald, 2024

5.3.10 The results have been compared with the Qatar annual mean air quality standards.

5.3.11 Despite the short duration of the monitoring survey and the potential seasonal variation, the results are considered suitable to provide indication of the airshed status and to determine the significance of impacts from the Project. The monitored results indicate that the measured concentrations of NO_2 are below the Qatari ambient air quality standards at all of the monitoring sites. As none of the Qatari ambient air quality standards have been exceeded the area monitored in the survey is considered to be a non-degraded air shed.

5.3.12 The largest recorded concentrations were at the AAQM06 monitor. This monitor was located on the roof of a building immediately adjacent to the RAF complex and as such is likely to have been heavily influence by emissions from the RAF plants and measured higher concentrations than those at ground level in locations representative of sensitive receptors. However, to provide a worst case and conservative assessment of impacts, the monitored monthly concentrations from AAQM06 have been included in the baseline conditions (see paragraph 6.3.4).

Table 5.6: Active monitoring results (µg/m³)

Name	Coordinates (WGS 1984 UTM Zone 39N)		NO_2 (µg/m³)		
	X	Y	1 hour max	24 hour max	1 month average
AAQM03	561945	2787767	149.9	42.5	22.0
AAQM06	562031	2787276	284.8	106.1	49.6
Average			217.4	74.3	35.8
Qatar ambient air quality standard			400	150	100[a]

[a] Annual mean Qatar air quality standard

[b] WHO air quality guideline as there is no national air quality standard for $PM_{2.5}$

Table 5.7: Passive monitoring results (µg/m³)

Name	Coordinates (WGS 1984 UTM Zone 39N)		NO_2 monthly average (µg/m³)
	X	Y	
PAQM01	561056	2788636	23.6
PAQM02	561706	2786777	25.3
PAQM04	561498	2787381	26.1
PAQM05	561456	2788208	23.5
Average			24.6
Annual mean national air quality standard			100

5.4 Climate resilience and Greenhouse Gas (GHG) emissions

Overview

5.4.1 This section provides an overview of the baseline conditions concerning climate change for the Project study area. It outlines both current climate trends and future projections that may impact the Project and the surrounding area. The discussion covers how factors such as temperature extremes, precipitation variability, sea level rise, and extreme weather events could affect the Project during its operational phase.

5.4.2 The methodology for writing the climate baseline involves analysis of historical climate data as well as projections for future conditions. Data from sources such as the World Bank Climate Knowledge Portal and The Intergovernmental Panel on Climate Change (IPCC) Regional Atlas were reviewed to capture observed trends from recent decades (1991–2020) and onwards to incorporate recent and relevant climate data. Information sourced from a 05 February 2025 Request for Information (RFI) sent to Samsung Construction and Trading (serving in the role of EPC contractor) with responses received on 14 February 2025 were also used.

5.4.3 For future scenarios, climate projections for the period 2060–2079 under a high-emission pathway (Representative Concentration Pathway (RCP) 8.5/SSP5-8.5) was used to represent the “worst-case” scenario when assessing potential future climate impacts and associated mitigation measures.

5.4.4 The future period of study selected was determined based on information obtained from the Project’s industrial license, which indicates the facility’s handover in 2054. This timeframe was selected to consider the potential extension of the facility’s operations due to future maintenance. The SSP5-8.5 climate pathway was used as the primary reference in line with the most recent climate data from the IPCC Sixth Assessment Report to further integrate the socioeconomic factors that contribute to the pathway (IPCC, 2021).

5.4.5 The approach identified notable weather features and extreme events relevant to the study area which are presented below. The findings were also integrated with geographical characteristics that could influence Project performance over its design life. Sensitive receptors were identified as well as the associated impacts and potential mitigation measures.

Study Area

5.4.6 The primary study area encompasses the boundaries of the Project and the surrounding power plant. Additionally, the assessment takes into consideration the associated infrastructure at a secondary level, including roads, connections to the national energy grid, and the surrounding areas of the plant. The associated infrastructure is considered due to the fact that the facility will be tied into Qatar’s critical infrastructure supplying a significant amount of energy to the nation.

Baseline Description - Current climate baseline (1991–2020)

5.4.7 The current climate baseline was assessed by analysing the following climatic parameters for the most recent twenty-year period (1991-2020), primarily from data made available by the World bank Climate Change Knowledge Portal (World Bank, 2021).

Temperature

5.4.8 Qatar’s climate is extremely hot and has been warming over recent decades. Average annual temperatures ranged roughly between 27–29°C in the 1991–2020 period (IFRC, n.d.). Summers are long, with daytime temperature highs in July/August in Doha typically reaching 40–45°C, with peaks above 45°C being common (World Bank, 2021). Evening temperatures during the summer months of June to September often remain above 30°C. Winters (December–February) are mild by comparison with an average low dropping to 14°C and occasionally nights dropping below 5°C on cold outbreaks. Heatwaves are a normal part of the climate. For instance, there are currently approximately 178 days per year in Qatar where the maximum temperature exceeds 35°C. This baseline implies that the Project’s workforce and equipment regularly endure heat stress conditions. Trends show a clear warming: historical records indicate Qatar’s mean temperature has risen 1.9°C from 1901 to 2021, with most of the temperature increase occurring in recent decades. Summers have grown longer and hotter, with shoulder months becoming shorter. The frequency of extremely hot days has increased compared to the late 20th century, in line with global warming. Table 5.8 shows the current local climate observations: average mean, maximum, minimum surface air temperature and precipitation. High ambient temperatures can negatively impact power and desalination processes, leading to output losses and reduced efficiency in water cooling. Due to the reasons mentioned, the current local climate already pushes the limits of safe and efficient operations during peak summer.

Table 5.8: Current local climate observations (Climate Change Knowledge Portal, 1991-2020)

Climate variable	Observed current climatology (1991-2020)
Average Mean Surface Air Temperature	28.1°C
Average Maximum Surface Air Temperature	33.26°C
Average Minimum Surface Air Temperature	23°C
Precipitation	69.13mm

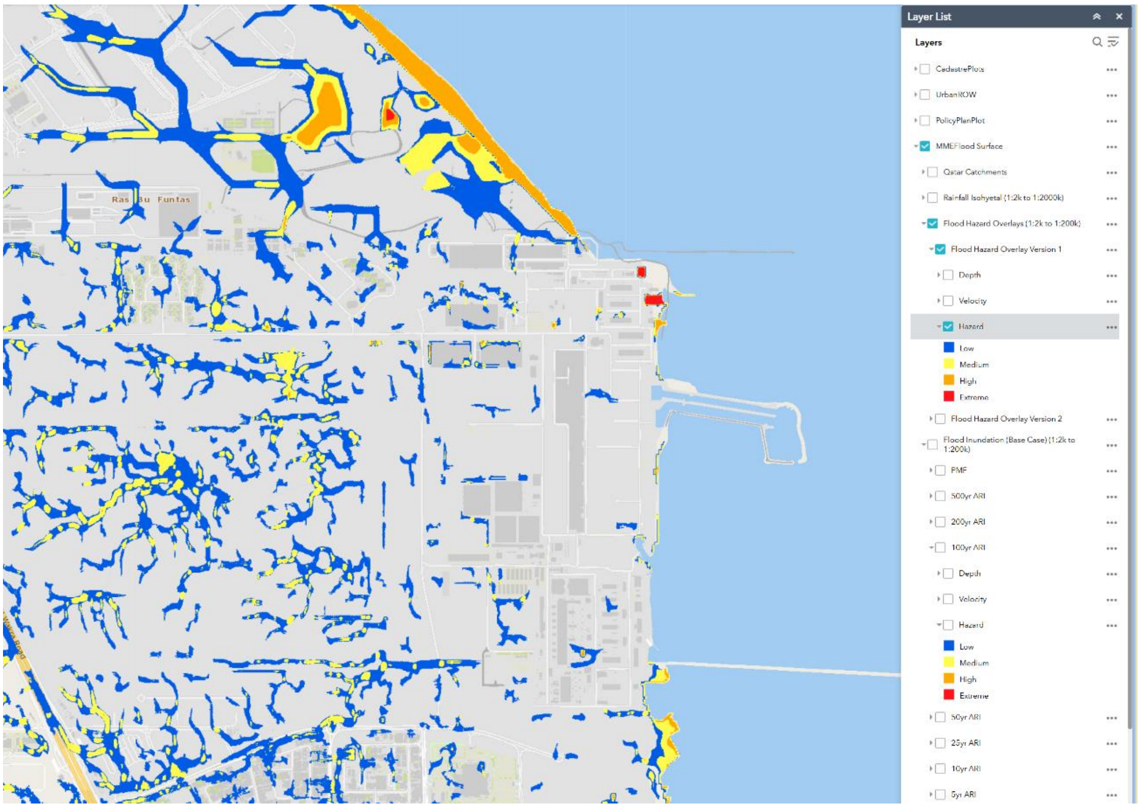
Source: Home | Climate Change Knowledge Portal, *accessed 14 February 2025*

Precipitation and Flood Risk

5.4.9 The Project is located within the boundaries of the Ras Abu Fontas Power Plant, approximately 12 km southeast from the centre of Doha and directly situated on the coast. The study area is characterised by a dry desert climate with often minor yet highly variable rainfall. On average, Doha receives roughly 69.13 mm of rain per year. Rainfall is also seasonal, as almost all rainfall occurs in the cooler months between November and April. Summers are virtually rainless. Typically, winter brings occasional brief rainfall or storms. However, despite the low amount of total rainfall throughout the year, rainfall tends to arrive in short intense bursts rather than gentle rains, resulting in an increased risk of flash flooding, according to a 2020 study by the Qatar Ministry of Municipality and Environment (Ministry of Municipality and Environment, 2020). The study further states that due to Qatar's relatively flat topography and lack of well-defined overland flow paths, surface water flows from heavy rainfall events often flow towards the urban road and drainage network. In recent years, single storm events have led to a large portion of the annual rainfall occurring in a day or two. For example, an extreme rain event in October 2018 resulted in approximately 60–80 mm of rain in 24 hours over parts of Qatar, corresponding to nearly a year's worth of precipitation at once (Davies, 2018). Roads turned to rivers in Doha's suburbs including areas not far from the Project site. Such incidents, while not frequent underline the flood risk present around the site location. Additionally, low-lying coastal sites like Ras Abu Fontas can experience water pooling and temporary flooding during heavy rains, especially if stormwater infrastructure is overwhelmed. Aside from rainfall, Qatar can also see localised flooding from tidal backflow during high tides or when winds drive water onshore.

5.4.10 Figure 5.14 below taken from the Qatar Ministry of Municipalities (MME) Flood Mapping Portal (Qatar Ministry of Municipalities, 2025), indicates that coastal areas to the north and south of the Ras Abu Fontas Power Plant have a medium to high flood hazard level, while areas further inland present low to medium risk and certain areas within the Ras Abu Fontas Plant have extreme risk hazard levels.

Figure 5.14 Flood hazard levels in areas surrounding Ras Abu Fontas plant



Source: Mott MacDonald Middle East Flood Mapping Portal, accessed 14 February 2025

Wind and Storms

5.4.11 While wind and storms associated with thunderstorms are uncommon in Qatar, they do happen mainly in the transitional seasons of spring and autumn. A severe disruptive storm can produce brief yet strong winds or even downbursts, both of which can cause infrastructure damage. Lightning strikes are also rare yet have been known to affect industrial facilities. Additionally, Qatar occasionally observes instances of severe weather and hail during winter, though this is rare and usually on a small scale. Small whirlwinds can form on very hot days however, these phenomena are often harmless.

Sea level rise

5.4.12 Qatar is inherently exposed to changes in sea level and coastal dynamics. Over 1991–2020, sea level rise (SLR) has been observed in the wider region in line with global trends. While specific tide gauge data for Qatar are limited, global measurements show that the rate of SLR has accelerated to roughly 3+ millimetres per year in recent decades (World Bank, 2021). Cumulatively, the world's oceans have risen 8 cm from 1990 to 2020 (Lindsey, 2023). The semi-enclosed Arabian Gulf has also experienced rising water levels, and Qatar's coastline has likely seen a similar rise. This gradual change may not yet be very noticeable day to day, but it does increase the baseline for coastal erosion and flooding. Qatar's gentle coastal gradients mean that even small vertical rises can allow the sea to reach significantly further inland in low areas. Coastal inundation risk during storms is slightly higher now than a few decades ago due to higher mean sea level. While the baseline climate period has not seen catastrophic coastal flooding in Qatar, minor flooding in Doha's Corniche and harbour areas during unusually high tides has been recorded. Tidal ranges in Qatar are modest, but when combined with wind set up and rising mean sea level, the highest water levels are trending upward.

Sea temperature

5.4.13 The Arabian Gulf surrounding Qatar is the world's hottest sea, with peak summer sea surface temperatures (SST) often exceeding 35°C. A record high SST of 37.6°C was recorded off the coast of Kuwait in 2020 and is indicative of the extreme marine heat in the region (Y Alosairi, 2020). Observations show a rapid warming trend in Gulf waters on the order of +0.5 to 0.7°C per decade in some areas. The SST around Qatar's coast has been rising roughly 0.6°C/decade in recent decades, far above the global ocean warming rate (Hereher, 2020). This warming, along with increasing salinity, has already led to negative impacts such as marine heatwaves and coral bleaching events. The mean SST in Qatari waters is roughly 30–32°C in summer (with winter SST ~20°C) in the period between 1991 and 2020, which reflects a high-temperature marine environment (Quesne, 2023).

Humidity

5.4.14 Despite low rainfall, Qatar experiences high humidity at certain times due to its maritime surroundings. During the late summer months (August–September), humid maritime air raises moisture levels notably during the nights and mornings. The "humidity index" or relative humidity (RH) typically averages around 45–65% in the latter half of summer in August until February (Tahir, Bansal, Belhaouari, Al-Romaihi, & Al-Thani, 2023). Along the coasts, sea breezes can make afternoons uncomfortably humid, and by August, the combination of 40°C+ heat with dew points often above 25°C yields oppressive conditions, with the humid season lasting roughly 4 to 5 months from May to September (Qatar Tourism, n.d). Peak daily relative humidity can reach 85–90% on some summer nights near the shore, although daytime relative humidity in the desert may drop below 30% in the peak of heat, e.g., approximately 26% in June average minimum (Tahir, Bansal, Belhaouari, Al-Romaihi, & Al-Thani, 2023). This variability means that while Qatar is a generally dry country, the coastal humidity is a serious factor for thermal comfort and design, as high moisture levels elevate the heat index, which is the felt temperature, and can strain cooling systems. Baseline data from Doha Airport indicate an annual mean RH of around 40–50%, with winter months seeing the highest RH up to 65%. These conditions already push the wet bulb temperature in Qatar close to 30–33°C during extreme summer events, which can be challenging for human health if exposure is prolonged.

Extreme weather events

5.4.15 Aside from the above climate observations Qatar is exposed to a range of weather events that can have impact on its infrastructure. Sand and dust storms are common as Qatar is impacted by Shamal winds, which are strong northwestern winds that periodically blow across the Arabian Peninsula carrying desert sands and fine dust. These sand/dust storms occur throughout the year (World Bank, n.d). For instance, in March 2012, Doha experienced a dust storm that cut visibility under 3 km on ten separate days (Gaulter, 2014), or roughly one in every three days of the month, with notable dust in the air. Such conditions can negatively affect air quality and visibility and can cause increased road accidents, airport flight delays, and forcing outdoor work to pause.

Baseline Description - Future Climate Baseline (2060–2079, SSP5-8.5 Scenario)

5.4.16 This section presents the future climate baseline following the SSP5-8.5 climate change scenario, detailing projected changes in temperature, precipitation patterns, and flood risk. Key aspects covered include anticipated increases in sea surface temperatures, wind and storm intensification, humidity levels, sea level rise, and the overall impact of extreme weather events on the region.

Projected temperature increases

5.4.17 Under a high emission worst case scenario SSP5/RCP8.5 substantial warming is expected. Mid-century projections show mean temperatures rising by roughly +2°C, reaching approximately 30.2°C and continuous warming continuing with a 2060–2079 temperature average of 32–33°C, far above the historical norm (World Bank, n.d). Extreme heat days will become more frequent and intense and the number of hot days with temperatures exceeding over 35°C is projected to climb from roughly 178 days annually to more than 230 days annually by 2100 according to the IFRC Qatar Climate Factsheet (IFRC, n.d.). Heat waves in the gulf region may occasionally reach 50 to 60°C in the hottest inland areas by late century under RCP8.5 warming scenario (McSweeney, 2015). Extreme heat combined with high humidity will substantially increase the risk of heat stress and other heat related illnesses. Consequently, the climate in the years between 2060–2079 will be expected to resemble today's summer extremes. Table 5.9 presents climate projections for the Ad Dawhah region of Qatar (Climate Change Knowledge Portal, RCP8.5, 2060-2079).

Table 5.9: Climate projections for Ad Dawhah region of Qatar

Climate variable		Climate projection (Annual)		
		10th Percentile	50th Percentile	90th percentile
Average Surface Temperature	Mean Air	+2.6°C	+3.6°C	+2.4°C
Average Surface Temperature	Maximum Air	+2.5°C	+3.4°C	+4.2°C
Average Surface Temperature	Minimum Air	+2.7°C	+3.5°C	+4.3°C
Precipitation – Winter		-12.5mm	6.5mm	30.6mm
Precipitation – Summer		69.13mm	0.2mm	0.8mm

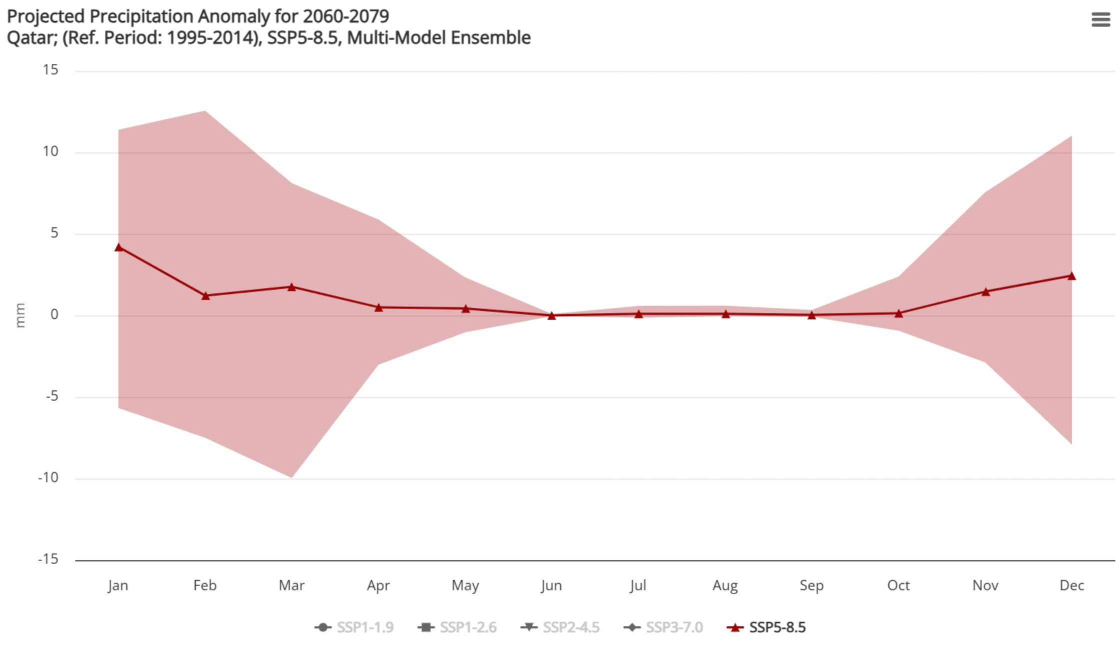
Source: Home | Climate Change Knowledge Portal, accessed 14 February 2025

Precipitation and Flood Risk

5.4.18 Based on the SSP5-8.5 projection pathway (World Bank, 2021), the summer months of June to September are expected to see a median increase of approximately 0.1 mm for the period from 2060 to 2079, compared to the reference period of 1995 to 2014, particularly during the months of July and August. In contrast, more significant increases in precipitation levels are anticipated outside of the summer months. Notably, a median increase of 4.2 mm is projected for January, corresponding to a 31.53% increase from the reference period, with a subsequent increase of approximately 2.44 mm in December corresponding to a 17.52% increase.

5.4.19 Figure 5.15 illustrates the projected precipitation anomaly for the period of 2060-2079 based on the SSP5-8.5 pathway and a reference period of 1995-2014.

Figure 5.15: Projected precipitation anomaly for the period of 2060-2079



Source: Home | Climate Change Knowledge Portal, accessed 14 February 2025

5.4.20 The marginal increase in precipitation observed during the summer months is unlikely to impact the operations of the upcoming Project. However, the more prominent increase in precipitation outside the summer months could pose notable risks to the facility's operations. Increased rainfall may lead to higher flood risks, infrastructure disruptions, and hinder access to critical operational areas. Additionally, increased rainfall may impact cooling water availability and quality and may require robust water management strategies to ensure continuous and efficient operations.

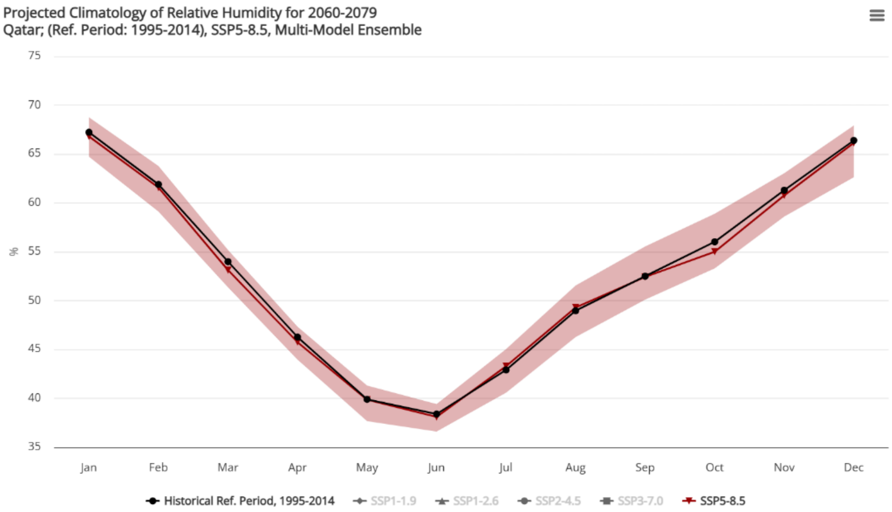
Sea surface temperature

5.4.21 Continued global sea warming is projected to significantly raise the Gulf SST under the worst-case scenario. Regional modelling studies based on the IPCC's RCP 8.5 ("business as usual" greenhouse gas emissions scenario) indicate that SST could increase by as much as 2.8°C to 4.3°C by 2100 (Lin, et al., 2021). By the period 2060-79, Gulf waters could be approximately 2°C hotter on average than present-day temperatures, with summer SSTs in the mid to high 30°C range. Such warming could push the Gulf marine climate beyond historical extremes and likely exceed the tolerance thresholds for many species. Increased thermal stress will intensify coral reef degradation, fisheries decline, and harmful algal blooms. Additionally, by 2070 SSTs of 35-38°C could occur regularly each summer, further threatening marine biodiversity and coastal livelihood.

Humidity

5.4.22 Projected changes in humidity around the project area are expected to be relatively minor. According to the SSP5-8.5 model for the period 2060-2079 (World Bank, 2021), the median humidity in June is estimated to be 38.1%, compared to a median of 38.93% during the reference period of 1995-2014. Similarly, the median humidity in December is projected to be 66.14%, slightly lower than the historical mean of 66.39% for the 1995-2014 period. Figure 5.16 illustrates the projected climatology of relative humidity for the period of 2060-2079.

Figure 5.16: Projected climatology of relative humidity for 2060-2079



Source: Home | Climate Change Knowledge Portal, accessed 14 February 2025

Sea level rise

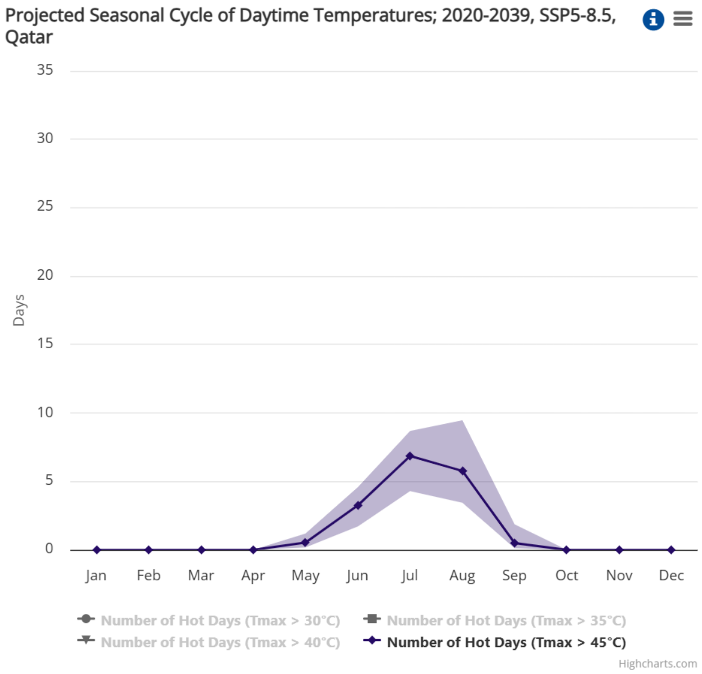
5.4.23 Based on the findings from the IPCC AR6 Report (IPCC, 2021), global mean sea levels (GMSL) are anticipated to steadily rise primarily due to thermal expansion and mass loss from glaciers and ice sheets. Projections under the SSP5-8.5 scenario estimate a sea level increase ranging from 0.2 meters to 0.29 meters by 2050, with further rises reaching between 0.63 meters and 1.01 meters by 2100.

5.4.24 According to Google Earth Pro satellite imagery, the elevation of the Ras Abu Fontas site ranges from 1 to 4 meters above sea level. Coupled with Qatar's relatively flat topography and the site's coastal location, this highlights the heightened risk to the facility's operations due to the projected increases in mean sea levels. More detailed site-specific elevation data would be required to assess the impact sea level rise could have on individual parts of the facility.

Extreme weather intensification

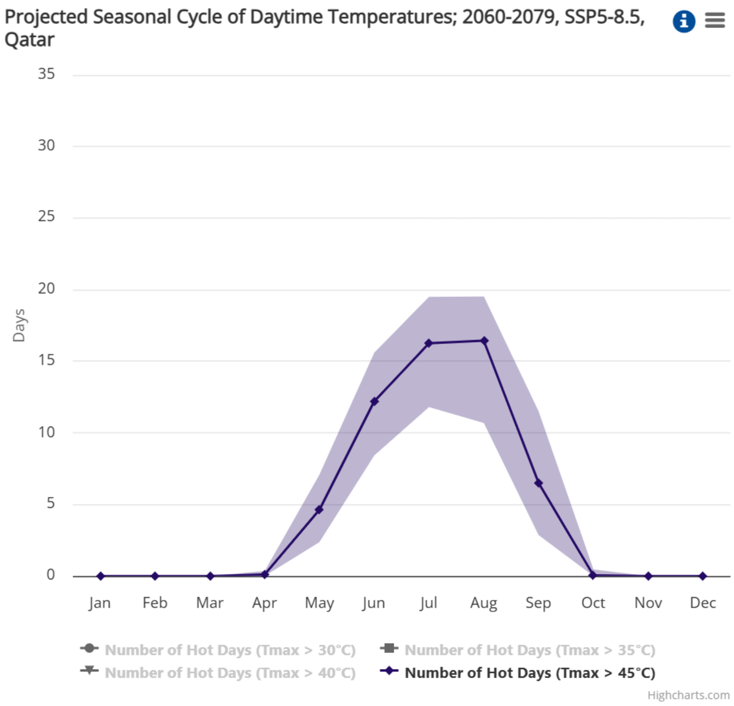
5.4.25 As seen in Figure 5.17 temperatures in Qatar are expected to rise by over 3°C during the period of 2060-2079. Figure 5.17 and Figure 5.18 illustrate the increase in the number of days with temperatures exceeding 45°C, based on the SSP5-8.5 warming scenario for the periods of 2020-2039 and 2060-2079, respectively (World Bank, 2021). The months of May to September will see a significant rise in the number of hot days recorded, with over half of the months of July and August receiving days over 45°C during the period of 2060-2079 compared to a peak of 7 days in July during the 2020-2039 period.

Figure 5.17: Projected seasonal cycle of daytime temperature 2020-2039



Source: Home | Climate Change Knowledge Portal, accessed 14 February 2025

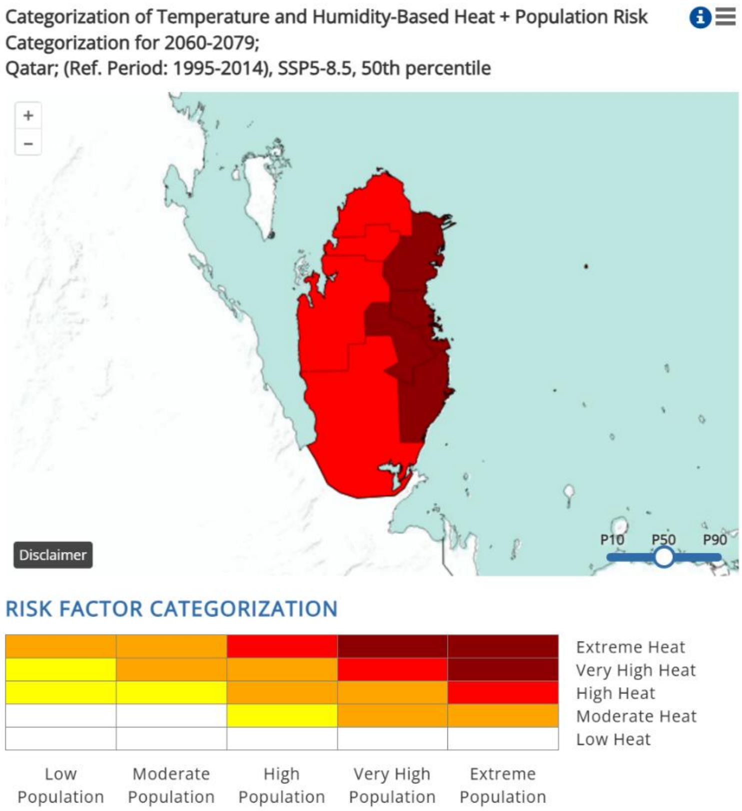
Figure 5.18: Projected seasonal cycle of daytime temperature 2060-2079



Source: Home | Climate Change Knowledge Portal, accessed 14 February 2025

5.4.26 Figure 5.19 below presents the risk factor categorisation for temperature and humidity-based heat across Qatar. As can be seen, the Ad-Dawhah region where the Project is located is under risk of extreme heat during the 2060-2079 period (World Bank, 2021). Extreme heat, particularly during the summer months, poses a significant risk to the health and well-being of site workers at the facility. High temperatures can lead to heat-related illnesses such as heat exhaustion and heat stroke, which could endanger the workforce while also posing a risk for operational disruptions of the facility, potentially compromising the efficiency and safety of the facility's operations.

Figure 5.19: Categorisation of temperature and humidity-based heat



Source: Home | Climate Change Knowledge Portal, accessed 14 February 2025

5.4.27 Extreme precipitation events, characterised by large quantities of precipitation occurring in short periods, are projected to become more frequent based on the SSP5-8.5 scenario. According to the World Bank Climate Change Knowledge Portal (World Bank, 2021), the mean return period for a 1 in 100-year precipitation event is projected to be 87.13 years for the period 2010-2039. This return period declines to 62.25 years during 2060-2089, indicating a potential increase in the frequency of extreme weather events.

5.4.28 Changes in wind patterns and storm frequency are less certain compared to temperature or rainfall projections, based on publicly available information. However, under worst-case scenarios, some relevant changes are anticipated. For instance, dust storms may become more frequent or prolonged if warming and drought persist (IPCC, 2019). This is because drier soil and increased desertification produce more dust, which the Shamal wind could carry more often.

Sensitive receptors

5.4.29 Climate change impacts on the Project will be felt across various receptors based on the elements that are exposed and sensitive to climate hazards. We identified four broad categories of sensitive receptors: (1) the facility's infrastructure itself and equipment, (2) the workforce and operations, (3) coastal and marine environment, and (4) surrounding infrastructure. Each faces distinct risks from current and future climate conditions:

1. Infrastructure and equipment
   a. Gas turbines & electrical systems: Risk of overheating, efficiency loss due to extreme heat
   b. Desalination equipment: Increased membrane fouling, higher maintenance costs due to rising seawater temperatures and salinity
   c. Flood prone areas: Electrical substations, control rooms, and roads vulnerable to coastal flooding
2. Workforce and operations
   a. Worker safety in extreme heat: Increased risk of heat stress during summer months
   b. Operational downtime: Potential power outages due to higher peak loads and extreme weather events
3. Coastal and marine environment
   a. Seawater intake quality: Changes in temperature, salinity, and algae blooms affecting water treatment efficiency
   b. Marine ecology: Potential disruptions to local ecosystems due to warming seawater and altered discharge conditions
   c. Residential areas, schools and hospitals, commercial areas, transportation infrastructure, agricultural land and other infrastructure used by residents of the areas surrounding the facility
4. Surrounding infrastructure
   a. Residential areas, schools and hospitals, commercial areas, transportation infrastructure, agricultural land and other infrastructure used by residents of the areas surrounding the facility.

Greenhouse gas (GHG) emissions

5.4.30 Greenhouse gas (GHG) emissions are a significant contributor to global climate change, impacting the environment and human health (World Health Organisation, 2023). Establishing a GHG baseline is crucial for understanding the emissions in the absence of a project (no-Project scenario), which will allow for the discussion of the impacts generated by the addition of the Project. This baseline was established for the planned Project, the recently decommissioned and demolished Facility A, as well as for Qatar's energy grid overall. This section explains the emissions quantification methodology, discusses the data limitations present, establishes the emission intensity of Qatar's current energy grid, and presents the study area and sensitive receptors. Moreover, the baseline factors that could contribute towards transitional risks are also discussed.

Methodology

5.4.31 To effectively lay out the baseline GHG conditions relevant to this assessment, several different factors are discussed:

- Qatar's national grid: Using data published by the International Renewable Energy Agency (IRENA), the Qatari electricity grid composition is discussed, including what percentage is generated from renewable vs. natural gas. Moreover, the country's grid emission factor is also sourced from IRENA and used to calculate the total CO_2

emissions baseline of the grid, based on data from 2022, as this reflects the most recent data available.

- Facility E and Facility A: To effectively compare the two facilities and establish the efficiency improvements Facility E brings compared to its predecessor, the following key operational parameters of the two facilities were sourced through previously obtained data as well as in RFI responses received on 14 February 2025 and 17 March 2025. By comparing the inputs (power and natural gas) to the output (power generated) of each facility, conclusions can be drawn regarding the GHG emissions and operational efficiency of Facility E, as well as how it may impact the grid emission intensity of Qatar's grid overall. While the scoping report initially set out to undergo a more detailed analysis of the emissions generated by the facility, the discussion and analysis was limited to expected emission hotspots, due to limited availability of operational data:
  - Planned production capacity (MW)
  - Electric power used (MW)
  - Natural gas consumption (MMSCFD)

5.4.32 The partial scope 1 and scope 2 emissions of both facilities were calculated using the above key parameters. Based on the GHG emissions calculated as well as the energy output of each facility, the efficiency and thus emissions intensity of each facility (tCO_2e/kWh) were calculated. The results of these calculations were discussed during the impact assessment, as well as an overall comparison between the two technologies used in Facility E and Facility A to draw on the overall advantages Facility E may bring to Qatar's overall decarbonisation efforts.

5.4.33 It should be noted that several data limitations exist particularly in relation to Facility E and the previously decommissioned Facility A. While certain emission sources could not be discussed due to a lack of available data, the key natural gas and energy inputs, as well as the designed output of each facility are sufficient to discuss the scope 1 and scope 2 emissions as well as the efficiency and emissions intensity of each facility in order to undertake a relevant comparison between the facilities.

5.4.34 In line with the Equator Principles (Equator Principles Association, 2020) Principle 2, any project where combined scope 1 and 2 emissions are expected to be more than 100,000 tonnes of CO_2 equivalent annually will need to be assessed for relevant climate transition risks as defined by Task Force on Climate-Related Financial Disclosures (TCFD, 2017). The Scope 1 and Scope 2 emissions calculations conducted for Facility E result in a combined Scope 1 and 2 footprint exceeding 100,000 tCO_2e, and as such the transitional risks were assessed. TCFD identifies the following factors as contributing to transitional climate change risks, and as such they will be presented in this baseline section and discussed during the impact assessment:

- Policy and legal risks: including regulations, emissions limits, or renewable energy mandates.
- Technological risks: this includes disruptions caused by the adoption of new technologies such as renewable energy, carbon capture or energy storage.
- Market risks: disruptions caused by shifts in demand as markets transition to more low-carbon alternatives, as well as changes in consumer and investor expectations.
- Reputation risks: potential reputational damage due to perceived inaction or failure to align with climate goals.

Study area

5.4.35 The GHG study primarily focuses on emissions generated within the site boundaries of Facility E, and as such also includes those of the decommissioned Facility A which was previously located in the same place. The study also takes into account the wider energy grid of Qatar as a whole in order to understand the general energy landscape in which the facility is operating within, as well as to qualitatively assess the potential impact Facility E may have on Qatar's overall grid decarbonisation efforts.

Baseline description

Qatar's national grid

5.4.36 Prior to discussing the baseline conditions and emissions present both in the now-decommissioned Facility A as well as the upcoming Facility E, the current state of Qatar's national grid must be described. Data was obtained from the IRENA Qatar Energy Profile (IRENA, 2024) as well as from the IRENASTAT Online Data Query tool (IRENA, 2024).

5.4.37 Table 5.10 presents the current on-grid installed electricity capacity (MW) across the different renewable and non-renewable sources in use. Similarly, Table 5.11 presents the electricity generation (in GWh) for these different sources for the year 2022.

Table 5.10 2022 Installed Capacity (MW)

Source	2022 Installed Capacity (MW)	Percent of Total (%)
Solar PV	805.1	7.05
Renewable municipal waste	15	0.13
Biogas	4	0.03
Natural gas	10,574	92.65
Other non-renewable	15	0.14
Total	**11,413.1**	**100**

Source: IRENA - Qatar Energy Profile (2024)

Table 5.11 2022 Electricity Generated (GWh)

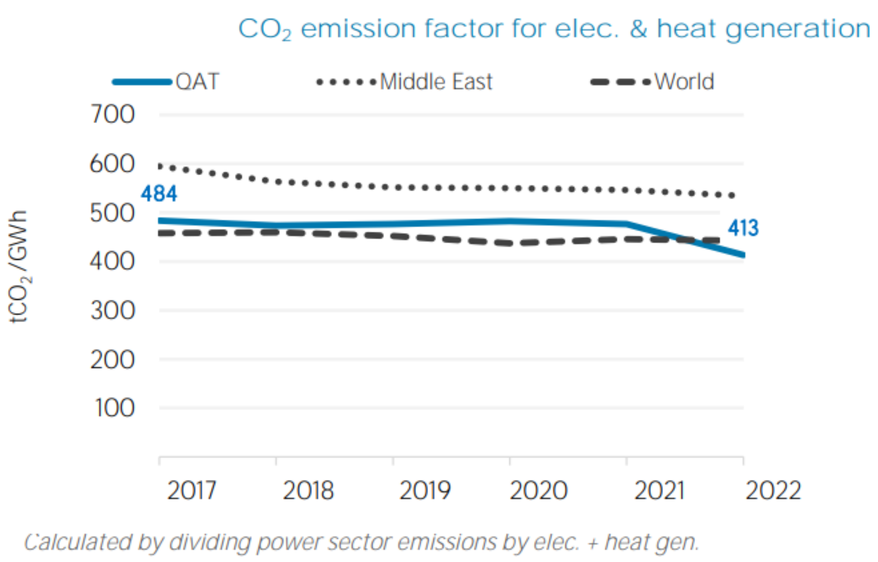
Source	2022 Electricity Generated (GWh)	Percent of Total (%)
Solar PV	8.36	0.015
Renewable municipal waste	106.1	0.193
Biogas	28.29	0.05
Natural gas	54,623	99.495
Other non-renewable	134.39	0.244
Total	**54,900.14**	**100**

Source: IRENA - Qatar Energy Profile (2024)

5.4.80 As can be seen from the tables above, the vast majority of Qatar's generated electricity comes from non-renewable sources, particularly from natural gas. In 2022, approximately 99.5% of generated electricity was produced by natural gas at 54,623 GWh compared to just 8.36 GWh being produced by solar PV, accounting for 0.015% of the total produced energy. Comparing the installed capacity of solar PV, which accounts for 7.05% of Qatar's total capacity, with the actual percent of energy generated via PV indicates that current PV is not being utilised as high as it could be.

5.4.81 Figure 5.20 below presents the CO_2 emission factor for electricity and heat generation in Qatar provided by IRENA.

Figure 5.20 CO_2 emission factor for electricity and heat generation



Source: IRENA - Qatar Energy Profile (2024)

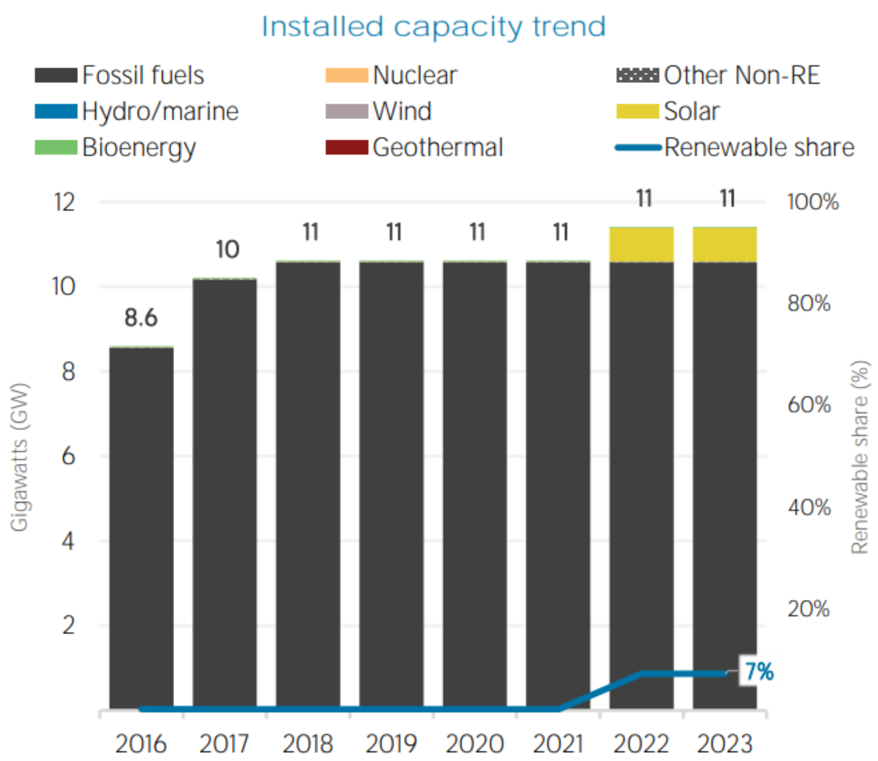
5.4.82 As can be seen from Figure 5.20, there has been a 14.6% decrease in Qatar's CO_2 emission factor from 484 tCO_2/GWh in 2017 to 413 tCO_2/GWh in 2022 likely as a result of national policies as well as the increased adoption of renewable energy sources and more efficient energy production technologies. The observed decrease in the CO_2 emission factor is likely coincides with the recent installation of large-scale solar infrastructure which will be discussed further below.

5.4.83 The total CO_2 emissions of the Qatari national energy grid can therefore be calculated as follows:

$$Total\ CO_2\ emissions\ (tCO_2\ e)$$
$$= total\ produced\ energy\ in\ 2022\ (GWh) \times 2022\ grid\ emission\ factor\ \left(\frac{tCO_2e}{GWh}\right)$$
$$= 54{,}900.14\ GWh \times 413\ \frac{tCO_2e}{GWh} = 22{,}673{,}757.82\ tCO_2e$$

5.4.84 Figure 5.21 below highlights the gradual increase in Qatar's installed energy capacity, as well as the gradual penetration of renewable energy primarily through solar PV rising from near zero to approximately 7% over the span of 2021-2023 (IRENA, 2024).The recent increase in Qatar's solar share likely stems from the introduction of the Al Kharsaah solar energy plant, a large-scale power plant with an 800MW installed capacity, comprising the majority of Qatar's solar infrastructure. Total Energies states that this project will contribute to avoiding 26 million tonnes of CO_2 emissions during its lifetime (TotalEnergies, 2022). This trend is projected to continue in line with Qatari decarbonisation commitments that will be discussed in a later section as part of the transitional risk baseline. Additional large-scale solar developments are currently underway, with an additional capacity of 875 MW being developed between the Mesaieed Industrial City (MIC) and Ras Laffan Industrial City (gulfbusiness.com, 2022).

Figure 5.21 Qatar installed capacity trend



Source: IRENA - Qatar Energy Profile (2024)

Facility E

5.4.85 Facility E which replaces the decommissioned RAF A plant is designed to meet the increasing Qatar demand for reliable electricity. During its operational phase, Facility E will primarily use two energy inputs – natural gas as well as electricity. Consequently, natural gas consumption required for the plant's operations will be considered for scope 1 emissions calculations. It should be noted that typically, scope 1 emissions calculations include additional factors such as methane and nitrous oxide emissions, fugitive emissions such as from gas leaks, as well as on-site fuel use from auxiliary equipment such as backup generators. Due to operational data limitations however, only natural gas consumption shall be considered for scope 1.

5.4.86 Table 5.12 below highlights the key operational parameters of Facility E based on the industrial license of the facility.

Table 5.12 Facility E operational parameters

Electric Power Input	173.8 MW
Natural Gas Consumption	141.97 MMSCFD
Designed Output	2,415 MW

Source: Facility E industrial license

Scope 1 Emissions

5.4.93 According to the Environmental Application Permit the facility consumes approximately 141.97 million standard cubic feet per day (MMSCFD) of natural gas. The IPCC emission factor for natural gas, set at 56.1 kg CO_2 per gigajoule (GJ) (IPCC, 2006), to calculate the CO_2 emissions was used.

5.4.94 The following general equation is used to calculate the emissions of the different construction processes involved as per 2006 IPCC guidelines for national greenhouse gas inventories (IPCC, 2006):

$$Emissions\ = Fuel\ consumption\ \times Emission\ factor$$

5.4.95 First, the natural gas consumption is converted from MMSCFD to the unit million British thermal units (MMBtu) by multiplying by 1037 resulting in 147,233 MMBtu per day. Next, this value is converted to gigajoules (GJ) by multiplying by 1.055, resulting in 155170 GJ per day. The daily Scope 1 CO_2 emissions are then calculated as follows:

155170 GJ/day x 56.1 Kg CO_2/GJ ÷ 1000 ≈ 8,705 tCO_2e/day

5.4.96 Assuming that the facility continuously operates for 365 days a year, the annual scope 1 emissions are 3,177,325 tCO_2e/year.

Scope 2 Emissions

5.4.97 While the industrial license states Facility E will generate its own electricity during normal operation, there may be a reliance on grid power during the initial startup phase. If the facility requires 173.8 MW of power for operations and assuming that it operates for 24 hours a day, the daily grid energy consumption is:

173.8MWx24hours = 4,171.2MWh per day

5.4.98 Using the IRENA 2022 emission factor of 0.413 tonnes CO_2e per MWh (IRENA, 2024) the grid supplied CO_2 emissions would be:

4171.2 MWh x 0.413 tCO_2e/MWh ≈ 1723 tCO_2e/day

5.4.99 Under the same assumption that the facility will continuously operate for 365 days a year, the annual Scope 2 emissions become 628,895 tCO_2e/year.

5.4.100 Table 5.13 below summarises the annual scope 1 and scope 2 emissions generated by Facility E. It should be noted that these values are based on the limited data available and do not take into account any additional factors.

Table 5.13 Facility E Scope 1 and Scope 2 emissions

Annual Scope 1 Emissions	Annual Scope 2 Emissions	Total
3,177,325 tCO_2e/year	628,895 tCO_2e/year	3,806,220 tCO_2e/year

Source: Mott MacDonald, 2025

Facility A

5.4.107 The RAF A Facility was built between 1977-1993 with a 500MW power capacity and 55 MIGD (MSF) water capacity. Currently, most of the structures have been demolished and cleared by the site owners with the exception of the old switchgear yard which is also currently under the commissioning process set to be finished in early January 2025. Since Facility E will be taking the place of Facility A, the same calculations conducted for Facility E are repeated for Facility A in order to compare the emissions intensity of both facilities. It is important to note however that Facility A was of an Open Cycle Gas Turbine (OCGT) typology and was decommissioned in order to be replaced with the upgraded Facility E.

5.4.108 The following operational data for Facility A was obtained through an RFI with the owner on 23 March 2025 in Table 5.14:

Table 5.14 Facility A operational parameters

		2013	**2014**	**2015**	**2016**	**2017**
RAF-A	Generation MWH	2,872,212	2,931,882	2,558,946	2,032,076	1,576,470
	In-House Consumption MWH	414,584	447,894	447,430	422,339	264,814
	Sent-Out MWH	2,457,629	2,483,988	2,111,516	1,609,737	1,311,656
	Gas Consumption (mmSCF)	52,486	54,207	49,970	40,520	35,838

Source: Sumitomo Corporation, 2025

5.4.141 By considering 2014 data in order to reflect high-capacity operation of the facility, the natural gas and electricity consumption are converted to similar units as Facility E as follows.

Scope 1 emissions:

5.4.142 Using a similar general equation as that mentioned for the scope 1 emissions of Facility E, the scope 1 emissions of Facility A are calculated as follows:

Natural gas consumption: 148.51 MMSCFD, or 162,475 GJ/day

5.4.143 Using the IPCC emissions factor for natural gas combustion of 56.1 kg CO_2 per gigajoule (GJ), Facility A scope 1 emissions are calculated as:

162,475 GJ/day x 56.1 kg CO_2e/GJ = 9,114.84 tCO_2e/day

5.4.144 Under the same assumption that the facility operates continuously for 365 days a year, this equates to approximately 3,326,916.6 tCO_2e/year.

Scope 2 emissions:

5.4.145 According to the data received, during the height of its operations in 2014 Facility A consumed 447,894 MWh of electricity, equating to approximately 1,277.1 MWh per day. According to data made available on the IRENASTAT online data query tool (IRENA, 2024), approximately 38,903 GWh of electricity were distributed across Qatar's grid in 2014. Moreover, according to the International Energy Association (International Energy Association, n.d), 19MT of CO_2 emissions were generated by the electricity and heat generation sector for the same year. Dividing emissions by electricity generation yields a placeholder grid emissions factor of 488.4 tCO_2/GWh (or 0.488 tCO_2/MWh).

5.4.146 The indirect emissions of Facility A due to electricity consumption can therefore be calculated as:

1.277 GWh/day x 488.4 tCO_2/GWh = 623.68 tCO_2e/day

5.4.147 Under the same assumption that the facility operates continuously for 365 days a year, this equates to approximately 227,643.2 tCO_2e/year.

5.4.148 Table 5.15 below summarises the annual scope 1 and scope 2 emissions generated by Facility A. It should be noted that these values are based on the key natural gas and electricity inputs required for the facility's operations as well as the designed output, and are sufficient for the purpose of efficiency comparisons between the Project and Facility A.

Table 5.15 Facility A annual scope 1 and scope 2 emissions

Annual Scope 1 Emissions	Annual Scope 2 Emissions	**Total**
3,326,916.6 tCO_2e/year	227,643.2 tCO_2e/year	**3,554,559.8 tCO_2e/year**

Source: Mott MacDonald, 2025

Relevant legislation, commitments, and national strategies

5.4.155 A key part of assessing the climate-related risk of a project lies in the transitional risks (and opportunities) involved. According to the TCFD, transitional risks are those arising from a general shift towards a low-carbon economy ((TCFD), 2017). Legislation, commitments and national policies alongside market, technological and reputational factors can therefore potentially impact the operationalisation of the facility. The following factors that may present risks or opportunities to Facility E in the future are discussed in the sections below.

Nationally Determined Contribution (NDC) of August 2021

5.4.156 The Qatar Nationally Determined Contributions (Qatar MoME, 2021) was most recently updated in 2021 to reflect Qatar's ambitions to reduce its overall emissions in response to the Paris Agreement. A key part of the NDC is Qatar's commitment to reduce 25% of its GHG emission relative to 2019 values. The NDC states several examples of economic diversification with mitigation co-benefits in place or under consideration to mitigate the nation's reliance on the oil and gas sector as its main economic sector. For example, carbon capture and storage (CCS) is discussed within the context of the oil and gas sector, as well as energy efficiency measures such as seasonal optimisation of gas turbine generators, improving heat recovery steam generators (HSRGs) as well as enhanced energy efficiency performance monitoring efforts. More importantly within the power and water sector, examples of measures discussed include the installation of new large scale solar power plants in order to transform renewable energy into a key driver for ecological and commercial benefits. Efforts are also being made to improve the demand-side energy efficiency, energy savings, and localised energy generation through awareness and educational programmes as well as the promotion of rooftop solar PV. Due to Qatar's reliance on the oil and gas sector, the NDC stresses the need for a balanced approach between balancing economic stability and environmental stability as part of its approach.

Qatar National Vision 2030 (and Third Qatar National Development Strategy NDS3)

5.4.157 Originally established in 2008, the Qatar National Vision 2030 outlines Qatar's developmental aspirations under the four key pillars of Human Development, Social Development, Economic Development and Environmental Development (Qatar Government Communications Office, n.d). More recently, the Third National Development Strategy (NDS3) covering the years 2024-2030 (Qatar Government Communications Office, 2024) published several key aspirations that are relevant to the context of Facility E under Strategic National Outcome 6: Environmental Sustainability:

- Reduce GHG emissions by 25%
- Reach 4GW of renewable energy capacity
- Invest in and adopt cutting-edge environmental technologies
- Position Qatar as a regional hub for environmental innovation.

5.4.158 In order to achieve these goals, NDS3 mentions measures such as scaling up advanced carbon capture and monitoring technologies, adoption of renewables and low carbon fuels, electrification, energy consumption reduction and efficiency measures, regulations and enforcement of standards.

Qatar National Renewable Energy Strategy (QNRES)

5.4.159 The QNRES is a national strategy (Qatar General Electricity and Water Corporation, 2024) released by the Qatar General Electricity and Water Corporation (Kahramaa) in order to set out targets and propose initiatives to support with the integration of Qatar's Third National Development Strategy discussed above. The main aim of the strategy is to increase the use of renewable energy alongside natural-gas fired electricity in order to ensure a sustainable transition of the energy sector. Notably, the strategy highlights the importance of integrating renewables alongside high efficiency thermal generation (such as Facility E) to compensate for the decommission of ageing thermal stations over the next decade while also accounting for the overall projected energy demand in Qatar overall. According to the strategy, Qatar's energy demand is expected to increase from 51 TWh in 2021 to approximately 80 TWh in 2040. The strategy further recommends the installation of 200MW capacity of distributed small-scale solar infrastructure to enable more localised power generation while also reducing the strain on centralised grid infrastructure.

5.4.160 Figure 5.22 below presents Qatar's projected electricity supply and demand (in GW) in 2030.

Figure 5.22 Qatar projected electricity supply and demand (in GW) 2030

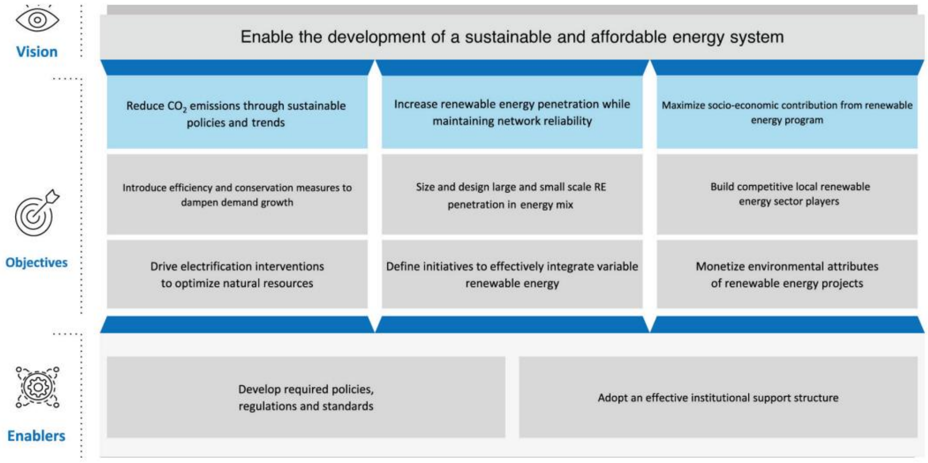
		2021	2030
	Demand	9.6	11.5
Conventional supply	CCGT	10.6	11.7
	OCGT	1.56	0
	Small scale	-	0.3
	Imports interconnection	1.2	1.2
Renewable supply	Solar PV	0.8	4
	Small scale RE	-	0.2

Source: Qatar National Renewable Energy Strategy

5.4.161 As can be seen in the above figure, the overall energy demand is set to increase from 9.6 to 11.5 GW, while Open Cycle Gas Turbine (OCGT) plants are set to be fully phased out by 2030. This highlights the important role Facility E will play in boosting the CCGT power generation capacity paired with the increase in solar PV to more sustainably meet the demand needs of the nation. The addition of more efficient gas-powered electricity generation alongside renewable energy will support Qatar towards reaching its stated goal of 25% GHG emission reductions by 2030. The strategy explicitly states that "To achieve higher penetration of renewable energy at lowest cost while ensuring the highest level of electric system reliability, it is essential to leverage the flexibility of high-efficiency dispatchable gas-fired generation."

5.4.162 Figure 5.23 below presents the vision, objectives and enablers of the QNRES. The development of facility E can be considered to directly tie to two of the stated objectives: Increase renewable energy penetration while maintaining network reliability and reduce CO_2 emissions through sustainable policies and trends.

Figure 5.23 Vision, objectives and enablers of the QNRES



Source: Qatar National Renewable Energy Strategy

5.4.163 Figure 5.24 below further highlights relevant parameters and projections as part of the QNRES. As can be seen, the proposed shift to greater renewable generation alongside more efficient gas-power aims to reduce CO_2 intensity by 27%, while also reducing the average yearly cost of the energy sector. Moreover, the QNRES presents a projected 10% reduction in overall carbon emissions despite an overall increase in demand due to the changes in the energy mix.

Figure 5.24 Cost and emission projections

		2021	2030
Cost	Average yearly cost (2030, 2021 real Bn USD)	7.4	6.3
	Total CAPEX (2022 to 2030, 2021 real Bn USD)		7.6
	OPEX (2030, 2021 real Bn USD)	3.6	4.6
Emissions	CO2 intensity (kg/MWh in 2030)	495	360
	CO2 intensity reduction vs 2021 (% in 2030)		27%
Energy mix	Gas power plants share of capacity (% of installed capacity in 2030)	100%	72%
	RE share of generation (% of total generation in 2030)	-	18%

Source: Qatar National Renewable Energy Strategy

Technological risk baseline

5.4.164 Technological advancements related to renewable energy, energy storage, carbon capture, and alternative fuels can have an influence over the operational viability and competitiveness of gas-fired power plants such as Facility E. Qatar is exploring such new technologies; for instance, Qatar Energy has teamed with General Electric (GE) to develop a carbon capture roadmap for gas facilities (General Electric, 2022). Qatar has also outlined technological goals in its Third National Development Strategy (NDS-3) and Qatar National Renewable Energy Strategy (QNRES) emphasising advanced carbon reduction technologies such as carbon capture utilisation and storage (CCUS), renewable energy integration, and improvements in power plant efficiency. Additionally, QNRES highlights leveraging high-efficiency gas-fired plants as a transitional technology to complement renewable sources and ensure grid stability while phasing out older, inefficient open-cycle gas turbines (OCGTs).

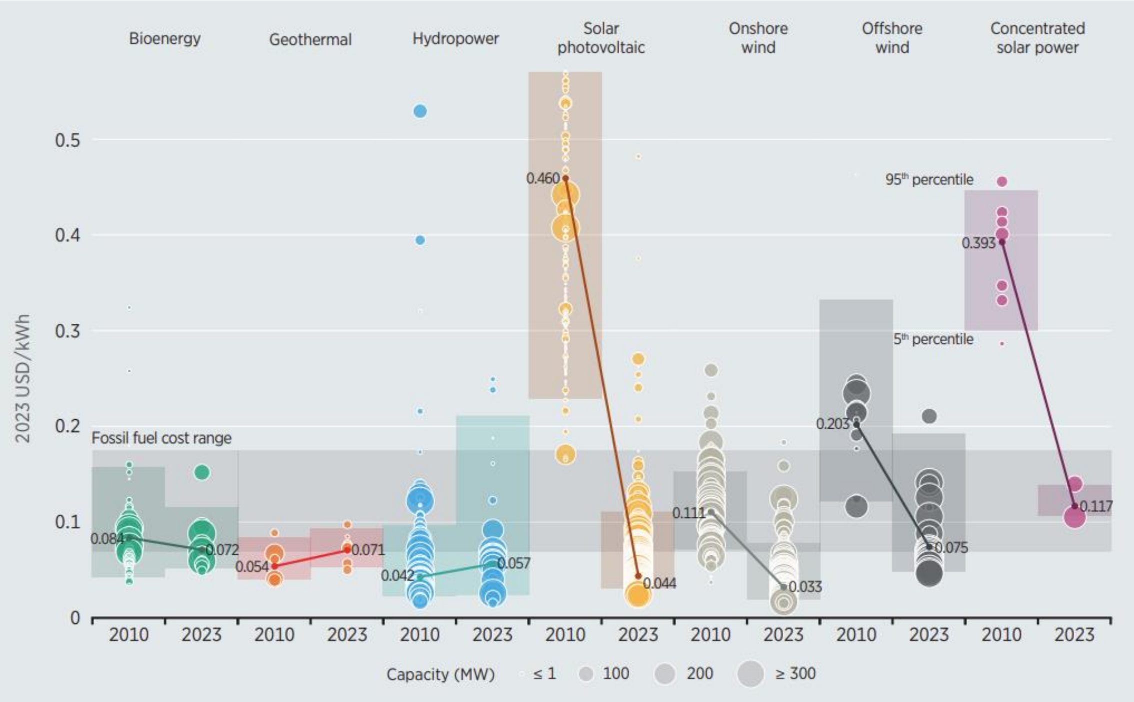
5.4.165 As technological advancements push carbon capture to become more commercially viable, Facility E may be expected to incorporate it. There are considerations to integrate CCUS into the facility during its first 15 years of operation, however no space for CCUS has currently been allocated.

5.4.166 Additionally, there is rapid advancement in solar photovoltaic (PV) technology globally, battery storage solutions, and the emergence of low-carbon fuels including green hydrogen, posing potential risks and opportunities for traditional gas-fired plants. This is especially relevant in the context of Qatar, as solar PV has already achieved record-low costs around 0.57 QAR/kWh, making it extremely competitive for daytime power as the cost of solar and energy storage continues to drop (TAIYANG News, 2020).

Market risk baseline

5.4.167 While the ways in which markets could be affected by climate change are varied and complex, one of the major ways is through shifts in supply and demand for certain commodities, products, and services as climate-related risks and opportunities becoming more significant. In Qatar, there is increasing demand for renewable energy as it aims to diversify its natural gas-dominated power sector. One of the key drivers of this demand is Qatar's national target to increase renewable energy's share in the power mix from 5% to 18% by 2030, through the production of 4 GW of solar capacity (Qatar Government Communications Office, 2024). Additionally, another significant driver is the cost-effectiveness of solar energy, as its costs have been decreasing globally. Figure 5.25 showcase the cost of electricity by renewable generating technology from 2010 to 2023 (IRENA, 2024). Given Qatar's high suitability for solar energy, this makes it a viable option for meeting the country's renewable energy targets. As seen in Figure 5.23 presenting the objectives of the QNRES, some objectives directly relate to the monetisation of renewable energy projects, building competitive local renewable energy sector players, and maximise socio-economic contribution from renewable energy programmes. These targets therefore point towards an opportunity for Facility E to establish a stable and reliable energy foundation which can accommodate the integration of planned renewable penetration to the grid, while introducing a more sustainable alternative to the previously decommissioned OCGT plant and complementary to the potential market shift promoting renewables. A potential source of risk may arise from future changes to national and international commitments. For example, in the event that further decreases in development costs as well as shifting external pressures through future national strategies such as the QNRES or the Long-Term Strategy (LTS) beyond 2030 include even larger percentages of renewable energy integration into the national grid, studies will need to be conducted to ensure that existing and planned CCGT plants are capable of providing the required support. Therefore, there is a risk of a combination of market and legislative factors influencing a change in national commitments and thus a revaluation of Facility E’s operations.

Figure 5.25 Cost of electricity by renewable generating technology 2010-2023



Source: Renewable power generation costs in 2023 - IRENA

Reputation risk baseline

5.4.168 Although Qatar has made efforts to improve its climate-related reputation, such as the $100 million contribution announced by HH Sheikh Tamim bin Hamad Al Thani in 2019 to support small developing states in addressing climate change and environmental challenges (Qatar Ministry of Foreign Affairs, n.d.), and has invested in sustainable development domestically with a high Human Development Index of 0.875 (UNDP, 2022) and modern, efficient infrastructure, it still often faces criticism for having among the highest CO_2 emissions per capita in the world (World Resources Institute, 2023) which is largely due to its small population compared to large oil and gas industry and energy-intensive desalination and cooling needs.

5.4.169 Qatar has made notable improvements such as the launch of its climate strategy and the inclusion of a 2030 target and renewable energy strategy, which have been viewed as positive steps by the international community.

Sensitive receptors

5.4.170 Compared to other topics, greenhouse gas (GHG) emissions do not directly affect local sensitive receptors like air quality or noise. However, GHG emissions impact the global climate, contributing to cumulative climate change effects. These effects include rising temperatures, sea level rise, and extreme weather events which will affect typical sensitive receptors. Additionally, Qatar's national goals for reducing emissions are also taken into consideration. Therefore, the sensitive receptors include:

- National goals (e.g., Nationally Determined Contributions - NDC): Qatar has committed to reducing its GHG emissions as part of its Nationally Determined Contributions under the Paris Agreement. The success of these goals is sensitive to the levels of GHG emissions from various sectors, including the power sector.

- The population of Qatar: The general population is indirectly affected by GHG emissions through the impacts of climate change. Rising temperatures can lead to increased heat-related illnesses, while sea level rise can threaten coastal communities. Extreme weather events, such as more intense storms and flooding, can disrupt daily life and pose risks to safety and infrastructure.
- Local infrastructure: Infrastructure such as roads, buildings, and utilities can be vulnerable to the effects of climate change. For example, higher temperatures can cause damage to road surfaces and increase cooling demands for buildings, while sea level rise and extreme weather events can lead to flooding and structural damage.
- Ecosystems: Excessive emissions contribute to the different climate change scenarios which will disturb the conditions in which different ecosystems have adapted to, thus leading to potential negative impacts.

5.5 Social

Overview

5.5.1 This section provides an overview of the social baseline which includes the socioeconomic, community health, safety and security, human rights and labour and their working conditions including occupational health and safety.

5.5.2 The methodology of the baseline study was mainly based on review and analysis of online resources. Throughout the ESIA, certain stakeholders were communicated with as outlined in Table 5.16.

Study Area

5.5.3 The Project falls under Qatar law and legislation, and wider international legislation or guidelines as listed below:

- Equator Principles (2020)
- IFC Performance Standards 1,2, and 4
- Dhaka Principles
- World Bank Group ESS and EHS Guidelines, ESS 2, 4, 5 and 10.

5.5.4 The Project will have approximately 6,000 employees during the construction period, who will be housed off-site, and 150 employees are expected during the operational phase.

ESIA Consultation

5.5.5 Stakeholder consultation will be a continuous process throughout the Project's duration. Table 5.16 outlines the consultations carried out to date.

Table 5.16 Consultations carried out with various stakeholders

Stakeholders	Relevance to the Project	Communication and consultation method	Outcome
Qatar Electricity and Water Company (QEWC)	The operator of the surrounding water and power facilities in the Project Area	Private site visit (8th October 2024)	View the Project location along with the surrounding facilities and examine the environmental and social baseline
Ministry of Environment and Climate Change (MoECC)	Authority responsible for receiving, reviewing and approving the ESIA as well as granting the Environmental Permit	Private meeting (25th November 2024)	Discussion on the Scoping Report outcomes and the consideration of certain environmental aspects during the ESIA
		Private meeting (23rd February 2025)	General overview meeting to discuss the Project and associated environmental baseline surveys
Kahramaa	Public corporate body who has a Power and Water Purchase Agreement (PWPA) with the Project Company	Electronic communication (November 2024 and ongoing)	Official sender, receiver and addressee of all formal documents from and to MoECC. They advise and amend formal documents accordingly.

Source: Mott MacDonald, 2025

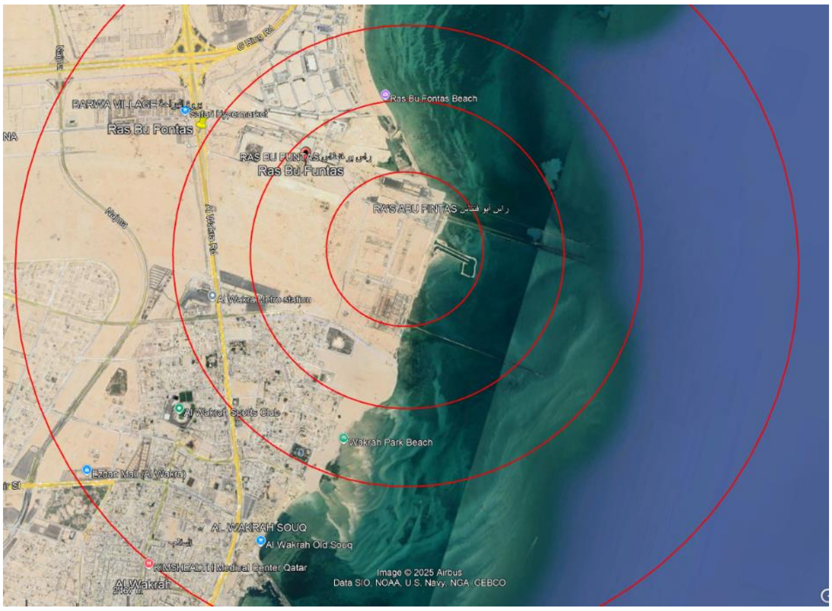
Social Baseline

5.5.24 The Project is situated on the Ras Abu Fontas coastline, less than 1 km away from the north of Al-Wakrah and 15km south-east of central Doha on the coast between Al- Wakrah and Hamad International Airport (HIA). The Project is located at the centre of the RAF Complex with existing and operational RAF plants A1, A2 and A3 to the north and plants B and B2 to the south. As the Project is located on a coastline, it may affect the fisheries in the area. Unfortunately, there is limited national data regarding the fisheries in Ras Abu Fontas coastline area and therefore determining the full impact of the Project during construction and operation is difficult.

5.5.25 Currently, there are operational plants on sites, and the construction of Facility E may result in the disruption of utilities such as the water and power supply as well as the generation of noise, dust and construction waste.

5.5.26 The communities closest to the Project area are Al-Wakrah, situated ~2 km south of the site and Al-Mashaf situated ~6 km southwest of the site, covering residential areas. Figure 5.26 below shows the sensitive receptors' locations within the Project's area of influence (AoI), and Table 5.17 describes the sensitive receptors shown within Figure 5.26.

Figure 5.26 Sensitive receptors 1km, 2km, 3km and 5 km away from the Project site



Source: Mott MacDonald, 2025

Table 5.17 Description of the Sensitive Receptors as shown in Figure 5.26 above

Community	Information on the Location	Impact Prioritisation	Potential Adverse Impact
In Al-Wakrah, the closest key areas are: • Surrounding water and power plants (<1km) • Al-Wakrah Celebration Halls (1.4km) • Residential area (1.5 km) • Al-Wakrah Beach Camping (1.5 km) • GAC Doha Main Office (1.7 km) • Workers village camp (1.7 km) • Mosque (Masjid Ali Bin Abdullah Al-Abbas) (1.8 km) • Schools (Al-Wakrah Independent Preparatory School, Saud Bin Abdulrahman Boys Independent School, The English Modern Kindergarten) (1.8 km)	2 km – closest receptors' distances are mentioned respectively	Primary	Expected roads closures, traffic and accessibility issues. In addition to noise formation and dust movement/dispersion.

Community	Information on the Location	Impact Prioritisation	Potential Adverse Impact
• Doha Metro Depot (1.9 km) • Al-Wakra Metro Station (2.5 km), • Fahes Al-Wakrah Petrol Station (2.5 km) • Restaurants, Markets and Bank on public road (2.8 km) • Residential buildings including Barwa Village (3.4 km)			
Al-Mashaf is known to be a residential area	6 km away	Primary	Expected roads closures, traffic and accessibility issues.

Source: Mott MacDonald, 2025

Baseline conditions – Socio-economic baseline

5.5.27 The socioeconomic baseline data presented in this section is derived from available open-source secondary data (i.e. existing published documents, reports, plans).

Population and Demographics

5.5.28 The city closest to the Project is Al-Wakrah city, where the Project is less than 1 km away from the Al-Wakrah north and ~5 km away from Al-Wakrah centre (Google Maps, 2024). For the purpose of this baseline assessment the data used to determine population and demographics will be from Al-Wakrah.

5.5.29 The latest census is dated from 2020, where the population of Al-Wakrah was 265,102 (Qatar Census, 2020). When comparing the population to previous census data from 2015 and 2010, results show that there is a decrease of 12.8% and an increase by 87.7%, respectively. Table 5.18 outlines the population information in Al-Wakrah, mapped out according to gender (Qatar Census 2010, 2015).

Table 5.18 Population data of Al-Wakrah

Census	Al-Wakrah Municipality	Male	Female
Census 2020	265,102	184,827	80,275
Census 2015 (April)	299,037	248,103	50,934
Census 2010	141,222	114,698	26,524

Source: Qatar Census, 2010 and 2015

5.5.30 In August 2024, data showed that 59% of the total population were male, and 41% were female. When classified by age, the majority of the population were aged between 25-64 (National Planning Council, 2020).

5.5.31 The social facilities such as the restaurants, coffee shops and mosques are 7km to 9 km from the Project location.

Economy Employment and Livelihood

5.5.32 No data was found on employment and livelihood specific to Al-Wakrah. However, data on economically active (+15 years old) Qataris and non-Qataris can be found in the nationwide Qatar Census (2020, 2010) data. Percentage distribution confirmed an increase in the number of Qatari employees from 2010 to 2020 reaching to 97.67% (representing 0.55% growth) and a decrease in the number of non-Qatari employees from 2010 to 2020 to 99.64% (representing 0.16% decline). However, the opposite was found for employers from 2010 to 2020, where Qatari employers decreased by 0.37% and the non-Qatari employers increased by 0.25%. Individuals who are self-employed decreased in both Qataris and non-Qataris from 2010 to 2020 (Planning and Statistics Authority, 2020).

5.5.33 According to Qatar Energy, Al-Wakrah plays a vital role in Qatar's economic landscape due its strategic location within the municipality that hosts Mesaieed Industrial City (20 km away) and Hamad Port (~15km north), two of country's most significant economic and industrial hubs (Qatar Energy,2025). In addition, according to Mwani Qatar, Hamad Port is the largest commercial port in in Qatar. In Mesaieed Industrial City, there are many major power plants operated by companies such as Qatar Petrochemical Company (QAPCO) and Qatar Energy (Qatar Factories, 2025).

5.5.34 Al-Wakrah was historically known for its maritime activities such as fishing and pearling, where its fishing activity/market is still active. Furthermore, the modern souq 'Al-Wakrah Souq' and the local markets keep the city lively and engaging.

5.5.35 The development in Al-Wakrah created a significant job opportunity in Qatar and increased human mobility by attracting both local and international workers (Qatar Energy, 2020). This contributed to Qatar's industrial and economic development, aligning with QNV 2030 (Public Works Authority, 2019.)

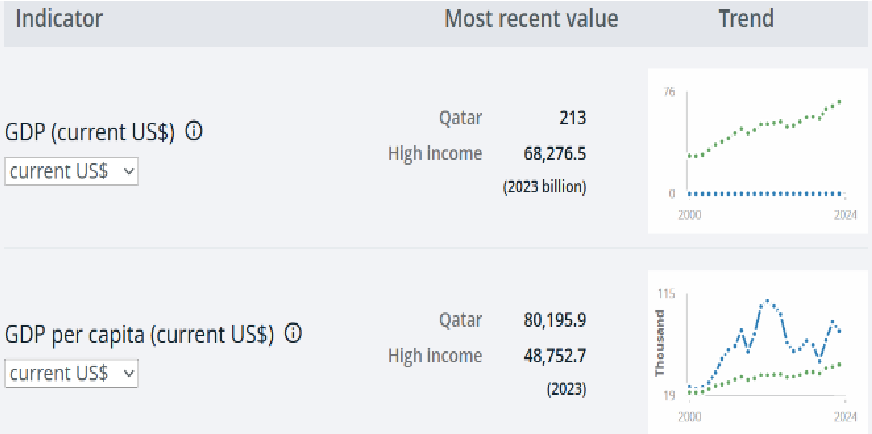
5.5.36 Al-Wakrah offers a variety of healthcare services through its public hospitals such as Al-Wakrah Hospital, medical centres, and pharmacies. The establishment of healthcare services in Al - Wakrah played a significant role in strengthening the local economy by creating job opportunities and facilitating the growth of health sector in region.

5.5.37 Workers in Al-Wakrah largely reside in a mix of residential neighbourhoods within the city, dedicated worker camps near the industrial zones, and surrounding areas such as Al Wukair and Mesaieed. With Al-Wakrah's growing role as an industrial and commercial hub, there are increasing efforts to develop more housing solutions to accommodate both the local population and the large workforce drawn to the area.

Income Distribution

5.5.38 According to the National Planning Council (2023), the Gross domestic product (GDP) per capita in 2023 reached 261,396 Qatari Riyal (QAR). Recently, the biggest contributors to Qatar's GDP fluctuations have been the World Cup 2022 and global energy prices (World Bank, 2022).

Figure 5.27 GDP and GDP per capita of Qatar, in US$ (World Bank, 2023)



Indicator	Most recent value		Trend
GDP (current US$) current US$	Qatar	213	
	High Income	68,276.5	
		(2023 billion)	
GDP per capita (current US$) current US$	Qatar	80,195.9	
	High Income	48,752.7	
		(2023)	

Source: World Bank, 2023

5.5.39 The Household Income and Expenditure Survey (HIES) in Qatar indicates that non-Qatari households' monthly income was QAR 24,400, and the average income of all households was QAR 41,600. Of this, the monthly household expenditure for Qatari households was QAR 49,600, compared to QAR 18,000 for non-Qatari households (National Planning Council, 2024). According to Window of Economic Statistics of Qatar-National Planning Council, the Household Final Consumption increased from QAR 150,673 in 2019 to QAR 167,280 in 2022.

Vulnerable Groups

5.5.40 Community-level vulnerable groups can be defined as those who may be disproportionately affected by Project impacts due to their specific circumstances; this includes women, children, the elderly, persons with disabilities, and indigenous peoples (IFC PS4 (2012); IFC PS7 (2012).

5.5.41 Since the Project is 5km from the centre of the closest community and the land is currently a brownfield site with no prior settlement, there will be no resulting social displacement and minimal impact to local community-level vulnerable groups.

5.5.42 However, because there will be migrant construction and operation workers, they will be considered as vulnerable groups who will be closely exposed to Project risks although being accommodated off-site. Mainly, safe and healthy working conditions, fair treatment, labour management relations and compliance with national laws must be thoroughly studied and maintained throughout the Project life cycle.

Education

5.5.43 According to Qatar Educational Directory (2016), there are three schools, three nurseries, and one special needs centre in Al-Wakrah. There are no universities in the Al-Wakrah area, however there are some in nearby cities, including Doha. The number of Qatari who obtained University degree or higher increased from 20.3% in 2010 to 33.9% in 2020. (Qatar Census, 2020; Planning and Statistics Authority, 2020). Figure 5.28 and Figure 5.29 below show education attainment for Qatari and non-Qatari between 2010 and 2020.

Figure 5.28 Percentage of Qataris (10 years and above by educational attainment in 2010 and 2020 Censuses

Figure 5.29 Percentage of non-Qataris (10 years and above by educational attainment in 2010 and 2020 Censuses

Source: Qatar Census, 2020; Planning and Statistics Authority, 2020

Gender Equality

5.5.44 Gender equality is a significant parameter that is influential on employment opportunities, educational attainment, poverty reduction and policymaking.

5.5.45 World Economic Forum (WEF) has been publishing Global Gender Gap Report annually for years, in which almost every country is included. The ranking criteria in the index are economic participation and opportunity, educational attainment, health and survival, and political empowerment. The Global Gender Gap report shows that gender equality has decreased in Qatar over 14 years, as shown in Table 5.19.

Table 5.19 Comparison of gender equality in Qatar based on WEF Global Gender Gap Index (2010, 2024)

Parameter	Rank in 2010	Rank in 2024
Economic Participation and Opportunity	116	123
Educational attainment	74	58
Health and survival	126	143
Political empowerment	131	137
Overall gender gap	116	130

Source: WEF Global Gender Gap Index, 2010 and 2024

Discrimination

5.5.46 Although no statistics are found in Qatar on discrimination due to different ethnicities, Qatar Constitution Article 35 on Public Rights and Duties states that *'All persons shall be equal before the law and there shall be no discrimination of whatsoever on grounds of sex, race, language, or religion.'* In addition, Qatar's active participation in global Human Rights conferences affirms its commitment to eliminate racism and discrimination of any kind.

Land Right

5.5.47 The Decree No. 7 of 2019, states that some lands are allocated to Qatar General Electricity and Water Corporation (Kahramaa) to establish an electricity and water production on it, as per Sheikh Tamim Bin Hamad, the Amir of Qatar.

5.5.48 Following Decree No. 7 and on that Kahramaa is the owner of land, a Power and Water Purchase Agreement (PWPA) has been established between Kahramaa and Sumitomo (Project Company) on that the Project Company has been granted the right to design, finance, engineer, procure, construct, own, test, commission, operate and maintain Facility E. Kahramaa has been authorised pursuant to the Emiri Decree, and has willed, to lease the land to Company and also to grant to Company certain licences relating to the Project subject to certain terms and conditions.

5.5.49 It has been confirmed that the land is not used by any informal users for any purpose, as evidenced by the site access restriction.

Community Health, Safety and Security (CHSS)

- **Life and Fire Safety and Emergency Response**: The closest hospital is Aman Hospital, located ~5km northwest of the Project area. There are two police stations located within 5km of the Project area: Al-Wakrah Police Department, located ~3km southwest of the Project area and Al-Wakrah Police Station, located ~4km southwest of the Project area. The closest fire station is Al-Wakrah Civil Defence fire station, located ~2.5km west of the Project area (Google Maps, 2025).
- **Traffic and Transport**: The Project site can be accessed via an unnamed road coming off the main Al-Wakrah Road which connected Al-Wakrah to Doha (Google Maps, 2025). This road is wide enough for two vehicles to pass and is well-surfaced and in good condition. This road provides access to other facilities including a cricket ground and several offices and will likely experience traffic in addition to construction vehicles. However, it is unlikely to be considered busy.
- **Water, Air Quality, Noise**: Baseline descriptions with respect to status of water bodies, ambient air quality and noise conditions in the Project area are described in the relevant chapters of this ESIA report.
- **Community Assets**: The addition of 6,000 employees during construction is likely to be a noticeable influx to the local area, depending on the time period in which they arrive on-site. This may have an impact on local assets however it is confirmed that the workers will live within off-site accommodation during the construction phase. Only 150 employees are anticipated during the operational phase which is unlikely to have a noticeable impact on local community assets.

Human Rights

5.5.50 Human rights are primarily safeguarded and promoted through legal frameworks, including treaties, customary international law, general principles, and other international legal instruments. International human rights law outlines the obligations of the Qatari government to take specific actions or refrain from certain behaviours to protect and advance the human rights and fundamental freedoms of individuals and groups. OHCHR shows that the State of Qatar cooperates fully with the human rights treaty bodies of the treaties to which it is a party. The State of Qatar has ratified and acceded several UN human rights treaties, which includes:

- International Covenant on Civil and Political Rights (ICCPR)
- International Covenant on Economic, Social and Cultural Rights (ICESCR)
- Convention on the Rights of Persons with Disabilities (CRPD)
- Convention on the Elimination of Discrimination against women (CEDAW)
- Convention on the Rights of the Child (CRC), and its optional protocol to the Convention on sale of children, child prostitution and child pornography, and the optional protocol to the Agreement on involvement of children in armed conflict
- Convention against Torture and Other Cruel, Inhuman or Degrading Treatment or Punishment (CAT)
- Convention on Elimination of Racial Discrimination (CERD).

5.5.51 As the state of Qatar submits and discusses its initial and periodic national reports to the treaty bodies committees, a constant communication between Qatar including its national human rights institutions and the UN treaty bodies is found.

5.5.52 Qatar considers the promotion and protection of human rights as a strategic priority and a key driver of its economic, social, cultural, and environmental transformation. This commitment is reflected in the Qatar National Vision 2030, which incorporates key human rights-related areas such as education, healthcare, labour rights, women's empowerment, and child protection (Government of Qatar, 2008). The country has also taken legislative measures to strengthen its human rights framework, including the enactment of Law No. 12 of 2015, which granted independence and legal immunity to the National Human Rights Committee[3] to ensure its ability to operate transparently and freely (National Human Rights Committee, 2015). Additionally, Qatar is in the process of developing a National Human Rights Plan, following a 2014 resolution by the Council of Ministers.

Labour and Working Conditions in Qatar including Occupational Health and Safety (OHS)

5.5.53 Qatar has achieved notable advancements in its commitments to human rights. ;However, some challenges may persistin fully aligning with international standards, in areas such aslabour rights. The country's rapid economic development and reliance on a large migrant workforce create complexities in labour protections and working conditions. Additionally, broader socio-economic and regulatory challenges may affect the extent to which businesses operating in Qatar can fully integrate human rights due diligence into their operations (HRW, 2025).

5.5.54 The following subsections include a national and international law section, as in sections above. However, they also cover the construction phase and operation phase of the Project, as the baseline conditions for these phases vary due to different companies being responsible for each, resulting in differing baseline company policies.

Occupational Health and Safety in Qatar

5.5.55 Operational planning and control of the processes need to be established and implemented as necessary to enhance occupational health and safety (OHS) by eliminating hazards or, if not

[3] In light of the evolution underway in the state of Qatar, priority has been given to promotion and consolidation of state of law, rights, freedoms, and institutions. In this regard, the NHRC was established in accordance with Decree Law No. (38) for the year 2002. The NHRC was re-organized in accordance with Decree law no. (17) for the year 2010, thereby consolidating NHRC independence as a permanent official body headquartered in the city of Doha with a separate legal personality and an independent budget; this Decree also specified the objectives and mandates of the NHRC. Retrieved from: https://www.nhrc-qa.org/

practicable, by reducing the OHS risks to levels as low as reasonably practicable for all activities. Examples of operational control of the processes include:

- The use of procedures and systems of work
- Ensuring the competence of workers
- Establishing preventive or predictive maintenance and inspection programmes
- Specifications for the procurement of goods and services
- Application of legal requirements and other requirements, or manufacturer's instructions for equipment
- Engineering and administrative controls.

5.5.56 Qatar has strengthened its occupational health and safety framework by integrating international and regional standards to the national legislation, demonstrating a commitment to enhancing workplace safety and wellbeing. The objective is to prevent workplace accident risks specified in the ILO Occupational Health and Safety Convention.

National and International Legislation, Regulations, and Guidance

5.5.57 The Project Company will develop an HSE Plan that will incorporate at minimum the following regulations and standards:

- Qatar Labor Law (14) – 2004
- Qatar Construction Specifications – QCS 2024
- National Environment Protection Law (30) – 2002 & Decision No (4) for Year 2005
- Law No. 14 of 1971 on crimes related to public health, safety, comfort, public discipline and public moral
- Law No. 20 of 2002 on the control of tobacco and its derivatives
- Human Resources Law
- Emiri resolution No. 35 of 2014 organising the General Electricity and Water Corporation (KAHRAMAA)
- Civil Service and Housing Minister resolution No. 19 of 2005
- Supreme Council of Health specifications and guidelines
- Civil Service and Housing Minister resolution No. 18 & No. 20 of 2005
- Civil Defence Law No. 19 of year 2012
- Qatar Traffic Law No. 19 of the Year 2007
- Applicable NFPA standards
- OSHA Code of Federal Regulations
- OHSAS 45001:2018
- ISO 14001:2015
- KAHRAMAA HSE regulation
- KAHRAMAA HSE Policy Statement
- KAHRAMAA General Regulations
- KAHRAMAA HSE Procedures & Guidelines
- KAHRAMAA occupational health, safety and environmental requirements specified elsewhere in the contract
- KAHRAMAA Occupational Health Legal register
- KAHRAMAA Occupational Health Guidelines

- KAHRAMAA ESIA requirements,CEMP and OEMP.

Construction Related Baseline: Pre-Existing Policies

5.5.58 Samsung is the Contractor tasked with the construction of this facility. The Contractor has pre-existing policies and guidelines which can be applied to this Project.

5.5.59 Samsung's Occupational Health and Safety Management System (OHSMS) (2018 onwards) are ISO 45001 certified (Samsung, 2025). It contains the following manuals, procedures, and instructions which will be applied during the construction phase of this Project:

- Corporate Health & Safety Management Policy: The policy emphasizes on that 'Safety comes First'. It encourages executives to deliver leadership by complying with health and safety measures, communicate the health and safety policy with all company workers, follow safe construction methods and address and mitigate hazards, promote a healthy working environment, attain growth by improving sub-contractors' skills and performance therefore reducing industrial accidents and establish a culture that promotes safety in every activity.
- Project Health, Safety and Management Policy: The policy assures the protection of all workers, sub-contractors, visitors of the Project for an ultimate goal of 'Zero Harm' through the implementation of Health, Safety and Management System.
- Alcohol and Drug Policy: The policy assures the termination of any worker hired directly or by sub-contractor if under the influence of alcohol or non-prescribed drug. Random screening of workers will take place on monthly basis.
- Smoking Policy: The policy states that smoking is prohibited at all construction sites except at the designated areas approved by the Contractor.

Operation Related Baseline: Pre-Existing Policies

5.5.60 Sumitomo are the lead sponsor awarded with this Project. As such Sumitomo's policies, procedures, and instructions will be reviewed as part of this baseline assessment, under the assumption that they will be implemented in this facility.

Personal Protective Equipment (PPE)

National and International Legislation, Regulations, and Guidance

5.5.61 In Qatar, the use of Personal Protective Equipment (PPE) is governed by several health and safety regulations, primarily under Law No. (14) of 2004 Promulgating the Labour Law. This law states that employers are required to provide a safe and healthy working environmental for their employees which includes supplying PPE. Employers must also ensure that employees are well-informed about the health and safety protocols including the correct usage of PPE. This law also says that employers must comply with the OHS standards as set by the Ministry of Administrative Development, Labor and Social Affairs.

Construction Related Baseline: Pre-Existing Policies

5.5.62 Samsung's Environment, Health and Safety Policy (Samsung, 2024) emphasizes the importance of ensuring safety and health standards at construction sites, including the use of PPE and implementing emergency response systems to protect workers from potential hazards.

Operation Related Baseline: Pre-Existing Policies

5.5.63 Although the Project Company has not yet initiated a plan on this regard at this stage, it is a requirement that an HSE Plan will be established to incorporate all details on the necessary PPE for all workers who will be permanently on the Project, following IFC General EHS Guidelines, IFC Performance Standard 1 and the IFC Specific Sector Guidelines.

Hazard and Operability Studies (HAZOP)

5.5.64 HAZOP studies are a well-proven structured team-based method for hazard identification at process design completion or for planned modifications. The technique is a detailed examination of the process within the facility to assess the hazard potential of operation outside the design intention or malfunction of individual items of equipment and their consequential effects on the facility as a whole.

National and International Legislation, Regulations, and Guidance

5.5.65 Qatar does not have specific laws exclusively governing HAZOP Studies. However, HAZOP studies are widely recognised and implemented as part of broader health, safety, and environmental regulations and standards in the country.

Construction Related Baseline: Pre-Existing Policies

5.5.66 Samsung's Environment, Health and Safety Policy (Samsung, 2024) highlights the importance of conducting HAZOP studies to identify and mitigate potential risks in the workplace, ensuring a safe and healthy environment for all employees.

Operation Related Baseline: Pre-Existing Policies

5.5.67 Although the Project Company has not yet initiated a plan on this regard at this stage, it is a requirement that an HSE Plan will be established to incorporate a HAZOP study on the Project, following IFC General EHS Guidelines, IFC Performance Standard 1 and the IFC Specific Sector Guidelines.

Risk Assessment

5.5.68 Risk assessments must be undertaken to identify the health and safety risks relating to specific hazards for the workers and communities. National occupational health and safety legislation, sector-specific standards, and international guidelines require a detailed risk assessment for workplaces. Conducting a risk assessment is an essential step to provide a safer workplace where occupational accidents, health and safety risks are prevented. It is necessary to conduct the risk assessment in order to:

- Identify the hazardous conditions that exist in a workplace or that may come from outside
- Determine the main factors and root-causes which may lead the hazardous conditions to become risks
- Define the risks related to the hazardous conditions
- Establish mitigation measures to be applied in the workplace

National and International Legislation, Regulations, and Guidance

5.5.69 Law No. (14) of 2004 Promulgating the Labour Law mandates employers to conduct risk assessments to ensure the health and safety of their employees. It also states that employers must take necessary measures to mitigate the identified risks and provide a safe working environment for employees.

5.5.70 Qatar also has Occupational Health and Safety Standards (2024) which require organisations to adopt proactive measures to identify potential hazards and mitigate the risks before they escalate. The Ministry of Administrative Development, Labour and Social Affairs oversees the implementation of these standards. The guidance document assists licensed parties in developing and implementing risk-based systems and controls to mitigate money laundering and terrorist financing risks and includes methodologies for conducting business risk assessments and ensuring appropriate risk mitigation.

Construction Related Baseline: Pre-Existing Policies

5.5.71 Samsung's Environment, Health and Safety Policy (Samsung, 2024) outlines the procedures and guidelines for identifying, evaluating, and mitigating risks related to environmental, health, and safety concerns within the company. This policy states that risk assessments should be regularly conducted and adhered to, and that the assessment itself adhere to all relevant environmental, health and safety regulations. It also states that the risk assessment should implement preventive measures to ensure the safety and health of employees.

Operation Related Baseline: Pre-Existing Policies

5.5.72 Although the Project Company has not yet initiated a plan on this regard at this stage, it is a requirement that an HSE Plan will be established to incorporate a risk assessment study on the Project, following IFC General EHS Guidelines, IFC Performance Standard 1 and the IFC Specific Sector Guidelines.

Emergency Preparedness and Response

National and International Legislation, Regulations, and Guidance

5.5.73 Law No. (14) of 2004 Promulgating the Labour Law mandates employers to develop and maintain emergency preparedness plans, and that employers must inform their employees about these plans and conduct regular safety inspections to address any identified hazards.

5.5.74 The Occupational Health and Safety Standards (2024) require organisations to adopt proactive measures for emergency preparedness. The standards state that regular drills and training sessions are mandated to ensure employees are familiar with emergency procedures.

Construction Related Baseline: Pre-Existing Policies

5.5.75 Samsung's Environment, Health and Safety Policy (Samsung, 2024) outlines key points of emergency response plans. The Policy covers various types of emergencies in its emergency response plan including fire and medical emergencies, natural disasters, chemical spills and hazardous materials, and security threats.

5.5.76 The policy states that Samsung regularly update and review these plans to ensure they remain effective and relevant. They also conduct regular emergency drills and training sessions for employees and ensure all employees are familiar with emergency procedures and their roles during an emergency.

Operation Related Baseline: Pre-Existing Policies

5.5.77 Although the Project Company has not yet initiated a plan on this regard at this stage, it is a requirement that an HSE Plan will be established to incorporate an Emergency and Preparedness Response for all workers who will be permanently on the Project, following IFC General EHS Guidelines, IFC Performance Standard 1 and IFC Specific Sector Guidelines.

Process Safety Management

5.5.78 The aim of process safety management is to develop management systems and procedures to prevent unwanted releases, which may ignite and cause toxic impacts, local fires or explosions in facilities, affecting workers and nearby communities. Additionally, process safety management can also address issues related to the operability, productivity, stability, and quality output of processes, leading to the specification of safeguards against undesirable events.

National and International Legislation, Regulations, and Guidance

5.5.79 In Qatar, process safety management is governed by a combination of laws and regulations aimed at ensuring workplace safety and protecting workers from occupational hazards. The primary legal framework is the Qatar Law No. (14) of 2004 Promulgating the Labour Law, which outlines general principles for maintaining a safe working environment. In summary, this law requires employers to inform workers about potential risks and preventive measures, provide necessary safety equipment, and ensure that safety standards are met, and requires workers to follow safety instructions and use provided PPE. The Ministry of Labour oversees the implementation of safety regulations and can enforce measures such as partial or total closure of worksites if safety standards are not met.

5.5.80 Additionally, the Qatar National Vision 2030 emphasizes the importance of workplace health and safety as part of sustainable development, reflecting the country's commitment to the well-being of its workforce. It promotes environmental sustainability by managing industrial activities to minimise pollution and ensure the safety of both the environment and the population.

Construction Related Baseline: Pre-Existing Policies

5.5.81 Samsung's Environment, Health and Safety Policy (Samsung, 2024) outlines the procedures and guidelines for ensuring safe and efficient operations, including the identification, evaluation, and control of process-related hazards.

5.5.82 The Standards for Control of Substances Used in Products Policy (2024) outlines the company's guidelines for managing substances in their products to ensure environmental compliance and minimize health risks. It includes a list of restricted and potentially risky substances, such as cadmium, lead, and mercury, to prevent pollution. The policy also mandates the development and maintenance of safety procedures for handling hazardous materials and processes and sets out the requirement of regular risk assessments and analysis to ensure compliance with environmental and safety standards.

Operation Related Baseline: Pre-Existing Policies

5.5.83 Although the Project Company has not yet initiated a plan on this regard at this stage, it is a requirement that an HSE Plan will be established to incorporate a Process Safety Management for the Project, following IFC General EHS Guidelines, IFC Performance Standard 3 and 4 and IFC Specific Sector Guidelines.

Personnel Competence and Training

National and International Legislation, Regulations, and Guidance

5.5.84 The laws governing personnel competence and training are primarily outlined in Law No. (14) of 2004 Promulgating the Labour Law. This law includes several provisions to ensure that workers are adequately trained and competent in their roles. It states that training must be conducted within establishments and at accredited institutions; the Minister of Labour issues orders determining the theoretical and practical training programs, including the maximum duration and the rules and conditions to be followed. It also states employers are required to provide necessary training to their employees to ensure they are competent in their roles and aware of safety procedures and that workers are expected to participate in training programs and apply the knowledge and skills acquired to their work. These regulations aim to enhance the skills and competencies of the workforce, contributing to overall workplace safety and productivity.

Construction Related Baseline: Pre-Existing Policies

5.5.85 Samsung's Environment, Health and Safety Policy (Samsung, 2024) outlines that Samsung provides ongoing training to employees on process safety management and ensures that employees are competent in handling process-related hazards. It also requires regular drills and training sessions to ensure employees' readiness for emergencies. The policy confirms employees are trained on how to respond to incidents and near-misses, the steps to take to mitigate risks and prevent future occurrences. The policy also promotes awareness of health and safety issues among employees, including the proper use of PPE.

5.5.86 The Standards for Control of Substances Used in Products Policy (2024) emphasizes the need for employee training to ensure a high level of competency around hazardous substances. It states that suppliers are also required to undergo training to understand and comply with Samsung's environmental standards.

Operation Related Baseline: Pre-Existing Policies

5.5.87 Although the Project Company has not yet initiated a plan on this regard at this stage, it is a requirement that an HSE Plan will be established to incorporate job training and upskilling for all workers who will be on the Project, following IFC General EHS Guidelines and IFC Performance Standard 2.

Routine Health Controls

National and International Legislation, Regulations, and Guidance

5.5.88 In Qatar, routine health controls are governed by various national laws and regulations aimed at ensuring the health and safety of workers. One of the primary legal frameworks is Law No. (14) of 2004 Promulgating the Labour Law, which mandates employers to implement regular health checks and risk assessments to identify and mitigate potential health hazards in the workplace. The law requires employers to maintain health records of employees and ensure that any work-related health issues are promptly addressed. Additionally, the Ministry of Public Health issues guidelines and conducts inspections to ensure compliance with health and safety standards, including the implementation of occupational health programs and vaccination initiatives. These measures are designed to promote a healthy work environment and safeguard the well-being of all employees.

Construction Related Baseline: Pre-Existing Policies

5.5.89 Samsung's Environment, Health and Safety Policy (Samsung, 2024) outlines the procedures and guidelines for maintaining a safe and healthy work environment, including measures to control health risks and ensure the well-being of employees. It requires employees to regularly conduct health risk assessments to identify potential health hazards in the workplace and implement measures to mitigate identified health risks. The policy also promotes the continuous monitoring of employees' health to detect any adverse effects from workplace conditions. It outlines occupational health programmes to improve employee health and wellbeing, including promoting initiatives such as vaccination programmes.

Operation Related Baseline: Pre-Existing Policies

5.5.90 Although the Project Company has not yet initiated a plan on this regard at this stage, it is a requirement that an HSE Plan will be established to incorporate routine checks and controls on workers who will be permanently on the Project, following IFC General EHS Guidelines and IFC Performance Standard 2.

Employment and Labour Relations

5.5.91 The following subsections include a national and international law section, as in sections above. However, they also cover the construction phase and operation phase, as the baseline conditions for these phases vary due to different companies being responsible for each, resulting in differing baseline company policies.

Labour Accommodation

5.5.92 Project labour will be accommodated off-site with the assurance of health, safety and security of the designated area.

Human Resources (HR) Policy

5.5.93 HR policies aim to create a structured, fair, and productive workforce and work environment. This often involves protecting and supporting vulnerable groups. Within the labour sector, vulnerable groups include women, disabled workers, and immigrant workers.

National and International Legislation, Regulations, and Guidance

5.5.94 Law No. 8 of 2009 on Human Resources Management (2009) is the primary piece of legislation governing HR policies within Qatar. It outlines various practices such as hiring practices, salaries and benefits, training and development, performance management, health and safety, and leave and end of service.

Construction Related Baseline: Pre-Existing Policies

5.5.95 Samsung has committed to promoting equal opportunities for all applicants and employees throughout the entire lifecycle of an employment relationship. This commitment includes gender equality and efforts to empower female workers, as well as the prohibition of any type of discrimination based on age, disability, ethnicity, sex, gender, race, colour, religion, nationality, sexual orientation, union membership, or any other status.

5.5.96 Samsung's Anti-Discrimination and Harassment Policy (Samsung, 2022) ensures pregnancy and postnatal employment protections, benefits, and pay. It provides maternity and paternity leave in line with local laws and regulations. Pregnant and breastfeeding women are excluded from performing hazardous work, and reasonable actions are taken to eliminate and minimize health and safety risks in their working environments, such as adjusting duties and providing reasonable breastfeeding facilities.

Operation Related Baseline: Pre-Existing Policies

5.5.97 The Project Company does not have an HR Policy in place currently, but it is a requirement that an HR Policy is well established in relation to the facility to assure the preservation of rights and fairness, standardisation throughout and legal compliance with national and international requirements. The HR policy should involve several subsequent policies including terms and conditions of employment, permit to work, workers' organisation, non-discrimination and equality, retrenchment, non-employee workers and supply chain as well as security forces.

Gender Considerations

National and International Legislation, Regulations, and Guidance

5.5.98 According to the 2024 Gender Gap Index of the World Economic Forum, Qatar is the 130th country out of 146 countries based on the indicators of economic participation and opportunity, educational attainment, health, and survival, and political empowerment (WEF, 2024). This is an improvement on 2023 where Qatar ranked 133rd, and 2022 where Qatar was ranked 137th (WEF, 2023; WEF, 2022). According to the Global Economy (2023) the labour force participation rate amongst women was 64.13% whereas it was 96.44% amongst men. Unemployment rate for women was 0.38%, and for men 0.08%.

5.5.99 Article 35 of the Permanent Constitution of the State of Qatar (2004) states that all individuals are equal before the eyes of the law and prohibits discrimination based on sex, race, language or religion.

5.5.100 Law No. (14) of 2004 Promulgating the Labour Law ensures equal pay for equal work and protects women from unjust dismissal due to pregnancy.

Construction Related Baseline: Pre-Existing Policies

5.5.101 Samsung have Global Human Rights and Principles which includes a non-discrimination and diversity section (Samsung, 2023). Samsung are committed to promote equal opportunities for all applicants and employees throughout the entire lifecycle of an employment relationship, including gender equality and efforts to empower female workers. Any type of discrimination based on age, disability, ethnicity, sex, gender, race, colour, religion, nationality, sexual orientation, union membership or any other status is strictly prohibited and won't be tolerated.

5.5.102 Samsung also have an Anti-Discrimination and Harassment Policy (Samsung, 2022) which states that they provide pregnancy and postnatal employment protections, benefits and pay as well as maternity and paternity leave in line with local laws and regulations. It also states that pregnant and breastfeeding women are excluded from performing hazardous work and reasonable actions are taken to eliminate and minimise health and safety risks in their working environments such as adjusting their duties and providing reasonable breastfeeding facilities.

Operation Related Baseline: Pre-Existing Policies

5.5.103 The Project Company should have an HR Policy that involves a clear policy on gender consideration which spotlights the issue and encourage on the implementation of strategies that consider differences between genders in terms of roles and responsibilities, activities, demands and opportunities.

Terms and Conditions and Employment

National and International Legislation, Regulations, and Guidance

5.5.104 On a national level, Law No. (14) of 2004 Promulgating the Labour Law lays down the fundamental rules governing employment relationships in Qatar and directly shapes the terms and conditions of employment such as employment contract, working hours and overtime, health and safety and wages and payment. Internationally, the International Labour Organization (ILO) plays a key role in shaping terms and conditions of employment worldwide, including in Qatar, such as ILO convention No.29 on Forced Labour which aims to eliminate all forms of forced or compulsory labour (Forced Labour Convention (No. 29), 1930).

5.5.105 Law No. (17) of 2020 on the Determination of the Minimum Wage for Workers and Domestic Workers (2020), states that minimum wage is reviewed annually, and that no worker is to be paid under the minimum wage. Currently, in February 2025, the minimum wage is set at QAR 1,000 per month as a basic wage. Additionally, employers must provide QAR 500 per month for accommodation and QAR 300 per month for food, unless these are already provided. This means the total minimum compensation can be QAR 1,800 per month if the employer does not provide food and accommodation (ILO, 2020). This has been consistent since August 2020.

Construction Related Baseline: Pre-Existing Policies

5.5.106 Samsung's Anti-Discrimination and Harassment Policy (Samsung, 2022) includes requirements to comply with local laws on working hours and ensuring for compensation. Samsung follows applicable local laws and ILO conventions regarding working hours and overtime. They state that overtime must be voluntary and paid at a premium rate as per local law, and that workers are provided with sufficient rest, including breaks, rest between shifts, holidays, and at least one day off every seven days. Through this policy Samsung also ensures that employee compensation complies with applicable wage laws, including minimum wages, overtime hours, and legally mandated benefits.

Operation Related Baseline: Pre-Existing Policies

5.5.107 It is important that the Project Company initiates terms and conditions that are relevant to the Project and in compliance with local and international legal requirements. Terms and conditions importance lies in ensuring that all employees understand and agree on the set roles, responsibilities, benefits and consequences of actions.

Permit to Work

National and International Legislation, Regulations, and Guidance

5.5.108 In Qatar, obtaining a work permit is essential for foreign nationals who wish to work in the country. Various laws and regulations that cover permits to work, the main one is the Law No. (14) of 2004 Promulgating the Labour Law. It states that non-Qatari workers must obtain approval from the Department and a work permit to work in Qatar. It states these permits may last a maximum of five years before renewal and may be cancelled if the worker fails to meet conditions set out.

5.5.109 The World Bank Environmental and Social Standard 2 (ESS2) focuses on labour and working conditions and includes fair treatment and non-discrimination and worker's rights and their working conditions. ESS2 requires that foreign workers are treated fairly and without discrimination, and that employers are responsible for obtaining and maintaining valid work permits for their foreign employees.

Construction Related Baseline: Pre-Existing Policies

5.5.110 Samsung's Migrant Worker Policy (2020) outlines Samsung's commitment to ethical recruitment and the protection of migrant workers. Samsung is committed to respect the fundamental human rights of workers including international human rights principles and the laws of the countries in which they operate. Samsung review and update this policy on a regular basis to ensure compliance with changes in applicable local and international laws and regulations.

Operation Related Baseline: Pre-Existing Policies

5.5.111 The Project Company must ensure the establishment of a permit to work for all employees. A permit to work authorises an individual to perform a specific role under which his name is mentioned within a specific location and for a determined time. The ultimate goal of the permit to work is to secure employee's health and safety through anticipating hazards and developing precautions necessary to perform the job.

Non-Discrimination and Equal Opportunity

National and International Legislation, Regulations, and Guidance

5.5.112 Within the Permanent Constitution of the State of Qatar (2004), Article 35 states that all individuals are equal before the eyes of the law and prohibits discrimination based on sex, race, language or religion. Article 34 ensures that citizens are equal in terms of public rights and duties, and Article 30 states that the employee-employer relationship is based on social justice and regulated by law to ensure equal opportunities for all.

5.5.113 Additionally, the Dhaka Principles for Migration with Dignity, Core Principle A, states that all workers are treated equally and without discrimination (IHRB, 2017). This means that migrant workers should receive the same treatment and opportunities as local workers, without any form of discrimination based on nationality, race, gender, or other characteristics. Core Principle B states that all workers enjoy the protection of employment law meaning policies and procedures should be inclusive, explicitly referring to migrant workers' rights in employer and recruiter public human rights policy statements (IHRB, 2017).

Construction Related Baseline: Pre-Existing Policies

5.5.114 Samsung have Global Human Rights and Principles which includes a non-discrimination and diversity section (Samsung, 2023). Samsung are committed to promote equal opportunities for all applicants and employees throughout the entire lifecycle of an employment relationship, including gender equality and efforts to empower female workers. Any type of discrimination based on age, disability, ethnicity, sex, gender, race, colour, religion, nationality, sexual orientation, union membership or any other status is strictly prohibited and won't be tolerated.

5.5.115 Samsung also have an Anti-Discrimination and Harassment Policy (2022) which states Samsung provides equal hiring opportunities to all job applicants and prohibits discrimination in compensation, promotions, job assignments, training, performance evaluations, benefits, social and recreational programs, disciplining, or termination. It also states that Samsung respects the religious practices of employees and provides appropriate and reasonable accommodation.

Operation Related Baseline: Pre-Existing Policies

5.5.116 In addition to the gender consideration, the Project Company will have to state a non-discrimination and equal opportunity policy in compliance with the IFC Performance Standard 2 on Labour and Working Conditions and the Dhaka Principles that emphasize on that all workers should be treated fairly and equally regardless their race, sex, gender, religion, nationality and colour.

Worker's Organisation

National and International Legislation, Regulations, and Guidance

5.5.117 Within Law No. (14) of 2004 Promulgating the Labour Law, Chapter 12 states that workers in an establishment where the number of Qatari workers is not less than 100, have the right to form a committee among themselves called the Labour Committee. It also states that the workers' organisations shall take care of the interests of their members and protect their rights and represent them in all matters related to the affairs of the work.

Construction Related Baseline: Pre-Existing Policies

5.5.118 Samsung have Global Human Rights and Principles which includes a section on Freedom and Association and Collective Bargaining (Samsung, 2023). Samsung recognises the right of its own and business partners' employees to form and join trade unions (or worker's organisations) of their own choosing, to bargain collectively, and to engage in peaceful assembly, as well as the right to refrain from such activities. Samsung commits to refrain from any interference which would restrict this right or impede the lawful exercise thereof, which includes that the discrimination of workers for forming or participating in a union (or worker's organisation) is strictly prohibited.

Operation Related Baseline: Pre-Existing Policies

5.5.119 The Project Company must have a workers' organisation formed which is dedicated to look into labour issues, interests and protect their rights. The existence of Workers' Organisation will assure that labour voices are well heard and considered.

Grievance Mechanism

National and International Legislation, Regulations, and Guidance

5.5.120 The ILO emphasise on that every worker should have the right to raise a grievance request without prejudice and the importance of having a procedure to handle a grievance. The ILO encourages to resolve issues through effective dialogues between the employers and the workers.

Construction Related Baseline: Pre-Existing Policies

5.5.121 Samsung has a Global Grievance Resolution Policy which outlines its available grievance channels and handling procedure (Samsung, 2025). Samsung offers various grievance channels for employees, partners, consumers, and other stakeholders to report concerns. These channels ensure confidentiality and protection against retaliation. Grievances are handled in a process of four steps: receipt, investigation, notification, and resolution. Samsung aims to handle grievances within three months, prioritising urgent cases.

Operation Related Baseline: Pre-Existing Policies

5.5.122 As a part of the Stakeholder Engagement Plan and the HR Policy, the Project Company must develop internal and external grievance mechanisms to escalate issues, concerns and opinions in a well organised manner from employees, labours and the surrounding community and ensure that they are managed effectively.

Child and Forced Labour

National and International Legislation, Regulations, and Guidance

5.5.123 IFC PS2 states that all persons under the age of 18 and those below the age of 18 years will not be employed in hazardous works.

5.5.124 Chapter Eight of the Law No. (14) of 2004 Promulgating the Labour Law states that a juvenile who has not attained the age of sixteen may not be employed in work of whatever nature and shall not be permitted to enter into any place of work.

5.5.125 IFC Performance Standards on Environmental and Social Sustainability defines Forced Labour as labour that consists of work or service involuntarily performed that is exacted from an individual under threat of force or penalty, including through abusive and fraudulent recruitment practices.

Construction Related Baseline: Pre-Existing Policies

5.5.126 Samsung have a Child Labour Prohibition Policy which enforces a zero-tolerance policy against child labour, adhering to international standards and national laws. The company also provides special protection for young workers to prevent harm and injury (Samsung, 2020). Samsung defines a child as anyone under 15 years old, and a young worker as anyone under 18 years old. This policy applies to all Samsung worksites and will be applicable during the construction of this Project's construction phase.

Operation Related Baseline: Pre-Existing Policies

5.5.127 Following the national law and IFC Performance Standard 2, the Project Company should issue a statement on the prohibition of child and forced labour employment and that no permit to work shall be issued to such individuals under any circumstance.

Retrenchment

National and International Legislation, Regulations, and Guidance

5.5.128 In Qatar, retrenchment, or collective dismissal, is addressed under the broader framework of employment termination laws. Article 49 of the Law No. (14) of 2004 Promulgating the Labour Law requires termination to have justifiable reasons and notice periods based on the individual's length of service, ranging from one week to one month. In 2020, amendments to this article expanded its scope, now allowing fixed-term and indefinite contracts to be terminated with a notice period without a specific reason.

Construction Related Baseline: Pre-Existing Policies

5.5.129 Samsungs does not have a policy which directly impacts retrenchment. However, their Global Grievance Resolution Policy (Samsung, 2025) outlines the procedures for handling grievances which include those related to retrenchment or collective dismissal, ensuring that employees have access to remedies and fair treatment during such processes.

Operation Related Baseline: Pre-Existing Policies

5.5.130 The Project Company must ensure that any labour termination must be associated with justified reasons along with sufficient notice period as stated in Article 49 of Law No. (14) of 2004. Moreover, terminated labour must be fairly treated under such circumstance.

Non-Employee Workers and Supply Chains

National and International Legislation, Regulations, and Guidance

5.5.131 Within The Permanent Constitution of the State of Qatar (2004), Article 30 states the employee-employer relationship, including third-party relationships, should be based on the ideals of social justice and regulated by law.

5.5.132 Article 29 of the Law No. (14) of 2004 Promulgating the Labour Law states that only licensed individuals or entities can recruit workers from abroad for third parties. Article 30 states that applications for recruiting workers from abroad for third parties must be submitted to the Department using a specific form and supporting documents.

Construction Related Baseline: Pre-Existing Policies

5.5.133 Samsung's Supplier Code of Conduct (Samsung, 2024) contains reference to third-party employers, stating that suppliers and recruitment agencies must ensure that all work is voluntary and that workers are not required to pay recruitment fees or surrender identification documents. It also states that suppliers must provide safe and healthy working conditions for all workers, including those employed by third parties, and that compensation for all workers, including third-party workers, must comply with applicable wage laws, including minimum wages and overtime pay.

Operation Related Baseline: Pre-Existing Policies

5.5.134 The Project Company must have an active policy in place on third-party relationships and supply chains as they have to be governed by local and international laws and standards. Furthermore, fair treatment and safe and healthy working conditions must be provided to such parties, while child and forced labour existence must be prohibited.

Security Forces

National and International Legislation, Regulations, and Guidance

5.5.135 Law No. 19 of 2009 on the Provision of Private Security Services states that private security services can only be provided by companies that have obtained the necessary license from the Licensing Authority, and that security personnel must perform their duties in accordance with the state's legislation and within the limits of the contracted services.

Construction Related Baseline: Pre-Existing Policies

5.5.136 Although no policy is found on this regard; it is recommended that Samsung should have a policy on the occupation of security forces on projects to maintain the safety and security of individuals, Project site and supervise and facilitate the entrance and the exit of vehicles.

Operation Related Baseline: Pre-Existing Policies

5.5.137 Due to the Project's strategic importance and for the safety of the facility and its operators, security forces must be present on site to supervise and coordinate the entrance of labourers, material and vehicles of all kinds and alert the responsible party in emergency situations.

5.6 Noise and Vibration

Overview

5.6.1 This section provides an overview of the existing ambient noise conditions within the Project area. The existing baseline conditions have been determined by a Project-specific baseline noise monitoring survey.

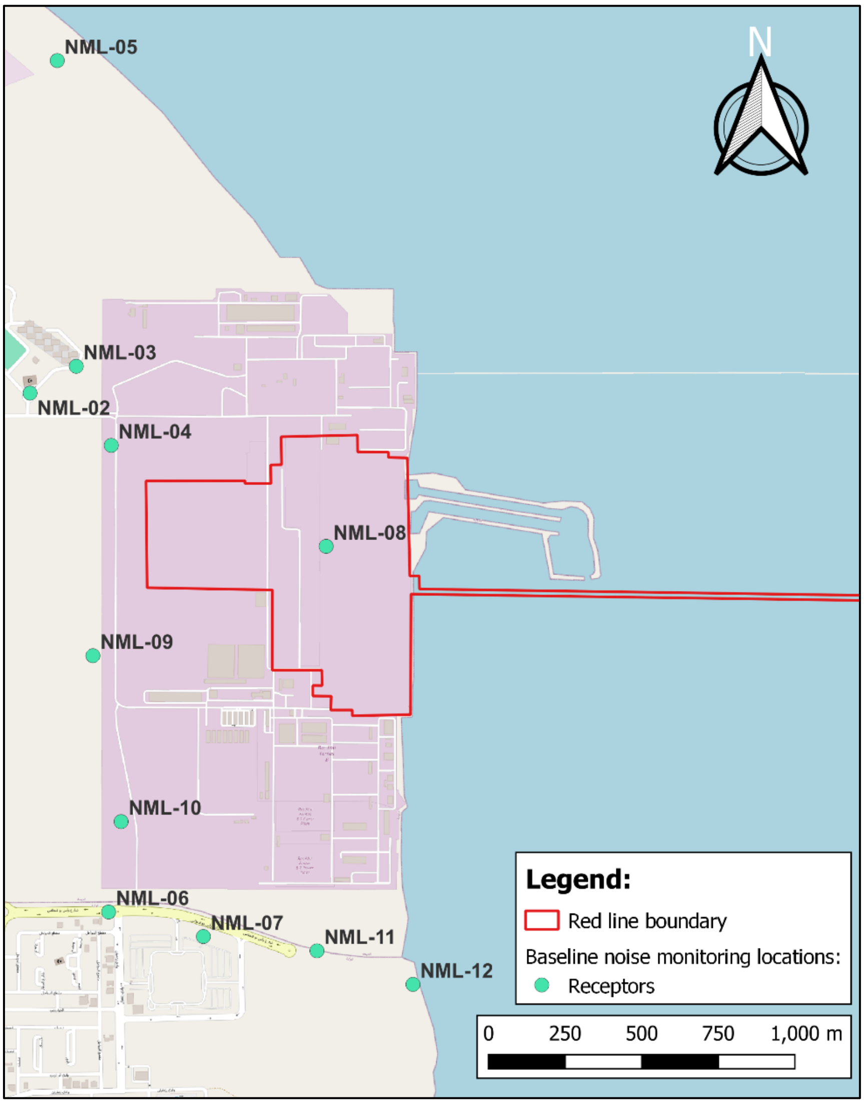
Study area

5.6.2 The Noise baseline survey was conducted at 12 identified sensitive receptors (as presented in Figure 5.30), the furthest receptor considered in this assessment is 1400m from the Project site.

Baseline noise survey

5.6.3 A baseline noise survey was undertaken by Petroltecnica Environmental Services (PES) between Thursday 16 January 2025 and Saturday 25 January 2025. The survey included 12 measurement positions as shown in Table 5.20. Measurements were made during the daytime (04:00-22:00) and night-time (22:00-04:00) periods on both weekdays and weekends.

Figure 5.30: Baseline noise survey measurement positions



Source: © OpenStreetMap contributors, 2025 and Mott MacDonald Ltd mark

5.6.4 A summary of the coordinates of the noise survey measurement locations and the representative receptors near each location are summarised in Table 5.20.

Table 5.20: Descriptions and coordinates of noise measurement survey

Receptor measurement position	Receptor description	Coordinates			
		WGS 1984 - UTM		QND 1995 (Local Grid)	
		Easting	Northing	Easting	Northing
NML-01	Near Doha Metro Depot	561027.04	2788597.63	239293.18	384424.82
NML-02	Mosque near QEWC Staff Accommodation	561190.71	2788380.11	239456.56	384206.96
NML-03	QEWC Staff Accommodation (sensitive receptor)	561341.42	2788468.06	239607.46	384294.70
NML-04	Near road at northwest of site	561456.10	2788209.79	239721.77	384036.15
NML-05	Ras Bu Fontas beach	561277.78	2789466.82	239545.42	385293.91
NML-06	Al Wakrah residential area (sensitive receptor)	561449.86	2786685.27	239713.06	382511.10
NML-07	Al Wakrah Celebration Hall Complex in residential area (sensitive receptor)	561759.34	2786605.58	240022.52	382430.88
NML-08	Within the proposed Project site boundary	562158.00	2787881.00	240423.41	383706.17
NML-09	Near road at west of site	561397.26	2787522.46	239661.79	383348.67
NML-10	Near road at southwest of site	561490.19	2786980.62	239753.88	382806.49
NML-11	Northeast of Al Wakrah residential area	562130.23	2786559.40	240393.47	382384.09
NML-12	Al Wakrah beach camping site	562443.76	2786450.22	240706.93	382274.36

Source: Environmental baseline survey – noise monitoring (Document ref. no. PES-ENV-R-2024-02-31-NML-EBSR-01)

5.6.5 At each measurement location, continuous noise monitoring was conducted for a period of 30 minutes in line with the MoECC requirement of noise monitoring. Reporting at multiple 10-minute averaged shifted intervals over 30 minutes have been carried out for the $L_{Aeq10\ minutes}$ parameter to generate monitoring data for review and evaluation. As a prerequisite, and in line with the prescribed method by MoECC, noise monitoring campaigns at every identified monitoring location were performed to represent a one-time daytime monitoring event.

5.6.6 The measurements were made using sound level meters which are designed to conform with the Class 1 specifications described in IEC 61672-1:2002. All sound level meters were calibrated in an accredited laboratory within a one-year period prior to the survey, and traceable to UK national standards. The sensitivity of the measurement system was checked using a field calibrator designed to comply with the Class 1 specification as described in IEC 942. Drift of no greater than 1 dB was observed over each set of measurements. The microphone of each sound level meter was supported using a tripod at a height of 1.2 to 1.5m above ground level and fitted with a windshield suitable for outdoor use.

5.6.7 The results of the survey are summarised in Table 5.21.

Table 5.21: Summary of the January 2025 baseline noise measurement results

Receptor measurement position	Measured baseline $L_{Aeq,10\ minutes}$ (dB)			
	Weekday		Weekend	
	Daytime	Night-time	Daytime	Night-time
NML-01	50.4	49.8	51.2	48.4
NML-02	56.4	53.1	54.7	50.7

Receptor measurement position	Measured baseline $L_{Aeq,10\ minutes}$ (dB)			
	Weekday		Weekend	
	Daytime	Night-time	Daytime	Night-time
NML-03	56.0	45.1	52.7	46.4
NML-04	56.7	44.3	54.1	44.2
NML-05	58.1	48.8	52.8	48.8
NML-06	51.6	42.8	52.7	59.7
NML-07	61.3	50.0	50.7	49.0
NML-08	56.1	50.3	55.4	49.0
NML-09	57.4	51.7	52.7	50.0
NML-10	59.2	48.9	50.7	46.6
NML-11	59.2	41.2	52.4	42.7
NML-12	54.2	45.4	50.4	45.0

Source: Environmental baseline survey – noise monitoring (Document ref. no. PES-ENV-R-2024-02-31-NML-EBSR-01)

5.7 Cultural heritage and archaeology

Overview

5.7.1 The cultural heritage and archaeology baseline was produced using a desk-based survey only, assembled from previous assessments carried out within the location and vicinity of the Project (Mott MacDonald, 2015).

Study Area

5.7.2 The study area considered within this assessment comprises the Project site and likely access routes.

Baseline Description

5.7.3 Qatar has had an extensive history of human habitation and activity with the earliest evidence of this dating back as far as the Palaeolithic period, though it is noted that evidence for this is primarily represented by surface scatters of stone artifacts (Muhesen, Sultan, Al Naimi, Faisal., 2014).

5.7.4 The Neolithic period provides the first well-dated sites of activity within Qatar with evidence having been noted of groups occupying primarily coastal sites where a variety of resources could be exploited. These sites appear to have been largely occupied on a seasonal basis. This period also appears to have seen closer ties between the peninsula and southern Mesopotamia which was going through the Ubaid period. Material evidence recovered from a variety of sites across Qatar have indicated strong trade links which allowed for items such as pottery and beads to make their way into the peninsula (Muhesen, Sultan, Al Naimi, Faisal., 2014).

5.7.5 The Bronze and early Iron Ages appear to have seen an overall reduction in the levels of activity within the Qatar peninsula. This may have been driven by an overall change in the climate which saw more arid intervals during these periods. It has also been suggested that during this period the peninsula formed a part of the kingdom of Dilmun in Bahrain, which was a prosperous kingdom with trade links from Mesopotamia to Oman. By the 1st millennium BC, the occupation of Qatar appears to have developed and extended with clear indications of a coexistence between nomadic and sedentary populations (Muhesen, Sultan, Al Naimi, Faisal., 2014). These periods also saw a great increase in the number of stone cairn burials with several of these having been identified and recorded across Qatar.

5.7.6 During the later pre-Islamic period, the peninsula came under the influence of Greco-Roman kingdoms and Parthian/Sassanid Persia. However, evidence from these periods is scarce and settled activity appears to have been largely concentrated around coastal fishing and pearling stations (Muhesen, Sultan, Al Naimi, Faisal., 2014).

5.7.7 The Islamic period saw Qatar being utilised primarily as rangeland for nomadic tribes with encampments being established in close proximity to sources of water. Settlements appear to have continued to be largely located along coastal regions (Muhesen, Sultan, Al Naimi, Faisal., 2014). Over the centuries the peninsula came under the control of a variety of foreign powers with the Umayyad Caliphate between 661 and 750 AD, the Abbasid Caliphate between 750 and 1253 AD, the Portuguese between 1521 and 1602 AD, the Ottomans between 1602 and 1670 AD and again between 1871 and 1913 AD, and finally the British between 1916 and 1971 AD. These periods were of broken up by periods of control by local powers. The withdraw of the British from peninsula in 1971 marked the establishment of Qatar as an independent state on the 3rd of September 1971.

5.7.8 It should be noted that archaeological features within desert areas have been identified across Qatar. These features include burial and marker cairns, rock art, stone outlines from temporary mosques, areas of stone clearance for camps. The exact date of these features can be difficult to determine due to the conditions present in the desert. Some can remain undisturbed for centuries but may visually appear almost indistinguishable from modern activity.

5.7.9 The nearest town is the city of Al Wakrah, which is less than 500m to the south-west of the Complex. The town has a number of buildings and structures of local and national importance for their cultural and archaeological features comprising: Al Wakrah Castle, Abu Manartain Mosque, Sheikh Ghanim Bin Abdulrahman House and the Al Wakrah Museum.

5.7.10 Historic architecture can be seen in a number of areas within Al Wakrah and especially along the old part of town particularly captured in mosques, old homes and along the harbour. Qatar Museum Authority (QMA) owns a significant number of archaeological and historical studies for Qatar and is the principal public body that overlooks the conservation of archaeological and culturally sensitive sites including those within Al Wakrah.

5.7.11 The presence of possible historical fish traps, known locally as maskar, in the intertidal zone to the east of the complex should also be noted. These fish traps formed intertidal barriers and took advantage of Qatar's shallow coasts which see several tide changes daily (Qatar Museums, 2022). These features are visible in satellite imagery (Google Earth, 2025) and have been noted from previous walkover surveys of the area, not directly associated with the present project Mott MacDonald. (2015). The specific age of these features cannot be determined from the available evidence as the morphology and construction has remained largely unaltered since earlier periods. Additionally, the lines of earlier weirs may have been preserved and built over into the modern period, up to AD 1994 when the practice was banned.

5.8 Terrestrial ecology

Overview

5.8.1 This chapter presents a summary of survey methodologies and baseline characterisation of the Project area's terrestrial biodiversity to enable comparison of the current situation with changes anticipated to biodiversity receptors as a result of the Project. It includes legally protected and internationally recognised areas, habitats, fungi, flora and fauna species, gathered through primary and secondary sources. The purpose of this baseline assessment is to identify natural/ modified habitats and the significant biodiversity values which may be present within the Project's Area of Influence (AoI) and assess the Project's impacts against them to develop appropriate mitigation in line with the policies and standards as set out in Section 3. Significant biodiversity values are those which are globally threatened (Critically Endangered (CR), Endangered (EN), Vulnerable, (VU)), nationally threatened or protected, restricted-range or migratory. These will be identified as part of this chapter. Marine biodiversity is covered under Section 3.2.

Study Area

5.8.1.1 For the purposes of this ESIA, three areas of interest to biodiversity are defined – the Biodiversity Study Area (BSA), the field survey area and the Area of Influence (AoI). The BSA includes a 30km buffer for all internationally recognised and legally protected areas and a preliminary list of species that could occur within the 30km buffer. This list is drawn from the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (purchased from Integrated Biodiversity Assessment Tool (IBAT).

5.8.2 The field survey area used to collect biodiversity field data in February 2025 considers the entire Project site and extends 150m beyond the site boundary.

5.8.3 The Biodiversity AoI has been defined as 150m around each Project component for habitats, flora, mammals and herpetofauna and 1km around each Project component for terrestrial birds. The AoI for coastal bird species extends to mangrove habitat within the BSA which has been identified 3.5km south of the Project. However, the AoI for mangroves, intertidal and marine habitats is defined in Section 5.2.

Methodology

5.8.4 Baseline data collection consisted of a desk study and field surveys as described below.

Desk Study

5.8.5 The assessment involved establishing a baseline understanding of habitats and associated biodiversity present within the BSA. This was undertaken through a desk study of national and international secondary data sources which included:

- IBAT (https://ibat-alliance.org/) – purchase of a 30km buffer 'GIS Download' in February 2025 ("IBAT GIS data" presented in Appendix F (403100049-C001-MML-RP-EN-015)) (IBAT, 2025)
- IUCN Red List of Threatened Species (http://www.iucnredlist.org) (IUCN, 2025)
- BirdLife International Data Zone (http://www.birdlife.org/datazone/home (BirdLife, 2025a)
- Global Biodiversity Information Facility (GBIF.org (9 August 2023) GBIF Occurrence Download (https://doi.org/10.15468/dl.w9be9u)
- Convention on Biological Diversity website (http://www.cbd.int/)
- Critical Ecosystem Partnership Fund (https://www.cepf.net/our-work/biodiversity-hotspots)
- The Cornell Lab of Ornithology - eBird (https://ebird.org/home)
- National Red List (https://www.nationalredlist.org/)
- Local Ecological Footprinting Tool– Qatar South of Doha (October 2024)

5.8.6 Information on the following nature conservation areas and other protected areas (existing or proposed) within the BSA has also been collected and reviewed:

- Ramsar sites
- Key Biodiversity Areas (KBA)

- Important Bird and Biodiversity Areas (IBA)
- World Heritage Sites (WHS)
- UNESCO Biosphere Reserves
- National Protected Areas of Qatar
  - Biosphere Reserve
  - Protected Area

5.8.7 The list of reviewed documentation for this ESIA includes:

- Environmental Impact Assessment Study Report (Rev 01) (January 2022)
- Petroltecnica Environmental Services- Terrestrial Ecology Survey Report (February 2025) (Petroltecnica Environmental Services, 2025a)
- Petroltecnica Environmental Services- Mangrove Survey Report (February 2025) (Petroltecnica Environmental Services, 2025b)
- RAF A2 Desalination Project - Environmental and Social Impact Assessment (June 2013) (Mott MacDonald)
- Facility D IWPP - Environmental Impact Assessment, (July 2015) (Mott MacDonald)
- Ras Abu Fontas (A) Station - Dismantling, Demolition, Excavation, Removal and Disposal -Environmental Impact Assessment (January 2022) (Petroltecnica Environmental Services)

Environmental Impact Assessment Study Report (Rev 01)

5.8.8 This document states that the decommissioning of the Ras Abu Fontas (RAF) 'A' station carried out in 2019 would result in insubstantial (neutral) impacts, and therefore an impact prediction and mitigation were not undertaken. However, no terrestrial ecology surveys were undertaken to inform the assessment.

Field survey methodology

5.8.9 A walkover survey was undertaken for terrestrial ecology by Petroltecnica Environmental Services (PES) consultants on 4-5 February 2025. Details of the methodology are presented in Appendix H (403100049-C001-MML-RP-EN-016). During the site visit the following activities were carried out:

- Different land features within the survey area were recorded and photographed.
- A description of each distinct habitat type was made with reference to the occurrence of each species identified on-site and its status in Qatar. The abundance of flora species was recorded using the DAFOR scale.
- Species of flora and fauna present within each area were photographed and geospatial data recorded. Indirect signs of animal presence such as footprints and nests were also photographed and geospatial data recorded.
- The flora identified was described and reference was made to their IUCN red list (IUCN, 2025) classification and abundance determined using the DAFOR scale as well as if they were present within the Convention on the Conservation of Wildlife and their Natural Habitats in the Countries of the Gulf Cooperation Council (Cooperation Council for the Arab States of the Gulf, 2009).
- The fauna identified was described and reference was made to their IUCN red list (IUCN, 2025) classification and status within Qatar. Their presence in the Convention on the Conservation of Wildlife and their Natural Habitats in the Countries of the Gulf Cooperation Council (Cooperation Council for the Arab States of the Gulf, 2009) was also identified.

Mangrove survey

5.8.10 A mangrove survey was undertaken in March 2025. Details of the methodology are presented in Appendix H (403100049-C001-MML-RP-EN-016).

5.8.11 A 2022 survey completed by Petroltecnica (Petroltecnica, 2022), satellite imagery from Google Earth was utilised to map the forest's extent and assess its spatial coverage. A preliminary ground-truthing survey was carried out to validate the satellite data and identify suitable observation points for measuring key parameters, including diameter at breast height (DBH), tree height, and overall mangrove health. Observation points were strategically selected based on forest coverage and accessibility, ensuring minimal disturbance to the natural ecosystem.

5.8.12 The Mangrove Health Assessment conducted in Al Wakrah provides insights into the current ecological status of the mangrove ecosystem, identifying both strengths and vulnerabilities. The survey revealed variability in mangrove health, with some areas exhibiting dense vegetation, active sapling recruitment, and healthy aerial root structures, while others showed signs of environmental stress, including chlorosis, root decay, and pollution-related degradation.

5.8.13 Despite these challenges found, the presence of saplings at several locations suggests ongoing natural regeneration.

Survey limitations

5.8.14 In line with good international industry practice (GIIP), 'it is good practice for baseline surveys to be structured in such a way as to help understand regular large changes in detectability and abundance of biodiversity values that may occur in the baseline study area over time (e.g., wet and dry seasons at tropical sites; some combination of spring/ summer/autumn/winter at temperate sites) (Gullison, 2015).

5.8.15 The terrestrial ecology survey was undertaken in February over two days. Due to the existence of two main season in the Project location (summer and winter), these survey efforts do not capture the seasonality as required by good international industry practice (GIIP)[4]. There is potential for passage birds during migration to utilise the surrounding areas of the Project. However, a literature review and desk-based study have been undertaken utilising available data sources (such as IBAT and GBIF), and an assessment of the flora and fauna potentially present throughout the year to consider seasonal data.

Mapping methodology

5.8.16 To inform the ESIA, a map was prepared to show broad habitat categories within 1km of the project AoI. Copernicus Land Use Land Cover data (100m resolution) from 2019 were used for this mapping (Buchhorn, et al., 2020). A habitat/landcover map of the AoI was prepared and ground-truthing was undertaken in February 2025 during the field surveys. A desktop review of the Project's AoI was undertaken using the existing project documents, online databases (including, but not restricted to IBAT, IUCN Red List and Birdlife Datazone) and satellite imagery concerning the AoI.

Biodiversity baseline

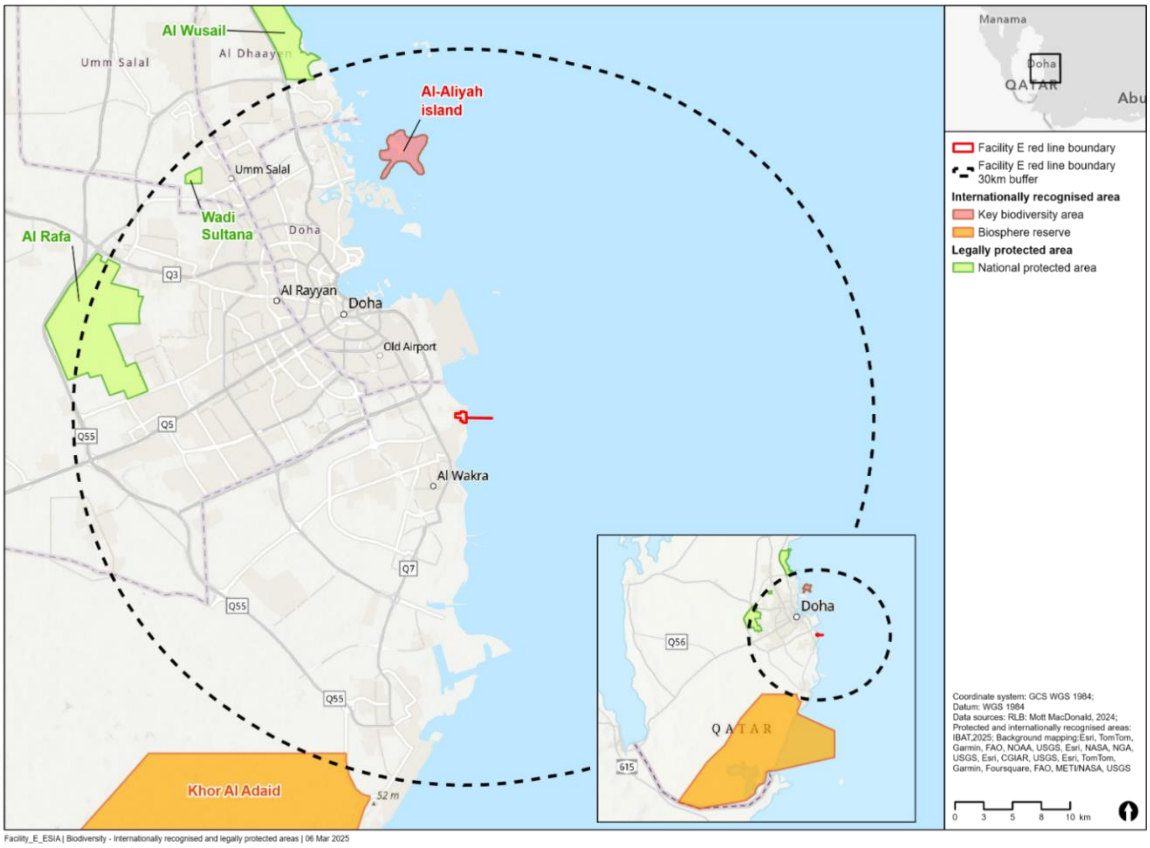
Legally protected and internationally recognised areas

5.8.17 The Project is not located within any legally protected or internationally recognised areas. Within the BSA, there are four legally protected areas and one internationally recognised area. These consisted of four nationally protected areas; Al Rafa located 24.5 km west, Al Wasail 29.7 km north, Wadi Sultana located 27.5km northwest and one National Biosphere Reserve (Khor Al

Adiad) located 28.9 km southwest and one Important Bird and Biodiversity Area (IBA)/ Key Biodiversity Area (KBA) (Al-Aliyah island) located approximately 20 km north and. A map of these areas is outlined in Figure 5.31.

Figure 5.31: Important Bird and Biodiversity Area (IBA) and Key Biodiversity Area (KBA)

Source: Mott MacDonald, 2025



Legally Protected Areas

Al Wusail (National Protected Area) 29.7km Northwest

5.8.18 Al Wusail was established in 2005. The 36km^2 nature reserve in northeast Doha, it was chosen in line with the biodiversity strategy objectives and to limit the rapid urbanisation on Qatar's eastern coast. Al Wasail, which has distinctive geological aspects, is significant to the ruling family as one of the largest historical locations. There is no reported IUCN management category or management plan (Qatar e-Nature, 2025a).

Al Rafa (National Protected Area) 24.2km West

5.8.19 The 53km^2 verdant reserve is located near Al Rayyan and Al Wajba areas. It is considered highland as it lies at a higher altitude than the surrounding land. It is populated with wild plants that sets it apart from other reserves. It is managed by the Natural Reserves Department under the Ministry of Environment and Climate Change. It has no IUCN Management category and no known management plan (Qatar e-Nature, 2025b).

Wadi Sultana (National Protected Area) 27.5km Northwest

5.8.20 Wadi Sultana is a nationally protected area in Qatar, designated for its terrestrial and inland water ecosystems. It covers approximately 1.33 km² and is managed by the Natural Reserves Department under the Ministry of Environment and Climate Change. It has no IUCN Management category and no known management plan (UNEP-WCMC, 2025).

Khor Al Adaid (National Biosphere Reserve) 28.9km South

5.8.21 The Khor Al-Adaid area also known regionally as the 'Inland Sea' was officially designated as a nature reserve by the Qatari government in 2007. The reserve is recognised for its ecological significance and was proposed as a UNESCO World Heritage Site in 2008 but as of 2025 remains on the tentative list (Unesco World Heritage Convention, 2025).

5.8.22 It is located in the south-east of the State of Qatar. The area presents a remarkable landscape formed by a globally unique combination of geological and geomorphological features. The Inland Sea is a large tidal embayment with a convoluted shoreline, about 15 kilometres from north to south and up to 12 kilometres from east to west. It is connected to the Arabian Gulf by a relatively narrow, deep channel, about 10 kilometres in length (Unesco World Heritage Convention, 2025).

5.8.23 The flora present in the area is typical of those habitats represented and supports species and communities mostly widespread on the Arabian Peninsula, yet not occurring in the same combination in any other single locality. The fauna includes several species which are internationally rare and/or threatened, for example Dugong and Turtles, with populations of certain species of bird being of national and regional importance, e.g. long-distance migrant waterfowl winter, and regionally declining breeding species also resident, including Ospreys nesting on islets. Terrestrial areas continue to support Arabian Gazelles, while there are plans to reintroduce Arabian Oryx within the hinterland of Khor al-Adaid (Unesco World Heritage Convention, 2025).

5.8.24 Terrestrial fauna species associated with the Kal Al Adaid area are unlikely to be present in the Project's AoI given the urban location of the Project. Details of marine fauna are covered within the Marine Chapter: Section 6.8. There is no reported IUCN management category, governance or management plan.

Internationally Recognised Areas

Al-Aliyah island KBA/IBA 20km North

5.8.25 The KBA/IBA is a small, low, rocky outcrop within 5 km of the northern outskirts of Doha, and 3 km offshore. Surface is loose, weathered limestone rock with uneven cover of salt-tolerant bushes Z*ygophyllum, Limonium*. A sand-spit extends south for about 2 km at low tide, and there are broad intertidal flats to the south and east, and coral reefs nearby. The island is occasionally visited by fishermen and authorized falcon-trappers (BirdLife, 2025b).

5.8.26 Surveys in 1992 and 1993 found Socotra Cormorant *Phalacrocorax nigrogularis* (350 pairs), Western Reff-Egret *Egretta gularis* (17 pairs), and second-hand reports of Lesser Crested Tern *Sterna bengalensis* (75 pairs), White-cheeked Tern *S. repressa* and Bridled Tern *S. anaethetus* (50 pairs). None of these populations exceed the 1% population levels, but the figures for terns are probably underestimates (BirdLife, 2025b).

5.8.27 The IBA previously supported 350 breeding pairs of Socotra cormorant listed Vulnerable on IUCN red list, however the status of the colony is unknown. Socotra cormorant from Al-Aliyah island could interact with the project area of influence because the average foraging range is likely to be in the order 32.6 km[2].

5.8.28 Socotra cormorant is also listed as a species found in this KBA. However, it is worth noting that it is not a species triggering the KBA designation (Key Biodiversity Areas, 2025).

Habitats

5.8.29 The Qatar peninsula is predominantly classified as desert and xeric shrublands by WWF Terrestrial Ecoregions of The World (Biomes) ((Olson, et al., 2001)) – Arabian Gulf desert and semi-desert ecoregion, although the Arabian Desert and East Sahero-Arabian xeric shrublands ecoregion is also present inland throughout the peninsula. The Qatar peninsula is not located in a Biodiversity Hotspot according to Critical Ecosystem Partnership Fund (CEPF, 2025).

5.8.30 The Project site is located on land previously built on and subsequently demolished and cleared in 2018. A site walkover survey (Petroltecnica, 2022) carried out in March 2021 and by Mott MacDonald in 2024, found that excluding the abundance of small-scaled bushes height ranging between 50cm – 100cm, the region was observed to be arid and devoid of flora and fauna.

5.8.31 Aerial imagery and the site walkover from 2025 shows that the site appears to be recolonised by scattered shrubs, likely including widespread, salt-tolerant plants (halophytes) such as *Zygophyllum qatarense* and *Suaeda vermiculata*. Small areas of wetland have developed around the base of the existing causeways. Due to the influence of previous land use and human activity, the flora of the Project site is likely to be limited to common and widespread species only.

5.8.32 The terrestrial ecology survey undertaken in February 2025 found that the vegetation is sparce and xerohytic. The flora species recorded are described in the Flora section below.

5.8.33 Table 5.22 below includes the habitat types present within the 1km AoI of the Project. Copernicus 2019 data was utilised to obtain this data as surveys were undertaken within a 150m buffer of the Project site. The natural/modified classification of the habitats is based on available data and professional judgment (see Natural/ Modified Habitats within 1km AoI section below).

Table 5.22 Habitat types within 1km AoI of the Project

Landcover type	Natural/ Modified	Description of habitat	Area (ha)	Proportion of AoI (%)
Herbaceous vegetation	Modified	Herbaceous vegetation typically consists of non-woody plants, including grasses, sedges, and forbs, which are often found in meadows, pastures, and other open areas.	2.8	0.3
Cropland	Modified	Cropland are areas used for the cultivation of crops, including both arable lands and permanent crops.	3.3	0.3
Built-up	Modified	Built-up areas are regions with a significant presence of buildings and other structures.	79.1	7.5
Bare / sparse vegetation	Modified	Bare/sparse vegetation as areas where vegetation covers between 10% and 50% of the surface. This can be naturally occurring; however, the Project area was previously cleared and the surrounding habitat has been significantly disturbed (see natural/ modified section below).	314.6	30.0
Permanent waterbody	Modified	Permanent waterbodies are areas consistently covered by water throughout the year. These include natural and man-made water bodies	7.4	0.7

Landcover type	Natural/ Modified	Description of habitat	Area (ha)	Proportion of AoI (%)
		such as lakes, rivers, reservoirs, and ponds.		
Open water	Natural	Natural or artificial water bodies with standing water present during most of the year. For this Project, open water is the Arabian Gulf.	642.5	61.2
Total			1049.6	100

Source: Mott MacDonald, 2025

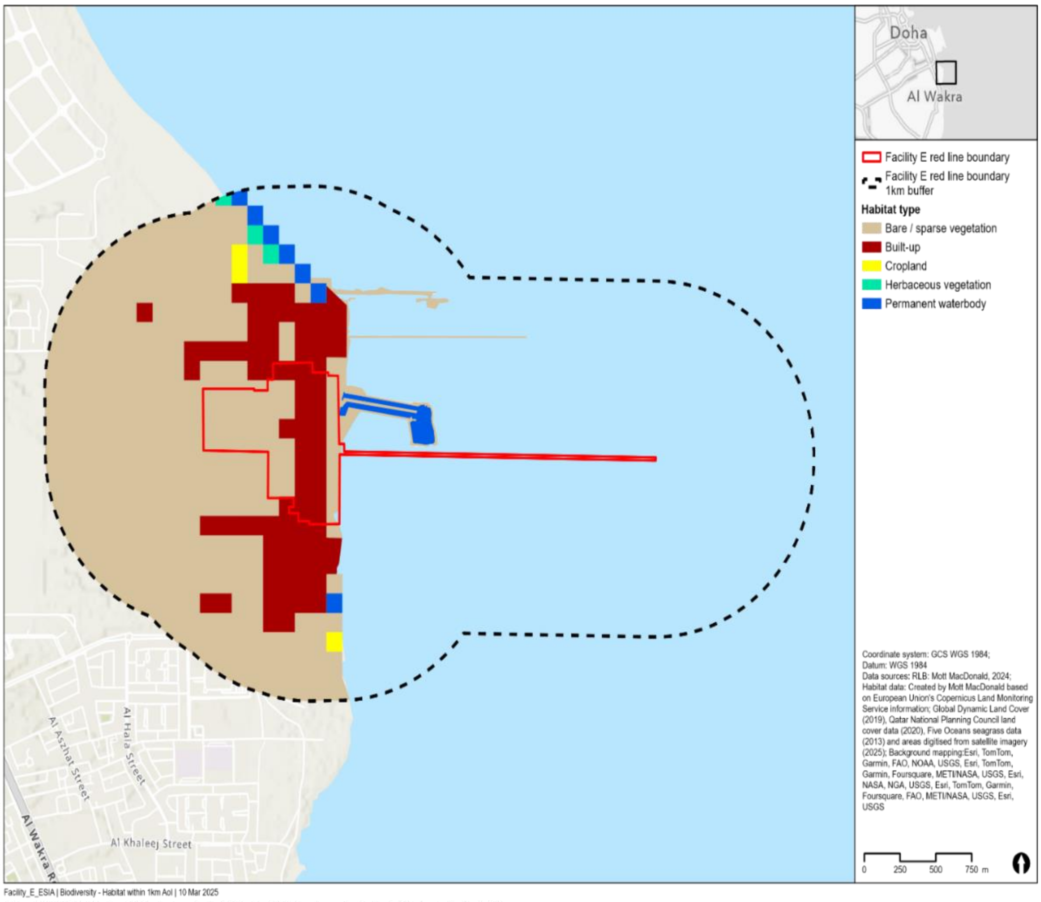
Natural/ Modified Habitats within 1km AoI

5.8.34 Small areas within the site are contain naturally occurring coastal saltmarsh species (<1% of the AoI) however, given the location in amongst built areas many of these areas are no longer functioning naturally. A large proportion of the AoI (37.5%) consisted of bare ground/sparse vegetation or built-up areas. Consequently, there is high level of previous development of the site, human-induced disturbance/pollution (vehicle movements and littering) indicating a modified environment. There is a small area (0.3% of the AoI) of cropland which is considered a modified habitat. In addition, the permanent waterbody on site (0.7% of the AoI) consisted of a few areas of modified coastline. The only natural occurring habitat is the open water consisting of the Arabian Gulf. It is therefore, considered that the majority of the Project boundary is modified habitat as per the PS6 definition (International Finance Cooperation , 2019). Following the survey in February 2025, it was noted that the built-up area under the footprint of the Project was ground/sparse vegetation however, this was still considered modified habitat.

Mangroves

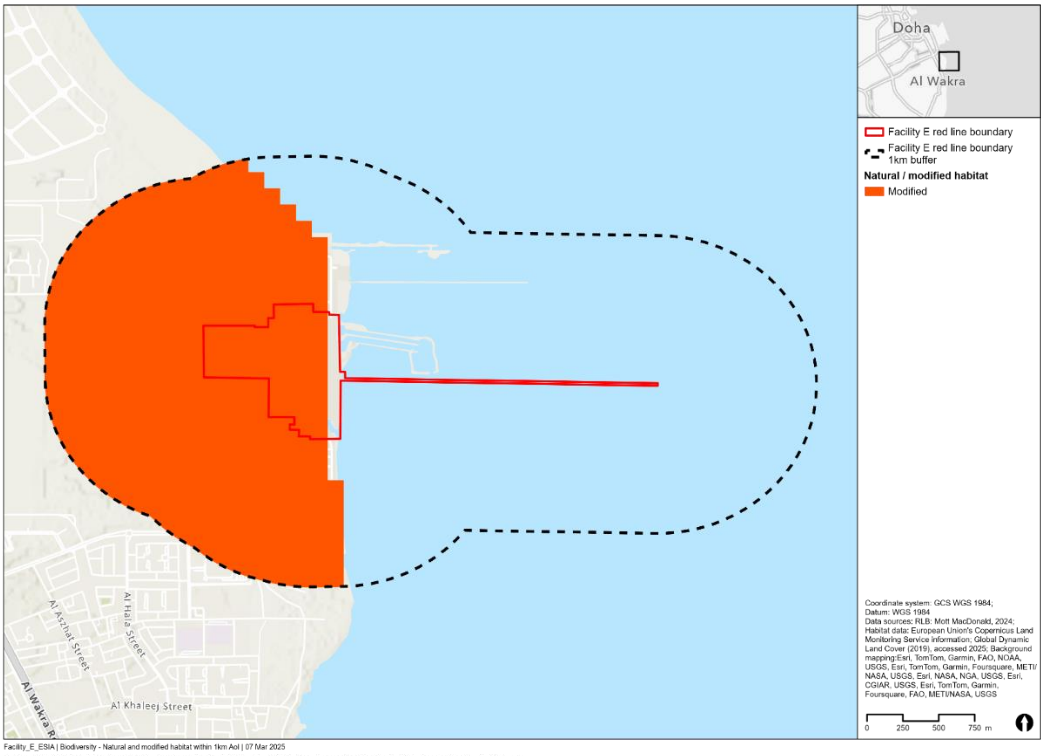
5.8.35 The Mangrove Health Assessment conducted in Al Wakrah provides insights into the current ecological status of the mangrove ecosystem, identifying both strengths and vulnerabilities. For the purposes of this ESIA, mangroves are covered in the marine chapter (see section 5.2) as they are located approximately 3.5km south of the Project site, and therefore outside of the AoI for terrestrial species. See Appendix H (403100049-C001-MML-RP-EN-016) for the full mangrove report.

Figure 5.32: Habitats present within the AoI of the Project



Source: Mott MacDonald, 2025

Figure 5.33: Natural and modified habitats within 1km AoI



Source: Mott MacDonald, 2025

Fungi

5.8.36 The IBAT data identified one fungus with potential to occur within the BSA (refer to Appendix F (403100049-C001-MML-RP-EN-015) for the full species list), and it is not considered globally Critically Endangered (CR) or Endangered (EN), or Vulnerable (VU) according to IUCN.

Flora

5.8.37 The IBAT data identified six species of plants with potential to occur within the BSA (refer to Appendix F (403100049-C001-MML-RP-EN-015) for the full species list). None of these are globally Critically Endangered (CR) or Endangered (EN), or Vulnerable (VU) according to IUCN. As part of the desk study, data from GBIF was obtained within the Project's AoI.

5.8.38 Following the February 2025 survey, the terrestrial flora comprised of shrubs including naturally occurring *Suaeda vermiculata* and *Salsola imbricate,* both species are typical salt marsh species. There was an abundance of patches of naturally occurring *Panicum turgidum* across three of the four survey areas. In the east half of the site naturally occurring Boxthorn *Lycium shawii* and Athel Pine *Tamarix aphylla* were occasionally recorded. There were also other areas of perennial herbs, shrubs along with common reed *Phragmites australis (cav.) Trin. ex Steud.* and the non-native California fan palm *Washintonia filifera* around the western side of the Site which indicates modified habitat in this area[7]. All species were considered LC under the IUCN Red List, and none were present in the Convention of Wildlife and their Natural Habitats in the Gulf Convention Cooperation Council (GCC). No threatened, protected or restricted range species of plants were recorded during the 2025 survey.

5.8.39 The Mangrove Survey Report concludes that natural regeneration of this ecosystem is present despite the challenges faced by the impacts identified. Long-term monitoring is recommended as a determine whether it is a sustainable environment for saplings to mature (see Appendix H (403100049-C001-MML-RP-EN-016) for details.

Fauna

Mammals (including bats)

5.8.40 The data from IBAT identified a total of 21 mammal species within the BSA (refer to Appendix F (403100049-C001-MML-RP-EN-015) for the full species list). No globally CR or EN species were included in this list. One IUCN VU species (Arabian Sand Gazelle *Gazella marica*) was identified and one IUCN NT species (Striped Hyaena *Hyaena hyaena*) that is on the national red list (National Red List, 2011).

5.8.41 Arabian Sand Gazelle occurs in deserts, including sand dunes and areas of sand and gravel as well as coastal flats; it avoids steep and rocky areas. All gazelles in Qatar and most of are considered in some form of managed conditions. The main threats to this species are uncontrolled hunting, and in parts of the range, habitat degradation due to overgrazing. In addition, these Gazelles are popular as pets and in private collections in the Arabian Peninsula and there is some trade in wild-caught individuals. Hunting for gazelle skins, meat, and trophy horns is common, and poorly regulated (IUCN SSC Antelope Specialist Group, 2017).

5.8.42 Striped Hyaena occurs in open habitat or light thorn bush country in arid to semi-arid environments. Although historically present, there are few reliable recent records of occurrence in Qatar. Striped Hyaenas are unafraid of humans and frequently forage on garbage and carrion near to human habitation. Reasons their decline include persecution, decreasing natural and domestic sources of carrion due to declines in the populations of other large carnivores and their prey, and changes in livestock practices (AbiSaid & Dloniak, 2015).

5.8.43 No range-restricted or migratory mammal species were included in the IBAT report. No mammals were recorded as part of the data from GBIF.

5.8.44 Of the terrestrial mammals, cape hare *Lepus capensis* was previously recorded at RAF A2 ESIA study (Mott MacDonald, 2013) and is likely the only mammal species of conservation concern. The regional IUCN Red List assessment of mammals classed cape hare as near threatened but approaching the criteria for vulnerable. Evidence suggests that the species may have been lost from previously occupied areas in Qatar. A systematic large-scale survey of bats has never been conducted in Qatar so there is uncertainty regarding their distribution. To date only three species of bat have been recorded in Qatar, however they may be more common in the south and are considered of least concern (Abdulrahman, Gardner, & Yamaguchi, 2021).

Birds

5.8.45 The IBAT report identified a total of 146 species of bird within the BSA (refer to Appendix F (403100049-C001-MML-RP-EN-016) for the full species list). Of these species, three was identified as globally Endangered and seven identified as Vulnerable. These are included in the Table 5.23. The data obtained from the GBIF within the AoI of the Project included 32 species of birds. Of these species, one was globally Vulnerable (Grey plover *Pluvialis squatarola*). All other species were NT or LC).

5.8.46 Of the 146 species, 122 species are considered to be migratory in 15 orders. The BSA has the potential to support populations of migratory bird species and therefore these will be assessed individually as part of the impact assessment in Chapter 6.

Table 5.23 Bird species of conservation concern

Species	IUCN status	Habitat preferences and likelihood of occurrence within the AoI
Coastal bird species		
Great knot *Calidris tenuirostris*	Endangered	This species breeds in north-east Siberia, Russia, wintering mainly in Australia, but also throughout the coastline of South-East Asia. The species winters in sheltered coastal habitats such as inlets, bays, harbours, estuaries and lagoons with large intertidal mud and sandflats, oceanic sandy beaches with nearby mudflats sandy spits and islets, muddy shorelines with mangroves and occasionally exposed reefs or rock platforms. The estimated global population of this species is 380,000 but is in decline (Bird Life International, 2016). This species could potentially be present in the Project's AoI but unlikely to be present in significant global populations.
Grey plover *Pluvialis squatarola*	Vulnerable	This species is fully migratory and spans all major flyways with a vast breeding range that covers much of Arctic Russia and the Nearctic. Populations winter in south-west Asia and eastern Africa. Outside of the breeding season the species frequents intertidal mudflats, saltmarshes, sandflats and beaches of oceanic coastlines, bays and estuaries. Numbers in the East Asian-Australasian Flyway estimated at c.80,000 in 2016. The estimated global population of this species is of c.1,250,000-2,250,000 but, is in decline (Bird Life International, 2024b). This species could potentially be present in the Project's AoI during its wintering period but unlikely to be present in significant global populations.
Curlew sandpiper *Calidris ferruginea*	Vulnerable	This species winters from sub-Saharan Africa through the Middle East on coastal brackish lagoons, tidal mud- and sand-flats, estuaries, saltmarshes exposed coral, rocky shores and tidewrack on sandy beaches. The species is exposed to threats on its staging and wintering grounds, through habitat degradation and conversion. The estimated global population of this species is 420,000-960,000 mature individuals (Bird Life International, 2024a). This species could potentially be present in the Project's AoI during its wintering period but unlikely to be present in significant global populations.
Broad-billed sandpiper *Calidris falcinellus*	Vulnerable	This species is a full migrant and is found along Middle Eastern shores during passage. On migration this species shows a preference for muddy and boggy areas on the shores of ponds and lakes. Overall, the global population of this species is estimated a 48,000-68,000 breeding pairs, or 96,000-136,000 mature individuals (Bird Life International, 2024c). This species could potentially be present in the Project's AoI during passage but unlikely to be present in significant global populations.

Species	IUCN status	Habitat preferences and likelihood of occurrence within the AoI
Socotra Cormorant	Vulnerable	This species is highly gregarious, occurring throughout the year in large aggregations. Roosts are tightly packed, occupying the smallest possible ground footprint, potentially to maximise shade to the feet. The species movements seem to be heavily associated in response to locally varying food availability and fish migrations. It breeds on offshore islands and islets that have shores of level sand or gravel. Outside the breeding season it roosts on coastal cliffs and rocky islets. They are known to breed and roost around the islands of the Arabian Gulf and coastal areas of Qatar. The breeding population is estimated at 110,000 pairs but is in decline (Bird Life International, 2019b). This species could potentially be present in the Project's AoI but unlikely to be present in significant global populations due to better habitat in the wider area on islands and coastline less developed.
Other notable bird species		
Steppe Eagle *Aquila nipalensis*	Engendered	This species inhabits areas of steppe and semi-desert and is recorded breeding up to 2,300 m in mountainous regions. This species is migratory and congregatory (and dispersive). The estimated global population of this species is 50000-75000 but is in decline (Bird Life International, 2021a). This species could potentially be present in the Project's AoI but unlikely to be present in significant global populations.
Saker Falcon *Falco cherrug*	Endangered	Saker falcon are found to prefer open terrain, of open grassy landscapes such as desert edge, semi-desert, steppes, agricultural and arid montane areas. In some areas, particularly near water and even in urban environments. The saker falcon in Qatar are considered native non-breeding species. The estimated global population is of c.17,400-28,800 breeding pairs in 1990, and it is considered their numbers are declining rapidly. The number trapped annually for Middle East falconers has been estimated at 1,000 in Qatar this trapping poses a threat to their global population with many other countries known to trap this species (Bird Life International, 2021b). This species could potentially be present in the Project's AoI but, unlikely to be present in significant global populations.
Greater Spotted Eagle *Clanga clanga*	Vulnerable	This species occurs in lowland forests near wetlands, nesting in different types of tall trees. It is a migratory species, with birds leaving their breeding grounds in October and November to winter in southern Europe, southern Asia and north-east Africa and returning in February and March. There are also resident population in Egypt. The estimated global population of this species is 3900-

Species	IUCN status	Habitat preferences and likelihood of occurrence within the AoI
		10000 but it is in decline (Bird Life International, 2021c). This species could potentially be present in the Project's AoI but unlikely to be present in significant global populations.
Eastern Imperial Eagle *Aquila heliaca*	Vulnerable	Eastern populations breed in natural steppe and agricultural habitats. Both adults and immatures of the eastern populations are migratory, wintering in the Middle East, East Africa south to Tanzania, the Arabian Peninsula, the Indian Subcontinent and south and east Asia. These birds make their southward migration between September and November, returning between February and May and prefer wetlands on the wintering grounds. The estimated global population of this species is 2500-9999 but it is in decline (Bird Life International, 2019a). This species could potentially be present in the Project's AoI during its wintering period but unlikely to be present in significant global populations.
Asian Houbara *Chlamydotis macqueenii*	Vulnerable	This species inhabits open, arid and sparsely vegetated steppe and semi-desert. It favours scattered shrubby vegetation, typically comprising xerophytic or halophytic plants This species extends from Middle East to central Asia within Qatar the species is nonbreeding passage. The estimated global population of this species is 78,960 and 97,000 individuals globally, but it is in decline (Bird Life International, 2021d) This species could potentially be present in the Project's AoI during passage period but unlikely to be present in significant global populations.

Source: Mott MacDonald, 2025

5.8.47 During the terrestrial ecology surveys, incidental bird sightings were recorded for Bimaculated Lark *Melanocorypha bimaculata* and Laughing Dove *Spilopella senegalensis.* Both species are common within the region and are LC on the IUCN Red List.

5.8.48 In addition, during the Mangrove survey seven bird species were recorded, all of which were LC on the IUCN Red List.

5.8.49 The habitats within and above the intertidal zone adjacent to the project are likely to support costal, migratory or congregatory waterbirds regularly during the spring and autumn migratory periods, as well as throughout the winter. Socotra cormorant *Phalacrocorax nigrogularis*, known to be present in marine waters within the wider area, may use the breakwaters for roosting.

Herpetofauna

5.8.50 The IBAT report identified 27 reptile species of which one species (Egyptian Spiny–tailed Lizard *Uromastyx aegyptia*) was identified as Vulnerable within the BSA. All other reptile species were listed as IUCN LC. No amphibians were identified.

5.8.51 Egyptian Spiny-tailed lizard occurs in open, flat, gravelly, stony and rocky areas, and it is infrequently seen in sandy areas. This species has been found across the Arabian Peninsula but, its occurrence is very patchy, and this is not easily explained by available habitat. This species has been regularly reported in the international pet and medicinal trade. Its habitat is also being lost due to over-grazing, human settlement, large-scale agricultural expansion, land reclamation, solid waste dumping and off-road vehicles (Wilms, et al., 2012).

5.8.52 The Project is likely to be situated in an area of moderate reptile species richness and could potentially support the globally and regionally threatened (vulnerable) Egyptian spiny–tailed lizard[14].

5.8.53 No range-restricted species were included in the IBAT report. No Herpetofauna were recorded as part of the data from GBIF.

5.8.54 No herpetofauna were identified during the field surveys. A singular burrow was identified within the AoI, which may be used by reptiles. The habitats within the AoI are considered to support other herpetofauna species.

Invertebrates

5.8.55 The IBAT report identified three invertebrate species all of which were listed as IUCN LC.

5.8.56 No range-restricted species were included in the IBAT report. One invertebrate species (Vagrant Emperor *Anax ephippiger*) which is IUCN LC, was recorded as part of the data from GBIF.

5.8.57 No invertebrates were identified during the field surveys.

Critical habitats

5.8.58 This ESIA has identified potential priority biodiversity values within the Project AoI including globally endangered, vulnerable and migratory terrestrial species. Therefore, a Critical Habitat Assessment (CHA) has been undertaken as part of this ESIA which is presented in Appendix N (403100049-C001-MML-RP-EN-023). The full list of species that were considered as part of this ESIA and CHA are included in Appendix F (403100049-C001-MML-RP-EN-016).

5.9 Soil, Hydrology and Contamination

Overview

5.9.1.1 The soil, hydrology and contamination chapter includes an assessment of impacts to and from soils, groundwater, surface water and contamination present in the ground/groundwater within a zone of influence of 250m. It is appreciated that impacts to groundwater or surface water may occur outside this zone but the immediate impacts within the zone of influence will infer whether this could occur. At the time of writing, the 2025 surveys were yet to be completed and therefore this baseline has been established using data from 2022. Once the 2025 data has been received, the baseline and impact assessment will be reviewed and updated as required and the results will be summarised in the Soil, Hydrology and Contamination Addendum Report (Appendix L, 403100049-C001-MML-RP-EN-023).

Study area

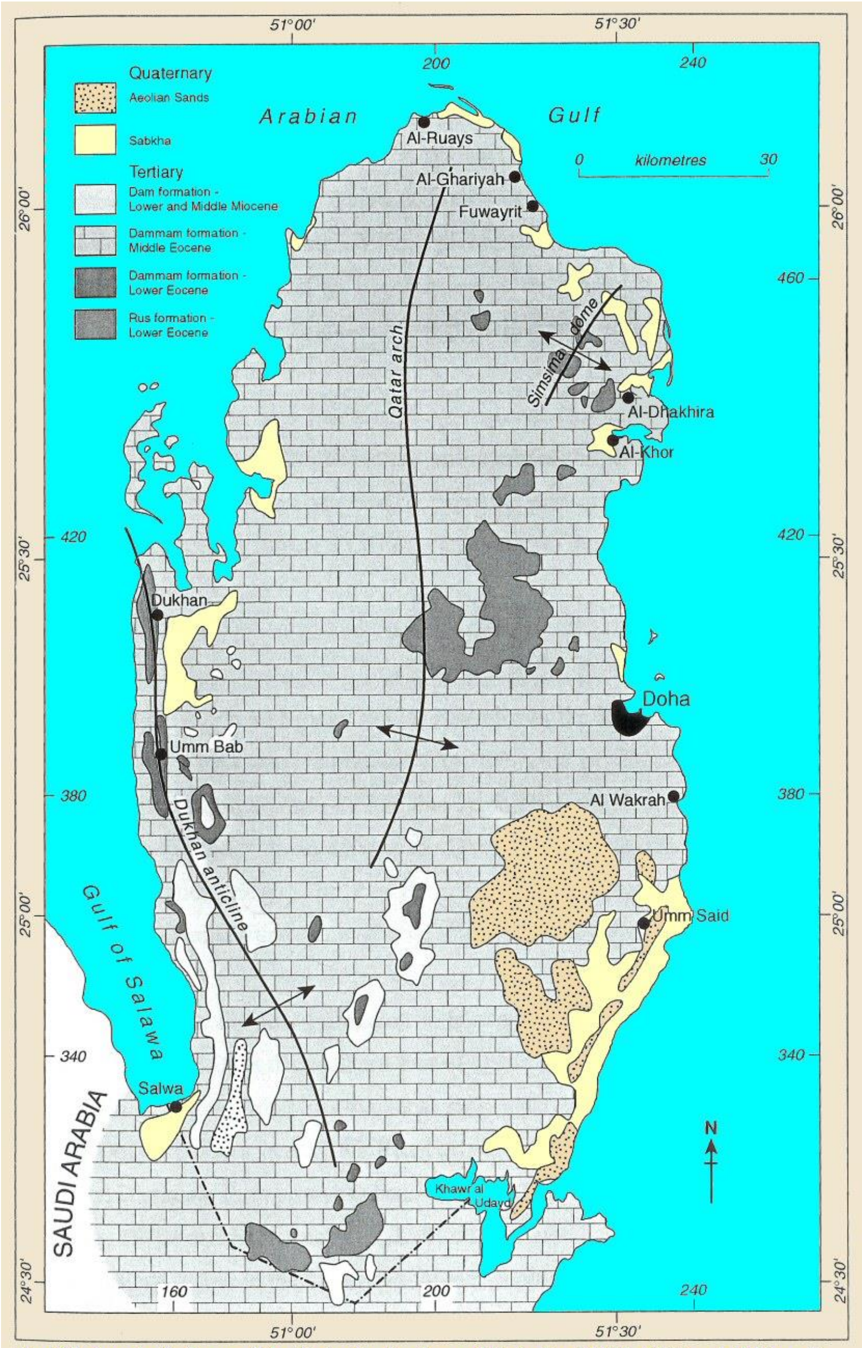
5.9.2 The study area comprises a 250m buffer from the Red Line Boundary of the site footprint. This distance has been selected upon professional judgment, considering the extent beyond which migration of contaminants likely to be minimal.

Geology

5.9.3 The majority of Qatar comprises uniform limestone beds which in places are overlain by younger unconsolidated strata.

5.9.4 The site lies in an area comprising mid Eocene Dammam Formation (Figure 5.34) with only very minor inconsequential tectonic activity. The Dammam Formation overlies the Rus Formation from the Lower Eocene. The Dammam Formation comprises the Midra Shale and the Simsima Limestone (Petroltecnica Environmental Sevices, 2022).

Figure 5.34: Qatar Geological Map



Simplified geological map of the Qatar Peninsula, modified after UNDP, 1978 and Al-Yousef (2003). Not all structures and sand deposits are shown.
Ian West & Tonya West (c) 2006.

Source: PES, 2022

5.9.4.1 Previous ground investigation (PES, 2022 and Gulf Laboratories, 2024) confirmed the geology to comprise made ground, residual soil, Weathered Simsima Limestone (WSL), Simsima Limestone, Midra Shale and Rus Formation, as summarised in Table 5.24.

Table 5.24: Summary of encountered lithologies

Lithology	Description	Thickness (average) (m)	Range of strata (m QNHD)
Made ground	Light grey, brown silty sandy gravel with occasional cobbles comprising angular to sub-angular limestone fragments	0.5 – 8.3m	3.55 to 6.04
Residual soils	Light greyish white to light greyish brown very silty sandy gravel (comprising angular to sub-angular limestone fragments)	0.37 – 3.5m	1.67 to 3.87
Weathered Simsima Limestone	Extremely weak to weak strength light brown to light greyish brown limestone	0.35 – 9.7m (5.14m)	0.81 -13.01
Simsima Limestone	Very weak to weak and occasionally medium strong light greyish brown, very fine-grained limestone intermixed with pockets of extremely weak to very weak calcareous siltstone. Siltstone is light greenish brown to light grey/brown and notably weaker than the limestone	18.75 – 25.35 (22.52)	0.42 to -30.22
Midra Shale	Very weak to weak light-yellow brown laminar bedded siltstone inter bedded with very think very weak light greyish white gypsum	5.2 – 8.55m (7.44m)	25.86 -35.42
Rus Formation	Light brownish grey to light greyish brown slightly porous and pitted limestone. Limestone is weak and slight to moderately weathered. Gypsum layer below the putted limestone.	Not established	Not established

Source: Mott MacDonald, 2025

Hydrogeology

5.9.5 Groundwater recharge is largely considered to be via rainwater, either directly or indirectly. As expected, groundwater elevations are relatively shallow at the site owing to the proximity of the site to the Arabian Gulf coast. Ground investigations in 2022 and more recently in 2024 measured groundwater elevations at the site to be relatively shallow between 0.3 and 3.21m below surface within the residual soils.

5.9.6 The Simsima Limestone and Rus Formation Limestone are considered to be groundwater bearing strata (aquifers) that transmit groundwater and allow for flow. The Midra Shale and Gypsum layers are likely to comprise lower permeability and could, however, inhibit groundwater flow, effectively acting as Aquitard.

5.9.7 Owing to the relative permeability of the residual soils and the underlying Simsima Limestone, it’s anticipated that these units are in hydraulic connectivity. Although the gypsum layers and lower permeability shale layers mostly associated with the Midra Shale may inhibit hydraulic connectivity between the upper Simsima Limestone and the lower Rus Limestone, borehole records from the most recent 2024 ground investigation do not identify the presence of deeper groundwater in the Rus Formation (no deeper groundwater strike), suggesting that there could be connectivity between the two aquifers or that deeper groundwater was not encountered during the ground investigations.

5.9.8 The Project location close to the coastline of the Arabian Gulf indicates that the groundwater on site is likely to be influenced by tidal fluctuations, especially as it is measured at shallow depths at the site. Depths measured are likely to be dependent on the phase of the tidal cycle at the time of measurement.

Hydrology

5.9.9 Regionally, surface water comprises wadis and channels flowing towards inland depressions and surface water accumulations. Within the site context, there are no known surface water features within 250m of the site, other than the coastal waters to the east.

Sensitive features

5.9.10 Sensitive features that could be impacted include coastal water and groundwater quality from residual contamination from historical activities or from operation of the proposed scheme. Additionally, soil or groundwater quality could impact human health, via dermal contact or ingestion/inhalation of contamination or through the buildup of gases or vapours from underlying contamination, especially in confined or enclosed spaces.

Soil quality

5.9.11 The soil baseline for the site is derived from the PES ESIA (2022) which is based on a ground investigation conducted within the Project footprint. The ground investigation (GI) sampled 11 boreholes for groundwater quality and 11 trial pits for soil samples. The soil and groundwater sampling locations were usually adjacent to one another. Soil samples were collected from each location at depths of 0.5-1m, 1-3m and 5-8m below ground surface.

5.9.12 The soil samples were tested for a comprehensive suite of determinants including (but not limited to) volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), heavy metals and metalloids, pH, electrical conductivity, ammoniacal nitrogen, microbiological parameters and asbestos.

5.9.13 The 2022 GI data indicate there were almost no exceedances of screening criteria that were applicable to commercial and industrial sites (Ontario soil standards, 2011, Dutch Target and Intervention values, 2013, and the National Environmental Protection Council for Australia, 2011). The only exceedances included minor exceedances for copper and zinc, although the exceedances were in a few locations, and all were within the same order of magnitude as the screening criteria. There were exceedances of electrical conductivity which is a reflection of the proximity to the coast, high salinity in the soil and infrequent rainfall within the arid region which allows for accumulation of soluble salt. All recorded exceedances were spread across Made ground and the Weathered Simsima Limestone. The detailed analytical results are presented in PES Petroltecnica ESIA, Rev01 (PES, 2022).

5.9.14 There were no exceedances of hydrocarbons, VOCs, asbestos or microbiological contaminants.

Table 5.25:Summary of soil analysis exceedances (2022)

Determinant	Range of concentration (unit)	Standard	
		Dutch Standard Intervention level	Ontario Standards
Electrical conductivity	100.00-7630 (mS/m)	-	0.7 (mS/m)

Determinant	Range of concentration (unit)	Standard	
Copper	212.91-990.32 (mg/kg)	190 (mg/kg)	-
Zinc	295.03-785.05 (mg/kg)	720 (mg/kg)	290 (mg/kg)

Source: Mott MacDonald, 2025

Groundwater quality

5.9.15 Similarly, baseline information on groundwater is provided using the PES (2022) Ground Investigation (GI). Groundwater samples were collected from the 11 groundwater wells and analysed for a similarly comprehensive suite of determinants as the soils, with the exception of asbestos.

5.9.16 The laboratory analytical results for groundwater only identified chloride as exceeding the Dutch Standards (Target and Intervention Values), and Ontario Standards protective of controlled waters (groundwater). This is likely to be associated with the proximity of the site to the coast and saline or brackish water intrusion from the sea. Some coliforms were detected in seven of the 11 boreholes, although it is unclear what activities on site may have resulted in this. No faecal streptococci were detected in the samples analysed.

Ground gas

5.9.17 The site's ground gas quality was informed from a laboratory analysis conducted in March 5 2025 where gas samples from the site were taken for subsequent analysis. Two samples (GGM-1 and GGM-02) were collected on two occasions (both on February 24, 2025). The sampling locations are provided within the survey report (Appendix H).

5.9.18 The samples for gases and VOCs were received in cannisters under chain of custody and stored according to analytical method requirements prior to analysis. Fixed gases (hydrogen, oxygen, nitrogen, carbon monoxide, methane, and carbon dioxide) were analysed using modified EPA Method. Hydrogen sulphide was analysed using modified SCAQMD and ASTM method. VOCs and Total Volatile Organic Compounds (TVOC) calculated as Toluene were analysed using EPA method.

5.9.19 Concentration for nitrogen and oxygen were reported to be 77.8% and 22.1% (v/v) respectively across two rounds. These concentrations are typical of ambient air and are not suggestive of oxygen depletion. Hydrogen sulphide concentration found were to 12.0 and 8.9µg/m^3 in the two samples. For context, these values are well below workplace exposure limits (WEL) of 7mg/m^3 for long term exposure or 14mg/m^3 short term exposure (UK Health Security Agency, 2024).

5.9.20 VOC concentrations from both rounds indicates that the detected levels are generally only marginally above and within same order of magnitude with the detection limits. A comparison of the VOC concentrations against the HSE workplace long-term exposure limits (Health and Safety Executive, 2020) showed no exceedances of any detected compound. Notably, the presence of compounds such tetrachloroethene (PCE), trichloroethene (TCE), dichloroethene (DCE), and vinyl chloride (VC) is suggestive of the presence of chlorinated solvents that may be undergoing natural degradation at the site. All other gases, including carbon dioxide and methane were not detected from the analysed samples. Despite gas monitoring detecting some VOCs, the soil and groundwater data collected in 2022 do not indicate the presence of detectable VOCs.

5.9.21 Furthermore, methane and carbon dioxide were not detected, suggesting that these ground gases may not be present at the monitored locations. It should be noted, however, that two locations are not indicative of the whole Project site and pockets of gas may occur.

5.10 Soil Waste and Material Management

Overview

5.10.1 Waste management in the State of Qatar is each municipality's responsibility, the collection and disposal of waste is managed either through their own logistics or aided by the private sector. Municipal waste is discharged at various transfer stations and then sent to designated waste management sites.

5.10.2 The predominant method of solid waste disposal in Qatar is landfilling with only about 10-15% of the country's waste being recycled. About 60% of the waste collected is organic waste, and the rest is mostly recyclables, but only a small percentage of that ends up being recycled.

5.10.3 Qatar's waste management infrastructure includes facilities for:

- Construction and demolition waste
- Hazardous waste
- Non-hazardous waste, and
- Recyclables.

5.10.4 Qatar has become the first country in the Middle East to implement a waste-to-energy program, converting waste to energy in the Domestic Solid Waste Management Centre (DSWMC) in Mesaieed Industrial City.

5.10.5 These waste management and recycling facilities are located no more than 50 km from the proposed Project site and will support the Project's waste management needs during construction and operation.

Area of influence

5.10.6 Activities during construction of the Project include site clearance, installation of laydown area, excavation, earthworks, installation of infrastructure, construction of power generation and desalination facilities, establishment of temporary storage areas, and refurbishment of marine intake system and construction of a new marine outfall system. These activities will result in the removal and displacement of natural capital stocks. During the operation phase activities will include power generation using gas turbine, seawater intake for reverse osmosis desalination, wastewater discharge into the marine environment, regular maintenance operations, and daily operational traffic within the site boundaries. These natural capital stocks will not be reinstated for the Project's operational stage, meaning that the loss of natural capital stocks within the footprint of the Project can be considered permanent.

5.10.7 The ecosystem services impact assessment has adopted an AoI comprised of the Project components (gas-fired combined cycle power plant and a seawater reverse osmosis desalination plant, with outfall pipe extending into the marine environment) with a 1km buffer. This is in alignment with the AoI adopted in the ecosystem services baseline assessment and the terrestrial ecology AoI for considering mammals, birds and herpetofauna. The buffer reflects the area where indirect temporary and permanent impacts are anticipated on natural capital stocks.

5.10.8 While the AoI for the natural capital and ecosystem services assessment is based on the area in which natural capital stocks will be affected (and so from which ecosystem service provision will change), the resulting changes in ecosystem services will affect beneficiaries located outside of the AoI. The beneficiaries affected range from local communities, industrial plants and businesses in the surrounding areas of Ras Abu Fontas.

Material management

Construction

5.10.9 Materials that are foreseen to be used during the construction phase of the Project will primarily comprise equipment for the power and desalination plant and includes materials used for the preparation of the site and infrastructure such as steel, concrete, aggregate, brick, wood, and glass.

5.10.10 Materials considered to be of a hazardous nature are identified in Section 5.10.17. Construction phase impact, these will require special consideration, particularly any final treatment and disposal options. The type and volume of these materials along with their storage volume will be confirmed by the Contractor at the time of construction as these are not available at the time of writing this ESIA.

Operation

5.10.11 Materials anticipated to be used during operation of the proposed facility is stated in Table 5.26. These materials have been stated in the application form for the initial Environmental Permit from the MoECC. Materials considered to be of a hazardous nature will require special consideration, particularly any final treatment and disposal options. Some materials will have a known consumption and storage volume whereas the consumption and volume of other materials will be dependent on routine maintenance and outage activities, therefore it is difficult to give exact quantities for all materials.

Table 5.26: Raw materials for use during operation

Material	Type (Solid-Liquid-Gas)	Total Quantity	Source
Natural Gas	Gas	141.97 MMSCFD	QE through pipelines
Seawater	Liquid	247,737 ton/h	Open sea tapping
Chemicals	Liquid	6,000 kg/day	Market suppliers
Industrial Gases	Gas	70 m^3/day	Market suppliers
Diesel Oil	Liquid	NA	Qatar oil suppliers

Source: Sumitomo Application form For Environmental Permit, 2024

Waste

Available waste management facilities within the region

5.10.12 Several existing waste management, waste disposal and recycling facilities are conveniently located in Mesaieed Industrial City, approximately 25km from the Project site. While others are in Doha City, ranging from 5 to 50km from the Project.

5.10.13 The waste facilities that are likely to be available to manage waste arisings from the Project are outlined in Table 5.27. The waste management facilities have been listed in Table 5.27 based on convenience of accessing the facility for the Project, rather than on proximity to the Project.

Table 5.27: Waste management facilities within 50km of the Project

Facility	Region/ Location	Approx. Distance from Project	Capability
Seashore	Mesaieed Industrial City	25 km	• Wood and timber waste
United Medical Waste			• Medical waste
The Mesaieed landfill			• Non-hazardous waste disposal landfill • An engineered landfill and approved backfill materials were used to elevate the land • HDPE geo-membrane liner established at the bottom to prevent contamination • Incoming waste is compacted and covered.
Mesaieed Hazardous Wate Treatment Centre (HWTC)			• Provides treatment and secured landfill facilities for hazardous wastes generated in various industries • Major elements are Landfill Class 1, Landfill Class 2, Solidification and Stabilization Facility, Oily Waste Treatment Facility, Liquid Hazardous Waste Facility and Evaporation Ponds • Does not have the capability to treat combustible (incinerable) hazardous waste
Boom Waste Treatment Facility (BWTF)			• Treats waste by Incineration of Hazardous Waste Disposal, Wastewater Treatment, Oil Sludge recycling, Hazardous waste Stabilization, Waste Neutralization, Hazardous Waste Landfill, MARPOL Waste disposal • Established quality systems in accordance with International Organisation for Standardisation (ISO) 9001:2015 and ISO 14001:2015. • A total Capacity of BWTC: 120 Tons/day • Plants include: - Plant I: Medical & Hazardous Waste: 10 Tons/day - Plant II - Step Heart: Hazardous & Medical Waste: 12 Tons/day - Plant III - Rotary Kiln: Hazardous & Medical Waste: 18 Tons/day - Plant IV- Pre -Treatment Recycling Plant: 80 Tons/day
Al Haya Waste Treatment Factory			• Waste Management, Waste Treatment, Plastic Waste Recycling Factory • First waste treatment facility in GCC to use sustainable technology

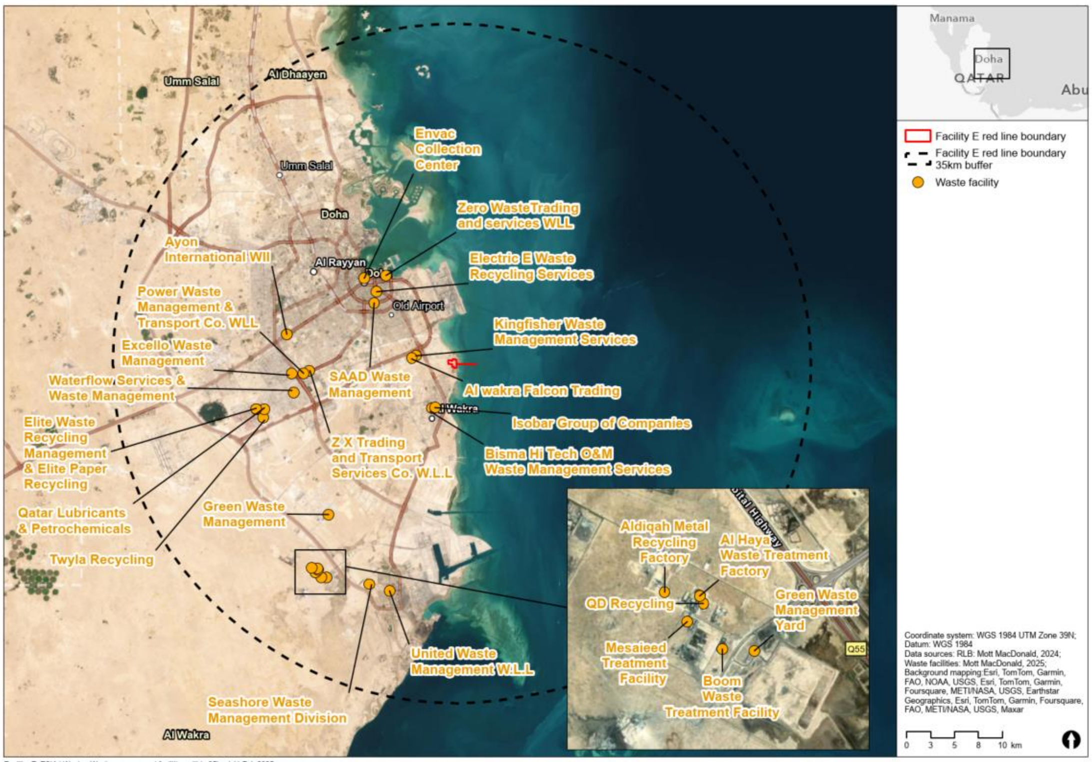
			• Treats solid, semi-solid and liquid waste oils to recover the hydrocarbon, which is then exported to be used as fuel in boilers and furnaces • Has the required technology to treat wax, contaminated grease, and contaminated soil • Equipped with necessary water treatment facilities to treat marine bilge water • Contracted with leading oil and gas industries in Qatar to treat their oily waste and hazardous waste • Holds required licenses and patents such as ZERO waste to landfill, license for Marpol waste collection and disposal services all over Qatari waters, and it is the only approved company for the same service at Ras Laffan Port • They have established quality systems in accordance with ISO 9001:2015 and ISO 14001:2015
Domestic Solid Waste Management Centre (DSWMC)			• Designed to treat up to 2,300 tons of mixed domestic, non-hazardous solid waste per day • Designed to maximize recovery of resources and energy from waste • It is the primary disposal site for general office, welfare, and biodegradable waste
Isobar Group		6 km	• Hazardous waste transportation
Qatar Maintenance & Services Co	Doha City	11 km	• Equipped to handle Domestic/Household Waste from residential compounds, accommodation buildings, and small-medium corporate companies • Manage Solid Waste that is generated from industrial, residential, and commercial activities as well as Industrial/Mix and Bulky Waste which are types that are too large to be accepted as regular waste • Manages Construction and Demolition Waste which includes waste that is generated during construction activities (such as packaging, or the products of demolition). • Has an Integrated Management System in line with ISO 9001:2008, OHSAS 18001:2007 and ISO 14001:2004 requirements and other applicable legal requirements
Qatar Lubricants & Petrochemicals		13 km	• Hazardous waste (oil) recycling
ELITE Paper Recycling		20 km	• Carboard and paper waste
Power Waste Management &		15 km	• Handles solid waste management which includes garbage collections and disposal

Transport Co. WLL			• Provide the complete solution for domestic waste including food waste, paper waste, organic waste and other household waste as well as non-domestic waste collection and disposal • Equipped to handle hazardous waste, they provide hazardous waste management including collection, transportation and disposal and provide certification for hazardous waste disposal
Rawdat Rashid Landfill		40 km	• Located west of Doha, under Al-Shahaniya municipality • Specifically designed for Construction and Demolition waste and small amounts of excavated spoils are also accepted
Alwakra Falcon Trading	Alwakra City	5 km	• Non-hazardous waste
Twyla Plastics	Ar-Rayyan City	20 km	• Plastic waste
Dukhan Petroleum Company	Dukhan City	50 km	• Hazardous waste (oil) recycling
Recycling Transfer Stations	Multiple Locations	Wide range	• Five transfer stations (South Doha, West Doha, Industrial Area, Dukhan and Al Khor) • Each equipped with collection bunkers for separating recyclables such as glass, paper, aluminium and plastic • Serves as an intermediate sorting point before materials are sent to specialized recyclers

Source: Mott MacDonald, 2025

The proximity of the waste management, disposal and recycling facilities are shown in Figure 5.35.

Figure 5.35: Key waste disposal and recycling facilities



Source: Mott MacDonald, 2025

Construction

5.10.14 Waste generated during the construction phase of the Project consists of:

- Surplus materials
- Over ordering of material, that are subsequently not used
- Damaged, off-cuts or unusable material
- Packaging
- Wastes originating from the initial site clearance and dredging activities

5.10.15 The anticipated waste streams include hazardous, non-hazardous, inert and general waste. Surplus construction material will comprise of offcuts of material, broken material, and any damaged goods during transferring. Any debris as a result of excavation for site clearance such as soil, rubble, and stones are anticipated to be produced. During construction, packaging materials are inevitable, usually consisting of plastics, cardboard, and wooden pallets from deliveries. Hazardous waste will arise from materials such as paint, plasterboard, paint thinners, and adhesives. It is anticipated that, during the construction of the Project, approximately 6,000 workers will be working on site. Site compound waste will also be generated during construction from worker welfare areas, and general refuse from canteens.

5.10.16 The waste that is likely to be generated in the site is shown in Table 5.28. Information from similar sites and projects were referred to estimate the monthly quantities of waste:

Table 5.28: Waste anticipated to be generated in the site

Material	Monthly Quantity
Concrete/Asphalt	100ton/month
Wood	10ton/month
Rebar	2ton/month
Mixed Waste (Inert, plastic, Styrofoam, Gypsum board)	40ton/month
General/Food	180ton/month
Hazardous waste	0.1ton/month
Sewage	1,000ton/month

Source: Sumitomo, 2025

5.10.17 Hazardous waste:

- Waste oil and oily solids (combustible)
- Waste oil lubricants
- Oily or chemically (non-sulphur) contaminated soil
- Oily rags and used or contaminated PPE
- Pyrophoric solids
- Batteries
- Waste chemicals (non-laboratory)
- Fluorescent light bulbs
- Catalysts, molecular sieves, activated carbon and resins
- Filters: mercury, sulfinol
- Contaminated drums and containers
- Sludge
- Laboratory waste

Operation

5.10.18 Once the Project is in the operational phase, it will produce wastes mainly associated with maintenance of the Project, routine processes, and administrative activities.

5.10.19 The anticipated waste streams stemming from the operation and maintenance of the Project will consist of general site waste such as:

- Office and cafeteria waste
- Packaging material such as paper, plastic, and biodegradable waste.

5.10.20 Waste stemming from the maintenance of the facility will likely be:

- Lubricants,
- Filters,
- Cleaning agents, and
- Chemical residues

5.10.21 Spent membranes, such as reverse-osmosis membranes, require periodic replacement once degraded. A specialist recycler is required to ensure appropriate management and handling of this waste stream. Larger equipment may have to be refurbished, repaired or replaced, such as turbine or pump parts, but eventually they will need to be recovered or disposed.

5.10.22 The operation of this facility will have potentially hazardous waste, such as solvents, chemical containers, and anti-scalant by products.

5.11 Landscape and visual impact

Overview

5.11.1 The landscape and visual impact baseline was produced using a desk-based survey, assembled from previous assessments carried out within the location and vicinity of the Project, as well as the site visit carried out by the Project team in October 2024.

Study Area

5.11.2 The study area considered within this assessment comprises the Project site, surrounding industrial area and likely access routes within 2km.

Baseline description

5.11.3 As shown in Figure 5.36 and Figure 5.37 the immediate surrounding landscape of the RAF Complex is generally dry and flat and there is no agricultural activity in the vicinity with a defined security zone around the plant and a significant area of the land to the south and west of the plant having been cleared. The Complex is visible from the Al Wakrah road at a distance of over 2km, though it is predominantly just the stacks and turbine buildings that are visible, and road users can be potentially exposed to the visual and landscape impact during both the demolition phase. The nearest sensitive receptors to the Complex are the QEWC Staff accommodation, situated less than 1 km away and the Al Wakrah residents that live in the northeast corner of that city, around Al Hala Street, and which lies less than 400m away from the south-west boundary corner of the Complex.

Figure 5.36 Project area facing main road

Source: Mott MacDonald Site Visit (08 October 2024)

Figure 5.37 Project area facing seaside

Source: Mott MacDonald Site Visit (08 October 2024)

5.12 Transport

Overview

5.12.1 The Transport baseline was produced using a desk-based survey, assembled from previous assessments carried out within the location and vicinity of the Project, as well as the site visit carried out by the Project team in October 2024.

Study Area

5.12.2 The study area considered within this assessment comprises the Project site, surrounding industrial area and likely access routes.

Baseline description

5.12.3 The Project will be located immediately to the north/east of the Qatar Economic Zone 3, and within the existing Ras Abu Fontas industrial complex with existing and operational Ras Abu Fontas plants A1, A2 and A3 to the north and plants B and B2 to the south. The Ras Abu Fontas facility is located 15km south-east of central Doha on the coast between Al Wakrah and Hamad International Airport. Access to the site is through public roads however, site roads for construction and operations shall be constructed under the Project. Traffic is expected to be impacted temporarily during construction works due to increased vehicular traffic from trucks, plants, buses, machines and workers movement.

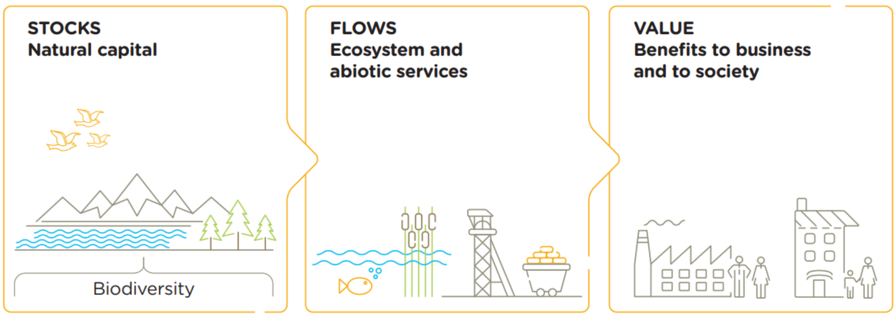
5.13 Ecosystem services

Overview

5.13.1 This section presents an overview of ecosystem services and the baseline against which expected impacts from Project activities were assessed. Ecosystem services are provided by stocks of natural capital assets. The ecosystem services assessment methodology involved mapping expected changes in natural capital stocks as a result of the Project, then qualitatively analysing how this would likely impact on the provision of ecosystem services. This section first provides a short overview of natural capital and ecosystem services concepts relevant to the baseline, before then giving further methodological details of how the baseline was determined, describing the baseline, and highlighting sensitive receptors.

5.13.2 Natural capital is a way of describing the stocks of renewable and non-renewable natural resources that combine to yield flows of benefits to people, as shown in Figure 5.38 (Coalition Capitals, 2016). The term ‘ecosystem services’ describes the flows that result in benefits, which provide value. Natural capital includes the ‘nature’ element in the Conceptual Framework of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (IPBES, Conceptual Framework, 2013), but also emphasises abiotic elements of nature such as minerals and water.

Figure 5.38: Delivery of value from natural capital through ecosystem services



Source: Coalition Capitals, 2016

5.13.3 Traditionally, ecosystem services have been categorized into four types provisioning, cultural, regulatory, and supporting, but IPBES has expanded it into a broader framework called "Nature's Contributions to People" (NCP). IPBES aimed to explicitly include both positive and negative effects and felt that the term 'services,' rooted in economics, was too narrow to capture the complex relationships between nature and people. The new terminology is also considered more inclusive.

5.13.4 This approach acknowledges that nature offers a wide range of benefits to humanity, categorized into three main groups:

- Material contributions: Tangible products from nature, such as food, freshwater, timber, fibres, and medicinal plants
- Regulating contributions: Ways in which natural systems regulate environmental conditions, including climate regulation, disease control, and water purification
- Non-material contributions: Intangible benefits from nature, such as recreational experiences, spiritual enrichment, and cultural identity

5.13.5 For the purposes of this assessment, ecosystem services will continue to be categorised by provisioning services, regulating and cultural services to align with international categorisations, discussed further below. However, it is important to note the latest approach set out by IPBES, which provides greater nuance to the complex nature of ecosystem services.

5.13.6 Biotic ecosystem services arise directly from the living components of ecosystems or their interactions. Abiotic ecosystem services do not depend directly on ecological processes in the short term but arise from geological processes and include, for example, the supply of minerals, metals, and oil and gas, as well as geothermal heat, wind, tides, and the annual seasons.

5.13.7 Biodiversity is the variety in the living component of natural capital stocks. As well as being an asset that delivers value, biodiversity supports the condition of other stocks and can contribute to the quantity and quality of the ecosystem services they deliver. Furthermore, biodiversity contributes to the resilience of natural capital stocks and the stability of ecosystem service provision. It's important to note that biodiversity is being assessed separately as part of the terrestrial and marine ecology assessments for this ESIA.

5.13.8 The value added by including ecosystem services approaches in decision making is being increasingly recognised. In particular, ecosystem service assessments enable an enhanced and systematic understanding of the relationship between nature and peoples' health and wellbeing. They can demonstrate where interventions from the policy- to project-scale positively or negatively affect the dependencies that society has on nature, helping to guide decisions that result in better social outcomes.

5.13.9 The IPBES Global Assessment Report on Biodiversity and Ecosystem Services (IPBES, Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019), among other studies, has documented the ongoing decline in delivery of ecosystem services associated with environmental degradation at a global scale. Bringing ecosystem services into project-scale decision, planning and assessment processes helps to build understanding of the consequences of environmental impacts for human wellbeing. As such, it assists design of projects that safeguard people's security, health, social relations, and material needs.

5.13.10 The IPBES Regional Assessment for Asia and the Pacific (IPBES, Regional Assessment Report on Biodiversity and Ecosystem Services for Asia and the Pacific, 2018) highlights the significance of desalination technology in addressing freshwater scarcity in the region, but also emphasizes the necessity of carefully evaluating the dependencies and impacts of such technologies on ecosystem services. Desalination processes can have adverse effects on marine ecosystems from the discharge of brine and chemicals from pre-treatment processes, which may harm marine biodiversity and affect the livelihoods of communities reliant on these ecosystems. it is important to integrate these considerations into environmental impact assessments and management practices when developing desalination projects to ensure the preservation of ecosystem services and the well-being of dependent communities.

Figure 5.39: Global trends in the capacity of nature to sustain contributions to good quality of life from 1970 to the present

Source: IPBES, The global assessment report on biodiversity and ecosystem services summary for policymakers, 2019

Study Area

5.13.11 The natural capital baseline assessment has adopted an Area of Influence (AoI) comprised of the Project components (Facility E and intake / outfall structures) with a 1 km buffer. This buffer distance aligns with the terrestrial ecology AoI for considering mammals, birds and herpetofauna.

5.13.12 The terrestrial ecology assessment carried out as part of this ESIA also adopted a 30km buffer around the Project components as the BSA for considering internationally recognised and legally protected areas, while the marine ecology assessment has considered a 2km buffer around the Project components as the AoI for assessing marine habitats and species. The ecosystem services assessment applies the AoI with 1km buffer in both the terrestrial and marine realm, acknowledging that while the marine environment is highly connected and impacts can spread over large areas, impacts in the marine environment are also diffuse. The relationship between natural capital stocks and delivery of ecosystem services is often non-linear, with ecosystem service provision having some resilience to minor or temporary degradation of stocks. Therefore, for the ecosystem services assessment it was appropriate to consider the smaller 1km AoI in the marine realm as well as the terrestrial realm as the area in which impacts on natural capital stocks and associated ecosystem services are expected to be most significant and persist in the long term.

5.13.13 While the AoI for the natural capital and ecosystem services assessment is based on the area in which natural capital stocks will be affected (and so from which ecosystem service provision will change), the resulting changes in ecosystem services will affect beneficiaries located outside of the AoI.

Methodology

5.13.14 The natural capital baseline was developed by identify existing natural capital stocks within the Project's AoI. The existing natural capital baseline was then used to determine the associated ecosystem services likely being delivered based on the presence of types of natural capital stocks.

Desktop review

5.13.15 To assess the impact of the Project, a natural capital baseline was developed to identify existing natural capital stocks located within the Project's AoI. The natural capital baseline defines the natural capital stocks located within the Project AoI and has been developed based on the maps produced for the terrestrial and marine ecology assessments for this ESIA. The data sources for the map include information from the European Union's Copernicus Land Monitoring Service, Global Dynamic Land Cover (2019), Qatar National Planning Council land cover data (2020), Five Oceans seagrass data (2013), and areas digitized from satellite imagery (2025). The natural capital baseline was classified into stocks based on a common framework of natural capital assets for use in public and private sector decision making (Leach, et al., 2019).

5.13.16 Table 5.29 provides a summary of the identified stocks, categorised into abiotic and biotic categories. Abiotic stocks include atmospheric gases like oxygen and climate-regulating processes. Water resources from the ocean, which are vital for the marine ecosystem, and ocean sediments, including blue carbon from seagrass beds, which contribute to climate mitigation. Biotic stocks include marine habitats like seagrass and open waters that support marine biodiversity. Terrestrial habitats that include herbaceous vegetation and limited cropland areas. Note that we have not included built-up areas as natural capital stocks due to their limited direct role in providing ecosystem services.

Table 5.29: Classification of natural capital stocks in the baseline assessment

			Natural capital stocks
Abiotic	**Functional**	*Atmosphere*	Atmospheric gases - oxygen
			Climate, weather and temperature regulation
		Water	Water resources provided by oceans
			Water resources provided by surface waterbodies
			Water resources provided by soil and rainfall
			Groundwater
	Non-renewable	*Soils and sediments*	Top-soil
			Sub-soil
			Ocean sediment
Biotic	**Biodiversity**	*Habitats*	Seagrass bed
			Open marine water
			Herbaceous vegetation
			Bare / sparse vegetation
			Agriculture and cropland
		Species	Fish (and other marine species)
			Terrestrial species

Source: Adapted from Leach et al. 2019

5.13.17 A spatial overlay was carried out in GIS to clip the natural capital baseline map to the Project AoI and identify the natural capital stocks present within the AoI and their respective areas.

5.13.18 Ecosystem services were scoped into the baseline assessment based on the natural capital stocks present and evidence for delivery of the ecosystem service at the Project site. Ecosystem services were classified according to the Common International Classification of Ecosystem Services (CICES) version 5.1 (European Environment Agency, 2018). As discussed previously, CICES has been designed to help measure, account for, and assess ecosystem services.

5.13.19 To establish the link between baseline natural capital stocks and ecosystem services, a high-level review was undertaken of ecosystem services provided by the stocks at the site. The review was informed by a high-level review of academic literature, the Exploring Natural Capital Opportunities, Risks and Exposure (ENCORE) tool (Natural Capital Finance Alliance, 2025), and expert judgement.

5.13.20 This approach ensured the assessment of ecosystem services was comprehensive while focussing on the services most relevant to the Project. An overview of the ecosystem services scoped into the assessment is provided in Figure 5.38.

Field survey

5.13.21 The natural capital and ecosystem services baseline was developed based on the natural capital baseline. No field surveys were carried out for the ecosystem services baseline assessment.

Limitation and assumptions

5.13.22 The natural capital and ecosystem services baseline has been derived from a GIS map developed using secondary open-source data. The presence of natural capital stocks described in this baseline is based on stocks that are likely to be present, rather than those fully confirmed through primary field data. Although there is high confidence in the accuracy of the mapped stocks within the Project AoI, however, it should be noted that these stocks have not been independently verified through additional primary field surveys specifically dedicated to ecosystem services. For the terrestrial data, the baseline assessment was informed by secondary GIS data and existing documentation, supplemented by terrestrial surveys conducted on the 14th of February 2025, as detailed in the terrestrial ecology chapter. However, these surveys did not involve detailed GIS mapping and were not used to directly inform the areas illustrated in the terrestrial habitat map and natural capital map.

5.13.23 Similarly, the marine ecosystem baseline assessment primarily utilizes secondary sources. At the time of writing, the findings from the marine surveys were not available when preparing the natural capital baseline map.

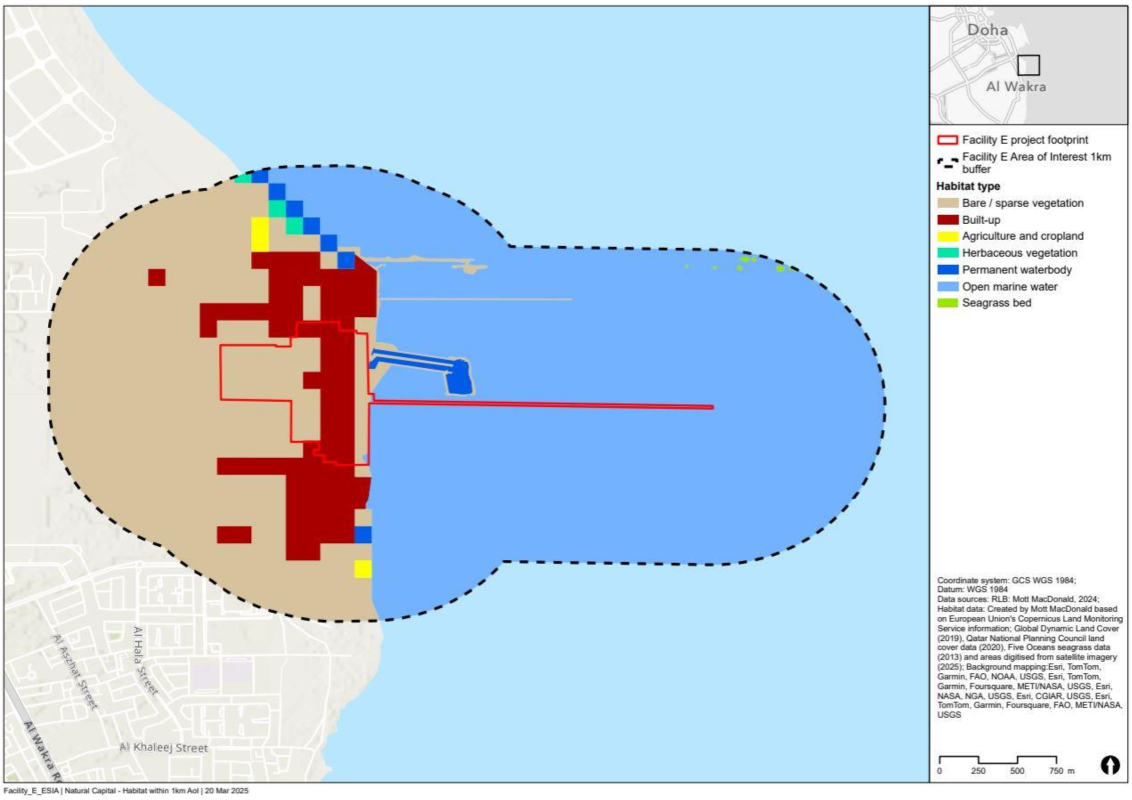
5.13.24 The ecosystem services baseline is based on a qualitative linking of natural capital stocks to the potential delivery of services. This assessment has been undertaken using desktop-based reviews of the Project documentation and opensource resources. A precautionary approach has been adopted, including potential ecosystem services provided by stocks in the AoI whenever there was uncertainty about their presence. Identification of ecosystem services has considered only their presence or absence, and a qualitative assessment of their importance to the local area, with no consistent quantification of this importance.

5.13.25 Ecosystem services, as a concept, consider the benefits that people receive from ecosystems, rather than dis-benefits or dis-services. While frameworks for these benefits such as CICES are well established, in reality the consequences for people from ecosystem processes and functions are often more nuanced and location specific. What is beneficial in one circumstance may be disadvantageous in another for example, a species may be commercially valuable but also pose a physical threat to people.

Baseline description

5.13.26 The baseline natural capital stocks within the Project AoI have been assessed using the baseline natural capital map shown in Figure 5.40 including those stocks within a 1 km radius of the Project components.

Figure 5.40: Baseline natural capital stocks within the AoI for the ecosystem services assessment



Source: Mott MacDonald, 2025

5.13.27 A quantitative summary of the baseline natural capital stocks located both within the footprint of the Project components and within the wider AoI is provided in Table 5.30. The summary indicates the extent and proportion of each natural capital asset that may be impacted. The Project footprint mainly consists of bare/ sparse vegetation accounting for over 55% and a minor 7% of open marine water of the total Project footprint. As for natural capital stocks identified within the AoI, these include herbaceous vegetation and cropland areas totalling less than 1% of the total AoI. Outside the immediate footprint of the Project components, areas of herbaceous vegetation and sparse vegetation types indicate minor but notable ecological values that could provide ecosystem services. The map supports these findings by visually representing the distribution and proximity of these assets within the defined AoI.

Table 5.30: Baseline natural capital stocks in the Project AoI

Natural Capital Stock	Area within Project footprint (ha)	Percentage (%) of total Project footprint	Area within AoI (ha)	Percentage (%) of total AoI
Herbaceous vegetation	-	-	3	<1%
Cropland	-	-	3	<1%
Built-up	20	37%	85	8%
Bare / sparse vegetation	31	56%	333	32%
Permanent waterbody	-	-	13	1%

Natural Capital Stock	Area within Project footprint (ha)	Percentage (%) of total Project footprint	Area within AoI (ha)	Percentage (%) of total AoI
Open marine water	4	7%	612	58%
Seagrass bed	-	-	1	<1%
Total	55 ha	100%	1050 ha	100%

Source: Mott MacDonald 2025

Based on the baseline natural capital stocks and the scoping process outlined in the methodology section, Table 5.31 presents the baseline ecosystem services identified in the Project AoI, and their importance to the local area.

Table 5.31: Baseline ecosystem services identified in the Project AoI (classified following CICES v5.1) and their importance to the local area

Division	Group	Class	Code	Associated natural capital stocks	Importance to local area
Section: Provisioning (Biotic)					
Biomass	Cultivated terrestrial plants for nutrition, materials or energy	Cultivated terrestrial plants (including fungi, algae) grown for nutritional purposes	1.1.1.1	Agriculture and cropland	Terrestrial ecology mapping indicates that pockets of agriculture and cropland are being cultivated, providing a potential source of livelihood and income for the local population.
Section: Regulation & Maintenance (Biotic)					
Transformation of biochemical or physical inputs to ecosystems	Meditation of wastes or toxic substances of anthropogenic origin by living process	Bio-remediation by micro-organisms, algae, plants, and animals	2.1.1.1	Fish (and other marine species); seagrass bed	Benthic invertebrate communities and plankton in the water column, as well as seagrass, contribute to bio-remediation of wastes and toxic substances in the water in and around the Project AoI.
	Meditation of wastes or toxic substances of anthropogenic origin by living process	Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals	2.1.1.2	Fish (and other marine species); seagrass bed	Benthic invertebrate communities and plankton in the water column, as well as seagrass bed, contribute to filtration, sequestration, accumulation and storage of wastes and toxic substances in the water in and around the Project AoI.
	Meditation of nuisances of anthropogenic origin	Noise attenuation	2.1.2.2	Herbaceous vegetation	Herbaceous vegetation mediates the extent to which noise generated from existing developments can travel

Division	Group	Class	Code	Associated natural capital stocks	Importance to local area
					across the landscape and impact upon sensitive receptors, such as nearby communities located within Al-Wakrah.
	Mediation of nuisances of anthropogenic origin	Visual screening	2.1.2.3	Herbaceous vegetation	Herbaceous vegetation reduces the visual impact of human structures, including the existing developments in proximity to the AoI, for nearby sensitive receptors.
Regulation of physical, chemical, biological conditions	Regulation of baseline flows and extreme events	Control of erosion rates	2.2.1.1	Herbaceous vegetation; permanent surface waterbody	Herbaceous vegetation and the permanent surface waterbodies located along the coast provide coastal protection contributing to control of erosion, and dissipation of wave energy protecting adjoining land.
	Regulation of baseline flows and extreme events	Buffering and attenuation of mass movement	2.2.1.2	Herbaceous vegetation; permanent surface waterbody	Herbaceous vegetation and the permanent surface waterbodies located along the coast act to defend coastal areas against storm surges and strong waves, reducing scouring of the seabed and loss of sediments. These stocks also act to dissipate wave energy protecting adjoining land.
	Regulation of baseline flows and extreme events	Hydrological cycle and water flow regulation	2.2.1.3	Herbaceous vegetation; permanent surface waterbody	Herbaceous vegetation and the permanent surface waterbodies located along the coast act to defend coastal areas against storm surges and strong waves, reducing flooding and loss of sediments. These stocks also act to dissipate wave energy protecting adjoining land.
	Regulation of baseline flows and extreme events	Wind protection	2.2.1.4	Herbaceous vegetation	Herbaceous vegetation reduces the speed of wind across the landscape, acting as a wind break to mitigate or prevent potential damage

Division	Group	Class	Code	Associated natural capital stocks	Importance to local area
					(including from wind-related sand damage) to nearby sensitive receptors.
	Lifecycle maintenance, habitat and gene pool protection	Pollination (or 'gamete' dispersal in a marine context)	2.2.2.1	Open marine water	Open marine water acts as the medium for many marine species through which gametes are dispersed, and the Project AoI support various marine species including commercially important fish, shrimps, crabs and pearls.
	Lifecycle maintenance, habitat and gene pool protection	Maintaining nursery populations and habitats (Including gene pool protection)	2.2.2.3	Seagrass bed; open marine water; permanent surface waterbody; fish (and other marine species)	Seagrass meadows provide nursery environments for fish and other aquatic species in early life stages. Coastal and sand bank habitats, and open marine water, also provide nursery and spawning grounds for marine species.
	Water conditions	Regulation of the chemical condition of salt waters by living processes	2.2.5.2	Seagrass bed; fish (and other marine species)	Seagrass meadows help maintain the chemical condition by stabilizing sediments, absorbing nutrients for the water in and around the Project AoI. Benthic invertebrate communities and plankton in the water column similarly help to process organic matter and regulate nutrient cycles.
	Atmospheric composition and conditions	Regulation of chemical composition of atmosphere and oceans	2.2.6.1	Seagrass bed; herbaceous vegetation; agriculture and cropland; permanent surface waterbody	Terrestrial vegetation and phytoplankton in the marine environment sequester carbon, which becomes stored in the environment for example in living organisms and sediments, contributing to the natural carbon cycle and regulation of climate.
Section: Cultural (Biotic)					
Direct, in-situ and outdoor interactions with living	Physical and experiential interactions with natural environment	Characteristics of living systems that that enable activities promoting health,	3.1.1.1	Open marine water; fish (and other marine species)	The sea around the Project AoI is used by local people and visitors for recreation and tourism

Division	Group	Class	Code	Associated natural capital stocks	Importance to local area
systems that depend on presence in the environmental setting		recuperation or enjoyment through active or immersive interactions			activities, such as boating, fishing, and pearl diving.
	Intellectual and representative interactions with natural environment	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	3.1.2.1	Seagrass bed; open marine water; permanent surface waterbody; fish (and other marine species)	The waterbodies and natural habitats around the Project AoI provide opportunities for research, for example seagrass meadows are researched extensively including for their beneficial contributions to ecosystem services such climate change regulation.
		Characteristics of living systems that enable aesthetic experiences	3.1.2.4	Open marine water; fish (and other marine species)	The characteristics and qualities of the seaside natural capital stocks in the AoI can provide inherent aesthetic value, inspiration and experiences, including biotic elements such as habitats and species.
Indirect, remote, often indoor interactions with living systems that do not require presence in the environmental setting	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an existence value	3.2.2.1	All stocks present within AoI	Living species and their habitats are widely considered to have existence value. Particularly high values are often attached to large or charismatic species, such the marine turtles which may occur around the AoI.
	Other biotic characteristics that have a non-use value	Characteristics or features of living systems that have an option or bequest value	3.2.2.2	All stocks present within AoI	Living species and habitats provide option and bequest values to future generations.
Section: Provisioning (Abiotic)					
Water	Surface water used for nutrition, materials or energy	Surface water for drinking	4.2.1.1	Open marine water	Open marine water provides a valuable source of drinking water (following anthropogenic processing) and is the provisioning service that underpins the purpose and need for the Project.
		Surface water used as a material (non-	4.2.1.2	Open marine water	Open marine water will be used by the Project for other consumptive

Division	Group	Class	Code	Associated natural capital stocks	Importance to local area
		drinking purposes)			purposes, including to support power generation, stored as firewater, and supplied for irrigation.
Regulation & Maintenance (Abiotic)					
Transformation of biochemical or physical inputs to ecosystems	Mediation of waste, toxics and other nuisances by non-living processes	Dilution by freshwater and marine ecosystems	5.1.1.1	Open marine water	Open marine water helps reduce the concentration of organic and inorganic substances through natural mixing processes, such as currents and upwelling. These processes disperse pollutants, mitigate harmful effects on marine ecosystems, and reduce the costs associated with disposal by other means.
	Mediation of waste, toxics and other nuisances by non-living processes	Mediation by other chemical or physical means (e.g. via Filtration, sequestration, storage or accumulation)	5.1.1.3	Open marine water	Open marine water mediates waste, toxins, and other nuisances through natural chemical and physical processes such as dilution, dispersion, and biodegradation. These processes help break down and neutralize pollutants, reducing their concentration and mitigating harmful effects on sensitive receptors.
Regulation of physical, chemical, biological conditions	Regulation of baseline flows and extreme events	Liquid flows	5.2.1.2	Open marine water; permanent surface waterbody	Open marine water and the permanent surface water bodies located along the coast mediate liquid flows through natural abiotic structures such as currents, tides, and underwater topography. They act to defend coastal areas against storm surges and strong waves, reducing flooding and loss of sediments. These stocks also act to dissipate wave energy protecting adjoining land.

Division	Group	Class	Code	Associated natural capital stocks	Importance to local area
Section: Cultural (Abiotic)					
Direct, in-situ and outdoor interactions with natural physical systems that depend on presence in the environmental setting	Physical and experiential interactions with natural abiotic components of the environment	Natural, abiotic characteristics of nature that enable active or passive physical and experiential interactions	6.1.1.1	Open marine water	The sea around the Project AoI is used by local people and visitors for recreation and tourism activities, such as boating, fishing, and pearl diving.
Indirect, remote, often indoor interactions with physical systems that do not require presence in the environmental setting	Other abiotic characteristics that have a non-use value	Natural, abiotic characteristics or features of nature that have either an existence, option or bequest value	6.2.2.1	Open marine water; permanent surface waterbody	Waterbodies including the permanent surface water bodies and the sea are sometimes considered to have existence value and provide option and bequest values to future generations.

Source: Mott MacDonald, 2025

Sensitive receptors

5.13.28 Delivery of ecosystem services from the baseline natural capital stocks within the AoI is likely to change with any changes to these stocks as a result of the Project. Sensitivity of ecosystem services represents the extent to which they are likely to change with changes to the underpinning natural capital stocks. This in turn depends on the sensitivity of the natural capital stock, including ability to withstand and recover from changes. the sensitive receptors identified within the AoI include both ecological and socioeconomic components.

Ecosystem services provided by terrestrial stocks

5.13.29 The ecosystem services offered by terrestrial stocks in the Project's AoI, set out in Table 5.31, are associated with stocks in these fixed locations. Delivery of the ecosystem services is therefore sensitive to any changes in land use that affect the quantity, quality or resilience of the stocks. While this ecosystem services baseline assessment is only qualitative, and changes in ecosystem service provision associated with changes in natural capital stocks have not been quantified or modelled, expected changes and sensitive services have been qualitatively identified.

5.13.30 The terrestrial stocks that comprise the natural capital baseline largely consist of bare / sparse vegetation surrounding built-up area, with smaller pockets of herbaceous vegetation and agriculture and cropland, with permanent surface waterbodies along the coast. The bare /

sparse vegetation, combined with pockets of herbaceous vegetation and permanent surface waterbodies, likely support the regulation of baseline flows and extreme events, for example helping to control erosion rates, as well as reducing the potential impact of human-driven nuisances, such as attenuating noise generated by the existing industrial developments. These ecosystem services and the other services provided by terrestrial stocks will be sensitive to changes in these natural capital stocks.

Ecosystem services provided by marine stocks

5.13.31 The ecosystem services provided by marine natural capital stocks within the AoI, set out in Table 5.31, are relatively diffuse, and the link between stocks in a specific location and provision of ecosystem services is weaker than it is in the terrestrial environment. Certain location-specific natural capital stocks that occur in the marine environment, such as seagrasses, are highly important for ecosystem service provision. However, at the time of writing, the only location-specific natural capital stocks that have been identified are relatively small grouping of seagrass at the northeastern extent of the Project AoI.

5.13.32 As a result, the sensitivity of ecosystem services provided by stocks of open marine water, fish and other marine organisms in the AoI is expected to be lower, as the same services are also provided in a diffuse way by the surrounding environment. These natural capital stocks within the AoI also have the ability to move into other parts of the surrounding environment. Nevertheless, displacement of stocks from the AoI may result in reduced ecosystem service provision if the surrounding marine environment cannot accommodate the replaced stock (for example if a lower overall population of fish can be supported as a result of displacement). The local beneficiaries of ecosystem services provided may also be different, as the services will be provided in a different location. Key ecosystem services provided by open marine water, fish and other marine organisms in the AoI that may be sensitive to change include the ability filtrate, sequester, accumulate and store wastes and toxic substances in the water.

5.13.33 It is important to note that the provision of surface of water by the marine environment underpins the purpose and is a fundamental component to the successful operation of the Project. The Project has been designed to realise and deliver the value that the marine environment provides to society as a potential source of drinking water.

5.13.34 Further information on the vulnerability of ecosystem services provided by terrestrial and marine stocks to the proposed Project activities is set out in Section 6.13.

6 Impact Identification and Assessment

6.1 Methodology

6.1.1 The assessment of effects and identification of residual significance will take account of any incorporated mitigation measures adopted by the Project and will be largely dependent on the extent and duration of change, the number of people or size of the resource affected and their sensitivity to the change.

6.1.2 The criteria for determining significance are specific for each environmental and social aspect but generally for each impact the magnitude is defined (quantitatively where possible) and the sensitivity of the receptor is defined. Generic criteria for defining magnitude and sensitivity are summarised below which will be adapted for individual impacts.

Magnitude

6.1.3 The assessment of magnitude will be undertaken in two steps. Firstly, the key issues associated with the Project are categorised as beneficial or adverse. Secondly, impacts will be categorised as major, moderate, minor or negligible based on consideration of the parameters such as:

- **Duration of the impact** - ranging from beyond decommissioning to temporary with no detectable impact
- **Spatial extent of the impact** - for instance, within the site boundary to regional, national, and international
- **Reversibility** - ranging from permanent, requiring significant intervention to return to baseline, to no change
- **Likelihood** - ranging from occurring regularly under typical conditions to unlikely to occur
- **Compliance with legal standards and established professional criteria** - ranging from substantially exceeds national standards and limits/international guidance to meets or exceeds minimum standards or international guidance

6.1.4 See Table 6.1 for criteria for determining magnitude.

Table 6.1: Criteria for determining magnitude

Magnitude (beneficial or adverse)	Description
Major	Fundamental change to the specific conditions assessed resulting in long term or permanent change, typically widespread in nature, and requiring significant intervention to return to baseline; exceeds national standards and limits.
Moderate	Detectable change to the specific conditions assessed resulting in non-fundamental temporary or permanent change.
Minor	Detectable but minor change to the specific condition assessed.
Negligible	No perceptible change to the specific condition assessed.
No change	No change to specific condition assessed.

Source: Mott MacDonald, 2025

Sensitivity

6.1.5 Sensitivity is generally site specific, and criteria have been developed from baseline information gathered.

6.1.6 The sensitivity of a receptor will be determined based on review of the population (including proximity/ numbers/vulnerability) and presence of features on the site or the surrounding area. Criteria for determining sensitivity of receptors are outlined in Table 6.2. Each detailed assessment will define sensitivity in relation to their topic. Effect evaluation matrix is provided in Table 6.3.

Table 6.2: Criteria for determining significance

Magnitude (beneficial and adverse)	Definition (considers duration of the impact, spatial extent, reversibility and ability of comply with legislation)
Very high	Vulnerable receptor (human, terrestrial, or marine) with little or no capacity to absorb proposed changes or minimal opportunities for mitigation.
High	Vulnerable receptor (human, terrestrial, or marine) with little or no capacity to absorb proposed changes or limited opportunities for mitigation.
Medium	Vulnerable receptor (human, terrestrial, or marine) with some capacity to absorb proposed changes or moderate opportunities for mitigation.
Low/ negligible	Vulnerable receptor (human, terrestrial, or marine) with good capacity to absorb proposed changes or and good opportunities for mitigation.

Source: Mott MacDonald, 2025

Table 6.3: Effect evaluation matrix

Magnitude of Impact	Sensitivity of Receptors			
	Low/ Negligible	Medium	High	Very High
No Change	Not significant	Not significant	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant	Not significant
Minor	Not significant	Minor	Minor	Moderate
Moderate	Not significant	Minor	Moderate	Moderate
Major	Not significant	Minor	Moderate	Major

Source: Mott MacDonald, 2025

6.1.7 The significance of impacts will be discussed before and after mitigation. Where feasible the following hierarchy of mitigation measures will be applied:

- Mitigation/elimination through design
- Site/technology choice
- Application of best practice

Uncertainty

6.1.8 Any uncertainties associated with impact prediction or the sensitivity of receptors due to the absence of data or other limitation will be explicitly stated. Where applicable, the ESIA will make recommendations concerning measures that should be put in place with monitoring and/or environmental or social management plans to deal with the uncertainty.

Mitigation and enhancement measures

6.1.9 Where both negative and positive impacts are identified, the ESIA will recommend possible mitigation measures to reduce or eliminate the negative impacts and enhancement measures to increase positive impacts. Each recommended mitigation measure will be described in detail and the possible degree of attenuation identified. The ESIA will also assess whether residual impacts, either beneficial or adverse, remain after mitigation. As mitigation measures may involve both technical and cost implications these will be discussed and agreed with the Consortium prior to finalising recommendations. It will be important to clearly link mitigation measures to significant environmental and social impacts and to ensure they are developed in close consultation with technical contractors to ensure that measures are practical, cost effective, culturally appropriate, and achieve their objectives.

6.2 Marine

Marine biodiversity receptors

6.2.1 The following sections outline the specific consideration for the marine biodiversity receptors of potential impacts. This will set out the criteria for which the relative sensitivity of each marine biodiversity receptor to inform the assessment of significance of effect. Then it will discuss the results of applying the criteria and how receptors have been grouped to aid assessment. It will then identify the pathways of potential impact against which each of the receptor groups will be assessed.

Sensitivity criteria

6.2.2 Marine biodiversity receptors sensitivity has been adapted not only to reflect their conservation status, but also to reflect their resource importance on both an economic and social scale given their commercial and recreational fisheries uses. The resulting criteria for marine biodiversity is defined in Table 6.4. Any marine biodiversity features that are of negligible sensitivity or are determined from baseline review as being unlikely to be present within the marine biodiversity zone of influence are not included in the assessment section for conciseness.

Table 6.4: Criteria for determining marine biodiversity receptor sensitivity

Sensitivity	Detail	Species criteria	Habitat or site criteria
Very High	Very high conservation concern and rarity. International scale or national/ regional scale with limited potential for substitution.	Species that trigger Critical Habitat thresholds in accordance with IFC PS6.	All areas of potential Critical Habitat (IFC PS6 definition). Internationally recognised areas (IFC PS6 definition) and nationally designated sites in IUCN categories I and II.
High	High conservation concern and rarity. International scale or national/ regional scale with limited potential for substitution. Commercially important species on a national or regional scale.	CR/EN/VU species that do not meet Critical Habitat thresholds in accordance with IFC PS6. Species represents a highly sensitive and regionally importance commercial fish species	Habitats of significant international ecological importance, Natural Habitats that are globally threatened and/or of international and/or national conservation concern and/or high biodiversity, with limited potential for substitution. Habitat represents a spawning or nursery ground for a highly sensitive or regionally important commercial fishery.
Medium	Medium conservation concern and rarity, regional scale with good potential for substitution. Commercially important species on a local scale. Species of significant recreational fishing value or important to local subsistence.	Vulnerable species listed by IUCN Nationally protected or rare species Restricted-range species. Migratory species Species represent a locally importance commercial fish species or is a prised recreational species or important to local subsistence.	Nationally designated sites in IUCN categories III-VI or with no equivalent IUCN category. Regionally important natural habitats. Natural habitats which do not qualify as Critical Habitat. Endemic Bird Areas (EBAs). Habitat represents a spawning or nursery ground for a locally important commercial fishery or for a prised recreational species or important to local subsistence.
Low	Very low or low conservation concern and local scale. Some commercial or recreational fishing value.	IUCN Near Threatened /Least Concern. IUCN Data Deficient species. Species of no national importance (threat and/or protection). Species of some commercial and recreational fishing value.	Sites designated at local level (no IUCN category). Undesignated sites and natural habitats of some local biodiversity and cultural heritage interest. Modified habitats with limited biodiversity value. Artificial and converted habitats (e.g., artificial water bodies, plantations, agricultural crops). Habitat represents a spawning or nursery ground for species of some commercial and recreational fishing value.
Negligible	Very limited ecological importance.	Invasive species. Species of no international or national value.	Highly modified habitats of no biodiversity value (e.g., hardstanding, bare ground and buildings).

Source: Mott MacDonald, 2025.

Sensitivity assessment

6.2.3 From the baseline review, it is evident that a wide variety of species and habitats form the marine biodiversity receptors to the effects from this Project. Subsequently receptors have been grouped to aid their discussion of impacts. The groups that will be discussed are presented in Table 6.5 with a list of species and habitats identified in the mBSA classified detailed in Appendix N. In addition, as receptors have been identified that are IUCN CR, EN, VU, restricted range and/or migratory, a Critical Habitat Assessment (CHA) has been undertaken as part of this ESIA which is presented in Appendix N. This has been used to support the evaluation of sensitivity of receptors though will be refined further once survey results are completed, however, according to the Critical Habitat Screening Layer, the Project is not located in potential or likely critical habitat (UNEP-WCMC, 2023).

Table 6.5: Marine biodiversity receptor groups and sensitivity classification

Receptor Group	Sensitivity	Justification
Habitats - Seagrass beds	High	Mentioned in Qatar's National biodiversity action plan though the area of seagrass identified within the AOI is below CHA thresholds.
Habitats - Mangroves	High	Mentioned in Qatar's National biodiversity action plan though the area of seagrass identified within the AOI is below CHA thresholds.
Habitats – Oyster Reefs	Medium	Below CHA thresholds and not currently listed as a target within Qatar's Biodiversity action plan though is a feature being considered for protection in new marine protected areas. Area known for historic records though no evidence of recent reefs though could possibly occur and included as a precaution.
Habitat-Coral patch reefs	High	Mentioned in Qatar's National biodiversity action plan though below CHA thresholds. There are no definitive records within the scheme though could possibly occur included as a precaution.
Migratory Species – Turtles	Medium	Below CHA thresholds. For the majority of species there are no records within the immediate area of the scheme, except for Hawksbill turtle tracked swimming through the AOI though the AOI has not been identified as a known foraging aggregation area (UNEP-WCMC., 2023).

Receptor Group	Sensitivity	Justification
		However, there is a possible relation between turtles and the seagrass ecosystem.
Commercially important -Fish -Sharks	Medium	Below CHA thresholds. There are no definitive records within the scheme though a list of species potentially within the AOI are detailed in Appendix N. Species of greater concern are likely to be associated with seagrass, reef flats or mangrove habitats so will be discussed proportionally with these habitats.
Recreationally important fish	Medium	Species identified as being of recreational interest were below CHA thresholds. There are no records within the scheme.
Fish of conservation concern	High	IUCN Critically endangered or endangered species below CHA thresholds.
Marine mammals	Medium	Under C1 – CHA thresholds. There are no records within the scheme though they could opportunistically forage within areas.
Solitary coral species – Seagrass dependant	Low	IUCN Near Threatened /Least Concern.
Infaunal invertebrate s	Low	No infaunal species are above CHA thresholds and those identified are generally either classified by IUCN as Near Threatened /Least Concern.
Plankton	Low	IUCN Near Threatened /Least Concern.

Source: Mott MacDonald, 2025

Pathway of potential impact

6.2.4 RO plants by their nature concentrate existing compounds within their reject waters as well as add new compounds as part of maintenance (pre-treatment biocides, biocide scavengers, antiscalants, coagulants and flocculants). A review conducted by Valdés et al. identified that the main marine environmental concerns associated with RO plant concentrates were as follows:

- Salinity changes
- Temperature changes
- Chemical load of pre-treatments and maintenance compounds
- Concentration of heavy metals from feedwater

6.2.5 In comparison to thermal desalination systems circulation patterns differ so it is likely that different parts of the environment would be affected by the change in discharge dispersion. This substantially is due to reduction in temperature changes which results in a negative buoyant hypersaline reject stream and spreads over the seafloor. In addition, where temperatures are reduced the chances that existing compounds in the feed water are volatised or broken down by heat are greatly reduced and the molecular sieve nature of RO systems only allowing water sized molecules to pass is likely to concentrate any existing compounds within the feed. A further model on likely dilution and dispersion will be included as an appendix once completed to confirm likely extent of compounds within the discharge and confirm any potential monitoring stations.

6.2.6 Construction in marine environment such as placement of a new outfall are also known to generate impacts on the marine environment including temporary damage and disturbance during construction and maintenance, and permanent damage from physical emplacement of the infrastructure (Missimer and Maliva, 2018). In addition, though the current plan is to draw water from an existing intake system there are potential effects associated with increases in the volume of water being withdrawn which can change the potential characteristics that cause impingement and entrainment of marine organisms (Aarninkhof and Luijendijk, 2010).

6.2.7 Accordingly, during the construction and operations of the proposed development there are a number of activities which have the potential to impact the marine environment. The potential impacts to marine ecology and their dependent water quality are summarised in Table 6.6. Each of these potential impact pathways will be discussed against the receptor groups within the impact assessment.

Table 6.6: Potential marine impacts

Activity	Potential Impact	Description
Construction phase		
New outfall pipeline	Habitat loss	Permanent habitat loss for marine species where infrastructure is placed and temporary loss during construction where vehicles, barges or vessels are used in the marine environment.
	Increased turbidity from suspended sediment	Sediments can be disturbed during the movement of vehicles and vessels in the marine environment when placing infrastructure or the necessary groundworks/ trenching to prepare the pathway for placement.
	Underwater noise	Depending upon the construction methods, there can be underwater noise introduced from rock dumping, dredging or piling activities that can harm or disturb marine organisms.
	Light changes	Placement of infrastructure and use of vessels can shadow the seabed and section of the water column which can impact marine organism behaviour and productivity.
	Introduction and/or spread of invasive species	Bringing personnel, vessels and equipment to/from outside of the project area has the potential to introduce or spread invasive species to/from the project areas. In addition, the placement of artificial hard substrate in a soft substrate area can promote settlement of invasive species. Invasive species can displace, smother and out compete other species which causes a decline in biodiversity value.

Activity	Potential Impact	Description
	Potential for spills in the marine environment	Use of vehicles, equipment and movement of construction material can introduce spills of fuels, cements and aggregates into the environment that can have toxic effect on marine organisms.
Operational phase		
Intake of feed water	Hydrological process changes: Impingement and entrainment of marine biota Circulation changes	Increased withdrawal of feedwater can increase the likelihood of animals and their eggs being impinged on the intake structures or entrained in the flow and sucked into the intakes resulting in their demise. In addition, it can potentially change the water flow rates to the benthic habitat near the intake reducing settlement of sessile species and their function i.e. through reduce time available for capturing suspended prey.
Discharge of Reverse Osmosis Concentrate	Water quality - Alteration of properties: Salinity Temperature	Localised long-term increases in salinity, and temperature are known to have deleterious effects on marine organisms.
	Water Quality - Increased concentration of existing contaminants in feedwater	Existing heavy metal and persistent organic compounds (including hydrocarbons such as PAHs, PCBs, organo-pesticides etc) are concentrated in the reject stream from the RO process, these can have toxic effects where tolerance thresholds for sensitive marine species are exceeded and alter pH if the receiving water.
	Hydrological process changes: Circulation changes	The introduction of a dense negatively buoyant water layer can affect the local flow enhancing stratification and limiting exchange of oxygen between the seafloor with the surface.
	Water Quality – introduction of contaminants from pre-treatment and maintenance processes: Increased turbidity Toxicity Nutrient changes	Use of coagulants and flocculants can increase turbidity in the discharged waters which may negatively impact marine organisms. Other byproducts from the breakdown of biocides and disinfectant pretreatments have the toxicological effect on sensitive marine organisms. Introduction of antiscalants can add nutrients which can cause the receiving waters to become locally eutrophic which can affect marine organisms.

Source: Mott MacDonald, 2025

6.2.8 During operation it is important to note that there is potential that the brine discharge may act cumulatively with other existing discharges and impact the existing ecological features within the wider region.

Impact assessment – construction impacts

Overview

6.2.9 The main construction activity related to the marine environment will be the construction of the new outfall pipeline between the existing RAF A2 and RAF B/B2 intake pipelines and south of the intended intake. This is likely to comprise dredging and rock dumping, so the pipe is installed at the correct angle and to ensure it remains in position for the life of the operation. The identified effects associated with this activity are assessed in the following sections relating to marine biodiversity receptors.

Habitat loss

6.2.10 The habitats within this area between the existing pipelines are already modified by the existing intake and outfall structures with flow patterns actively entrained and evident changes in seabed topography and geomorphology (See Section 5.2). Consequently, direct habitat loss is unlikely to attract or affect high-value receptors significantly. Consequently, receptors are likely to incidental occurrence of **medium** or **low sensitivity** fish receptors, with **low sensitivity** invertebrates. The magnitude of effect of loss of heavily modified habitat is likely **Moderate** as the existing modified habitat of sand and rock will be replaced with the same so there will a temporary reduction in functioning until it is recolonised. Therefore, loss of habitat would likely result in a Minor impact without mitigation.

6.2.11 Mitigation measures to reduce the magnitude of impact below significant levels would include:

- Minimising the placement of rock in sand dominated areas to the minimum extent possible to meet the engineering requirements
- Use of a backhoe dredger with a closed bucket to minimise the level of sediment disturbance and removal.
- Inclusion of ecological enhancements on any hard structures that encourage settlement of native species and attractive to fish species that would be temporarily displaced. This may include addition of textures that increase microhabitats or pool retaining areas in limited intertidal areas (Loke, Bouma and Todd, 2017)
- Monitoring of ecological enhancements to confirm return of baseline habitat functionality with intervention where functionality stagnates beyond agreed timeframe with MoECC.

6.2.12 With the implementation of these mitigation measures the magnitude of effect would reduce to **Minor** and therefore there would be **no significant residual effect**.

Increased turbidity from suspended sediment

6.2.13 The existing outfall structures either side of the planned outfall are likely to influence the dispersion of suspended sediments, entraining turbidity in the area. Consequently, most of the area likely to be affected by suspended sediments are heavily modified habitats as described above and likely to only attract **medium** or **low sensitivity** fish and **low sensitivity** invertebrates.

6.2.14 However, some suspended sediments are likely to disperse slightly beyond this area which means the main receptors at risk include the seagrass meadows located along the existing RAF A3 intake pipeline. The seagrass habitat represents a potential spawning ground for recreational and commercial fish species that may be **moderate** or **high sensitivity** fish species. Therefore, these habitats not only represent a **high sensitivity** receptor they may be opportunistically used by **high sensitivity** turtle or fish receptors as a temporary foraging habitat. Seagrasses also act as habitats for certain non-reef forming corals within the region though these are considered **low sensitivity** receptors.

6.2.15 While some seagrass species and associated fauna show a degree of tolerance to increased turbidity, others may be more sensitive and less resilient (Marangoni et al., 2022). From the seagrass species that could potentially be present, *Hadule uninervis is* known to dwell in areas with natural sedimentation of 1-4mm per year and negative effects of 50% mortality at burial depths to 4cm or 0.4 ratio of burial to the leaf length (Cabaço *et al.*, 2008b and Duarte et al., 1997 a cited in Zabarte-Maeztu et al. 2021). As the extent and degree of sedimentation is not yet known though like to reduce exponentially away from the outfall pipeline effects on seagrass species and considering the extent of seagrass affected the magnitude of effect is likely to be **Moderate** without mitigation measures**.**

6.2.16 Furthermore, the presence of non-reef forming coral species associated with seagrass may have increased effects given they have lower tolerance to suspended and settling sediments (Erftemeijer et al., 2012).

6.2.17 Increased sedimentation is known to reduce their capability for photosynthesis in the zooxanthellae-coral symbiosis which can impact their survival (Bouwmeester et al., 2021). Therefore, their magnitude of effect is likely **High** and as such the magnitude of impact is likely to be **not significant** in itself due to the **low sensitivity** of the receptors.

6.2.18 The exact location of reef forming corals are unknown and there is potential that the natural interpreted reef flat and crest geomorphological features could contain patch coral reefs. Similar to the non-reef forming corals associated with seagrasses they have a low tolerance to suspended and settlement of sediments across them (Zabarte-Maeztu et al., 2021). However, they are likely located further away from the construction, so the magnitude of effect is likely reduced to **Moderate** without mitigation measures**.**

6.2.19 Fish species can also be impacted by suspended sediments and where it may potentially settle in spawning or nursery grounds effects can be of greater concern (Kjelland et al., 2015). As mentioned under habitats, the area of immediate effect is likely to only attract **medium** or **low sensitivity** fish and spawning is only likely to be associated with seagrasses. Consequently, given the mobility of fish species and spawning more likely to occur in the main seagrass beds the magnitude of effect is likely to be **Moderate**. Therefore, the magnitude of impact without mitigation measures would be **Minor**.

6.2.20 **Medium sensitivity** turtles and marine mammals are unlikely to routinely use the habitats affected by suspended sediments and are highly mobile. As such, the effects are likely only temporary disturbance from this non-critical area and therefore magnitude of effect would be **minor** at most and therefore magnitude of impact without mitigation would be **minor**.

6.2.21 Mitigation measures to reduce the magnitude of impact below significant levels would include:

- Minimising the volume of material to be removed by the minimum amount possible to meet the engineering requirements
- Use of a backhoe dredger with a closed bucket to minimise the level of sediment disturbance and its re-suspension
- Use of silt curtains to screen off flows going around the outfall pipelines away from seagrass and coral receptors
- Undertaking dredging outside of critical spawning periods for species confirmed during surveys. See Appendix H.
- Monitoring of suspended sediment during dredging so that they do not exceed a specific limit beyond the end of the existing outfall, the exact threshold to be developed based upon the confirmed receptors in the survey in agreement with MoECC though a 30mg/l limit is proposed as an interim (Zabarte-Maeztu et al., 2021) (Erftemeijer et al., 2012) (Aarninkhof and Luijendijk, 2010)
- Undertaking dredging during calm wind and neap tides to minimise the extent of dispersion of suspended sediments. This will be identified as part of dispersion modelling included in Appendix N.

6.2.22 With the implementation of these mitigation measures the magnitude of effect would reduce to **Negligible** for **High sensitivity** receptors and **Minor** for **medium** or **low value** receptors mentioned and therefore there would be **no significant residual effect.**

Underwater noise

6.2.23 Underwater noise has the potential to cause harm and disturbance to receptors sensitive sound underwater, there are well established threshold effect on marine mammals, turtles and fishes (United States National Marine Fisheries Services, 2024) (Popper and Hawkins, 2019) (Southall et al., 2021) though there is evidence that diving birds are also sensitive to underwater noise (Johansen et al., 2016) (Anderson Hansen et al., 2020) (Pichegru et al., 2017). However, a review of noise generated during rock dumping as part of artificial reef creation indicated that noise levels were below levels that are known to cause harm in very high frequency hearing harbour porpoises, with only disturbance within 1.2km predicted (Sveegaard, Teilmann & Tougaard, 2024). Consequently, as very high frequency hearing marine mammals are considered as having the highest acoustic sensitivity to underwater noise, as a precaution the same acoustic thresholds are consider appropriate to reflect effects across other receptors.

6.2.24 The habitats within the immediate area where underwater rock placement may occur during construction is already heavily modified habitat so is unlikely to be routinely used so disturbance away from these would have a **negligible** magnitude of effect. However, the small patches of seagrasses along the RAF A3 intake pipeline are likely to be attractive to fish particularly during spawning periods. As there is potential to disturb fish away from potential spawning areas the magnitude of effect is considered at **Moderate**. Fish receptors likely to use these small areas may be considered as **Low** to **Medium sensitivity**, therefore the magnitude of impact is likely to be **Minor** without mitigation.

6.2.25 Mitigation measures to reduce the magnitude of impact below significant levels would include:

- Undertaking dredging outside of critical spawning periods for species confirmed during surveys. See Appendix N.

Light changes

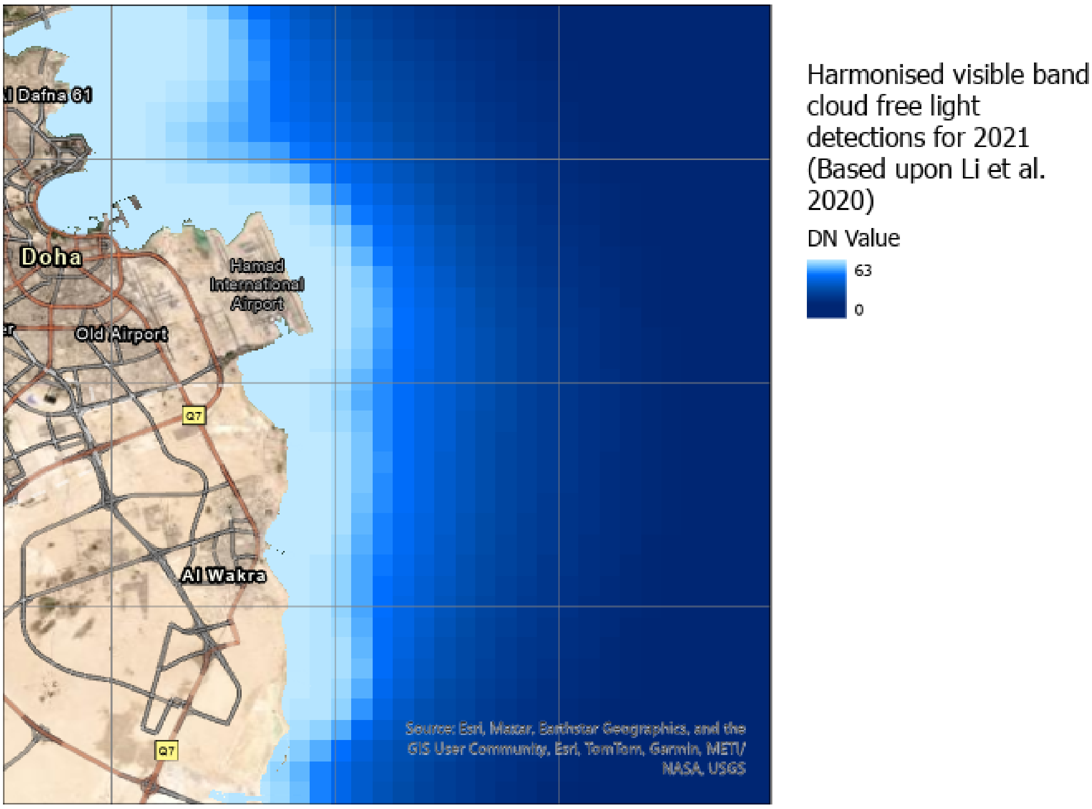
6.2.26 Artificial light at night is known to impact marine biodiversity receptors disrupting navigation, foraging, migration, spawning, and settlement of species (Marangoni et al., 2022). In addition, the shallow waters around Qatar have been identified as areas significantly at risk from effects from artificial light at night (Pichegru et al., 2017).

6.2.27 However, the habitats likely due to be affected by artificial light from the construction are likely modified. In addition, data on artificial light levels for 2021 (Li et al., 2020) indicate the marine area of construction is already subject to light at night (See Figure 6.1). Receptors at risk would predominantly be mobile fauna (Fish and turtles) that may incidentally use the adjacent area which are likely **Medium** to **High** sensitivity. Given receptors are not likely to dwell there and would only be transiting through or opportunistically foraging in areas already disturbed by artificial light at night, the magnitude of effect is **Minor** which results in a magnitude of impact of Minor without mitigation.

6.2.28 Mitigation measures to reduce the magnitude of impact below significant levels would include:

- As far as practicable construction operations will be conducted during daylight hours.
- Where artificial lighting is required sensitive lighting techniques such as directional and hooded lighting will be adopted to reduce any disturbance to birds, marine mammals and fish during night-time. If any artificial lighting is required on the foreshore (or from e.g., site cabins towards the foreshore) this will be directional or utilising lighting hoods to direct light spill away from any bird roosting or foraging areas, including open water areas.

Figure 6.1: Artificial light at night in marine areas



Source: Mott MacDonald, 2025

Introduction and/ or spread of invasive species

6.2.29 There is a risk of introducing invasive non-native species through personnel, equipment and vehicle movements, ballast water on vessels and through the importation of construction materials. These can introduce species that can out complete existing communities which could hinder the recovery of species given other construction pressures, introduce diseases or cause smothering which may lead to collapse of the sensitive ecosystem (Alidoost Salimi et al., 2021). Ecosystems such as the **high sensitivity** seagrass or coral patch reefs are most vulnerable therefore magnitude of effect could be **major** on a worst-case basis. Therefore, without mitigation the magnitude of impact could be

6.2.30 Mitigation measures to reduce the magnitude of impact below significant levels would include:

- All vessels will implement MARPOL ballast water management convention (2017) (MARPOL, 2025)
- Use of certificated imported materials (e.g. non-marine sources of rock or heat-treated) will minimise the risk of introducing invasive species into the marine environment
- Fill material should not be procured from sites / areas known to have presence of invasive species and should be screened ahead of use
- The number of vehicles used on site and the frequency at which they enter the intertidal area should be limited (vehicles should only enter the intertidal area on an ebb tide when there is a suitable dry area available for working).
- A stringent system of vehicle maintenance and cleanliness should be implemented during construction works, including frequent vehicle washing between road and beach access. Where it is necessary to move anything on or off site and where plant machinery is to be

moved from one part of the wite to another, biosecurity measure should be applied in line with ‘Check-Clean-Dry’ recommendations from the Non-native species secretariat (Available at http://www.nonnativespecies.org/checkcleandry/index.cfm). This would involve washing down, visual inspection, disinfection and / or thorough drying

- Boot washing as well as equipment cleaning facilities (with a biocide such as Virkon) should be provided and carried out when entering and exiting marine areas of the site.

Potential for spills in the marine environment

6.2.31 Accidental spills of hydrocarbons, cement, or other construction-related substances present a potential environmental risk and would be deleterious to high sensitivity receptors such as seagrasses, mangroves and patch corals that might be within dispersion range of any spills. As magnitude of effects from spills can be Major on a worst-case scenario the magnitude of Impact could be Moderate. Pollution prevention / control mitigation measures will be applied through the CEMP and include the following which will reduce the magnitude of effect to not significant levels:

- Bunded tanks, drum pallets and drip trays will be used, and all stored on impermeable bases away from drains
- COSHH materials will be stored in a suitable locked container
- Spill kits will be available on all plant / machinery and centrally in each area
- The workforce will be trained in the use of spill kits and training is updated throughout the works
- Toolbox talks covering the refuelling procedure including the emergency spill procedure will be provided to personnel responsible for refuelling plant and equipment
- Visual inspections of plant before and after each shift will take place, with any potential for leaks or spills to be corrected before use of plant
- Materials will not be stored within 10m of a watercourse or a surface water drain
- A COSHH waste bin will be present in the site compounds
- All drums, barrels, tanks, and bowsers >200l, and associated pipework will be bunded and stored more than 10m from any waterbody or surface water drain
- Any tap of valve permanently fixed to bowsers or tanks will be fitted with a lock and locked when not in use
- Drip trays will be placed at the point where oils / fuels are transferred from one container to another
- Oil / fuel storage and fuelling areas will be located on impermeable surfacing >10m from a waterbody or a surface water drain, will be locked when not in use and will be away from transport routes to avoid collisions
- Drip trays will be used to collect minor leaks and spills under static plant, which will be kept empty of water
- Emergency spillage response plans will be prepared, with all staff trained in the plan and spill drills carried out
- In the event of a spillage, personal protective equipment will be worn as appropriate

- Grout / concrete will not be mixed within 10m of water body or a surface water drain
- All cement or concrete washout will be poured into a skip positioned on a waterproof membrane and bunded to contain any leakage from the skip, which will be appropriately disposed of off-site. The skip will be kept >10m from a waterbody or surface water drain and be in a suitable condition to prevent rainwater collecting
- Plant servicing will only be carried out in compounds >10m from waterbodies or surface water drains in an impermeably surfaced area, or over a drip tray
- No materials will be stored within the marine environment or intertidal area
- Tracking of vehicles across the intertidal area will be minimised as much as possible
- The site manager will monitor weather forecasts, and any works will be suspended where flooding is forecasted and all materials, waste and equipment will be moved to high ground to prevent any pollutants mobilising
- Suitable waste disposal facilities will be located on board each of the vessels utilised for the Project
- Each vessel utilised for the Project will have its own spill kit and staff on the vessel will be trained in how to utilise this spill kit.

Impact assessment – operational impacts

Hydrological process changes – impingement and entrainment of marine biota

6.2.32 The habitats within the area between the existing pipelines are already influenced by the existing intake of outfall infrastructure. Consequently, direct impacts from the impingement and entrainment are unlikely to significantly affect high sensitivity receptors. Instead, receptors are likely to include incidental occurrences of medium to low-sensitivity fish species and low, sensitivity plankton or invertebrate taxa (Barnthouse, 2013) (Fu et al., 2023). The magnitude of effects from ongoing impingement and entrainment is considered **Moderate** on a worst case due to the persistence of operational structures and their limited footprint within an area of already modified habitat. Therefore, this process is expected to result in a **minor** impact without mitigation.

6.2.33 Mitigation measurements to reduce impact magnitude below significant levels include:

- Use of existing intake heads and structure to minimise differences in intake velocity and reduce entrainment of smaller organisms
- Use of a coarse screening to prevent entry of larger marine fauna entering the intake gallery
- Seasonal restrictions on operations intake rate during peak spawning or larval periods for receptors confirmed by monitoring surveys as representing medium sensitivity receptors or above
- Regular maintenance and biological monitoring of intake systems are necessary to assess biological load and adjust mitigation strategies as needed. Particularly of concern is reducing intakes temporarily where significant sargassum blooms or other mass occurring species would require unsustainable levels of biocide processing or cause operational issues

Hydrological process changes – circulation changes

6.2.34 Introduction of a hypersaline outfall has the potential to shift the local circulation as it can cause changes in flow direction and stratification of water column that can reduce mixing of nutrients fluxes between layers (Sirota et al., 2024) (Omerspahic et al., 2022). Depending on topography this mixing change can occur over different distances that physical water quality changes which are discussed in the next section, the likely extent of effect will be identified as part of dispersion modelling included in Appendix O.

6.2.35 Receptors most at risk from this are those that are static or highly dependent upon vertical nutrient fluxes. High sensitivity receptors that are likely to be affected include the **high** sensitivity seagrass beds, potential coral patch reefs considered **high** sensitivity though could occur on reef flats and crest, **low** sensitivity benthic infauna and plankton communities are also likely affected. The degree of effect will depend upon the relative thickness density gradient (pycnocline) that forms though on a worst-case basis it is likely to have a **moderate** magnitude of effect where the boundary is thicker and **minor** where layers are thin without mitigation.

6.2.36 Mitigation measurements to reduce impact magnitude below significant levels:

- Use of a directional multijet dispersion heads to both direct the reject brine away from confirmed seagrass of coral habitats and increase the mixing. This would be supported by detailed modelling of potential stratification effects relative to the potential receptors of moderate or high sensitivity
- Monitoring of actual density gradients/stratification across biodiversity receptors of medium sensitivity or greater. With adaption of discharge direction where required as agreed with MoECC.

Water quality – physical changes

6.2.37 Operation of the desalination plant will primarily modify the physical water quality parameters relating to salinity and temperature which are each discussed in the following subsections.

Salinity

6.2.38 The recirculation study by HR Wallingford (HR Wallingford Ltd, 2024) indicated that mean salinities increased within approximately 3km of the discharge location both under calm (Figure 6.2) and typical wind conditions (Figure 6.3). The main difference between the wind conditions is under typical wind condition there is more evident surface salinity changes. Mean salinity concentrations are shown to increase by up to 4 parts per thousand (PPT), if this is added to the baseline concentrations established from satellite derived surface salinity and monitoring it potentially would mean that salinities that receptors receive would vary between 41.44 – 46.06 PSU.

6.2.39 In terms of receptors, the effects are more likely for sedentary species or life stages than they are for mobile species (Omerspahic et al., 2022) who will freely move away from areas of undesirable changes in water quality if alternative areas are available particularly if only opportunistically used. Consequently, the main receptor of concern are the **high** sensitivity seagrass beds which fall within the range of predicted changes in mean salinity concentration. These would also be host to potentially spawning grounds for **moderate** or **low** sensitivity fish species and may also host non-reef forming corals that are **low** sensitivity. In addition, potential coral patch reefs considered **high** sensitivity could also occur on reef flats and crest within the projected marine salinity changes.

6.2.40 Likely seagrass species in the region are known to be tolerant to increased salinity concentrations with *Halodule unniveris* known to tolerate salinities up to 45PSU without apparent damage only loosing vitality as PSU approaches 55PSU (Khalafallah et al., 2013) and

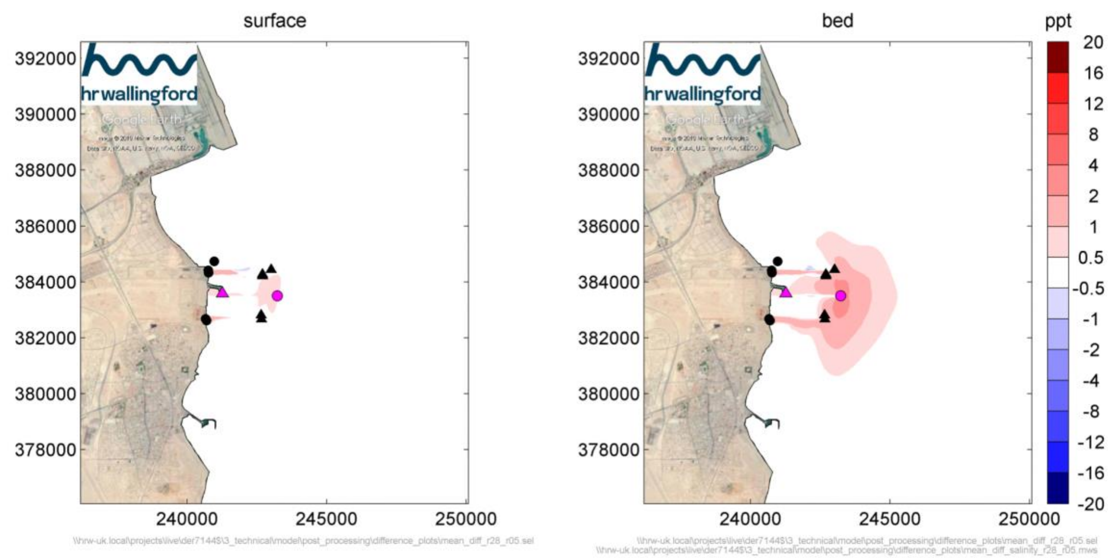
Halophila stipulacea is known to tolerate up to 60PSU for up to 3 weeks though thrives at 40PSU (Oscar et al., 2018). Consequently, the magnitude of effect on these species and the degree of predicted change are **minor**, which given their **high** sensitivity results in **Minor** magnitude of impact without mitigation.

6.2.41 Effects on fish in the region is less well known though it was evident that pacific species that usually inhabit salinity up to 37PSU were found to survive salinities up to 45PSU (Iso et al., 1994). However, there are also potential that it can cause reductions in available dissolved oxygen both from forming a separate layer and from consumption of oxygen from the treatment process (Hosseini et al., 2021) (Fu et al., 2023). Consequently, the estimated changes relative to existing salinities for the Arabian gulf is likely a **moderate** magnitude of effect on a worst-case basis affecting spawning habitat. Consequently, the resulting magnitude of impact is **minor** without mitigation.

6.2.42 Mitigation measurements to reduce impact magnitude below significant levels include:

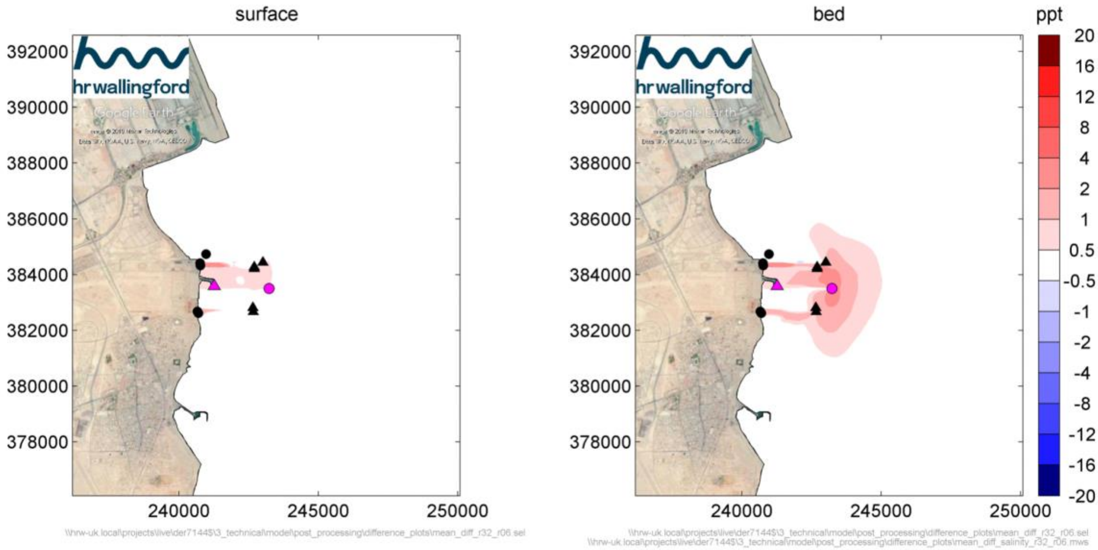
- Use of a directional multijet dispersion heads to both direct the reject brine away from confirmed seagrass of coral habitats and increase the mixing
- Aeration of the discharge stream to improve dissolved oxygen saturation prior to or during release
- Monitoring of actual salinity changes and biodiversity receptors of medium sensitivity or greater during operations. Form of monitoring and locations to be agreed with MoECC once surveys are completed
- Reduction in discharge rates or discharge direction during any marine heatwave that might be exacerbated by flow changes as necessitated by the confirmed receptors. This may be facilitated through reduction in other more flexible operations or shared systems that contribute to salinity increases (Wastewater).

Figure 6.2: Mean differences in excess salinity between Facility E and baseline, calmer conditions



Source: HRWallingford, 2024

Figure 6.3: Mean differences in excess salinity between Facility E and baseline, typical conditions



Source: HRWallingford, 2024

Temperature

6.2.43 During operation the RO plant coupled with the cooling water combined discharge is predicted to increase sea water temperatures on release. Outcomes of a recirculation model predicted mean increases in the surrounding seawaters during typical wind conditions up to 1°C at the surface and up to 4°C on the seabed (See Figure 6.2). Similar changes were also predicted during typical wind conditions though affecting a slightly smaller area due to the reduced mixing (See Figure 6.3) If these maximum predicted mean temperature increases added to the baseline established from satellite derived sea surface temperature and buoy monitoring it potentially would mean that temperatures that receptors experience would vary between 21.9° to 39.9°C .

6.2.44 As with the effects from salinity the effects are more likely for sedentary species or life stages than they are for mobile species. Particularly as mobile species will freely move away from areas of undesirable changes in water quality if alternative areas are available and particularly if only using the outfall area opportunistically. Consequently, the main receptors of concern within this predicted area of mean difference are high sensitivity seagrasses, high sensitivity patch reefs, medium and low sensitivity fish species that would spawn in the seagrass habitats, low sensitivity plankton and infaunal communities.

6.2.45 One of the potential seagrass bed species, *Halophila stipulacea* is known to survive temperatures up to 38.9°C (Marbà et al., 2022), whilst the other species *Halodule unnivevis* is reported to inhabit water between 10-39°C (Short et al., 2010) in inshore areas around the Arabian gulf though can survive brief periods of greater than 45°C in Doha though may be damaged (Al-Bader et al., 2014). The nearest seagrasses along the RAF A3 occupy the lower predicted mean increases in the recirculation modelling though it doesn't detail how the maximum temperatures will change; therefore, it is considered that magnitude of effect is moderate. This has been set as these small patches are likely to be directly impacted when considering continuing projected climate change driven sea surface temperatures are projected to rise by 4.3°C near Qatar by 2100 (Noori et al., 2019). with annual increases of 0.61°C per decade (Hereher, 2020) likely to push both species outside on their normal temperature range. However, it is unlikely the thermal changes will reach the main seagrass bed further north of the outfall so any associated losses from the impact would be a small proportion of the total seagrass ecosystem. As receptors seagrass beds are high sensitivity this would result in a Moderate magnitude of impact without mitigation measures.

6.2.46 In addition to seagrass beds there is potentially coral patch reefs which could be within the areas where mean temperatures could increase. Corals are also considered a high sensitivity receptor, and studies have shown where areas with temperatures persistently occur above 35.5°C within the Southern gulf are subject to significant bleaching (Paparella et al., 2019). Given the baseline indicates sea surface temperatures already are exceeding this threshold without the introduction of additional heat from the discharge it is likely that prolonged periods above this threshold could occur. Consequently, magnitude of impact on patch reefs where they occur without mitigation would be moderate given potential areas where corals could occur within the area of predicted effect are small reef flats and crests from geomorphological classification. This would be confirmed once surveys have completed.

6.2.47 In terms of low and medium sensitivity fish species, a study on ecological traits of two common reef fishes *Lutjanus ehrenbergii* and *Pomacanthus maculosus* were projected to not only tolerate increases in temperature though were found to be subject to increased growth rate (D’Agostino et al., 2021). Furthermore, a study on commercial fishes noted that certain species showed greater adaptability in their feeding strategies and general shifts in body size that allowed them to code with higher temperatures (Johansen et al., 2024). The predicted increased temperature range was within the critical thermal tolerance limits for the anomalous goby (*Coryogalops anomolus*) which are likely to use the seagrass, sands and rubble areas (Brandl et al., 2020) (Randall, 1995 as cited in Froese and Pauly, 2025). Though papers indicate several particular species are likely to tolerate it well other species are likely to be less tolerant of the change. Consequently, a precautious **minor** magnitude of negative effect is considered, which given the sensitivity of medium receptors that may potentially routinely use the area of effect results in a **Minor** magnitude of impact without mitigation.

6.2.48 Mitigation measurements to reduce impact magnitudes include:

- Use of a directional multijet dispersion heads to both direct the reject brine away from confirmed seagrass of coral habitats and increase the mixing
- Aeration of the discharge stream to improve dissolved oxygen saturation prior to or during release
- Monitoring of actual temperature changes and biodiversity receptors of medium sensitivity or greater during operations
- Contribution towards seagrass restoration programmes to improve seagrass conditions across Qatar which may include:
  - Pollution reduction programmes to improve water quality and reduce marine litter that effect seagrass beds.
  - Use of advanced moorings to reduce scarring from vessels in existing beds in wider Qatar
  - Planting where locations prove technically feasible after studies undertaken.

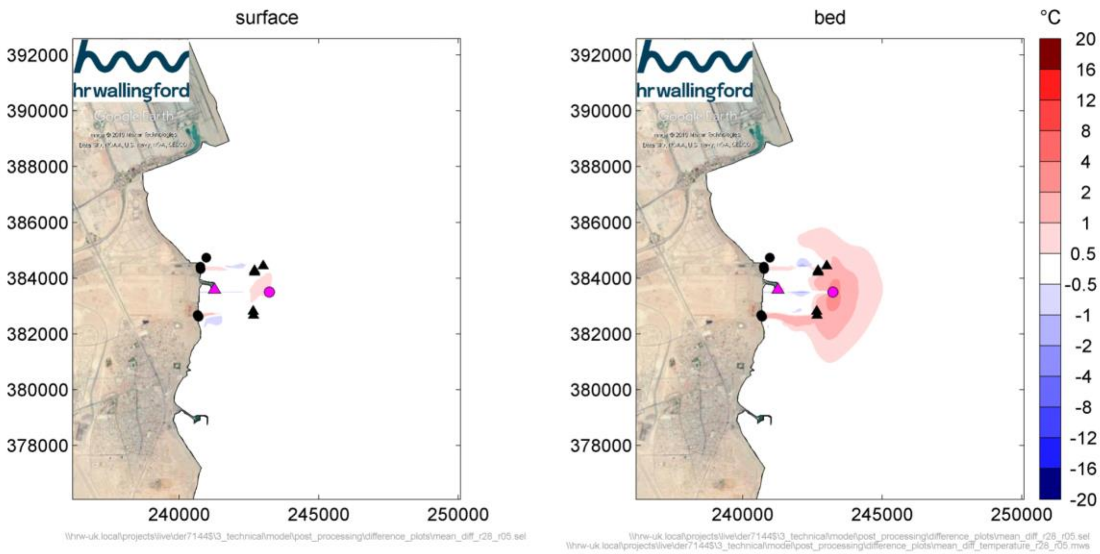
6.2.49 Form and nature of contribution will be agreed with the MoECC.

- Reduction in any additional discharge rates (cooling water or wastewater) nearby or discharge direction during any marine heatwave that might be exacerbated by flow changes as necessitated by the confirmed receptors.

- Contribute to studies on thermotolerant species and support development of schemes for coral resilience building (thermally tolerant coral nurseries, restoration in potential thermal refugia). Form and nature of contribution will be agreed with the MoECC.
- Provision of fish ecological enhancement structures outside of modelled increased temperature areas to offset effects where medium sensitivity features are confirmed dependent upon area of effect.
- Mitigation measures to be discussed with MoECC once survey results have been obtained to agree monitoring approaches.

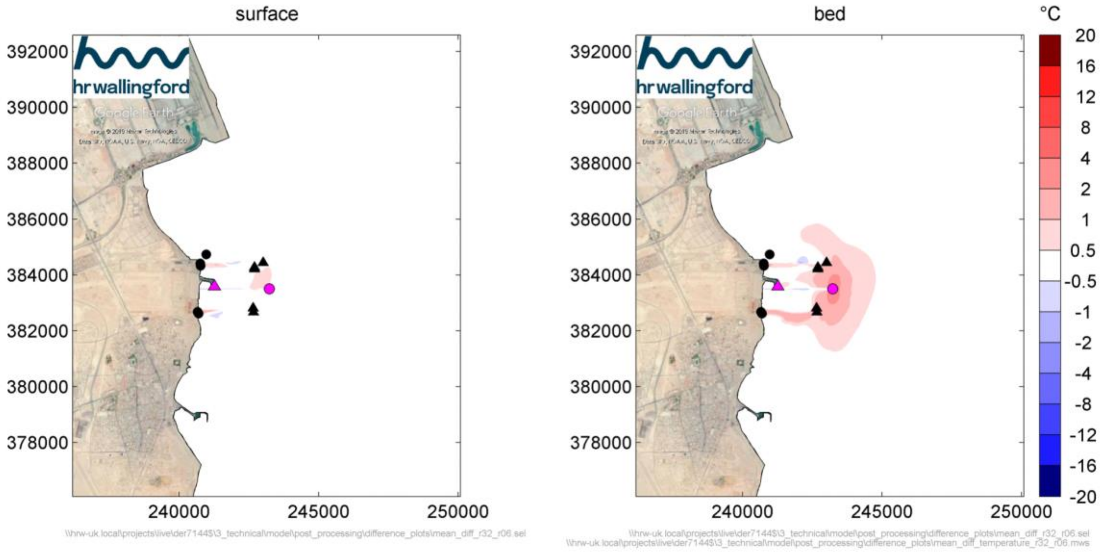
6.2.50 Given the proximity of the seagrass beds to the discharge location and the uncertainty of restoration techniques for the species likely to occur within them, it is likely that the magnitude of effect with mitigation measures would be reduced to Minor resulting in a residual magnitude of impact of Minor that is still significant for a high and medium sensitivity receptor. An agreed action plan on mitigation measures and necessary compensation will be agreed with MoECC.

Figure 6.4: Mean differences in excess temperatures between Facility E and baseline, calmer conditions



Source: HRWallingford, 2024

Figure 6.5: Mean differences in excess temperatures between Facility E and baseline, calmer conditions



Source: HRWallingford, 2024

Water quality – contaminants

Increased concentration of existing contaminants in feedwater

6.2.51 From the permit the RO plant is intended to operate at approximately a 8.3% efficiency rate at removing freshwater from the marine water intake. Consequently, it is considered that existing compounds within the intake seawater would increase in concentration by approximately 10%. In addition, the Project has committed to operate both RO plant and the powerplant's wastewater treatment system so that compounds remain within the referenced design standards (F.14.2 WasteWater Quality). The compounds from existing monitoring programme in the baseline were generally very low and even if increased by 10% are still well below regulatory thresholds of concern (see section 3.2) so meeting these standards are generally feasible.

6.2.52 The exceptions are boron, cadmium, iron, nickel, and selenium, when reviewing the Australian guidelines technical brief it indicated the following effect threshold:

- Nickel 152 µg/L for acute toxic effects and short term effects >50µg/L though no chronic effects threshold established.
- Selenium 0.255mg/L was reported for acute toxic effect
- Cadmium 15.5 µg/L was reported for chronic effects and it was noted to bioaccumulate

6.2.53 The guidelines also mentioned that boron, iron concentration were naturally high in marine waters and there is little evidence of toxic effects.

6.2.54 In a recent study (Resgalla et al., 2022) , Boron concentrations ≤6.75mg/L were noted to have no ecological effect and a ecological effect on 50% of the test community (EC50) when concentrations exceed 14.6mg/L. A study on pacific white shrimp (Asare et al, 2025) , detailed that iron concentrations in their native waters typically vary between 8.32 and 9.14 µg/l with toxicity and leathal effects for 50% of the text subjects (LC50) were not noted until concentrations of 5.484 mg/L for 96 hours.

6.2.55 Given the ambient marine waters in the region are already likely to exceed toxic effect threshold for less tolerant species it is likely that receptors in the region are already tolerant to a degree.

Further research would be required to determine the extent of effect for the receptors in the region though it is likely that there will still be some increase that could cause effects. O a precautionary approach it is assumed a major magnitude of effect would be likely. Most of the less tolerant taxa generally are those that would be equivalent of plankton and invertebrates within the region which are receptors considered as Low Sensitivity. As such the magnitude of impact even without mitigation is not significant.

6.2.56 Consequently, it unlikely that a significant effect would be caused by the concentration of contaminant within feedwater. Particularly as the receptors will already be subject to outfalls meeting these standards so any receptors that would be sensitive are unlikely to be in the receiving waters within the bay south of the airport.

6.2.57 Recommended mitigation measures to overcome the uncertainty of effects and reduce them where possible from major magnitude of effects include:

- Undertake investigation of chelation or ion exchange resins (Nyamato, 2023) to reduce the initial trace metal concentrations prior to RO filtration or as part of wider wastewater treatment programmes.
- Monitoring of metal concentrations over extent of dispersion and biodiversity receptors of medium sensitivity or greater during operation.
- Mitigation measures to be discussed with MoECC once survey results have been obtained to agree monitoring approaches.

Introduction of contaminants from pre-treatment and maintenance processes

6.2.58 As part of the operating process of the RO plant a number of compounds are listed to be used as part of pre-treatment of feed waters, maintenance phases, and neutralisation of compounds in discharge. Those listed as part of the water treatment process for the proposed Project include:

- Scale Inhibitor
- Hydrochloric Acid (32%)
- Caustic Soda (25%)
- Ferric Chloride/Coagulant (40%)
- Sodium Hypochlorite (12.5%)
- Anionic Polymer (Flopam AN 934 AB20)
- Cationic Polymer (NEILCP 151)
- Sodium Bisulfite
- Hydrated Lime
- Cationic Resin (AmberLite™ IRC120 H Ion Exchange Resin)
- Anionic Resin (AmberLite™ IRA402 Cl Ion Exchange Resin)
- Ammonia Solution 25%
- Z0K Cleaning Fluid for Compressors of Gas turbine Engines
- Caustic Flakes
- Tri Sodium Phosphate

- O2 Scavenger 25%
- Corrosion inhibitor (EC-162)
- Biocide (EC-401)
- Ammonia Solution 8%

6.2.59 A number of studies have highlighted concerns over the residual effects of neutralised disinfectants containing nutrients can cause eutrophic blooms, corrosion of poor-quality steels releasing heavy metals, coagulants boosting turbidity, and some toxicity as well as persistence of pH reducing compounds (UNEP-WCMC, 2025) (Abouzied and Abouzied, 2023) (Fernández-Torquemada et al., 2019) (le Quesne et al., 2021). Recently it is considered by the industry that there has been a reduction in compounds used in desalination with improvements in management to ensure minimisation of effects in the marine environment (Voutchkov, 2019). Most of the effects exponentially decrease with distance from the point discharge as it is increasingly diluted as it mixes with receiving waters. Consequently, the receptors most at risk would be those that are within 1km of the discharge point (Sirota et al., 2024). Receptors within this zone include the small patches of **high sensitivity** seagrasses along the RAFA3 intake pipeline, potentially **high sensitivity** coral patch reefs could occur in the reef flats/small crest within this area, **medium and low sensitivit**y fish could opportunistically use these areas including spawning associated with the limited seagrass patches.

6.2.60 As a precaution and due to potentially toxic nature of compounds/potential turbidity effects it is assumed a **moderate** magnitude of effect on stationary or limited mobility receptors given highly mobile receptors would have reduced chance of exposure where compounds are potentially released intermittently and therefore, they would experience a minor magnitude of effect. At worst case for the high sensitivity seagrass and potential patch-reef corals and fish spawning ground of Medium sensitivity fish that would be a static receptor this would resulting in a **Moderate** magnitude of impact without mitigation.

6.2.61 Plankton could also be impacted given their low mobility and ubiquitous nature which are considered **Low** sensitivity receptors. However, as their likely response is mostly deleterious blooms that cause eutrophication, they are considered to have a **Major** magnitude of effect without mitigation response which though itself **Not significant** magnitude of impact it could cause **moderate** magnitudes of effects on the other receptors within the wider study area where this occurs which could be significant.

6.2.62 Mitigation measurements to reduce impact magnitudes include:

- Compounds are dosed at a minimum level to effect the required change in water quality for RO treatment
- When not in use compounds should be stowed in line with control of substances hazardous to health (COSHH) and in a location that ensures no accidental release into the aquatic environment
- Avoidance of marine reactive phosphorous containing scale inhibitors through the use of safe alternatives (Organic polymers, such as polyacrylic acid and polymaleic acid, and non-bioavailable phosphonates)
- All compounds will be completely neutralised and reduced in line with permit requirements prior to release. Quantitative monitoring of the waters to be discharged to ensure that neutralisation of the residual chemical used during maintenance and treatment process are fully completed prior to discharge. Where evident that compounds are not fully neutralised operation of the plant will be reduced and feed waters will be mixed to reject to reduce discharge flow volumes to encourage greater dilution
- Use of non-chemical techniques such as ultraviolet and ultra-microfiltration at pretreatment stage to reduce the chemical biocide needs
- Review use of a membrane bioreactor treatment stage to further breakdown any pretreatment and existing polluting chemicals prior to discharge release
- Aeration of the discharge stream to improve dissolved oxygen saturation prior to or during release, which can also increase breakdown/ neutralisation of dosed compounds
- Use of high-quality stainless steel validated specifically to minimise corrosion on other compounds into the marine environment during any acidification or high temperature maintenance/pre-treatment stages of the process
- Corrosion monitoring of water interacting faces where steels are subject to high temperatures and low pH conditions during maintenance with replacement with alternative grade where issues occur
- Use of lamella thickeners and centrifuges to remove as much suspended materials from the system and safe disposal in the form of dewatered sludges ideally with beneficial use
- Monitoring of plankton and seagrass communities along with nutrient and heavy metal loads for 2 years after construction to determine potential for eutrophic or harmful algal blooms or seagrass changes with measures to reduce nutrient load where detriment projected to occur. This will be reviewed pending results and agreement with MoECC
- Use of a directional multijet dispersion heads to both direct the reject brine away from confirmed seagrass of coral habitats and increase the mixing.

As these measures both avoid and minimise the potential effects the residual magnitude of effect will reduce to low which results in a not significant residual magnitude of effect for any receptors.

6.3 Air quality

Methodology

Baseline conditions methodology

6.3.1 The baseline assessment has used a site-specific monitoring survey undertaken as part of the assessment. Monitoring has been undertaken for NO_2 for one month between 14 January and 13 February 2025 at six locations around the Project site, using four passive monitors and two active monitors.

6.3.2 The baseline assessment includes a review of data from the site-specific air quality monitoring survey undertaken for this Project compared with modelled ground level concentrations from the operational Ras Abu Fontas plants A1, A2 and A3, B and B2 to determine the most suitable approach to setting baseline conditions. This comparison is presented in Appendix J (403100049-C001-MML-RP-EN-018). demonstrates that the monitoring survey measured higher NO_2 concentrations that the modelling for the existing RAF plants.

6.3.3 Pollutant concentrations derived from the baseline monitoring have been used within the impact assessment to represent the current ambient conditions. When assessing the impacts from the Project on short term averaging periods (one hour and 24 hour) the background concentration used to represent ambient conditions has been assumed to be twice that of the long term (annual) concentrations used within the assessment. This approach is consistent with international best practice and specified by the UK Environment Agency which states:

'Detailed assessment of short term-effects is often complex as the maximum process contribution and maximum background concentration may be separated both temporally and spatially, so that the addition of the "two worst" concentrations may not represent a likely event.'

'When you calculate background concentration, you can assume that the short-term background concentration of a substance is twice its long term.'

6.3.4 On this basis, the average of all monitoring sites (28.4µg/m^3) has been adopted as the annual mean background NO_2 concentration in this assessment and 56.8µg/m^3 has been adopted for short term averaging periods (one hour and 24-hour averaging periods).

Construction phase impact assessment methodology – Public amenity/nuisance from construction dust

6.3.5 Construction activities can result in temporary effects from dust. 'Dust' is a generic term which usually refers to particulate matter in the size range 1-75 microns. Emissions of construction dust are predominantly associated with the movement and handling of minerals and therefore composed of the larger fractions of this range, which do not penetrate far into the respiratory system. Therefore, the primary air quality issue associated with construction phase dust emissions is normally loss of amenity and/or nuisance caused by, for example, soiling of buildings, vegetation and washing and reduced visibility.

6.3.6 Dust deposition can be expressed in terms of mass per unit area per unit time, e.g. mg/m^2/month. No relevant Qatari standards exist for dust deposition, however, criteria ranging from 133 to 350mg/m^2/month are found around the world as representative of thresholds for significant nuisance.

6.3.7 It is considered that a quantitative approach is inappropriate and unnecessary for assessing particulate emissions associated with the construction and decommissioning phases of the Project, given their relatively short duration, the limited number of sensitive receptors and the nature of dust emissions.

6.3.8 The purpose of the assessment is to determine the dust risk associated with the construction activities and the mitigation measures required to reduce dust risk to below levels at which they may cause nuisance or harm to human health. The purpose of the assessment is to determine the level of impact, and the mitigation measures required to reduce dust impacts to below levels at which they may cause nuisance or harm to human health.

6.3.9 The first stage of the assessment involved the identification of construction activities which have the potential to cause dust emissions, along with the degree of dust potential. Table 6.7 provides a list of potential activities at each stage of construction. Selected information for this table has been used within this assessment to determine the impact of the Project with respect to construction dust.

Table 6.7: Relevant Generic Dust Emitting Activities

Potential dust emitting activities	Description	Dust emission potential
Earth handling	Potential to be high in dust nuisance, depends on soil dryness	High
Loading activities	Potential to be high in dust nuisance, depends on material characteristics	High
Storage of materials onsite	Potential to be high in dust nuisance, depends on material characteristics	High
Transport of materials within site	Can be high depends on type of transport and nature of road surface	Medium
Drilling and digging activities (Including soil excavation)	Can be high depending on type of drilling and digging activities and material characteristics	High
Transport of material offsite	Generally low as transport occurs by surfaced roads	Low
Construction of new buildings	Generally low although some activities with high dust raising such as material cutting can occur	Medium-low
Assembly of plant	Generally low as involves assembling prefabricated pieces	Low

Source: Table adapted from UK Department for Environment and Rural Affairs and Buildings Research Establishment Guidance Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England, Annex 1: Dust

6.3.10 In the second stage of the assessment, all sensitive receptors with the potential to be significantly affected by construction dust emissions have been identified. The distances from source at which construction dust effects are felt are dependent on the extent and nature of mitigation measures, prevailing wind conditions, rainfall and the presence of natural screening by, for example, vegetation or existing physical screening such as boundary walls on a site. However, research indicates that effects from construction activities that generate dust are generally limited to the areas within 150-200m of the construction site boundary. Given that the Project is located in a desert, and to ensure a conservative assessment, any receptors within 1000m of the construction site boundary have been identified, and their classification determined in accordance with Table 6.8.

Table 6.8: Receptor classification

Classification		
High	**Medium**	**Low**
Hospitals and clinics	Residential areas	Farmland
-	Workers' accommodations	Other industry
-	Beaches	-
-	Places of work	-

Source: Table adapted from UK Department for Environment and Rural Affairs and Buildings Research Establishment Guidance Minerals Policy Statement 2: Controlling and Mitigating the Environmental Effects of Minerals Extraction in England, Annex 1: Dust

Construction phase impact assessment methodology – Occupational health impacts from construction dust

6.3.11 Following the assessment undertaken above, potential dust generated during the construction phase is not considered to cause an occupational exposure risk and has not been considered further.

Construction phase impact assessment methodology – Construction traffic

6.3.12 During the construction phase there will be an increase in traffic during construction related to the movement of workers and plant. Additional traffic movements during the construction phase are expected to comprise the following movements per day: 20-30 bus movements, 20-30 truck/trailer movements and 40-60 passenger car movements. The site traffic management plan is likely to include measures that will be implemented to minimise additional traffic generated by the Project during the construction period.

6.3.13 Access to the site is through public roads however, site roads for construction shall be constructed under the Project. Appropriate mitigation measures have been presented in Section 7.1 to avoid any significant effects on local air quality at sensitive receptors and no further consideration has been given to the effects of construction road traffic on ambient air quality.

Construction phase impact assessment methodology – Plant

6.3.14 Effects of plant emissions on local air quality are of negligible significance, as the existing monitored pollutant concentrations do not exceed the Qatari air quality standards and the number of sensitive receptors in close proximity is limited given the industrial setting of the Project. Impacts from construction plant are therefore considered to be not significant from an air quality perspective and have not been considered further. However, mitigation measures to minimise emissions from onsite combustion plant has been presented in Chapter 7.

Operational phase impact assessment methodology

6.3.15 This section describes the scenarios modelled and the methods used to assess air quality impacts from the operational phase of the Project.

6.3.16 Impacts from operational phase vehicle movements on air quality are not significant and have not been considered in this assessment. This is because the vehicle movements associated with the Project are expected to be limited to the movements of workers and maintenance of the Project, and therefore likely to be very small. Also given the industrial location of the Project, effects of vehicle emissions on local air quality are of negligible significance relative to the baseline air quality and due to the limited number of sensitive receptors in close proximity.

Stack height determination

6.3.17 This ESIA provides a recommended stack height based on an assessment of potential impacts on air quality only. Amongst others, it does not take account of structural requirements, safety issues or associated regulations which should be considered by those using this information to develop the stack design.

6.3.18 Full details of the stack height determination carried out are provided within Appendix I (403100049-C001-MML-RP-EN-017) which confirms that a bypass stack of 45m above ground level and an HRSG stack of 60m above ground level are suitable to overcome building downwash effects and enable adequate dispersion of the plume.

Model selection

6.3.19 A number of commercially available dispersion models are able to predict ground level concentrations arising from emissions to atmosphere from elevated point sources such as a power plant. A new generation dispersion model - AERMOD (executable version 14134) was used to inform the air quality assessment. AERMOD is acknowledged by the IFC as an appropriate tool for predicting emissions from point sources such as those associated with this Project.

6.3.20 A committee, AERMIC (the American Meteorological Society / Environmental Protection Agency Regulatory Model Improvement Committee), was formed to introduce state-of-the-art modelling concepts into the US Environmental Protection Agency's local-scale air quality models. AERMIC's focus was on a new platform for regulatory steady-state plume modelling. AERMOD was designed to treat both surface and elevated sources in simple and complex terrain.

6.3.21 Special features of AERMOD include its ability to treat the vertical heterogeneity nature of the planetary boundary layer, special treatment of surface releases, irregularly-shaped area sources and limitation of vertical mixing in the stable boundary layer.

6.3.22 AERMOD is a modelling system with three separate components and these are as follows:

- AERMOD (AERMIC Dispersion Model)
- AERMAP (AERMOD Terrain Pre-processor)
- AERMET (AERMOD Meteorological Pre-processor)
- AERSURFACE (AERMET surface parameters Pre-processor)

6.3.23 AERMAP is a terrain pre-processor designed to simplify and standardise the input of terrain data for AERMOD. Input data include receptor terrain elevation data. For each receptor, the output includes a location and height scale, which is an elevation used for the computation of air-flow around hills.

6.3.24 AERMET is the meteorological pre-processor for AERMOD. Input data can come from hourly cloud cover observations, surface meteorological observations and twice-a-day upper air soundings. Output includes surface meteorological observations and parameters and vertical profiles of several atmospheric parameters.

6.3.25 The AERSURFACE utility obtains the required surface parameters (albedo, Bowen ratio and surface roughness) by importing land cover datasets of surface characteristics that vary by land cover type and season to obtain realistic and reproducible surface characteristic values for use in AERMET.

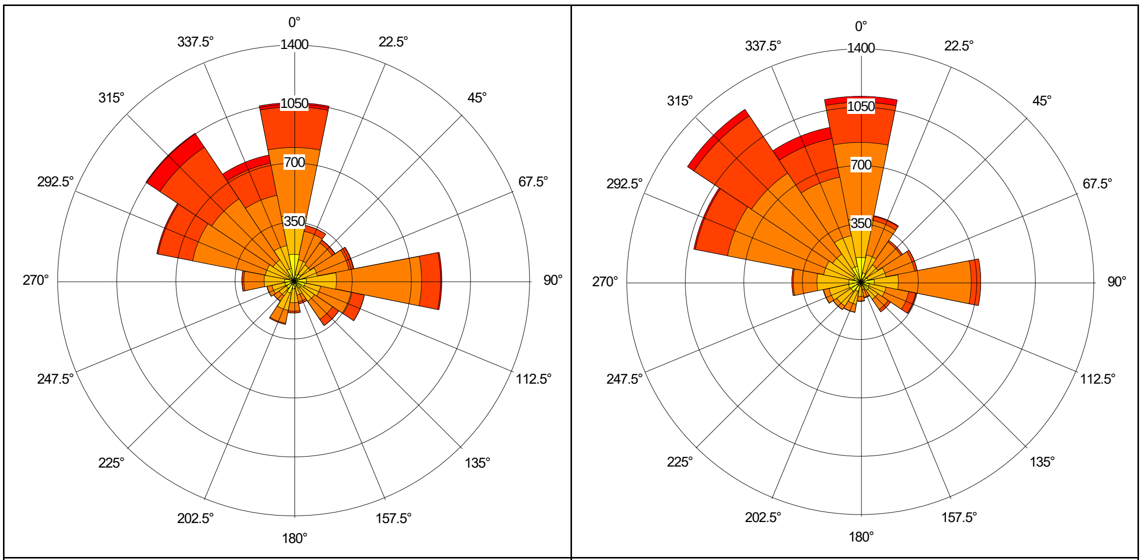
Meteorological data

6.3.26 The most important meteorological parameters governing atmospheric dispersion of pollutants are wind direction, wind speed and atmospheric stability, as described below:

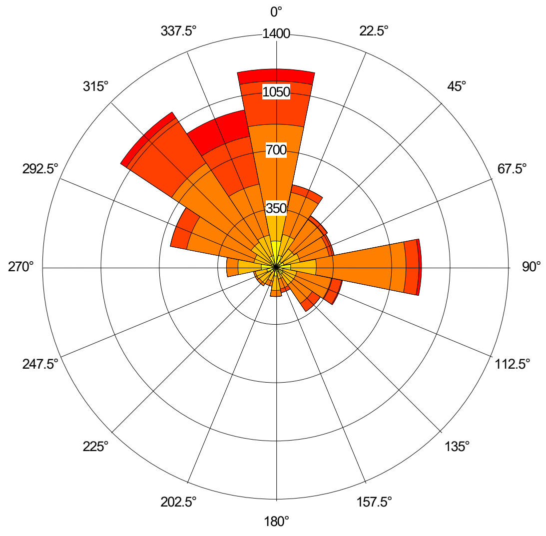
- Wind direction determines the sector of the compass into which the plume is dispersed.
- Wind speed affects the distance which the plume travels over time and can affect plume dispersion by increasing initial dilution of pollutants and inhibiting plume rise.
- Atmospheric stability is a measure of the turbulence of the air, and particularly of its vertical motion. It therefore affects the spread of the plume as it travels away from the source. New generation dispersion models use a parameter known as the Monin-Obukhov length that, together with wind speed, describes the stability of the atmosphere.

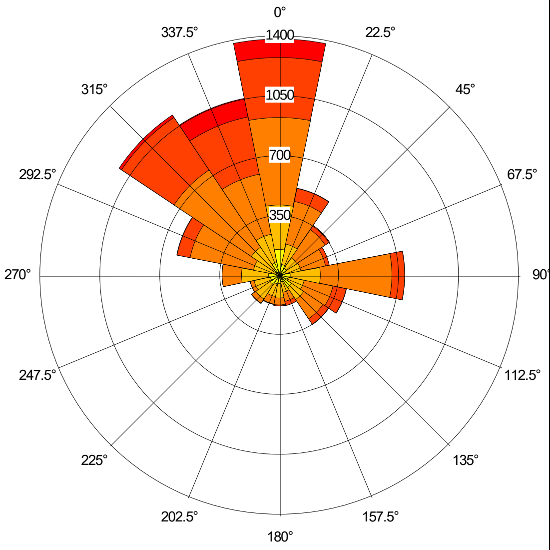
6.3.27 For meteorological data to be suitable for dispersion modelling purposes, a number of parameters need to be measured on an hourly basis. These parameters include wind speed, wind direction, cloud cover and temperature. There are only a limited number of sites where the required meteorological measurements are made. Doha International Airport is the closest and most representative site in relation to the Project where these parameters are recorded on an hourly basis with data available for the required period of time. The dispersion modelling has been based on data from this site for the last 10 years. Windroses presenting this data are presented in Figure 6.6.

Figure 6.6: Windroses from Doha International Airport

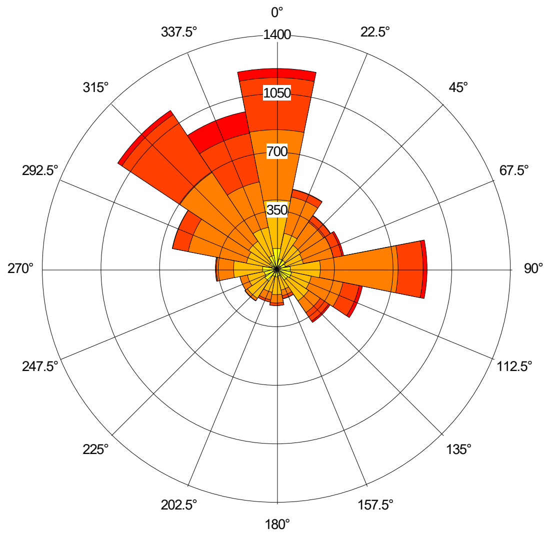


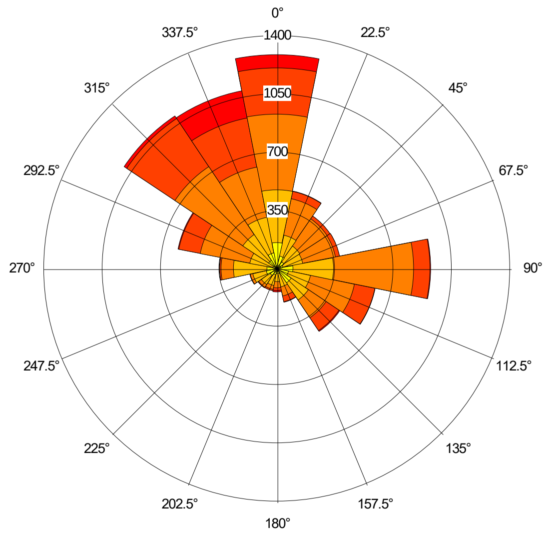
2015	2016



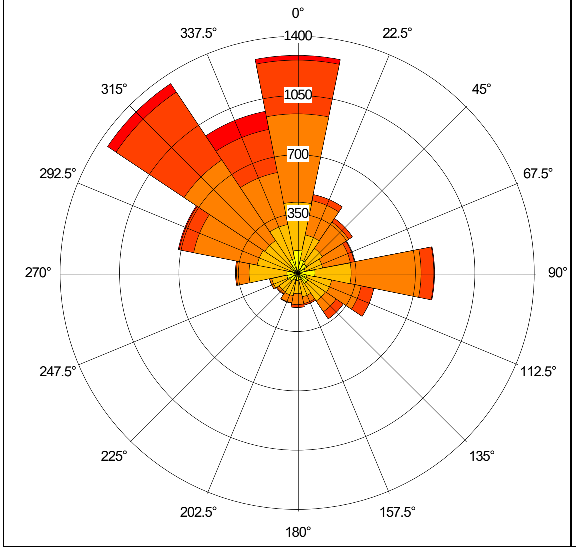


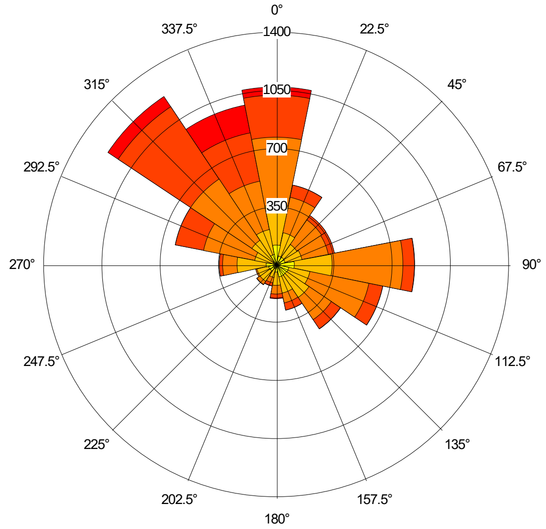
2017	**2018**

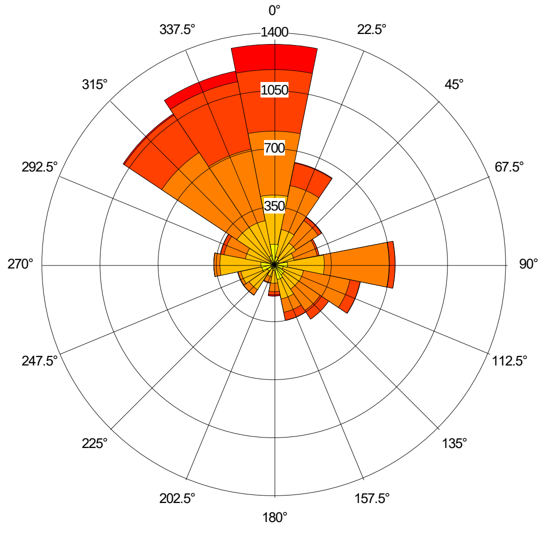
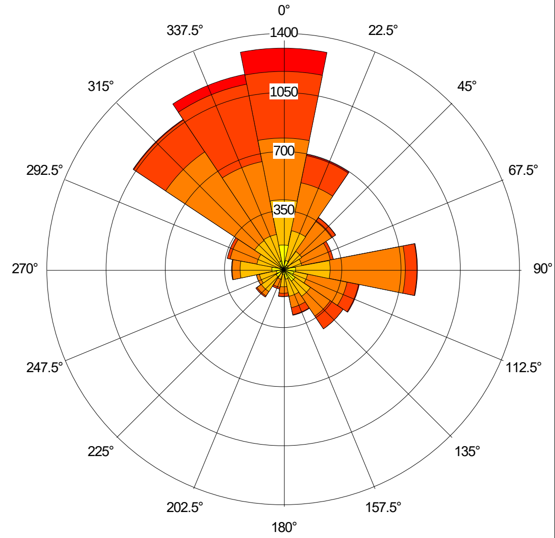
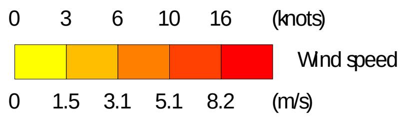




2019	**2020**





<table>
<tr><th>2021</th><th>2022</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><th>2023</th><th>2024</th></tr>
<tr><td>Notes on scale:
Number around the outside of the wind rose shows direction in degrees.
Rose petals show direction in which wind is blowing from.
Numbers within chart (350 to 1400) show number of hours per year.
Colours represent wind speed with adjacent scale.</td><td>
</td></tr>
</table>

Source: Generated from meteorological data supplied by Enviro Data Services, 2025

Surface roughness

6.3.28 Roughness of the terrain over which a plume passes can have a significant effect on dispersion, by altering the velocity profile with height and the degree of atmospheric turbulence. This is accounted for in the meteorological data processing by a parameter called the ‘surface roughness length’. The surface roughness length, along with albedo and Bowen ratio, within the study area has been calculated using AERSURFACE to process land use data within 1km radius of the meteorological station, which is then used in the AERMET meteorological pre-processor.

NOx to NO_2 conversion

6.3.29 NOx emissions associated with combustion sources such as turbines will typically comprise approximately 90-95% nitric oxide (NO) and 5-10% NO_2 at source. The NO oxidises in the atmosphere in the presence of sunlight, ozone, and volatile organic compounds to form NO_2, which is the principal pollutant of concern with respect to environmental and health effects.

6.3.30 There are various techniques available for estimating the proportion of NOx that is converted to NO_2. A 50% conversion of NOx to NO_2 has been assumed for short term averaging periods (1 hour and 24 hour), and 70% conversion for long term averages (annual). This approach is considered appropriate based on guidance from the United Kingdom’s Environment Agency (EA).

Terrain

6.3.31 The presence of elevated terrain can significantly affect (usually increase) ground level concentrations of pollutants emitted from elevated sources such as stacks, by reducing the distance between the plume centre line and ground level and increasing turbulence and, hence, plume grounding. The terrain in the study area is generally flat however it has been included within the assessment for completeness.

Buildings

6.3.32 The movement of air over and around buildings generates areas of flow circulation, which can lead to increased ground level pollutant concentrations in the building wakes. The buildings likely to have the dominant effect (i.e. with the greatest dimensions likely to promote turbulence) are the turbine halls and heat recovery steam generators (HRSGs). Table 6.9 presents the building dimensions assumed within the assessment and Figure 6.7 provides a visual representation of the building inputs in the dispersion model.

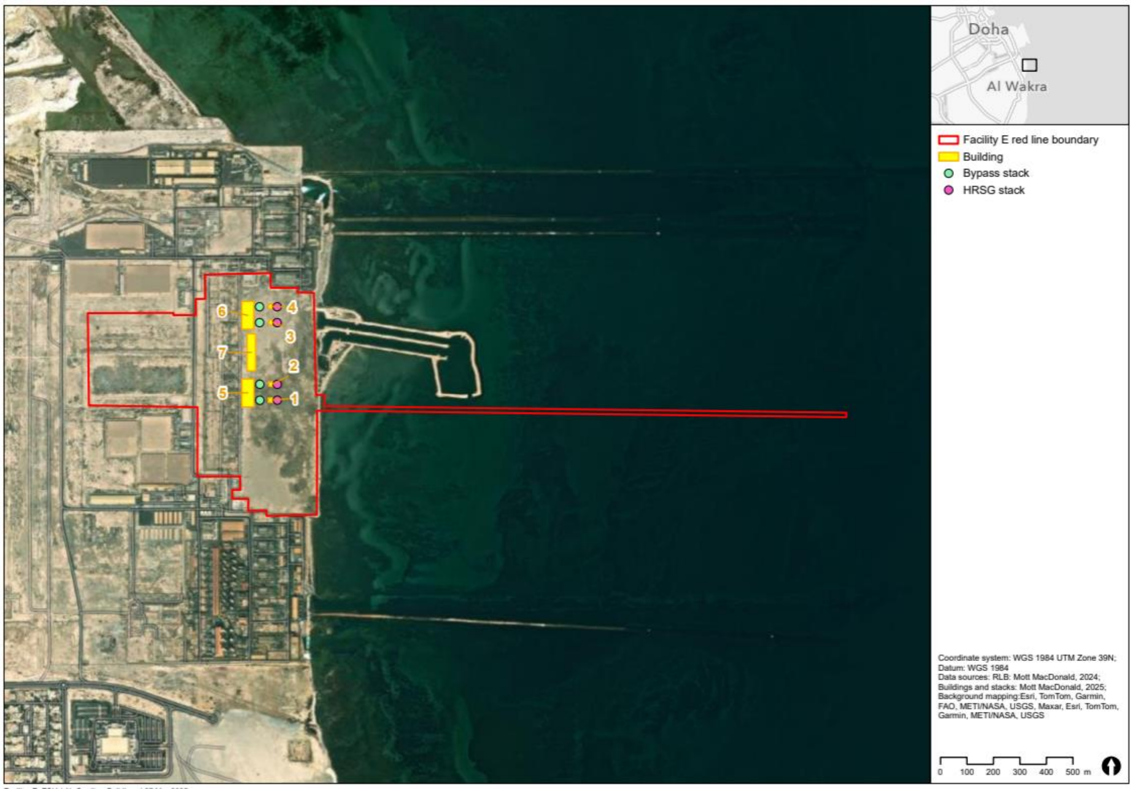
Table 6.9: Building dimensions included in the dispersion model

Building ID	Building name	X (m)	Y (m)	Height above ground level (m)	Length/ diameter (m)	Width (m)	Angle (°)
1	HRSG	562250	2787756	25.6	26	17	0
2	HRSG	562252	2787817	25.6	26	17	0
3	HRSG	562253	2788050	25.6	26	17	0
4	HRSG	562251	2788110	25.6	26	17	0
5	Gas Turbine Generator	562151	2787740	28.6	45	105	0
6	Gas Turbine Generator	562150	2788033	28.6	45	105	0

Building ID	Building name	X (m)	Y (m)	Height above ground level (m)	Length/ diameter (m)	Width (m)	Angle (°)
7	Steam Turbine	562170	2787875	29.5	32	140	0

Source: Mott MacDonald, 2025

Figure 6.7: Buildings included in the dispersion model



Source: Mott MacDonald, 2025

Emissions to air

6.3.33 Emissions data have been based on information provided by the OEM turbine manufacturer and additional calculations carried out by Mott MacDonald. The emissions data used within the dispersion modelling are presented in Table 6.10.

6.3.34 The normal operation of the Project will be in closed cycle mode with emissions to air from the HRSG stack. Qatar has a policy ambition of limiting emissions of NOx from stationary sources to 9ppm (approximately 18mg/Nm^3), therefore NOx emissions for the HRSG stack will meet 9ppm and have been modelled on this basis. However, to provide a complete assessment of potential impacts the emissions from the Project operating in open cycle mode with emissions from the bypass stack have also been considered and compared to both short (1 hour and 24 hour) and long term (annual) ambient air quality standards.

6.3.35 Four operational scenarios have been assessed in order to identify the potential impacts of the Project. These include:

6.3.35.1 Baseline sensitivity scenario: RAF modelled concentration compared with monitored concentration (presented in Appendix J (403100049-C001-MML-RP-EN-018)).

- Scenario 1: Bypass stacks at 100% gas turbine load
- Scenario 2: Bypass stacks at low exhaust gas volumetric flow
- Scenario 3: HRSG stacks at 100% gas turbine load
- Scenario 4: HRSG stacks at low exhaust gas volumetric flow

It has been conservatively assumed that all emission sources would operate continuously all year (8760 hours a year). This is a conservative approach as it means the assessment considers the maximum amount of pollution emitted to the atmosphere within a calendar year.

Table 6.10: Emissions data per turbine

Parameter	Bypass stack	Bypass stack	HRSG stack	HRSG Stack
Scenario	1 - 100% load	2 – low volumetric flow	3 – 100% load	4 – low volumetric flow
Stack height (m)	45	45	60	60
Actual volumetric flow (Am^3/s)	2265	1520	856	664
Normalised volumetric flow (Nm^3/s)[(a)]	902	521	894	679
Efflux temperature (°C)	671	695	87.3	76.6
Efflux velocity (m/s)	34.9	23.4	19.4	15.0
Stack internal diameter (m)	9.1	9.1	7.5	7.5
NOx emission limit (mg/Nm^3)	55	55	18	18
NOx mass emission (g/s)	49.6	28.7	16.1	12.2

Source: Samsung, Siemens and Mott MacDonald, 2025

[(a)] Normalised reference conditions: dry, 15% O_2, 0°C, 1 atmosphere

Arithmetic discrepancies may occur due to rounding of values

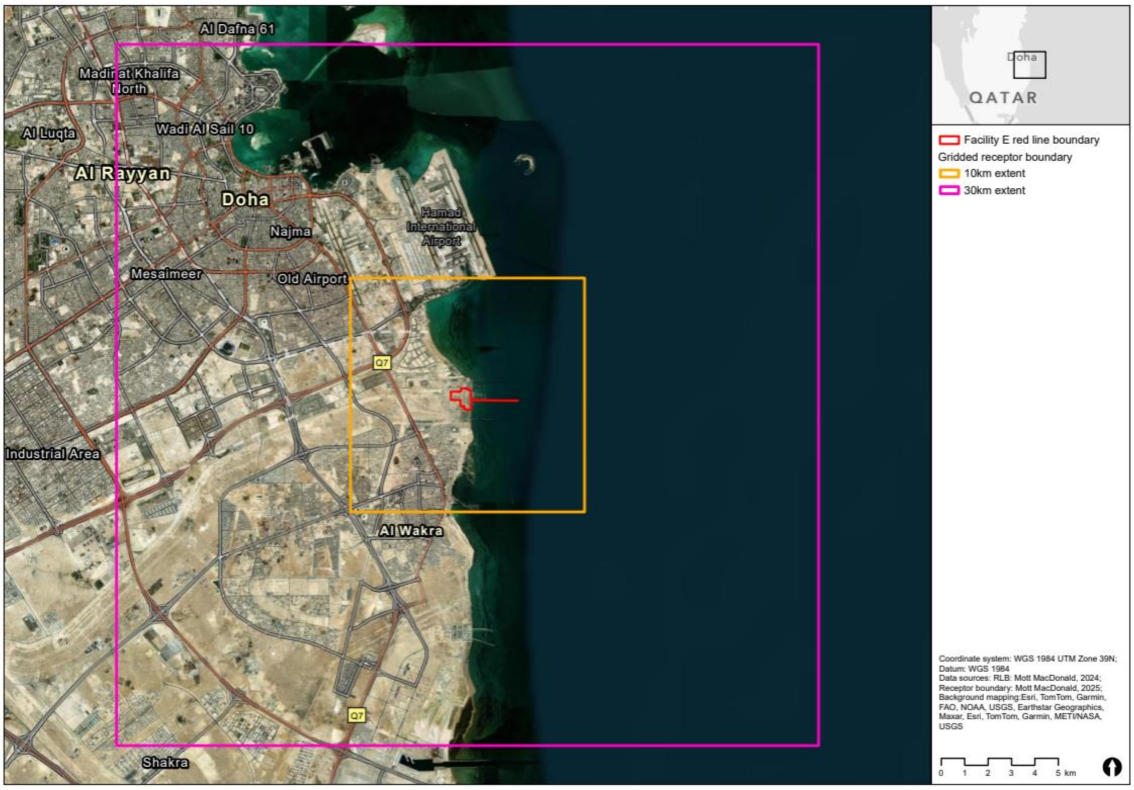
6.3.36 Start up and shut down will take place during commissioning of the facility, after each maintenance shutdown period and during emergencies. During this time emissions to air from the Project will be higher than during normal operation but the duration of startup and shut down periods is typically less than 3 hours. Due to the few number of occasions on which this would occur, and their short duration, potential impacts are very small and have not been considered further.

Receptors

6.3.37 For air quality, the phrase 'discrete receptor' has been used to refer to a specific identified location where the dispersion model has been used to predict pollutant concentrations. Additionally, a 'receptor grid' refers to a dispersion modelling concept where pollutant concentrations are predicted over a grid in uniform arrangement. The discrete receptors allow air quality impacts to be assessed at identified existing receptor locations. The receptor grid aids the assessment of pollutant concentrations over a wide spatial area and, by interpolating between these points, allows the production of pollutant contours which illustrate how pollutant concentrations change across the study area.

6.3.38 In order to assess potential impacts on sensitive receptors, modelling was carried to predict pollutant concentrations across a study area with a 30km radius grid, as shown below in Figure 6.8. This involved modelling a 30 x 30km grid of receptors with a receptor spacing of 500m and a 10 x 10km grid with a receptor spacing of 100m, both at heights of 1.5m.

Figure 6.8 Modelled gridded receptor extent



Source: Mott MacDonald, 2025

6.3.39 Outputs from the modelled grids have been used to present ground level ambient pollutant concentrations from the Project, referred to as 'process contributions'. The process contributions have been added to the 'ambient concentration' to report the total 'predicted environmental concentrations' (see paragraph 6.3.45).

6.3.40 Discrete receptors have also been modelled at locations presented in Table 6.11 and Figure 6.9 to represent specified sensitive receptor locations within the study area. An elevation of 1.5m was used during modelling to be representative of a typical human height.

Table 6.11: Modelled discrete receptor locations

Receptor ID	Name	X	Y
R1	School	561746	2786024
R2	Al Wakrah Residential 1	561460	2786655
R3	Al Wakrah Residential 2	561857	2785841
R4	Barwa Village	558724	2788643
R5	Workers Accommodation 1	560524	2788350
R6	Workers Accommodation 2	561316	2788478
R7	Al Wakrah Celebrations Hall	561673	2786544

Source: Mott MacDonald, 2025

Figure 6.9: Modelled discrete receptor locations

Source: Mott MacDonald, 2025

Impact assessment criteria

Overview

6.3.41 Determining the significance of impacts identified is one of the main purposes of an environmental assessment and enables the identification of necessary mitigation measures. An environmental impact can be either beneficial or adverse and is assessed by comparing the quality of the existing environment with the predicted quality of the environment once a project is in place.

6.3.42 In order to describe the severity of an impact it is important to distinguish between two concepts: 'magnitude' and 'sensitivity'. The application of these concepts for this assessment is outlined in Section 7.1 Methodology and should be read in conjunction with this chapter. This section describes how the impact assessment criteria for the construction and operational phase has been derived based on assessment of magnitude of the impact and receptor sensitivity.

Construction phase

6.3.43 A combination of dust emission potential from on-site activities (Table 6.7) and their expected duration has been used to determine the impact magnitude of construction and decommissioning phases (Table 6.12 and Table 6.13).

Table 6.12: Determination of magnitude – construction phase

Magnitude	Dust Raising Potential [(a)]	Duration
Major	High	Any
Moderate	Medium	> 3 Months
Minor	Medium	< 3 Months
Negligible	Low	Any

Source: Mott MacDonald, 2025

Notes[(a)] Dust raising potential defined in accordance with the approach described in Table 6.7.

6.3.44 In addition, receptor sensitivity has been based on the type of receptor and the distance from the construction or decommission activity boundary. Table 6.13 presents the criteria on which receptor sensitivity has been based.

Table 6.13: Determination of receptor sensitivity – construction phase

Notes: (a) Receptors classified based on method described in Table 6.8

		Distance to Activities			
		200-1000m	100-200m	50-100m	0-50m
Receptor Classification (a)	No change	Not significant	Not significant	Not significant	Not significant
	Negligable	Not significant	Not significant	Not significant	Not significant
	Minor	Not significant	Minor	Minor	Moderate
	Moderate	Minor	Minor	Moderate	Moderate
	Major	Minor	Moderate	Major	Major

Notes: (a) Receptors classified based on method described in Table 6.8

Operational phase

6.3.45 Guidance has been issued in the UK Section 3.3 to assist in determining the significance of operational phase impacts in air quality assessments. This guidance recommends that significance should be determined by a combination of two aspects:

- Change in concentrations (Process Contribution (PC)) caused by the Project
- Resulting total concentrations (Predicted Environmental Concentrations (PEC)) calculated by adding the PC to the ambient concentration

6.3.46 This approach is considered to represent best practice for assessments of this kind and has therefore been adopted in determining the significance of impacts on local air quality from the Project.

6.3.47 Changes in ambient concentrations over 25% of the relevant standards are considered to represent an impact of ‘Major’ magnitude as the General EHS Guidelines Section 3.3 note that Projects should:

6.3.48 ‘…prevent or minimise impacts by ensuring that …emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards. As a general rule, this guideline suggests 25 percent of the applicable air quality standards to allow additional future sustainable development in the same airshed.’ (IFC General EHS Guidelines)

6.3.49 The IFC General EHS Guidelines classify ‘poor quality airsheds’ as those where relevant standards are exceeded significantly. Therefore, receptors experiencing existing ambient pollutant concentrations above the relevant standards are concluded to be of ‘Major’ sensitivity.

6.3.50 For each of the key pollutants and averaging periods assessed, a number of ambient air quality standards are applicable.

Impact magnitude and receptor sensitivity criteria are presented in Table 6.14 and Table 6.15.

Table 6.14: Determination of impact magnitude– operational phase

Change in concentrations as % of standard	Magnitude
Increase >25%	Major
Increase 15-25%	Moderate
Increase 5-15%	Minor
Increase <5%	Negligible
No perceivable increase	No Change

Source: Mott MacDonald, 2025

Table 6.15: Determination of receptor sensitivity – operational phase

Ground level pollutant concentrations in relation to standard	Receptor sensitivity
Above standard	Very High
75 to 100% of the standard	High
50 to 75% of the standard	Medium
Below 50% of the standard	Low/Negligable

Source: Mott MacDonald, 2025

Operational significance

6.3.51 Based on the methods defined above for determining the magnitude of impact and sensitivity of receptors, the significance matrix specified in Section 6.1 has been applied to determine overall significance.

6.3.52 Notwithstanding the above, any non-negligible increases causing a new exceedance of the relevant standards are considered to represent a significant impact irrespective of their impact magnitude. All impact descriptors described as ‘moderate’ or ‘major’ are considered to be significant.

Assessment of impacts

Construction phase

6.3.53 Although no detailed construction methodology is available at present, the construction period will consist of major construction works including considerable earthworks from the start of construction. Therefore, the construction assessment has been based on generic activities. Table 6.16 presents the dust raising potential of activities associated with construction of the proposed plant.

Table 6.16: Construction activities and dust emitting activities during construction

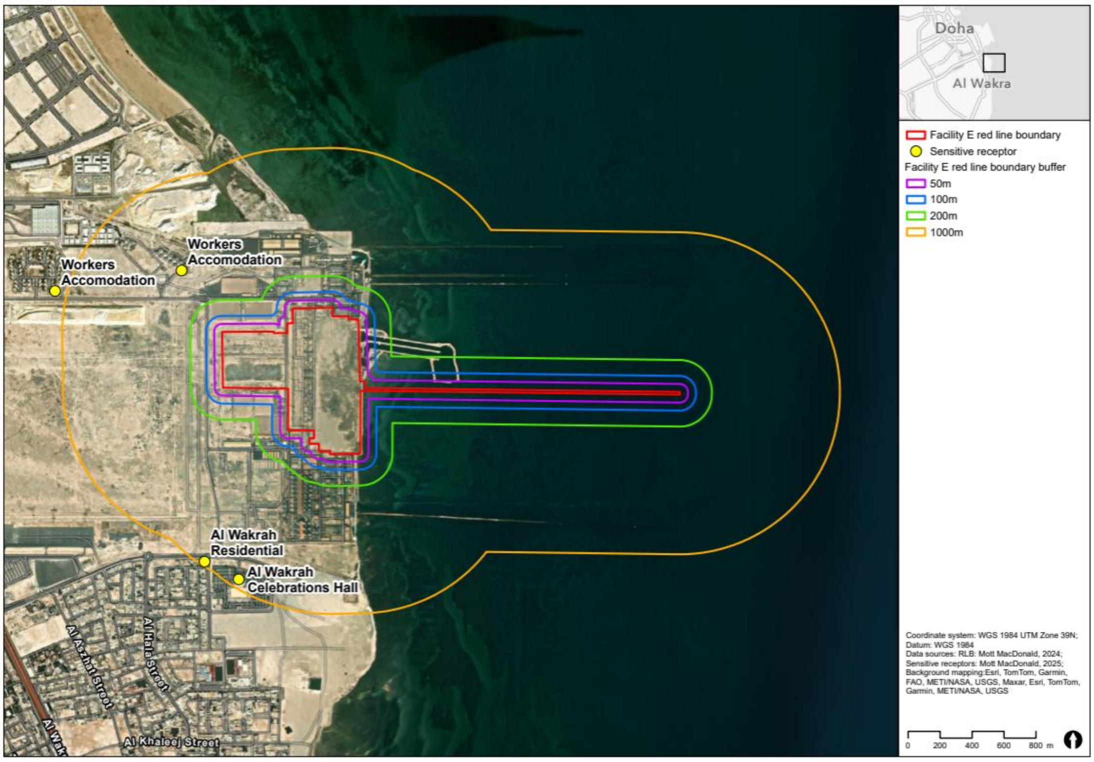
Section	Description of works	Key activities	Dust raising potential	Duration at any one point	Impact magnitude
Site preparation, clearance and groundworks	Excavation and moving material	Earthmoving Excavation Wind	High (assumes undertaken in summer months)	>3 months	Major
Roads and infrastructure	Ancillary works and delivery of materials to site, removal of wastes from site	Minor excavation works Transport of materials Re-suspension of dust on unsurfaced roads	Medium	<3 months	Minor
Construction of plant	Assembly of the main components of the plant	Storage of materials Preparation of materials (cutting) Re-suspension of dust on unsurfaced roads	Medium	>3 months	Moderate
Landscaping	Landscaping requirements	Earthmoving Excavation Transport of materials Wind Re-suspension of dust on unsurfaced roads	High (assumes undertaken in summer months)	< 3 months	Major

Source: Mott MacDonald, 2025

6.3.54 The impact magnitude of construction activities is conservatively described as ‘major’ for the whole construction period in accordance with Table 6.15. However, not all construction activities have a high dust-raising potential which implies that dust episodes may only occur over short periods, and not throughout the whole construction phase. In addition, it should be noted that fugitive dust arising from natural lift and transport of particulate matter is a common phenomenon due to the nature of the ground and the climate in Qatar.

6.3.55 Figure 6.10 presents the Project’s site boundary and potentially affected sensitive receptors. The closest receptor to the Project boundary is the workers’ accommodation located approximately 460m to the northwest.

Figure 6.10: Potentially affected sensitive receptors



Source: Mott MacDonald, 2025

6.3.56 The receptors identified are classified as 'medium' in accordance with the assessment method. When combined with distance from the dust raising activities (more than 200m) the receptor located closest to the site boundary is described as having a 'low/negligible' sensitivity to dust nuisance.

6.3.57 Based on an impact magnitude of 'major' and a receptor sensitivity of 'low/negligible' the significance of impacts resulting from the construction phase dust emissions is therefore considered temporary 'minor' adverse effect in accordance with the criteria adopted for this assessment. In the event of decommissioning of the Project, it is likely that any potential air quality impacts would be similar to those in the construction phase, as broadly similar activities would be required. Similar to the construction phase these are considered to be temporary minor adverse effect.

6.3.58 There is some uncertainty in the presence of receptors in the future, which, depending on the time of decommissioning, may have been introduced or removed from the study area due to the development of the economic zone. Therefore, at the time of decommissioning, the management plan should take due care to ensure that all receptors at that time are accounted for and that the management plan adequately minimises potential issues for receptors that could be affected.

6.3.59 Mitigation measures to control the dust emissions during construction are presented in Section 6.3.

Operational phase

Stack height determination

6.3.60 Results from the stack height determination are presented in Appendix J (403100049-C001-MML-RP-EN-018). The stack height determination confirmed a bypass stack height of 45m and the main stack height of 60m above ground level are appropriate to overcome building downwash effects.

6.3.61 As discussed in paragraph 6.3.17, this assessment provides a recommended stack height based on an assessment of potential impacts on air quality only. Amongst others, it does not take account of structural requirements, safety issues or associated regulations which should be considered by those using this information to develop the stack design.

Main assessment

6.3.62 The following section presents the predicted ground level concentrations at the maximum location and at discrete receptor locations as a result of emissions from the Project and provides an assessment of their significance against the Qatar ambient air quality standards.

6.3.63 The average of Project-specific ambient air quality monitoring sites (28.4µg/m^3) has been assumed as the annual mean background NO_2 concentration in this assessment and 56.8µg/m^3 has been assumed for short term averaging periods (one hour and 24-hour averaging periods).

6.3.64 A comparison of model results against international ambient standards is presented in Table 6.25.

6.3.65 Four operational scenarios have been assessed to identify the potential impacts of the Project. These include:

- Scenario 1: Bypass stacks at 100% gas turbine load
- Scenario 2: Bypass stacks at low exhaust gas volumetric flow
- Scenario 3: HRSG stacks at 100% gas turbine load
- Scenario 4: HRSG stacks at low exhaust gas volumetric flow

Scenario 1 (Proposed bypass stacks at 100% gas turbine load)

6.3.66 Table 6.17 to Table 6.20 presents the maximum ground level concentrations predicted within the modelled grids for scenario 1 to scenario 4.

6.3.67 Table 6.21 to Table 6.24 presents the ground level concentrations at identified discrete receptors for scenario 1 to scenario 4.

6.3.68 According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are ‘not significant’.

Table 6.17 Scenario 1: - Maximum modelled concentrations (µg/m^3)

Averaging period	Qatar standard	PC	PC as % of standard	Magnitude	PEC	PEC as % of standard	Sensitivity	Significance
1hr 99.9th %ile	400	13.7	3.4	Negligible	70.5	17.6	Negligible	Not significant
24hr 99.7th %ile	150	3.7	2.5	Negligible	60.5	40.3	Negligible	Not significant
Annual	100	0.9	0.9	Negligible	29.3	29.3	Negligible	Not significant

Note: Values are presented to 1 decimal place. PC – Process contribution from Project; PEC – predicted environmental concentration (PC + ambient concentration); Sensitivity based on ambient concentration of 28.4µg/m^3 for annual mean and 56.8µg/m^3 for one hour and 24-hour averaging periods.

Table 6.18 Scenario 2: - Maximum modelled concentrations (µg/m³)

Averaging period	Qatar standard	PC	PC as % of standard	Magnitude	PEC	PEC as % of standard	Sensitivity	Significance
1hr 99.9th %ile	400	10.9	2.7	Negligible	67.7	16.9	Negligible	Not significant
24hr 99.7th %ile	150	3.1	2.1	Negligible	59.9	39.9	Negligible	Not significant
Annual	100	0.8	0.8	Negligible	0.8	29.2	Negligible	Not significant

Note: Values are presented to 1 decimal place. PC – Process contribution from Project; PEC – predicted environmental concentration (PC + ambient concentration); Sensitivity based on ambient concentration of 28.4µg/m³ for annual mean and 56.8µg/m³ for one hour and 24-hour averaging periods.

Table 6.19 Scenario 3: - Maximum modelled concentrations (µg/m³)

Averaging period	Qatar standard	PC	PC as % of standard	Magnitude	PEC	PEC as % of standard	Sensitivity	Significance
1hr 99.9th %ile	400	14.4	3.6	Negligible	71.2	17.8	Negligible	Not significant
24hr 99.7th %ile	150	4.7	3.2	Negligible	61.5	41.0	Negligible	Not significant
Annual	100	1.6	1.6	Negligible	30.0	30.0	Negligible	Not significant

Note: Values are presented to 1 decimal place. PC – Process contribution from Project; PEC – predicted environmental concentration (PC + ambient concentration); Sensitivity based on ambient concentration of 28.4µg/m³ for annual mean and 56.8µg/m³ for one hour and 24-hour averaging periods.

Table 6.20 Scenario 4: - Maximum modelled concentrations (µg/m³)

Averaging period	Qatar standard	PC	PC as % of standard	Magnitude	PEC	PEC as % of standard	Sensitivity	Significance
1hr 99.9th %ile	400	13.6	3.4	Negligible	70.4	17.6	Negligible	Not significant
24hr 99.7th %ile	150	5.0	3.3	Negligible	61.8	41.2	Negligible	Not significant
Annual	100	1.5	1.5	Negligible	29.9	29.9	Negligible	Not significant

Note: Values are presented to 1 decimal place. PC – Process contribution from Project; PEC – predicted environmental concentration (PC + ambient concentration); Sensitivity based on ambient concentration of 28.4µg/m³ for annual mean and 56.8µg/m³ for one hour and 24-hour averaging periods.

Table 6.21 Maximum modelled process contribution at discrete receptors – Scenario 1 (µg/m³)

Receptor ID	1hr 99.9%ile	24hr 99.7 %ile	Annual
R1	7.8	2.0	0.6
R2	7.2	1.7	0.5
R3	7.9	1.9	0.6
R4	4.6	0.9	0.2
R5	6.2	1.7	0.4
R6	8.2	2.2	0.5
R7	8.7	2.3	0.6

Receptor ID	1hr 99.9%ile	24hr 99.7 %ile	Annual
Qatar standard	**400**	**150**	**100**

Note: Values are presented to 1 decimal place. PC – Process contribution

Table 6.22 Maximum modelled process contributions at discrete receptors – Scenario 2 (µg/m^3)

Receptor ID	1hr 99.9%ile	24hr 99.7 %ile	Annual
R1	5.8	1.6	0.5
R2	5.8	1.4	0.4
R3	5.8	1.5	0.4
R4	3.4	0.6	0.2
R5	5.0	1.4	0.3
R6	6.8	1.9	0.4
R7	7.0	1.8	0.5
Qatar standard	**400**	**150**	**100**

Note: Values are presented to 1 decimal place. PC – Process contribution

Table 6.23 Maximum modelled process contributions at discrete receptors – Scenario 3 (µg/m^3)

Receptor ID	1hr 99.9%ile	24hr 99.7 %ile	Annual
R1	7.2	2.3	0.8
R2	9.1	2.4	0.8
R3	6.7	2.1	0.7
R4	5.6	1.0	0.2
R5	7.6	2.3	0.6
R6	12.7	4.1	1.0
R7	9.5	2.8	0.9
Qatar standard	**400**	**150**	**100**

Note: Values are presented to 1 decimal place. PC – Process contribution

Table 6.24 Maximum modelled process contributions at discrete receptors – Scenario 4 (µg/m^3)

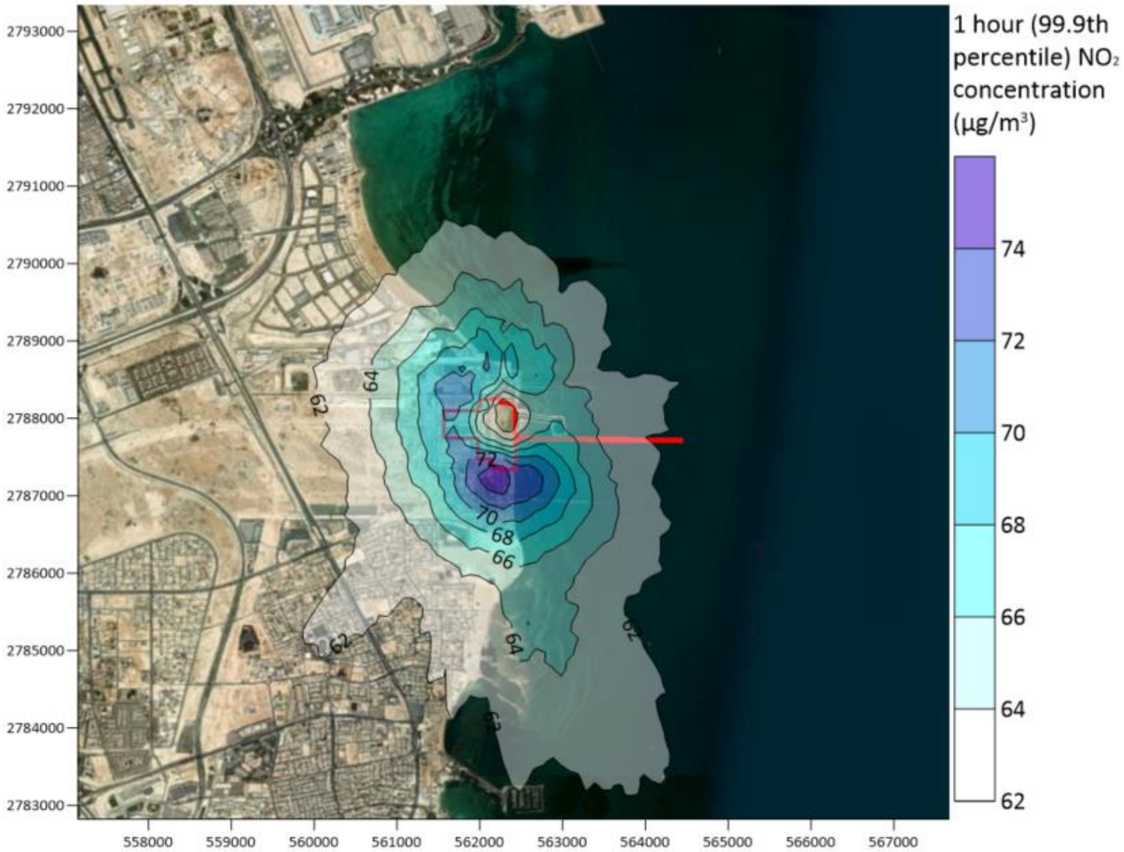
Receptor ID	1hr 99.9%ile	24hr 99.7 %ile	Annual
R1	6.5	2.0	0.7
R2	8.2	2.4	0.8
R3	6.0	1.8	0.6
R4	5.3	1.1	0.2
R5	9.1	2.4	0.6
R6	12.3	4.6	1.1
R7	8.5	2.5	0.8

Receptor ID	1hr 99.9%ile	24hr 99.7 %ile	Annual
Qatar standard	**400**	**150**	**100**

Note: Values are presented to 1 decimal place. PC – Process contribution

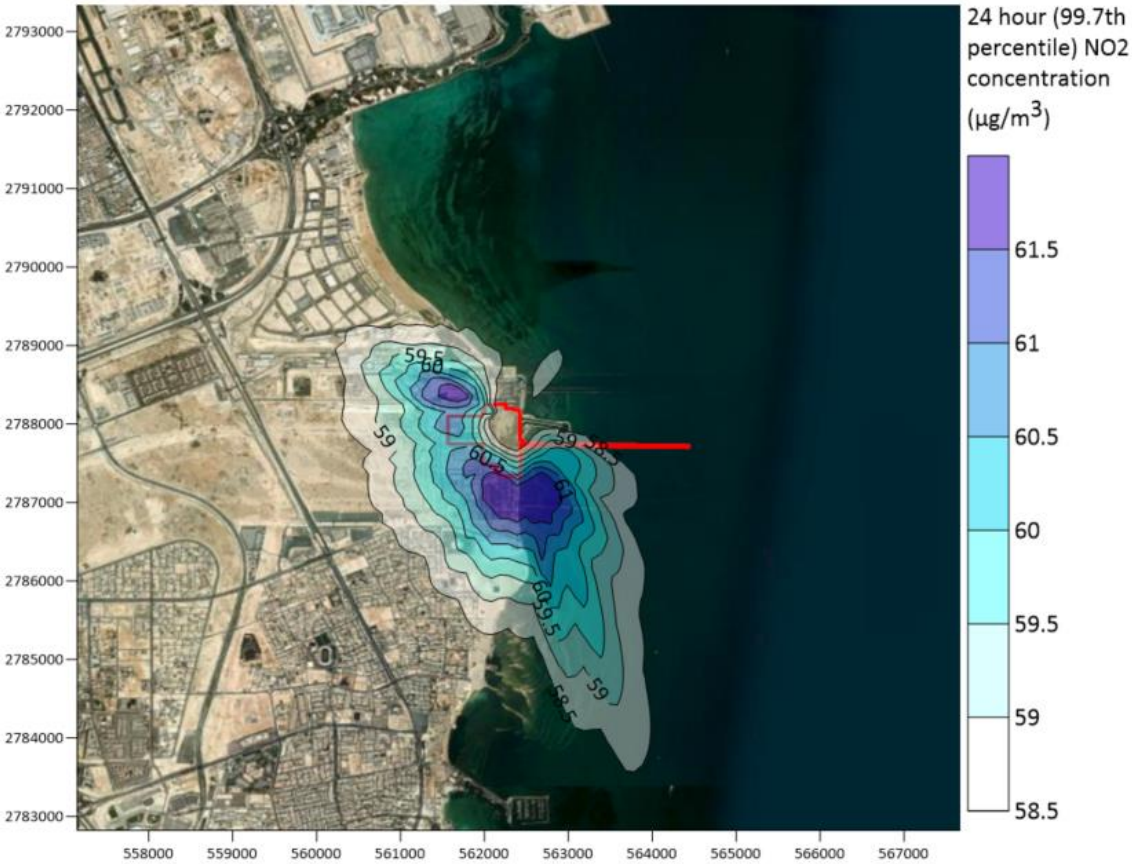
6.3.69 Figure 6.11 to Figure 6.13 presents contour plots of the 1 hour 99.9th percentile, 24 hour 99.7th percentile and annual mean concentrations for scenario 3 as this scenario results in the largest predicted ground level concentrations. The contours plots show that the largest impacts are located close to the RAF industrial complex both to the south, west and northwest which is consistent with prevailing wind directions presented in Figure 6.6. These largest impacts are in locations where there is either no public access or access is likely to be limited to short durations.

Figure 6.11: Contour Plot of Scenario 3 – maximum modelled concentration of the 1 hour 99.9th percentile



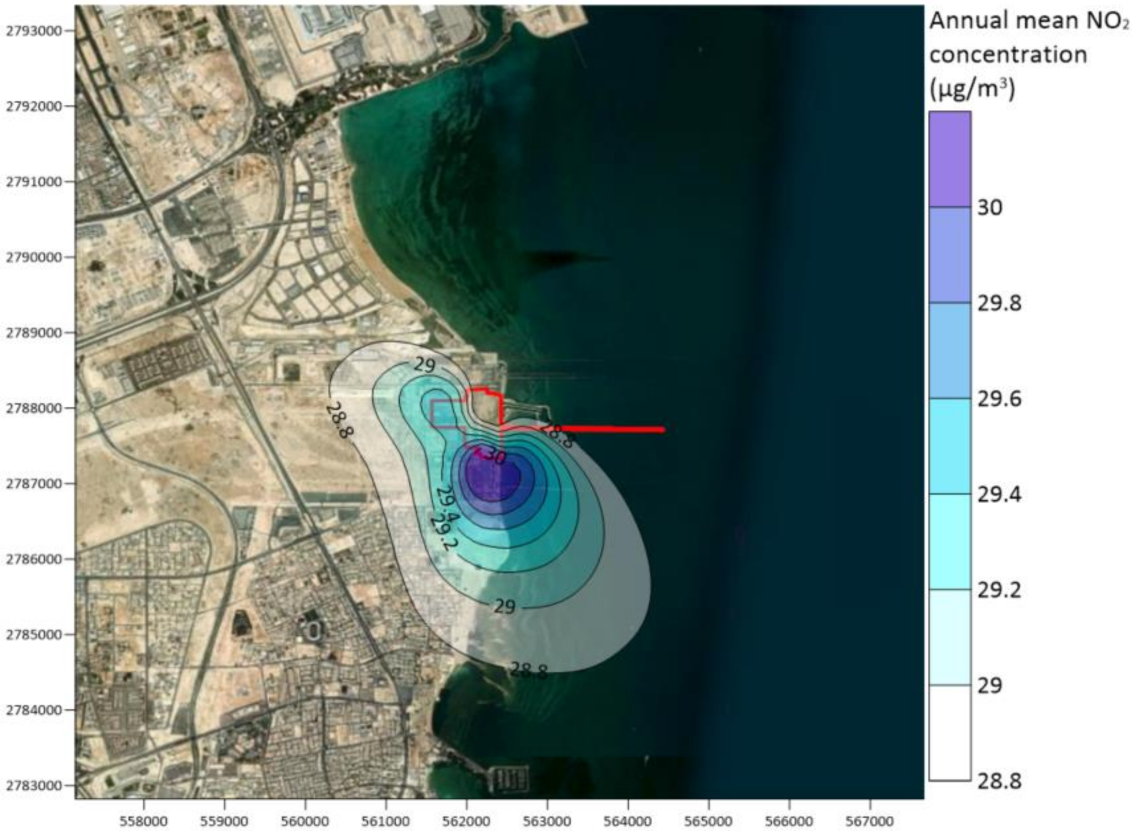
Notes: Red line shows Project site; ambient concentration 56.8µg/m^3; minimum contour 60µg/m^3; maximum contour 74µg/m^3; interval 2µg/m^3; meteorological year 2023

Figure 6.12: Contour Plot of Scenario 3 – maximum modelled concentration of the 24 hour 99.7th percentile



Notes: Red line shows Project site; ambient concentration 56.8µg/m³; minimum contour 58.5µg/m³; maximum contour 61.5µg/m³; interval 0.5µg/m³; meteorological year 2024

Figure 6.13: Contour Plot of Scenario 3 – maximum modelled concentration of the annual mean



Notes: Red line shows Project site; ambient concentration 28.4µg/m³; minimum contour 28.8µg/m³; maximum contour 30µg/m³; interval 0.2µg/m³; meteorological year 2018

Comparison of model results against international standards

6.3.70 Table 6.25 presents the maximum ground level concentrations predicted within the modelled grids for Scenario 1 to 4 for comparison with international ambient standards.

6.3.71 In accordance with the IFC Guidelines, where national legislated ambient standards exist they take precedence over international ambient standards. Therefore, no magnitude, sensitivity or significance has been applied to the results in Table 6.25. It should also be noted that the process contributions presented in Table 6.25 represent the maximum modelled ground level concentrations which are not at identified receptor locations.

Table 6.25 Maximum ground level NO_2 concentrations against international ambient standards and guidelines (µg/m³)

Period	Source	International Ambient Standard/Guideline	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
			PC	PEC	PC	PEC	PC	PEC	PC	PEC
1 hour 99.79%	EU	200	12.7	69.5	10.4	67.2	13.7	70.5	13	69.8
24-hour 99%	WHO	25	3.4	60.2	2.8	59.6	4.5	61.3	4.2	61
Annual	WHO	10	0.9	29.3	0.8	29.2	1.6	30	1.5	29.9
Annual	EU	40	0.9	29.3	0.8	29.2	1.6	30	1.5	29.9

Note: Ambient standards from EU Limit Values and WHO air quality guidelines.

Values are presented to 1 decimal place. PC – Process contribution from Project; PEC – predicted environmental concentration (PC + ambient concentration); Sensitivity based on ambient concentration of 28.4µg/m^3 for annual mean and 56.8µg/m^3 for one hour and 24-hour averaging periods.

6.4 Climate resilience and Greenhouse Gas (GHG) emissions

Climate resilience

6.4.1 This section identifies and assesses the physical climate impacts, which are described within the baseline conditions that may influence the sensitive receptors previously discussed.

6.4.2 The following section describes the criteria used for determining the magnitude of the impacts and the receptors sensitivity in relation to climate change impacts. The guidelines to set the assessment criteria are based on the scoping report. Further information on the spatial and temporal scope for this assessment is as follows:

Methodology

6.4.3 The following climate change impact assessment is conducted in line with the EP4 (Equator Principles Association, 2020), which Principle 2: Environmental and Social Assessment states the need for the assessment of physical risks as defined by the TCFD ((TCFD), 2017). While the Principles also mention the need for the assessment of relevant Climate Transition Risks, for this specific Project context these fall more closely under the scope of greenhouse gases and climate change mitigation, and as such will be included under the section on greenhouse gas emissions. Additionally, while TCFD recommends the use of multiple scenarios during this analysis, both positive and negative, the SSP5-8.5 scenario discussed during the future climate baseline was solely used to account for the worst-case scenario leading to the maximum potential impact on the facility.

6.4.4 It should be noted that construction phase impacts were not assessed due to the short-term timeline of the facility's construction (reaching approximately 2029) compared to the time period discussed during the future climate baseline. This is also in alignment with the recommendations made in the previous developed scoping report.

6.4.5 The impact magnitude and receptor sensitivity based on the criteria mentioned in Section 5.4 are described for each of the identified impact categories based on the future climate baseline previously discussed for the time period of 2060-2079. The results of this assessment are then tabulated in an impact summary table as seen in Table 6.26.

6.4.6 Additionally, the climate change impact assessment for the Project is based on the most reliable publicly available data, however, several key assumptions were made, and limitations were faced:

- **Climate model uncertainty**: Future climate projections, like temperature and rainfall changes, have uncertainties. Different models are based on different assumptions and hence can discuss different outcomes.
- **Data limitations**: Climate data used for this assessment was primarily country-wide for the entire country of Qatar, and as such, data granularity for local conditions at the site location may not be fully represented. Moreover, historical reference periods mainly between 1995-2014 were considered and, as such, may not reflect trends or conditions taking place before this period.
- **Facility operating conditions**: It's assumed the facility will operate continuously from 2027 to 2054 without major redesigns. Normal maintenance is expected, but no climate adaptation measures are planned. If significant upgrades happen, such as the

integration of new technologies to drive plant efficiency or weather resistant components that may allow for operation under extreme conditions, the impact outcome could differ.

- **Determining impact**: Categorising impact magnitude and sensitivity involves partially subjective decisions based on where the impact lies within the criteria described in the following sections. There is therefore a risk that different assessors may allocate differing impact magnitudes and sensitivities.

6.4.7 These points highlight the uncertainties faced during impact identification and should be taken into consideration when reviewing the following sections.

Spatial and temporal scope

6.4.8 The spatial scope of this climate impact assessment encompasses the Project site and its wider area of influence. This includes all on-site components of the power and desalination plant from turbine units, boilers, desalination units, cooling systems, fuel storage, electrical switchyard as well as immediate off-site areas that could be affected by climate-induced events. The assessment area will also include the associated sensitive receptors previously mentioned in the climate resilience baseline.

6.4.9 Regarding the time periods under consideration for this impact assessment, the facility’s construction phase was not considered due to the impacts of climate change being observed over decades while the facility’s construction stage is only expected to last several years. Impacts of climate change on the operational phase of the facility are considered due to their significant relevance towards its ongoing functioning.

6.4.10 Impacts are assessed by considering the magnitude, sensitivity and significance of the effect on the previously identified sensitive receptors during the period of 2060-2079 in order to fully account for the projected operational period of the facility as well as the possibility for its extended operations past this date.

Operational phase impacts

Impacts of rising air temperatures

6.4.11 Increases in air temperature and more frequent heatwaves will put a strain on both infrastructure and personnel. Equipment and facilities exposed to extreme heat will likely face higher cooling demands, reduced operational efficiency (especially for turbines or other machinery sensitive to intake air temperature), and potential material fatigue. The health and productivity of the workforce could be severely affected by heat stress, as employees may need more frequent breaks or shift changes. Moreover, the general population of residents within the sensitive receptors identified in the area surrounding the facility will experience the same heat stressors. As a result, this impact is considered adverse and major for human health and safety due to the high sensitivity of the workforce, and both adverse and moderate for infrastructure performance, particularly if temperature tolerance thresholds are repeatedly exceeded over the facility's operational life, gradually degrading equipment and increasing the need for repairs and replacements.

Impact of changing precipitation patterns and flood risk

6.4.12 Although overall rainfall totals may remain low in a desert climate, heavier and more intense downpours are projected to increase the risk of flash floods. Drainage systems designed for historical storm intensities may be overwhelmed, leading to localised flooding, equipment damage, and temporary shutdowns. Flooded roads or transportation routes could disrupt access, indirectly affecting the workforce and supply logistics. Additionally, changing precipitation patterns could result in intermittent droughts, exerting pressure on water availability for specific operational processes. Collectively, these factors could result in moderate to major adverse impacts, contingent on the severity of extreme rainfall events relative to existing flood defence and drainage capacities.

Impact of sea level rise

6.4.13 Gradually rising sea levels, as shown by global and regional data available data sets, increase coastal flood risks and shoreline erosion, especially during high-wind storms. These rising sea levels paired with the coastal and relatively low-level nature of the site leads to low lying areas of the site becoming more vulnerable to even moderate surges in sea level, leading to saltwater intrusion into foundations or utility corridors, corrosion of coastal assets, and increased maintenance needs. Over time, these effects could have a major adverse impact, eventually threatening plant reliability and requiring significant design adaptations if higher end sea level projections materialise by mid- to late-century.

Impact of increasing sea temperature

6.4.14 Warmer sea surface temperatures, which are already being observed in the region, are expected to continue rising under a high emissions scenario. This poses a threat to marine ecosystems, particularly coral reefs and nearshore habitats, through more frequent coral bleaching events and potential shifts in local fisheries. For the Project, if seawater is used for cooling, higher intake temperatures will reduce cooling efficiency and may require more frequent maintenance to manage biofouling or algal blooms. Moreover, warmer seawater temperatures can adversely impact the efficiency of reverse osmosis (RO) systems due to increased biological growth resulting in scaling as well as higher temperatures impacting the solubility of gases and salts in seawater. The ecological harm is considered major adverse for sensitive marine species, while the operational impacts are typically moderate and adverse.

Impact of increased specific humidity

6.4.15 Warmer air holds more moisture, resulting in higher specific humidity as temperatures rise. This combination exacerbates heat stress for workers by reducing sweat evaporation, potentially elevating the "feels-like" temperature to hazardous levels. Furthermore, elevated humidity can induce corrosion and condensation in electrical or mechanical components, thereby increasing maintenance costs. While this factor alone might be considered moderately adverse, it significantly amplifies the impacts of heat, culminating in a major net effect when combined with extreme temperature conditions.

Impact of intensifying extreme weather events

6.4.16 Due to the extreme and often unaccounted for possibility of these kinds of events, an extreme weather event may result in failures or disruptions across multiple areas within the facility, as well as in the associated external infrastructure and sensitive receptors. A single intense cyclone, storm surge, or extreme precipitation episode could cause catastrophic damage, exceeding the design limits of site infrastructure. These high impact, low probability scenarios carry major to critical adverse significance due to the potential for prolonged operational shutdowns, structural failures, and serious workforce safety concerns. Repeated exposure to multiple extreme events over the project's lifespan increases cumulative risks and highlights the need for strong contingency planning.

6.4.17 Projections suggest that dust storms may become more intense, even if their overall frequency remains uncertain. Severe wind gusts can damage infrastructure such as roofs, turbines, or above-ground pipelines, posing direct safety risks to onsite personnel. When storms coincide with high tides, storm surges can exacerbate flood hazards in coastal areas, threatening coastal defences and critical plant components. These storm-related impacts, especially if extreme winds exceed design wind loads, can lead to Major adverse outcomes for both infrastructure integrity and operational continuity.

Climate change risk register

6.4.18 A summary of the impact and their magnitude and significance are outlined in the climate change risk register presented in Table 6.26 below. This takes into consideration the measures included within the design, which include embedded mitigations to improve climate resilience.

Table 6.26: Climate change risk register

Climate trend	Potential impact	Affected receptor(s)	Adverse/Beneficial	Receptor sensitivity	Impact significance	Impact magnitude
Rising air temperatures	Heat stress, reduced equipment efficiency	Workforce	Adverse	High	Major	Moderate
		Infrastructure	Adverse	Medium	Moderate	Moderate
Changing precipitation and flood risk	Flooding, drainage overload, access disruption	Infrastructure	Adverse	Medium	Moderate	Moderate
		Operation	Adverse	Medium	Moderate	Moderate
		Surrounding	Adverse	Medium	Moderate	Moderate
Increased wind and storm	Storm damage to infrastructure and operation	Infrastructure	Adverse	Medium	Negligible	Minor
		Workforce	Adverse	Medium	Moderate	Moderate
		Costal environment	Adverse	Medium	Negligible	Minor
Sea level rise	Erosion, saltwater intrusion	Infrastructure	Adverse	High	Major	Major
		Marine environment	Adverse	Medium	Moderate	Moderate
Increased sea temperature	Coral bleaching, fouling, reduced cooling efficiency	Marine ecosystem	Adverse	High	Major	Moderate
		Sea water intake equipment	Adverse	Medium	Moderate	Moderate
Increasing specific humidity	Higher heat index, corrosion	Workforce	Adverse	High	Moderate	Moderate
		Equipment	Adverse	Medium	Moderate	Moderate
Extreme weather events	Multi hazard events, long duration outages	All receptors	Adverse	High	Major	Major

Source: Mott MacDonald, 2022

Greenhouse Gas (GHG) emissions

Introduction

6.4.19 This section identifies and assesses the impacts of GHG emissions for both the operation and construction phases of the Project along with transitional impact, comparing them to the baseline conditions where no Project is implemented.

Methodology

6.4.20 As mentioned in the GHG baseline, due to a shortage of available information regarding the construction and operation of Facility E and A, the scope of the impact assessment is slightly reduced compared to what was set out in the scoping report. As a result, a mostly qualitative assessment of the following factors is made, however Scope 1 and Scope 2 emissions for both facilities are calculated based on key energy and natural gas inputs and are sufficient to discuss the emissions intensity of both facilities.

6.4.21 Due to limited information available regarding construction methods, schedules and materials used for the construction of the Project, the construction stage impacts are discussed qualitatively, with an emphasis on identifying potential emission hotspots involved during construction and discussing the impact they may have on the overall GHG footprint of the Project.

- **Impacts during operational stage**: The scope 1 and scope 2 emissions of both Facility E and Facility A were calculated within the baseline chapter using the natural gas and energy inputs required and yielded the following results: Facility E combined emissions - 3,806,220 tCO_2e/year, Facility A combined emissions – 3,554,559 tCO_2e/year. A comparison between the combined annual scope 1 and scope 2 emissions of each facility was made. Additionally, by taking into account the designed output of each facility, the emissions intensity (in tCO_2e/KWh) of both facilities was compared. As outline of the technological differences between closed cycle gas turbine (CCGT) and open cycle gas turbine (OCGT) typologies, the technology behind Facility E and Facility A respectively, is discussed to comment on the theoretical improvements the Project may bring to the overall grid decarbonisation.
- **Transition risk**: The transition risk impacts will be identified based on the transition risk baseline highlighted in the GHG baseline including policy and legal risks, technology risks, market risks and reputational risks. A qualitative assessment of the identified sources of transition risk will be discussed. The risks will be identified based on the magnitude and sensitivity provided for each category, with the overall risk then being identified based on the criteria presented in the Methodology Section.

Construction impact

6.4.22 GHG emissions during The Project construction phase will mainly come from diesel consumption in machinery and vehicles, water use, and the embodied carbon in building materials such as concrete and steel.

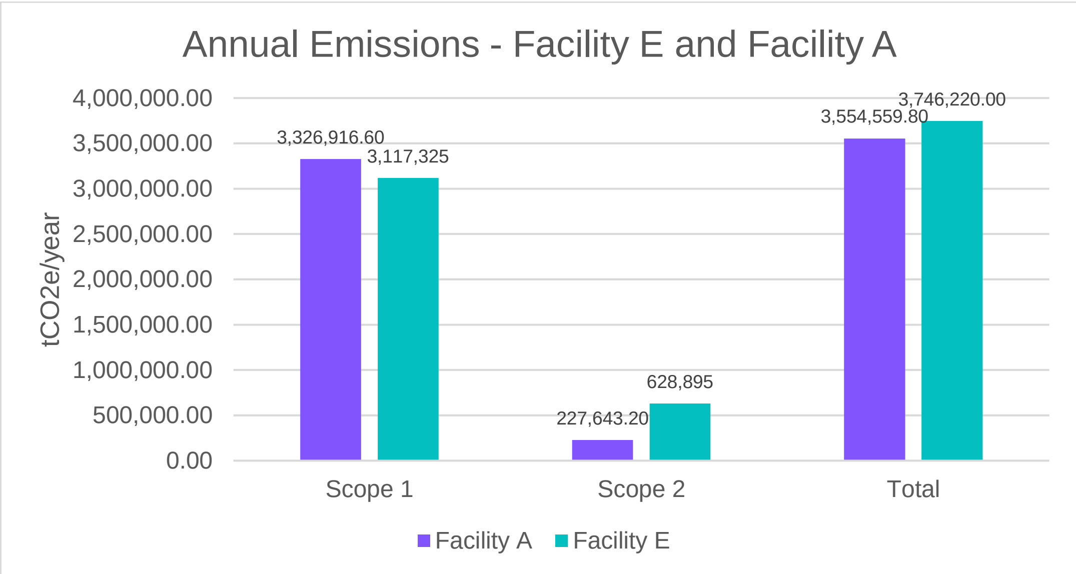
6.4.23 Other than the energy usage on site, construction materials themselves carry significant embodied carbon. Regionally and globally, the most carbon-intensive materials typically utilised in major infrastructure projects are concrete and steel. Cement manufacturing is responsible for about 8% of the world's total CO_2 emissions (World Economic Forum, 2024), mainly due to calcination reactions and fossil fuel usage in kilns. Steel production, especially from blast furnaces, which is the most common method, produces about 3 billion tonnes of CO_2 per year, accounting for 8% of the world's total CO_2 emissions (World Economic Forum , 2023).

6.4.24 With the scale of The Project, considerable volumes of concrete and steel will inevitably be required for foundations, structural supports, turbine pedestals, and associated infrastructure, resulting in a potentially large embodied GHG footprint. However, without detailed procurement information such as specific material sources, suppliers, transport distances, production technologies, and exact quantities, it is currently impossible to provide precise embodied carbon calculations.

Operational phase Impact

6.4.25 Figure 6.14 below presents a summary of the annual scope 1 and scope 2 emissions for both Facility E and Facility A.

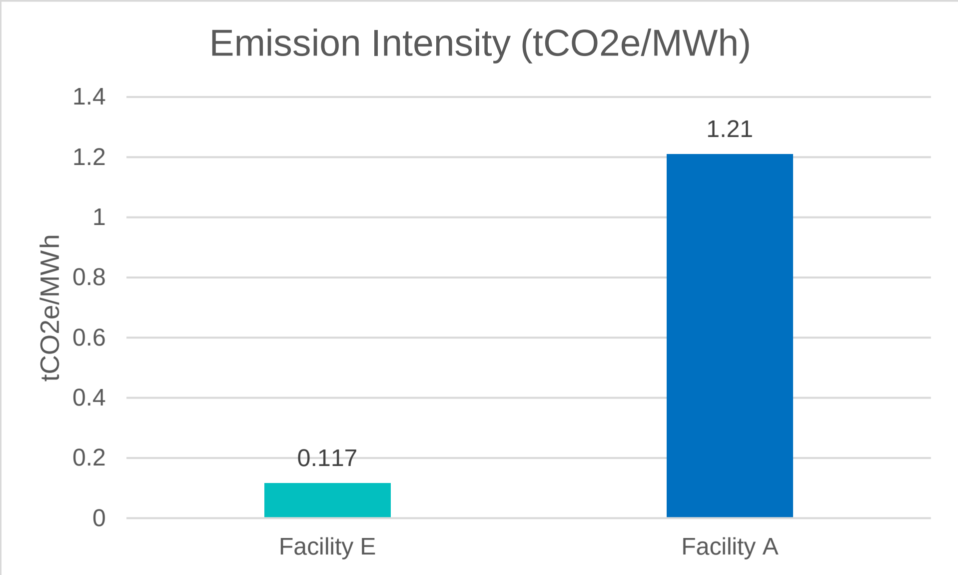
Figure 6.14: Annual emissions - Facility E and Facility A



Source: Mott MacDonald, 2025

6.4.26 While it may appear that Facility E has a slightly greater emissions footprint than Facility A, it is important to note that the designed output of Facility E is 2415 MW or approximately 21,155,400 MWh per year, far exceeds the output of Facility A during its peak performance in 2014 at 2,931,882 MWh. By dividing the total emissions of each facility by its electricity output, the emissions intensity of each facility is calculated and allows for a direct comparison of CO_2e emissions per MWh of electricity generated the values presented in Figure 6.15 below:

Figure 6.15: Emission intensity comparison



Source: Mott MacDonald, 2025

6.4.27 Based on the emissions intensity of the two facilities, it is observed that Facility E produces approximately 10% of the CO_2e emissions that Facility A releases per MWh of energy produced. An improved efficiency would therefore correspond to an overall reduction in Qatar's grid emission factor, due to the fact that a portion of the overall power capacity is being provided with lower carbon equivalent emissions associated with it.

6.4.28 It is important to highlight several key differences between the different types of turbines being used in the two facilities. Facility E will make use of combined cycle gas turbine (CCGT) technology, which is considered to be much more efficient compared to open cycle gas turbines (OCGT) used in Facility A. According to the International Petroleum Industry Environmental Conservation Association (IPIECA), open cycle gas turbines are the simplest application of gas combustion for power generation. An OCGT setup consists of a gas turbine without any additional waste heat recovery systems. The efficiency of an OCGT facility varies with the size of the turbine, however on average ranges between 33-43% at maximum load (IPIECA, 2022). Combined cycle gas turbines (CCGT) make use of through several processes the exhaust heat generated from the gas turbines to generate steam, which is then fed into a steam turbine to provide additional power. This heat recovery system results in a much higher efficiency compared to OCGT plants, ranging from approximately 50-63% (IPIECA, 2022). This means that hypothetically, Facility A would need to consume more natural gas, and therefore produce higher CO_2 emissions, in order to produce the same planned quantity of power that Facility E does. Theoretically, the switch from OCGT to CCGT technology will therefore lead to a reduction in Qatar's overall grid emission factor, which will then be further compounded by the planned increase in renewable energy generation being planned.

Transitional impact

6.4.29 The following sources of risk have been identified for each of the key transitional risk categories outlined during the GHG baseline. It should be noted that in many instances these risks are interconnected and may fall under more than one of the listed categories but are not repeated to maintain simplicity and clarity of the discussion. It should be noted that due to the qualitative manner in which these impacts are discussed, different assessors may provide varying severities to the different types of risks involved leading to uncertainty.

- **Policy and legal risks impact -** The stated purpose of Facility E is to positively contribute to the national legislative and policy commitments outlined in the Nationally Determined Contribution (NDC), Qatar National vision (QNV) 2030 and the Qatar National Renewable Energy Strategy (QNRES) by enhancing the nation's overall installed energy capacity in a more efficient approach. This is demonstrated by the technological shift from OCGT used in the now decommissioned Facility A to a more efficient CCGT technology of facility E. This is in alignment particularly with the stated objectives of the QNRES, which at its foundation aims to increase the overall energy capacity of Qatar while reducing the grid emission factor through a series of different initiatives. It should be noted though that the overall impact Facility E will have towards achieving the national objective of reducing CO2 emissions by 25% can be influenced by several factors, including potential unforeseen increases in Qatar's energy demand in the coming years based on economic growth, as well as the need to integrate with the planned solar PV plants currently under development. Given the interconnectedness of facility E with the success of other external energy initiatives in order to meet Qatar's stated goals, the Project is assessed to have a medium sensitivity, as well as a moderate magnitude of impact. Overall, this would result in a minor risk impact for policy and legal transitional risk impacts.
- **Technology risks impact** - The QNRES states that one critical aspect of the national strategy is to find the right balance between renewable energy generation, efficient gas-fired generation, energy storage systems, as well as Carbon Capture Utilisation and Storage (CCUS) solutions. Currently integration of CCUS into Facility E will be considered within the first 15 years of its operations, however no space allocation for CCUS units is being considered for the current design. As technological advancements and production efficiencies lead to CCUS technology adoption becoming cheaper over time, the limited availability of space on-site could present a significant challenge, particularly when on-site installation of CCUS becomes a preferred option to improve the facility's operational efficiency. Moreover, as the cost of solar PV technology continues to decrease, alongside technological improvements in battery technology and energy storage, there is the potential for reliable and consistent solar generated power being introduced into the grid, potentially reducing the operations and economic competitiveness of Facility E in the long run. This can potentially have a positive effect too however, such as advancements in renewable energy generation and storage leading to Facility E becoming less reliable on grid energy and instead consuming the required 173.8 MW of power from renewable sources such as solar plants installed near the facility. Based on these two factors, the sensitivity to technological risks is assessed as medium due to the potential to integrate renewable energy and CCUS into the facility while the magnitude is considered moderate due to the potential works that may be needed to integrate future technologies to the facility. Overall, the combination of these two factors results in an overall risk assessed to be minor.
- **Market risk impact -** From a market risk perspective, The Project is positioned favourably in a transitioning market by providing critical grid stability and reducing Qatar's reliance on older, less efficient OCGT power plants. However, if Qatar introduces future policy measures such as carbon pricing, emissions trading, or financial incentives favouring renewable generation, the competitiveness of Facility E's natural gas-based production could decline. While The Project currently provides a benefit through providing stable and consistent energy at a low cost to the consumer, this has the potential to be overshadowed in the future as renewables become cheaper and more reliable (i.e. less variable due to increased storage capacity). This could affect long-term profitability unless the facility adopts measures such as operational efficiency improvements, implementing CCUS, or exploring low-carbon fuels. Given these

considerations, the sensitivity to market risk is deemed to be medium, while the magnitude is considered to be moderate. As such the overall risk is minor.

- **Reputational risk impact -** The greatest source of reputational risk surrounding The Project lies in its continued reliance on natural gas as the main fuel source. While the transition from OCGT to CCGT represents a positive step toward improving energy efficiency, lowering emissions and contributing towards Qatar's stated commitments such as the NDC or QNRES, the facility's natural gas-based operations may still draw criticism. Non-governmental climate-based organisations, media or climate observers may still highlight the emissions profile of gas-powered facilities as misaligned with the global push towards decarbonisation. This is further compounded by Qatar's unique economic context. The nation's dependency on natural gas and oil as key to its economy may partially shield Facility E from any immediate reputational criticism domestically, however the international visibility around Qatar – especially as having the highest CO2 emissions per capita, makes reputational risks important. Additionally, corporate stakeholders, like any international partners in The Project consortium, often have their own GHG reduction pledges and may face reputational harm if this project is perceived as counterproductive to their own emission reduction goals. Such perceptions may pressure project sponsors and lenders to enhance transparency, demonstrate proactive mitigation measures such as high efficiency, renewable integration, or CCUS and communicate clear alignment with Qatar's broader decarbonisation strategy. Based on the factors above, The Project is deemed to have a high sensitivity to reputational risk, but a moderate magnitude of impact due to the facility's direct role in implementing national legislation. As such, these factors combined result in a moderate risk.

Summary of impacts

6.4.30 The assessment outlines several potentially significant effects on climate change from The Project.

6.4.31 Embodied carbon present in the construction materials, particularly cement and steel, will likely contain the majority of carbon relating to the construction of the Facility.

6.4.32 The operational GHG assessment compared the Project's emissions with the now decommissioned Facility A. Scope 1 and 2 emissions were calculated for both facilities, and the gross emissions of each facility were then divided by the electricity output for each facility respectively in order to obtain the emissions intensity in terms of tCO_2e released per MWh of electricity generated. Based on this analysis, the Project had an emissions intensity of 0.117 tCO_2e/MWh compared to Facility A with 1.21 tCO_2e/MWh. This indicates the project operating at a significantly higher efficiency at approximately 10% of the emissions intensity of Facility A and thus positively contributing to the decarbonisation of Qatar's energy grid through a reduction in the overall grid emission factor.

6.4.33 Transitional risks were identified around the key areas of policy and legal risks, technology risks, market risks and reputational risks. The impacts of these risks were assessed to be minor to moderate and mostly stemmed from the continuously shifting policy landscape around decarbonisation both within Qatar and globally, as well as technological factors such as potential difficulties arising in future CCUS installation, and market factors such as market trends pushing for greater renewable energy demand in the future.

6.5 Social

6.5.1 Determining the significance of social impacts is one of the main purposes of this assessment which enables the identification of necessary mitigation and benefit enhancement measures. A social impact can be either beneficial or adverse and is assessed by comparing the quality of the baseline conditions with the predicted quality of the social environment once the Project is operational.

6.5.2 To describe the significance of an impact it is important to distinguish between two concepts, magnitude (of impact) and sensitivity (of receptors). The sensitivity of receptors is related to their socioeconomic vulnerability, measured by their capacity to cope with social impacts that affect their access to or control over additional or alternative social resources of a similar nature, ultimately affecting their wellbeing. Sensitive or vulnerable receptors generally have less means to absorb adverse changes, or to replicate beneficial changes to their resource base than non-sensitive or non-vulnerable receptors.

6.5.3 The guideline criteria used to categorise the sensitivity of receptors, and the definition used to determine the magnitude of impacts are presented in Table 6.27 and Table 6.28, respectively.

Table 6.27 Criteria for Determining Sensitivity

Sensitivity of Receptors	Definition
Very High	A highly vulnerable receptor with very little capacity and means to absorb socioeconomic shocks and take advantage of opportunities.
High	A vulnerable receptor with some capacity and means to absorb socio-economic shocks and take advantage of opportunities.
Medium	A non-vulnerable receptor with limited capacity and means to absorb socio-economic shocks and take advantage of opportunities.
Low/Negligible	A non-vulnerable receptor with plentiful capacity and means to absorb socio-economic shocks and take advantage of opportunities.

Source: Mott MacDonald, 2025

Table 6.28 Criteria for Determining Magnitude

Magnitude (positive or negative)	Definition (considers duration of the impact, spatial extent and reversibility)
Major	A probable impact that affects the wellbeing of groups of many people or business entities within a widespread area beyond the project life.
Moderate	A possible impact that will likely affect either the wellbeing of a group of people or business entities beyond the local area of influence into the wider area of influence or continue beyond the project life.
Minor	An impact that may affect the wellbeing of a small number of people and/or households or businesses, or occurs exceptionally, mostly within the project area of influence and does not extend beyond the life of the project.
Negligible	An impact that is localised to a specific location within the project’s site boundary and is temporary or unlikely to occur with no detectable effect on the wellbeing of people or a business entity so that the socioeconomic baseline remains consistent

Magnitude (positive or negative)	Definition (considers duration of the impact, spatial extent and reversibility)
No change	No perceivable impact.

Source: Mott MacDonald, 2025

The significance has been determined by the interaction between the magnitude of impacts and the sensitivity of receptors affected, as depicted in the significance matrix shown in Table 6.29.

Table 6.29 Impact Evaluation Matrix

	Sensitivity of Receptors			
Magnitude of Impact	**Negligible**	**Low**	**Medium**	**High**
No Change	Not significant	Not significant	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant	Not significant
Minor	Not significant	Minor	Minor	Moderate
Moderate	Not significant	Minor	Moderate	Major
Major	Not significant	Moderate	Major	Major

Source: Mott MacDonald, 2025

Methodology

6.5.4 As part of the ESIA process, it is necessary to define the existing socioeconomic conditions in the Project's impact area in detail. In line with this necessity, the methodological approach of the socioeconomic baseline data collection and assessment consists of socioeconomic secondary data collection.

6.5.5 The process of impact assessment includes the analysis of the qualitative and quantitative socioeconomic data, understanding of potential project impacts and development of mitigation mechanisms to minimise any potential adverse impacts. The residual impacts are then assessed.

6.5.6 For significant impacts and key issues determined during the scoping stage, information regarding the existing socioeconomic conditions was collected based on existing published documents, reports, and plans. Data including demographic characteristics, socioeconomic variables and characteristics of the Project impacted neighbourhoods on a city, district and neighbourhood basis were collected through available official statistical data derived from the Qatar National Planning Council.

Limitations and Assumptions

6.5.7 The impact assessment study relied mainly on secondary data sources such as statistical reports and open reports. These are typically available at nation-level granularity. This resulted in limitations across multiple assessment sectors that would ideally include more area-specific information.

6.5.8 The Qatar Census (2010, 2015, 2020) – this has been a valuable source of information however it fails to offer data to a more area-specific degree. It is also only repeated in five-year cycles and currently, the data is now four years old, with the next Census due this year (2025). Although this is standard practice it means the anticipated change in data following the World Cup 2022 is not considered, and the status of the area might not be accurate.

6.5.9 GDP, employment data, and gender data – both the National Planning Council (2023) and the World Bank (2022) primarily provide data for Qatar at national level. Similarly, The World Economic Forum (WEF) publishes Global Gender Gap Reports annually which provides national-level data covering Qatar but has no data on regions within countries.

6.5.10 Fishery Data – there is limited data on the fisheries in Ras Abu Fontas coastline and the lack of engagement with fishermen in the area has resulted in limited evidence and therefore accurate impacts and mitigation measures cannot be determined.

Construction Phase

Socioeconomic Impacts

6.5.11 The key potential socioeconomic impacts identified during construction are summarised in Table 6.30 as follows:

Table 6.30: Potential impacts related to socioeconomic during construction

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative	Local infrastructure and social facilities	Impacts on the local infrastructure (i.e., water resources, sewage) and social facilities (i.e. mosques, shops, hospitals) may occur due to labour influx, particularly causing social disruption.	Moderate	Medium	Moderate
Negative	Misconduct & inappropritae behaviour	The possibility of misconduct & inappriprotae behavior among employees and towards nearby community members by employees may occur, especially when the workforce is over 6000 employees.	Moderate	Medium	Moderate
Negative	Environmental impacts	During construction, environmental impacts such as air pollution, water contamination, and noise disturbances can occur.	Moderate	Medium	Moderate
Positive	Local benefits such as employment creation	The Project will create job opportunities for local community members.	Moderate	Medium	Moderate

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative and/or Positive	Increase in goods consumption and demands	Although the labour influx can cause social disruptions, but the high number of workers can also increase the demand for local services and activate the economy.	Moderate	Medium	Moderate

Source: Mott MacDonald, 2025

Community Health, Safety and Security Impacts (CHSS)

6.5.12 Table 6.31 describes the potential impacts related to Community Health, Safety and Security.

Table 6.31: Potential impacts related to Community Health, Safety and Security (CHSS) during construction

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative	Community security	The community security may be impacted due to the high influx of workers which can cause, at any time, social tensions.	Moderate	Medium	Moderate
Negative	Water, air quality and noise	Although precautions and continuous monitoring will take place, resulting dust dispersion and noise impacts may be inevitable. Also, as the Project site is close to the coastline and particularly due to the plant points of discharge, the marine ecosystem may be impacted.	Minor	Medium	Minor
Negative	Spread of disease	The spread of diseases can be caused due to the high number of construction workers, including migrant workers, who will be assigned to the Project. This could be because of the lack of awareness, unsanitary living conditions or non-continuous health monitoring.	Moderate	Low/ negligable	Minor
Positive	Increase in the local employment rates	The Project has the possibility to employ people from nearby settlements. People	Moderate	Medium	Moderate

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
	through job opportunities created by the Project	residing in the nearby settlements of the Project have medium sensitivity about this impact.			
Positive	Increase in the number of building establishments and occupancy	Labour required during the operations phase of the Project is likely to reside in nearby areas which will increase the local economy there.	Moderate	Low	Minor
Positive and/or Negative	Local infrastructure	The Project will lead to an infrastructure development, particularly in terms of utilities such as better water and power supply and human resources up-skilling. On the other hand, due to high number of human resources and construction operation ongoing, the community could be impacted from an environmental aspect, traffic congestion/road accidents and stress on the local services.	Moderate	High	Major
Positive and/or Negative	Increase in goods consumption and demands	The increase in the number of labours will consequently result in further consumption and demand of goods therefore activating the food market and local shops. This could be both a positive or negative impact depending on the level of strain and location of strain on the supply chains.	Moderate	Low	Minor

Source: Mott MacDonald, 2025

6.5.13 There may also be an impact on food availability due to the high numbers of construction workers anticipated in the area. The potential impact of the Project on fisheries remains uncertain as the scope of potential impact on habitats serving as spawning grounds or to connect commercial species has yet to be determined. Additionally, national fisheries statistics are limited and no engagement with fishermen has occurred. In this situation, it is hard to evaluate risks and establish appropriate mitigation measures.

Labour and Working Conditions including Occupational Health and Safety (OHS) Impacts

6.5.14 Table 6.32 below describes the potential impacts related to labour and working conditions.

Table 6.32: Potential impacts related to labour and working conditions during construction

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative	Fair treatment, non-discrimination and equal opportunity of workers	Any discrimination on the basis of race, colour, gender, religion, political opinion, disability, nationality or social origin should not be tolerated. The protection of vulnerable immigrant workers may not be properly ensured due to the obscurity.	Minor	Medium	Minor
Negative	Grievance mechanism and information disclosure to the workers on terms and conditions of employment	The Project workers might not be adequately informed about grievance mechanism as well as terms and conditions of their employment within the Project activities.	Minor	Medium	Minor
Negative	Contractor and subcontractor management (including child and forced labour)	Construction works will be carried out by the Samsung main contractor and its subcontractors. The contractor or subcontractors may not have adequate knowledge about the World Bank	Minor	Medium	Minor

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
		standards and practices regarding contractor and subcontractor management.			
Negative	Overtime working without workers' consent and/or compliance with national and international requirements	The Contractor may apply compulsory overtime for the completion of construction works on time. It also may not compensate the overtime work through payments. The overtime working may exceed the standard 48 hours per week (36 hours during Ramadan) (Article 73, Law No. 14 of 2004 the Labour Law).	Minor	Medium	Minor
Negative	Misconduct and inappropriate behaviour risks	Unless preventive measures are taken appropriately, the possibility of misconduct and inappropriate behaviour among employees may occur.	Moderate	Medium	Moderate
Negative	Worker's accommodation	Workers' off-site accommodation conditions may not meet the World Bank standards (i.e. space per person, number of people staying in a room, hygiene of the rooms and other facilities within the camp).	Minor	Medium	Minor
Negative	Conflict occurrence between workers	The high number of construction workers may result in conflict	Minor	Medium	Minor

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
		occurrence which may further lead to physical risks.			
Negative	Compliance with Qatar and international standards	All employee relations should be managed in alignment with Qatar and international standards. Mishandling and managing employees' files is an expected risk due to the high number of workers expected.	Minor	Medium	Minor

Source: Mott MacDonald, 2025

6.5.15 Occupational health and safety impacts during site preparation and construction for the proposed Project would be the same as any construction project. The impacts would be localized and would affect only site workers or visitors on the site. However, construction activities have the potential for exposing workers or site visitors to a number of common hazards including physical hazards, electrical hazards, fire and explosion hazards. Table 6.33 below describes these.

Table 6.33: Potential impacts related to occupational health, safety and security during construction

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative	Personal protection use	Construction workers would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and the handling and assembly of various building materials, and therefore personal protection measures will be a routine part of the construction activities (such as gloves, hard hats, steel toed boots, eye shields, and	Minor to major	High	Moderate to Major

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
		ear plugs or covers).			
Negative	Accidents/incidents	Potential impacts also include near misses, injuries or incidents due to the inadequate risk assessment, application of risk control measures and regular monitoring of the workplace incidents.	Moderate to major	High	Moderate to major
Negative	Dust, noise and vibration	Generation of dust, noise and vibration during construction activities (such as earthmoving, operation of equipment and vehicles, construction traffic) may cause adverse effects on workers to be employed for the construction works unless sufficient measures are taken (i.e. health controls, usage of PPE).	Minor	Medium	Minor

Source: Mott MacDonald, 2025

Operational Phase

Socioeconomic Impacts

6.5.16 The key potential socioeconomic impacts identified during operation are summarised in Table 6.34 as follows:

Table 6.34: Potential impacts related to socioeconomic during operation

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative	Environmental impacts	Environmental impacts related to air, water and noise during operation if not managed properly as it can cause cumulative impacts.	Moderate	Medium	Moderate
Positive	Local infrastructure	The improved water and power supply will result in better living conditions.	Moderate	High	Major
Positive	Local benefits such as employment creation	The Project will create job opportunities for local community members.	Minor	Medium	Minor

Source: Mott MacDonald, 2025

Community Health, Safety and Security (CHSS) Impacts

6.5.17 Table 6.35 shows the potential impacts related to community health, safety and security during operation.

Table 6.35: Potential impacts related to community health, safety and security (CHSS) during operation

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative	Community security	The community security may be impacted which can cause, at any time, social tensions.	Minor	Medium	Minor
Positive	Increase in the local employment rates through job opportunities	Labour required during the operation phase of the Project is likely to reside in nearby areas which will	Moderate	Low	Minor

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
	created by the Project	increase the local economy there.			
Positive	Local infrastructure	The Project will lead to an infrastructure development, particularly in terms of utilities such as better water and power supply and human resources up-skilling.	Moderate	High	Major
Positive and/or Negative	Increase in goods consumption and demands	The increase in the number of labours will consequently result in further consumption and demand of goods therefore activating the food market and local shops. This could be both a positive or negative impact depending on the level of strain and location of strain on the supply chains.	Moderate	Low	Minor

Source: Mott MacDonald, 2025

Labour and Working Conditions including Occupational Health and Safety (OHS) Impacts

6.5.18 Table 6.36 below describes the potential impacts related to labour and working conditions that may occur during the operational phase of the Project.

Table 6.36: Potential impacts related to labour and working conditions during operation

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative	Fair treatment, non-discrimination and equal opportunity of workers	Any discrimination on the basis of race, colour, gender, religion, political opinion, disability, nationality or social origin should not be tolerated. The protection of vulnerable workers may not be properly ensured due to the obscurity.	Minor	Medium	Minor
Negative	Grievance mechanism and information disclosure to the workers on terms and conditions of employment	The Project workers might not be adequately informed about grievance mechanism as well as terms and conditions of their employment within the Project activities.	Minor	Medium	Minor
Negative	Misconduct and inappropriate behaviour risks	Unless preventive measures are taken appropriately, the possibility of misconduct and inappropriate behaviour among employees may occur.	Moderate	Medium	Moderate
Negative	Conflict occurrence between workers	A new influx of workers may result in conflict occurrence which may further lead to physical risks.	Minor	Medium	Minor
Negative	Compliance with Qatar and international standards	All employee relations should be managed in alignment with Qatar and international standards. Mishandling and managing employees’ files are an expected risk due to the high number of workers expected.	Minor	Medium	Minor

Source: Mott MacDonald, 2025

Table 6.37: Potential impacts related to occupational health, safety and security impacts during operation

Type of Impact	Topic	Impacts	Magnitude	Sensitivity	Significance Outcome
Negative	Personal protection use	Workers would be actively involved in potentially hazardous activities such as heavy equipment operations, soil excavations, and the handling and assembly of various materials, and therefore personal protection measures will be a routine part of the operation activities (such as gloves, hard hats, steel toed boots, eye shields, and ear plugs or covers).	Minor to major	High	Moderate to major

Source: Mott MacDonald, 2025

6.6 Noise and Vibration

6.6.1 The construction and operation of the proposed Project is expected to generate temporary and permanent noise and vibration impacts which may result in effects at nearby sensitive receptors. This section presents an assessment of key noise and vibration impacts in order to identify any potential significant effects, and so that the scope to mitigate them can be considered.

6.6.2 Temporary noise and vibration impacts during the construction phase are expected to arise due to:

- Activities within laydown areas
- Excavation and ground works
- Offshore activities in constructing a temporary causeway and jetty
- Additional road traffic in moving materials and site personnel to and from the site
- Demolition and removal of existing structures on the site

6.6.3 Permanent noise and vibration impacts of the Project once operational are expected to be associated with additional equipment installed within the RAF complex. The main noise-emitting items are identified as the:

- Sea water pump and chlorination unit
- Heat Recovery Steam Generators (HRSGs)
- Transformers for gas and steam turbines
- Stacks for HRSGs
- Water/wastewater treatment plant station

- Portable water reservoir and pump stations
- 400kV and 220kV gas insulated (GIS) substations.

6.6.4 The nearest receptors sensitive to noise and vibration are identified as:

- Al Wakrah residential area to the south
- The QEWC accommodation adjacent to the north-west corner of the complex.

Sensitivity of receptors

Significance of efforts

6.6.5 The significance of effects due to noise is a function of the magnitude of impact and the sensitivity of the receptor. Table 6.38 presents the significance criteria to be used in this assessment which is consistent with the ESIA.

Table 6.38: Impact evaluation and determination of significance

Magnitude of impact	Sensitivity of receptors			
	Low/negligible	Medium	High	Very high
No change	Not significant	Not significant	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant	Not significant
Minor	Not significant	Not significant	Minor	Minor
Moderate	Not significant	Minor	Moderate	Moderate
Major	Not significant	Minor	Moderate	Major

Source: Mott MacDonald, 2025

6.6.6 The methodologies and scales used to assess the magnitude of impact for the key noise impacts expected during construction and operation are set out below.

Sensitivity criteria

6.6.7 Sensitivity criteria for the assessment of noise impacts affecting sensitive receptors are assigned in Table 6.39.

Table 6.39: Sensitivity criteria

Sensitivity	Type of receptor
Very high	Residential area, hospitals, schools, colleges or universities, places of worship, designated environmental areas, nature areas, high value amenity areas, cemeteries.
High	Offices, recreational areas, agricultural land
Medium	Public open spaces, industrial areas, car parks.
Low/negligible	Derelict land.

Source: Mott MacDonald, 2025

6.6.8 The main sensitive receptors identified are grouped into village settlements and accommodation for site personnel. All receptors within these areas are considered to have Very High sensitivity for the purposes of this assessment.

Assessment of impacts

Construction noise

6.6.9 The British Standard 5228 ‘Code of Practice for Noise and Vibration Control on Construction and Open Sites’ (2009+A1:2014) provides comprehensive guidance on construction noise and vibration including details of typical noise levels associated with various items of plant or activities, prediction methods and measures and procedures that have been found to be most effective in reducing impacts. The guidance forms the basis for the majority of construction noise assessments in the United Kingdom and is widely recognised internationally. It has been adopted for this assessment.

6.6.10 Construction work is transient in nature and generally includes both stationary and moving sources of noise. Stationary sources include construction plant positioned at a given location on a temporary basis while moving sources normally comprise mobile plant and vehicles.

6.6.11 The first stage of the construction noise assessment involves the identification of activities that have the potential to generate high levels of noise. It is necessary to consider the contribution of all noise sources involved in a particular construction activity in order to predict the likely impact.

6.6.12 The second stage of the assessment involves identifying and ranking the nearest sensitive receptors to the construction areas in terms of sensitivity of the receptor. The predicted impact will depend primarily on the levels of noise emitted and the distance between sources and the receivers. However, the degree and nature of incorporated mitigation measures are also of importance.

6.6.13 The third stage of the construction noise assessment involves the prediction of noise level at the receptor position in order to assess the magnitude of impact. Annex E of BS 5228 – Part 1: Noise presents example methods for assessing the significance of construction noise levels at noise sensitive receptors and ‘Example method 2 – 5 dB(A) change’ method has been adopted here. Construction noise levels are deemed to be significant if the ambient noise levels during construction (pre-construction ambient plus construction noise) exceed the pre-construction ambient noise by 5 dB(A) or more subject to lower cut-off values of:

- 65 dB L_{Aeq} during the daytime 07:00 to 19:00 Monday to Friday, and Saturdays 07:00 to13:00
- 55 dB L_{Aeq} during evenings and weekends 19:00 to 23:00 Monday to Friday, 13:00 to 23:00 on Saturdays and 07:00 to 23:00 on Sundays
- 45 dB L_{Aeq} during the night-time 23:00 to 07:00 on any day

6.6.14 These conditions would need to prevail for one month or more unless works of a shorter duration are expected to result in significant impacts. Based on these criteria, the magnitude of impact of noise due to general construction noise will be assessed using the scales presented in Table 6.40.

Table 6.40: Assessment of construction noise impacts

	Construction noise level dB L_{Aeq}		
Definition	**Daytimes**	**Duration**	**Magnitude of impact**
Potentially perceptible but non-significant change in conditions	<55	Months	Negligible
	<60	Weeks	
	<65	Days	
Perceptible but restricted change in conditions	55 – 60	Months	Minor
	60 – 65	Weeks	

	Construction noise level dB L_{Aeq}		
Definition	**Daytimes**	**Duration**	**Magnitude of impact**
	65 – 70	Days	
Material but non-significant change in conditions	60 – 65	Months	Moderate
	65 – 70	Weeks	
	70 – 75	Days	
Significant change in conditions	>65	Months	Major
	>70	Weeks	
	>75	Days	

Source: Mott MacDonald, 2025

Construction phase road traffic noise

6.6.15 Traffic accessing the site during the construction phase may generate temporary increases in road traffic noise in the area. The UK methodology for predicting noise impacts due to free-flowing road traffic is the Calculation of Road Traffic Noise (CRTN). This demonstrates that a 25% increase in the volume of traffic (all other factors unchanged) is required to result in a corresponding 1 dB(A) increase in traffic noise. This is the smallest change in steady-state road traffic noise that may be perceptible in the short-term. The LA 111 Noise and Vibration Revision 2 is a UK standard relevant to road projects and Section 3 includes specific guidance for assessing noise associated with road projects. It should be noted that CRTN can only be applied where traffic flows exceed 50 vehicles per hour. Annex F of BS 5228 – 1:2009 includes a method for calculating the L_{Aeq} noise level due to mobile items of plant using a haul route based on the sound power level of the noise source, speed, number of vehicles per hour and distance from the route. This method shall be adopted for this assessment in the case of low traffic flows (less than 50 vehicles per hour).

6.6.16 The scales given in Table 6.41, used for the classification of the magnitudes of impact of short-term changes in road traffic noise levels described using the L_{A10} dB statistical descriptor for the 18-hour daytime period 06:00 to 24:00 ($L_{A10,18\text{-}hour}$ dB), as given in the LA 111 guidance. This is the noise level exceeded for 10% of the measurement interval and describes the highest part of the sound measured. The assessment has been adapted here to apply to traffic noise levels expressed as LAeq,1 hour where appropriate (in the case of low flows).

Table 6.41: Assessment of magnitude of changes in road traffic noise

Change in the level of road traffic noise*	Definition	Magnitude of impact
<1 dB(A)	A potentially perceptible but non-significant change in conditions	Negligible
1 to < 3 dB(A)	A perceptible but restricted change in conditions	Minor
3 to < 5 dB(A)	A material but non-significant change in conditions	Moderate
>=5 dB(A)	A significant change in conditions	Major
Note: * Traffic noise expressed as $L_{A10,18hour}$ dB or $L_{Aeq,1hour}$ dB as appropriate.		

Source: Mott MacDonald, 2025

Operational noise from fixed plant

6.6.17 The project has the potential to generate noise during normal operation due to the items of equipment that are to be installed within the proposed RAF complex. Additional temporary noise impacts may be generated during emergency situations (audible alarms, venting noise) but as this is anticipated to be very infrequent this is not considered further.

6.6.18 The magnitude criteria for operational noise impacts presented in Table 6.42 have been developed based on the more stringent aspects of Qatari Standards and the IFC/World Bank Group guidelines.

Table 6.42: Assessment of magnitude of impact of operational noise from fixed plant

Criteria	Definition	Magnitude of impact
Residential - Daytime 55 L_{eq} dB(A) - Night-time 45 L_{eq} dB(A) Commercial receptors - Anytime 70 L_{eq} dB(A)	Operational noise level below criterion	Negligible
	Operational noise level less than 3 L_{eq} dB(A) over criterion	Minor
	Operational noise level less than 5 L_{eq} dB(A) over criterion	Moderate
	Operational noise level 3 L_{eq} dB(A) or more above the criterion	Major

Source: Mott MacDonald, 2025

Operational phase road traffic

6.6.19 It is understood that there will be no permanent changes to traffic conditions accessing the RAF complex as a result of the proposed Project and therefore this is not assessed further.

Construction and operational phase vibration

6.6.20 Ground-borne vibration from construction activities or operational sources has the potential to affect the occupiers of buildings or the structure itself. This is mainly associated with construction activities such as percussive piling or vibratory equipment used in demolition. It is understood that no piling activity will be required for the proposed Project.

6.6.21 Given the proximity of the development site to sensitive receptor positions offsite, effects due to vibration during construction works, and during operation, are not expected and are not assessed further.

Uncertainty, assumptions and limitations

6.6.22 Construction noise is inherently variable in nature and strongly dependent on the proximity and duration of noise sources relative to receptors, and the simultaneous use of multiple items of equipment. It is not possible to accurately predict the distribution of equipment and the utilisation. Consequently, the assessment of construction noise impacts is based on an assumed usage of equipment based on the most recent plant inventory and site layout.

6.6.23 It was assumed that the noise emitting equipment installed for the Portable water reservoir and pump station and Water/wastewater treatment plant station will be enclosed within a building. Without details of the apertures in the building, louvers or door specifications, it is assumed within the acoustic model of operational noise that the building is constructed from concrete block-work and that there are no significant openings. The sound reduction of the enclosure will diminish if there were paths for the sound to break out into the outdoor environment.

Construction impacts and effects

6.6.24 The main items of noise emitting equipment expected to be used in the construction of the gas-fired combined cycle power plant and seawater reverse osmosis desalination plant are the following:

- 1No. Mobile crane (over 200 tonnes)
- 1No. Mobile crane (150 tonnes)
- 2No. Mobile cranes (25 to 50 tonnes)
- 1No. Excavator (85 to 160 tonnes)
- 2No. Excavators (CAT330 or equivalent)
- 3No. Diesel generators
- Wheeled loaders (shovel) (quantity as required)
- Trucks (quantity as required)
- Dumpers (quantity as required)

6.6.25 Additional traffic movements during the construction phase are expected to comprise:

- 20 to 30 bus movements per day
- 20 to 30 truck/trailer movements per day
- 40 to 60 passenger car movements/day

6.6.26 Generally, site personnel will arrive at the site to begin work at 06:00 every day and depart the site between 16:30 and 22:30. Night work may occur within the June to August period.

6.6.27 The assessment has been based on the above information being the primary noise emitting equipment, there may be other sources operating within the area, however, those listed above are expected to be dominant. The results of the construction assessment (Table 6.43 below) indicate that the noise levels produced at any of the five identified noise sensitive receptors will be both below the existing measured background noise levels in the area and both the day and night threshold noise level stated in BS 5228.

Table 6.43: Summary of construction noise assessment results

Sensitive receptor measurement position	Sensitive receptor description	Approximate distance to receptor position from site (m)	Reference source noise level at 10m (dB)	Source noise level at receptor – distance corrected (dB)
NML-02	Mosque near QEWC Staff Accommodation	470	77.3	40.7
NML-03	QEWC Staff Accommodation	430	77.3	41.6
NML-05	Ras Bu Fontas beach	1400	77.3	30.0
NML-06	Al Wakrah residential area	950	77.3	33.8
NML-07	Al Wakrah Celebration Hall Complex	860	77.3	34.8
NML-12	Al Wakrah beach camping site	880	77.3	34.6

Source: Mott MacDonald, 2025

6.6.28 For the construction plant listed above, the assessment indicates a negligible significance.

6.6.29 Calculation of the additional traffic that will use the local routes both as a haul route and as access once the site is built has also been undertaken.

6.6.30 Noise levels of the vehicles listed above, along with the average predicted frequency were calculated. The results indicate that the additional traffic should not increase the ambient noise levels with any significant impact. The precise level of impact that could occur to surrounding receptors is very dependent on the existing flow of traffic. However, based only on the measured background noise levels taken and the significance table, Table 6.41, it is predicted that the likely impact will be minor.

Operational impacts and effects

6.6.31 The main noise impacts during operation are expected to arise due to the operation of the new facilities to be installed within the complex. These are identified as:

- Sea water pump and chlorination unit
- Heat Recovery Steam Generators (HRSGs)
- Transformers for gas and steam turbines
- Stacks for HRSGs
- 400kV and 220kV gas insulated (GIS) substations

6.6.32 Current Project information indicates that each noise emitting component within each of the above facilities has an acoustic specification of 85 dB(A) at one metre. This is stated for the purposes of product guarantees for health and safety requirements and compliance with Executive By-Law for Law No. 30 of 2002 issued by MoECC and Occupational Safety and Health Administration (OSHA) Standard 1910.95 ‘Occupational noise exposure’ (1974). Therefore, provided the noise emissions of all plant are within the guaranteed level, any assessment environmental noise based on the 85 dB(A) at 1 metre reference for all plant will also consider a worst-case scenario.

6.6.33 A three-dimensional acoustic model was developed within DataKustik GmbH CadnaA software version 2025, which implements the procedures of the International Standard ISO 9613 ‘Acoustics Attenuation of Sound during Propagation Outdoors Part 2 General Method of Calculation’ (1996).

6.6.34 Table 6.44 presents a summary of the results of the noise predictions. A noise contour plot of the predicted noise levels at the boundary of the proposed Project is also presented in Figure 6.16.

Table 6.44: Summary of operational noise assessment results

Receptor position*	Receptor type	Predicted noise level at receptor L_{Aeq} dB	MoECC maximum noise level at property line dB(A)		Measured baseline $L_{Aeq,10\ minutes}$ (dB)			
					Weekday		Weekend	
			Daytime	Night-time	Daytime	Night-time	Daytime	Night-time
NML-01	Commercial	41.8	65	55	50.4	49.8	51.2	48.4
NML-02	Residential	43.9	55	45	56.4	53.1	54.7	50.7
NML-03	Residential	45.6	55	45	56.0	45.1	52.7	46.4
NML-04	Commercial	47.7	65	55	56.7	44.3	54.1	44.2
NML-05	Commercial	39.0	65	55	58.1	48.8	52.8	48.8
NML-06	Residential	41.2	55	45	51.6	42.8	52.7	59.7

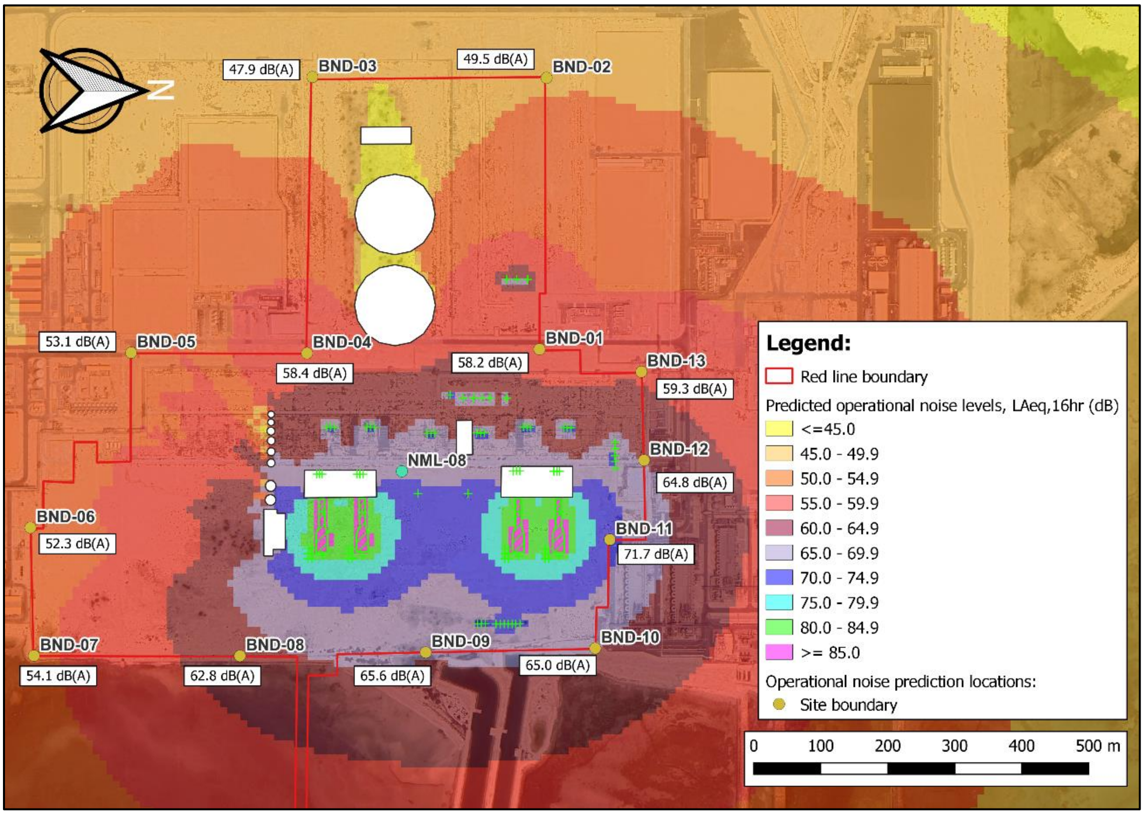
NML-07	Residential	40.9	55	45	61.3	50.0	50.7	49.0
NML-09	Commercial	45.4	65	55	57.4	51.7	52.7	50.0
NML-10	Commercial	43.4	65	55	59.2	48.9	50.7	46.6
NML-11	Commercial	41.1	65	55	59.2	41.2	52.4	42.7
NML-12	Commercial	41.0	65	55	54.2	45.4	50.4	45.0

Note:

* Receptor position NML-08 is not included in the operational noise assessment as it is located within the Project site boundary

Source: Mott MacDonald, 2025

Figure 6.16: Noise contour plot of predicted operational noise assessment



Source: Mott MacDonald, 2025

6.6.35 The noise contour plot results show that the combined operational noise levels at the site boundaries are below the MoECC limit value of 75 dB(A) for industrial receptors during daytime and night periods.

6.6.36 The results of predictions show that the combined noise levels from all plant to be installed are below the most stringent Guideline limit value of 55 dB(A) for commercial receptors during the night period.

6.6.37 For most residential receptors, the results of predictions show that the combined noise levels from all plant to be installed are below the most stringent Guideline limit value of 45 dB(A) for the night-time. The exception being receptor position NML-03 representing the QEWC Staff Accommodation, which exceeds the limit value by 0.6 dB(A) and results in one minor night-time impact.

6.6.38 The assessment concludes that operational noise from fixed plant is expected to have ten negligible impacts and one minor impact at the nearest sensitive receptors to the proposed Project. Overall, the resulting effects from the operational noise will be insignificant.

6.7 Cultural Heritage and Archaeology

6.7.1 An assessment of the significance of effects with regards to cultural heritage and archaeology has been made for the construction and operational phases of the project. The significance of potential effects is a function of the presence and sensitivity of cultural heritage receptors, and the magnitude (duration, spatial extent, reversibility, likelihood and threshold) of the impact.

Sensitivity of receptors

6.7.2 The sensitivity of cultural heritage receptors for a site is presented in Table 6.45, below.

Table 6.45: Criteria of sensitivity

Sensitivity	Criteria
High	Sites of the highest importance, e.g. World Heritage Sites (including nominated sites), assets of acknowledged international and/or national importance and assets that can contribute significantly to acknowledged international research objectives.
Medium	Undesignated archaeological sites; well preserved structures or buildings of historical significance, historic landscapes or assets of a reasonably defined extent and significance, or reasonable evidence of occupation / settlement, ritual, industrial activity.
Low	Comprises undesignated sites with some evidence of human activity but which are in a fragmentary or poor state or assets of limited historic value, but which have the potential to contribute to local research objectives, structures or buildings of potential historical merit.
Negligible	Historic assets with very little or no surviving archaeological interest or historic buildings and landscapes of no historical significance.

Source: Mott MacDonald, 2025

Assessment of impact

6.7.3 The degree or magnitude of an impact is determined through consideration of the nature, scale and extent of effect In line with the impact assessment methodology provided in the Section 6.1 above. The criteria for determining magnitude of the impact on cultural heritage and archaeology are presented in Table 6.46, below.

Table 6.46: Impact Magnitude Criteria

Magnitude	Criteria
Major	Severe damage or loss of the cultural heritage resource
Moderate	A high proportion of the cultural heritage resource damaged or destroyed
Minor	A medium proportion of the cultural heritage resource damaged or destroyed
Negligible	A small proportion of the cultural heritage resource damaged or destroyed
No change	The cultural heritage resource will not be affected, because of distance from the development, or method of construction

Source: Mott MacDonald, 2025

6.7.4 The significance of the effect is dependent upon the importance of particular site and the amount of potential damage. Table 6.46 above, presents the manner in which the significance of effects is determined by the interaction between the magnitude of impacts and the sensitivity of receptors affected. Moderate or major effects are considered to be significant.

Construction impacts and effects

6.7.5 The historic buildings within Al Wakrah are considered of high sensitivity. However, the proposed site falls 3.5 km to the north of an existing desalination plant and will not represent a significant change to the industrial character of the complex or any alteration to its visual profile or visibility from the direction of Al Wakrah. Furthermore, the structures within Al Wakrah are screened from the site by substantial intervening urban development. Given these factors and the distances in relation to the site, there will be no anticipated temporary or permanent impacts to these cultural heritage receptors resulting from the Project. The magnitude of impact due to construction activities will therefore be negligible, meaning that the significance of any potential effects will be negligible.

6.7.6 Any offshore works associated with the construction of a new outfall and associated dredging has the potential to impact upon historical fish traps that have been identified within the intertidal environment to the east of the Project. Evidence of these barrier type traps could be damaged through direct disturbance during the construction. The assets are of negligible to low sensitivity, depending upon their exact nature, but this cannot be ascertained without further investigation. Impacts are likely to be limited and will not affect the wider understanding of the assets, therefore these would be considered to be permanent adverse minor impacts, meaning that the potential effects will be not significant.

6.7.7 It is likely that there have been substantial levels of ground disturbance due to previous construction within the site boundary. However, in the absence of any comprehensive archaeological evaluation of the site, it should be considered possible that undisturbed finds or pockets of archaeological deposits, if present, may have remained undisturbed. Excavation, backfilling, grading, levelling associated with the construction phase will present the largest potential for impact to archaeological remains, should they be present. There is the potential for high surface pressure, such as from heavy plant or stockpiling, to result in sub-surface disturbance from compaction, even where there is no direct excavation. This compaction has the potential to impact any shallow archaeological remains within the footprint of the Project. The presence, extents and sensitivity of any surviving archaeological deposits is uncertain due to the absence of field investigation. Should any archaeological remains be present, the destruction of deposits would result in permanent adverse moderate to major impacts.

6.7.8 Details of access routes, compounds and stockpiling locations have not been finalised. There is the potential that the location of any of these elements of the construction infrastructure, if beyond existing areas of known disturbance, may result in the disturbance or complete destruction of unidentified archaeological remains that may survive within the wider landscape surrounding the complex. There is also the potential for the disturbance or removal of surface archaeological features, such as cairns, temporary mosques, or remains of temporary camps. In the absence of finalised details and archaeological data, it is not possible to assess the potential impacts within the current assessment. However, it is suggested that further communication should be conducted with the relevant parties once the requirements and locations of these are identified. Additional surveys may also be required to establish the potential presence of archaeology.

Operational impacts and effects

6.7.9 The operation of the project is not anticipated to result in change to any identified cultural heritage receptors as summarised in Table 6.47 below.

Summary of construction impacts and effects pre-mitigation

Table 6.47: Cultural heritage summary of impacts

Receptor	Summary of Impact	Sensitivity of receptor	Magnitude of impact	Significance of effect
Historic buildings in Al Wakrah	No impacts anticipated due to distance (3.5km) screening and negligible change to site character or visual profile.	High	Negligible	Not significant
Intertidal fish traps	Potential damage to weir fish traps during works associated with construction of new outfall and associated dredging.	Low	Permanent adverse Minor	Not significant
Unknown archaeology within the Project's footprint	Potential impact to archaeological deposits, if present. Impacts could result from compaction, due to pressure from stockpiling or compounds, or subsurface disturbance, such as from excavation, in previously undisturbed areas.	Uncertain	Permanent adverse Major	Uncertain

Source: Mott MacDonald, 2025

6.8 Terrestrial Ecology

6.8.1.1 The methodology for the assessment of impacts on biodiversity is summarised in the following sections.

Criteria for determining biodiversity receptor sensitivity

6.8.1.2 In line with the methodology presented in the Section 6.1 above, the criteria used to determine the sensitivity of biodiversity receptors to the changes which the Project will cause is defined in Table 6.48 and Table 6.49 defines the sensitivity for each receptor identified in the baseline and discussed the inclusion in the impact section. Features of negligible sensitivity and features that are unlikely to be present within the AoI are not included within the assessment.

Table 6.48 Criteria for determining biodiversity receptor sensitivity

Sensitivity	Detail	Species criteria	Habitat or site criteria
Very High	Very high conservation concern and rarity. International scale or national/ regional scale with limited potential for substitution.	Species that trigger Critical Habitat thresholds in accordance with IFC PS6.	All areas of potential Critical Habitat (IFC PS6 definition). Internationally recognised areas (IFC PS6 definition) and nationally designated sites in IUCN categories I and II.
High	High conservation concern and rarity. International scale or national/ regional scale with limited potential for substitution.	CR/EN/VU species that do not meet Critical Habitat thresholds in accordance with IFC PS6.	Habitats of significant international ecological importance, Natural Habitats that are globally threatened and/or of international and/or national conservation concern and/or high biodiversity, with limited potential for substitution.
Medium	Medium conservation concern and rarity, regional scale with good potential for substitution.	Vulnerable species listed by IUCN Nationally protected or rare species Restricted-range species. Migratory species	Nationally designated sites in IUCN categories III-VI or with no equivalent IUCN category. Regionally important natural habitats. Natural habitats which do not qualify as Critical Habitat. Endemic Bird Areas (EBAs).
Low/ Negligible	Very low or low conservation concern and local scale.	IUCN Near Threatened /Least Concern. IUCN Data Deficient species. Species of no national importance (threat and/or protection). Invasive species. Species of no international or national value.	Sites designated at local level (no IUCN category). Undesignated sites and natural habitats of some local biodiversity and cultural heritage interest. Modified habitats with limited biodiversity value. Artificial and converted habitats (e.g., artificial water bodies, plantations, agricultural crops). Highly modified habitats of no biodiversity value (e.g., hardstanding, bare ground and buildings).

Source: Mott MacDonald, 2025

Table 6.49 Sensitivity of biodiversity receptors

Receptor	Analysis of sensitivity	Sensitivity	Inclusion in impact assessment
Al-Aliyah Island KBA/IBA	This is designated as a KBA and IBA which are internationally recognised sites.	Very High	No – the designating features of the IBA: Socotra cormorant, and white-cheeked tern which is included within the assessment below. There are no other designating features of the KBA/IBA to consider in the impact assessment.
Khor Al Adaid National Biosphere Reserve	This is a nationally protected area and is a “strict nature reserve” Category Ia under the IUCN management categories.	Medium	No – impacts are unlikely due to the distance of this nationally protected habitat
Al Wusail Natural Reserve	This is a nationally protected area. No IUCN management category.	Low/ negligible	No- impacts are unlikely due to the distance of this nationally protected habitat
Al Rafa Natural Reserve	This is a nationally protected area. No IUCN management category.	Low/ negligible	No- impacts are unlikely due to the distance of tis nationally protected habitat
Wadi Sultana Natural Reserve	This is a nationally protected area. No IUCN management category.	Low/ negligible	No- impacts are unlikely due to the distance of this nationally protected habitat
Cropland, Herbaceous vegetation, Bare / sparse vegetation, and Permanent waterbody	Modified habitat	Low/ negligible	Yes
Built-up	Highly modified habitat of no ecological value	Negligible	No
Open water (Arabian Gulf)	Natural habitat	Medium	Refer to marine chapter (see section 5.2)
Flora	All flora NT/LC/DD/NE	Low/ negligible	Yes
Mangroves	Natural habitat	Low/ negligible	Refer to marine chapter (see section 5.2)
Arabian Sand Gazelle	IUCN VU species	Medium	No- All gazelles in Qatar and most of are considered in some form of managed conditions. The coastal and urban location of

Receptor	Analysis of sensitivity	Sensitivity	Inclusion in impact assessment
			the Site makes it unlikely that this species is present within the AoI
Striped Hyena	IUCN NT species and EN on national red list	Medium	No- no recent records of the species within Qatar and coastal location surrounded by urban habitat, therefore, unlikely present within the AoI.
Mammals (including bats)	All mammal NT/LC/DD/NE	Low/ negligible	Yes
Great Knot, Steppe Eagle and Saker Falcon	IUCN EN species	High	Yes
Greater Spotted Eagle, Eastern Imperial Eagle, Asian Houbara and Grey Plover	IUCN VU species	Medium	Yes
Curlew Sandpiper and Broad-billed Sandpiper	ICUN VU species	Medium	Yes
Socotra Cormorant	IUCN VU species and qualifying species of the Al-Aliyah Island IBA	High	Yes
White-cheeked Tern	IUCN LC species and qualifying species of the Al-Aliyah Island KBA/IBA	Medium	Yes
Other coastal birds	Other coastal birds NT/LC/DD/NE	Low/ negligible	Yes
Migratory birds	All migratory birds EN/VU/NT/LC/DD/NE	Medium	Yes
Birds	All birds NT/LC/DD/NE	Low/ negligible	Yes
Egyptian Spiny Tailed Lizard	IUCN VU species	Medium	Yes
Herpetofauna	All herpetofauna NT/LC/DD/NE	Low/ negligible	Yes
Invertebrates	All invertebrates NT/LC/DD/NE	Low/ negligible	No

Source: Mott MacDonald, 2025

Criteria for determining impact magnitude

6.8.1.3 The magnitude of impact is defined by taking into account the degree of change to the biodiversity baseline in terms of how permanent or reversible the impact is likely to be, its spatial scale (local, regional, national, international) and the ease with which mitigation measures can be put in place to return it to the baseline state.

6.8.1.4 The criteria used to determine the magnitude of the changes which will be created by the Project is defined in Table 6.50.

Table 6.50 Criteria for determining impact magnitude

Magnitude (positive or adverse)	Description (considers probability of impact occurring, duration of the impact, spatial extent, reversibility and ability to comply with legislation)
Major	Fundamental change to critical habitat (natural/ modified) and/or natural habitats and associated species, resulting in long term or permanent change, typically widespread in nature (regional, national and international). Would require significant intervention to return to baseline.
Moderate	Detectable change to the habitats and associated species, resulting in non-fundamental temporary or permanent change typically affecting the local area.
Minor	Detectable but minor change to habitats and associated species that is temporary in nature, with high capacity to return to the baseline conditions.
Negligible/No change	No perceptible change to habitats and associated fauna.
No change	

Source: Mott MacDonald, 2025

6.8.1.5 The magnitude of biodiversity impacts is, to an extent, subjective. The determination of the magnitude will therefore be based upon professional judgement taking into account the perceived sensitivity of the receiving environment.

Determination of significance

6.8.1.6 Significance takes into account the interaction between magnitude criteria and sensitivity criteria as presented in the significance matrix in Table 6.51. Impacts that are evaluated as being ‘Moderate’ or ‘Major’ are significant effects and identified as such. Consequently, impacts that are ‘Minor’ or ‘Negligible’ are not significant.

Table 6.51: Effect evaluation matrix

Magnitude of Impact	Sensitivity of Receptors			
	Low/ Negligible	Medium	High	Very High
No Change	Not significant	Not significant	Not significant	Not significant
Negligible	Not significant	Not significant	Not significant	Not significant
Minor	Not significant	Minor	Minor	Moderate
Moderate	Not significant	Minor	Moderate	Moderate
Major	Not significant	Minor	Moderate	Major

Source: Mott MacDonald, 2025

Construction impacts

Overview:

6.8.1.7 Details of the construction phase is provided in Section 2.4. The majority of the construction is within areas of built up or bare/sparce vegetation habitats. Theses habitats are considered modified with little natural ecosystem function, and it is therefore not considered a sensitive area. Habitats under the footprint of the Project are presented in Table 6.52 below. No freshwater surface water is present within the Project AoI.

Table 6.52: Habitats under the Project footprint

Habitat Type	Area (ha)	Percentage (%) of total area
Built-up (modified)	20.24	36.81
Bare / sparse vegetation (modified)	31.05	56.46
Open water* (Arabian Gulf)	3.70	6.73
Total	**54.99**	**100**

*Impacts to marine environment are covered under the Marine Chapter 6.2.

6.8.1.8 Expected construction actives such as ground clearance and excavation, movement of heavy machinery, waste storage and disposal, storage of materials (including fuel), mixing concrete fencing, soil compaction and drainage requirements may result in temporary and permanent habitat loss, disturbance of fauna and injury death of terrestrial mammals, birds, herpetofauna and invertebrates. Due to the coastal location of the Project, there is also potential for surface runoff and accidental chemical spills into the Arabian Gulf. Non-native invasive species could also be spread as a result of construction if not managed appropriately.

6.8.1.9 Table 6.53 presents each receptor that could be impacted by construction activities, the magnitude of the impact (considering the probability of the impact occurring, duration of the impact, spatial extent and reversibility) and the resultant significance of the impact. The impact magnitude is considered to be either minor or negligible given they are short-term, temporary and/or reversible or there is no perceptible change to the habitats and associated fauna.

Table 6.53 Construction impact significance on biodiversity

Receptor	Impact	Sensitivity	Magnitude	Significance
Cropland	The AoI is significantly modified. Cropland is outside of the Project and makes up a small percentage of the AoI (0.3%). No direct impact is anticipated, dust through movement of heavy machinery may impact crops.	Low	Minor-Adverse	Not significant
Herbaceous vegetation	The AoI is significantly modified. Herbaceous vegetation is outside of the Project and makes up a small percentage of the Project footprint (0.3%). No direct impact is anticipated, however, dust through movement of heavy machinery may impact herbaceous vegetation.	Low	Minor-Adverse	Not significant
Bare / sparse vegetation	The AoI is significantly modified. Bare/sparce vegetation makes up the majority of the terrestrial habitat under the Project footprint (31.7%).	Low	Minor-Adverse	Not significant

Receptor	Impact	Sensitivity	Magnitude	Significance
	A total of 56.46ha of bare/sparce vegetation will be lost. The remaining bare/sparce vegetation within the AoI may be indirectly impacted by dust through movement of heavy machinery.			
Permanent waterbody – Open water Arabian Gulf (discharge outfall pool and marine pool, permanent due as they are fed into by the gulf)	The AoI is significantly modified. Permanent waterbody is outside of the Project and makes up a small percentage of the AoI (1.2%). No direct impact is anticipated, drainage requirements and wastewater disposal may impact permanent waterbody.	Low	Minor-Adverse	Not significant
Flora	There will be permanent loss of flora due to ground clearance and excavations under the project footprint. Flora on areas left as bare ground have the potential to recover naturally but, most is considered to be lost as a result of the Project.	Low	Minor-Adverse	Not significant
Mammals (including bats)	Temporary disturbance from noise and vibration due to the movement of construction traffic, ground clearance and excavations. There is a probability of injury or death of terrestrial mammals due to the presence of burrows under the Project footprint. These could also be entrapped during open excavations or involved in collisions with heavy machinery during construction. However, the magnitude of this impact is minor as there is suitable habitat for small burrowing mammals in the surrounding areas. There are no suitable roosting habitats for bats within the AoI. Bat roost sites will not be impacted during construction however, passing bats could be impacted by artificial light pollution within the AoI at night. The magnitude of this impact is also considered minor due existing disturbance in the surrounding areas.	Low	Minor-Adverse	Not significant
Great Knot	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground	High	Minor-Adverse	Minor

Receptor	Impact	Sensitivity	Magnitude	Significance
	clearance and excavation. No nesting habitat will be impacted by this Project. It is a coastal species, and the Project could impact the Arabian Gulf through pollution if not properly managed. Modification of the coastal environment if present may also impact this species, although it is considered a vagrant so unlikely to be present.			
Steppe Eagle and Saker Falcon	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. No nesting habitat will be impacted by this Project. It is likely that the disturbance will not significantly differ from the baseline.	High	Negligible	Not significant
Greater Spotted Eagle, Eastern Imperial Eagle and Asian Houbara	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. No nesting habitat will be impacted by this Project. It is likely that the disturbance will not significantly differ from the baseline.	Medium	Negligible	Not significant
Grey Plover, Curlew Sandpiper and Broad-billed Sandpiper	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. No nesting habitat will be impacted by this Project. It is a coastal species, and the Project could impact the Arabian Gulf through pollution if not properly managed. If these species are present, modification of the coastal environment may also reduce important roosting locations for these species.	Medium	Minor-Adverse	Minor
Socotra Cormorant	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. No nesting habitat will be impacted by this Project. It is a coastal species, and the Project could impact the Arabian Gulf through pollution if not properly managed. The species could also be present within the nearby mangroves and if these are adversely impacted could also impact Socotra Cormorant.	Medium	Minor-Adverse	Minor
White-cheeked Tern	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground	Low	Minor-Adverse	Not significant

Receptor	Impact	Sensitivity	Magnitude	Significance
	clearance and excavation. No nesting habitat will be impacted by this Project. It is a coastal species, and the Project could impact the Arabian Gulf through pollution if not properly managed.			
Coastal birds	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. No nesting habitat will be impacted by this Project. It is a coastal species, and the Project could impact the Arabian Gulf through pollution if not properly managed. Modification of the coastal environment may also reduce important roosting locations for these species	Low	Minor-Adverse	Not significant
Migratory birds	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. Loss of potential wintering habitat due to modification of the coastal environment, may also reduce important roosting locations for these species	Medium	Minor-Adverse	Minor
Birds	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. Nesting habitat through loss of trees within the Project boundary will be impacted by this Project. It is likely that the disturbance will not significantly differ from the baseline.	Low	Minor-Adverse	Not significant
Egyptian Spiny Tailed Lizard	If present, there is a moderate probability of injury or death during ground clearance and excavations as this species digs burrows in sandy compacted soil in which the majority of the site consists of. Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation.	Medium	Minor-Adverse	Minor
Herpetofauna	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. There is a low probability of injury or death to terrestrial reptiles becoming trapped in open	Low	Minor-Adverse	Not significant

Receptor	Impact	Sensitivity	Magnitude	Significance
	excavations during excavation of the pipes or due to movement of heavy machinery during construction activities.			

Source: Mott MacDonald, 2025

Operation impacts

6.8.1.10 Detail of the operation phase is provided in Section 2.4. No additional habitat is expected to be lost during the operation phase. Expected operation impacts are from additional Project lighting, noise, and air emissions which can disturb resident and seasonally migrating birds and other fauna. Ongoing Site work may cause disturbance of fauna and potentially injury/death of fauna. Heavy good vehicle movement to and from the Project site could result in injury/death of fauna and dust impacts to nearby habitats. The pumping of seawater could also impact the water quality and fish mortality within the Arabian Gulf. This impact is covered under the Marine Chapter 6.2.

6.8.1.11 Table 6.54 presents each receptor that could be impacted by operation activities, the magnitude of the impact (considering the probability of the impact occurring, duration of the impact, spatial extent and reversibility) and the resultant significance of the impact. The impact magnitude is considered to be either minor or negligible given they are short-term, temporary and/or reversible or there is no perceptible change to the habitats and associated fauna.

Table 6.54 Operation impact significance on biodiversity

Receptor	Impact	Sensitivity	Magnitude	Significance
Cropland, Bare / sparse vegetation, Herbaceous vegetation, Permanent waterbody and Flora	These habitats and flora that are outside of the Project boundary and are not likely to be impacted as a result of operation. There may be some dust as a result of road tankers to and from the Project site, but this is not likely to be significantly increased from baseline.	Low	Negligible	Not significant
Mammals (including bats)	No further clearance work is expected during operation. There may be some noise disturbance during operation from the sea water pump and generators. Also, potential injury/death to small terrestrial mammals as a result of road tankers to and from the Project site, but this is not likely to be significantly increased from baseline. Passing bats could be impacted by artificial light pollution within the AoI at night. The magnitude of this impact is also considered minor due existing disturbance in the surrounding areas.	Low	Minor - adverse	Not significant
Great Knot, Steppe Eagle and Saker Falcon	Expected operation impacts are from additional Project lighting, noise, and air emissions which can disturb these species during migration but given the urban location of the Site is not	High	Negligible	Not significant

Receptor	Impact	Sensitivity	Magnitude	Significance
	likely to be significantly increased from baseline.			
Greater Spotted Eagle, Eastern Imperial Eagle and Asian Houbara	Expected operation activates such as additional Project lighting, noise, and air emissions which can disturb these species during migration but given the urban location of the Site is not likely to be significantly increased from baseline	Medium	Negligible	Not significant
Grey Plover, Curlew Sandpiper and Broad-billed Sandpiper	Expected operation activates such as additional Project lights, noise, and air emissions can disturb these species if present whilst wintering. Whilst the presence of these birds cannot be ruled out. Given the former land use and the urban location of the site the impact is not likely to be significantly increased from baseline.	Medium	Negligible	Not significant
Socotra Cormorant	Expected operation activates such as additional Project lights, noise, and air emissions can disturb Socotra Cormorant if present. In addition, the pumping of seawater from the Arabian Gulf and pollution risks during operation could also indirectly impact Socotra Cormorant due to impact on fish numbers and water quality which could degrade supporting habitat. Refer to Marine Chapter 6.2.	Medium	Minor-Adverse	Minor
White-cheeked tern	Expected operation activates such as additional Project lights, noise, and air emissions can disturb white-cheeked tern if present. In addition, the pumping of seawater from the Arabian Gulf and pollution risks during operation could also indirectly impact white-cheeked tern due to impact on fish numbers and water quality which could degrade supporting habitat. Refer to Marine Chapter 6.2	Medium	Minor-Adverse	Minor
Other coastal birds	Expected operation activates such as additional Project lights, noise, and air emissions can disturb these species if present whilst wintering. Whilst the presence of these birds cannot be ruled out. Given the former land use and the urban location of the Site the impact is not likely to be significantly increased from baseline. Refer to Marine Chapter 6.2 for impacts to marine habitats.	Low	Negligible	Not significant

Receptor	Impact	Sensitivity	Magnitude	Significance
Migratory birds	Expected operation impacts are from additional Project lighting, noise, and air emissions which can disturb these species during migration but given the urban location of the Project is not likely to be significantly increased from baseline.	Medium	Negligible	Not significant
Birds	Expected operation activates such as additional Project lights, noise, and air emissions can disturb resident and migratory birds. No further clearance work is expected during operation therefore, no additional nesting habitat is to be lost.	Low	Negligible	Not significant
Egyptian Spiny Tailed Lizard and other Herpetofauna	No further clearance work is expected during operation. Noise disturbance during operation from the sea water pump and generators. Also, potential injury/death as a result of road tankers to and from the Project site, but this is not likely to be significantly increased from baseline.	Medium/ Low	Negligible	Not significant

Source: Mott MacDonald, 2025

6.9 Soil, Hydrology and Contamination

6.9.1 The Project is located on a former industrial site and therefore there is the potential for contamination from historical land use to be present in soils and underlying groundwater. Potential impacts on soil and groundwater during the construction may arise from the following:

- Contamination to groundwater within aquifers via creation of migration pathways from construction activities
- Mishandling of hazardous and non-hazardous wastes
- Accidental fuel and chemical spillage, leakages
- Accidental sewage and wastewater spillage
- Wastewater discharge and freshwater water intake.

6.9.2 The EPC Contractor will be responsible for the permanent access roads to the Power Generation Area and Potable Water Reservoir Tank from the main road as well as temporary access to Power and Water Areas.

6.9.3 The associated systems to the power plant that will to be constructed as part of the proposed Project are stormwater drainage system, wastewater treatment system and the sanitary drainage system.

6.9.4 The plant does not have a dedicated Wastewater Treatment Plant (WWTP) for sewage during the operation phase. Instead, liquid wastes, including sewage, are disposed of through direct connection with the municipality or via road tanker.

6.9.5 Approximately 6,000 workers are expected to work on site during construction phase, however, there will be no accommodation on site.

Assessment criteria

Sensitivity criteria

6.9.6 In line with the impact assessment methodology provided in the Section 6.1 above, the criteria for determining the importance (sensitivity) and magnitude of soil and hydrology receptors are outlined in Table 6.55 and Table 6.56 respectively.

Table 6.55 Receptor sensitivity criteria applicable to the Project

Receptor sensitivity	Description/condition
Very High	Human health: High sensitivity land such as residential developments with gardens or allotments. Surface water: site includes protected sites for ecology and surface water dependence Groundwater: aquifer providing a regionally important resource or used for strategic drinking water or to support ecologically important sites
High	Human Health: High sensitivity land use such as residential developments (no gardens or allotments). Surface water: includes supporting ecological sites and habitats Groundwater: aquifer providing locally important water resources, including drinking water
Medium	Groundwater: aquifer which provides water for agricultural or industrial use.
Low	Human health: Low sensitivity land such as commercial or industrial Low surface water: no significant populations of ecological habitats present, low water quality or low flows with insignificant contribution to groundwater or other surface water bodies Groundwater: aquifer with poor water quality not providing baseflow to rivers; non-aquifer

Source: Adapted from DMRB LA 109 -Geology and soils (2019) and IEMA A New Perspective on Land and Soil in Environmental Impact Assessment and DMRB LA113 land drainage and the water environment

6.9.6.1 **Magnitude of impact**

Table 6.56: Magnitude of Impact criteria

Magnitude of impact (change)	Typical description
Major adverse	Contamination is above relevant screening criteria and construction or operation results in an increase in the existing contamination risk. For example, land that has a low to medium contamination risk in the baseline becomes a high or very high risk.
Moderate adverse	Some contamination above screening criteria is identified and there may be an increase in contamination risk. For example, land that has a very low to low contamination risk in the baseline becomes a moderate or high-risk contamination status as a result of construction or operation.
Minor adverse	Contamination is below relevant screening criteria. Only minor risks exist that could change the contamination status, associated with construction or operation. For example, from a very low risk to low risk.
Negligible	No change in contaminated land risk.
Minor beneficial effect	A reduction in contamination risk of 1 risk level, for example land that has a moderate/low contamination risk in the baseline becomes a low / very low risk.

Source: Adapted from DMRB LA 109 -Geology and soils (2019) and IEMA A New Perspective on Land and Soil in Environmental Impact Assessment and DMRB LA113 land drainage and the water environment

Significance of effects

6.9.7 Significance of potential effects will be determined by cross referencing the ascribed sensitivity of the receptor with the magnitude of impact as shown in Table 6.57. Note that due to the final use for the site and the proximity to the sea (and likely saline impacts on groundwater quality), only the Medium and Low sensitivity receptors will be considered.

6.9.8 Significant impacts are highlighted in blue and those significant impacts potentially relevant to this project are also shown in bold.

Table 6.57: Significance of impact

		Magnitude of impact				
		No change	Negligible	Minor	Moderate	Major
Value / Sensitivity	Very high	Neutral	Slight	Moderate / Large	Large / Very Large	Very Large
	High	Neutral	Slight	Slight / Moderate	Moderate / Large	Large / Very Large
	Medium	Neutral	Neutral / Slight	Slight	Moderate	Moderate / Large
	Low	Neutral	Neutral / Slight	Neutral / Slight	Slight	Slight / Moderate

Source: Mott MacDonald, 2025

Construction Impacts

6.9.9 Exceedances of screening criteria protective of human health were noted for metals (copper and zinc) and electrical conductivity from soil analysis. This suggests the potential for impacts to human health receptors (such as construction workers) upon contact with contaminated soils during the construction phase of the Project.

6.9.10 Based on the current groundwater baseline, no elevated levels of contamination were identified to be present within groundwater. However, construction activities may create a migration pathway that could expose groundwater beneath the site to contamination identified in the soils.

6.9.11 No freshwater surface water body is present within the Project AoI. Impacts due to wastewater discharge and freshwater intake have been scoped out of this assessment as the use of freshwater will be minimal and wastewater discharge is considered in Section 6.2.

6.9.12 The construction impacts of the Project are summarised in Table 6.58. The assessment assumes standard/ embedded mitigation is included.

Table 6.58: Summary of construction impacts

Receptor	Sensitivity	Summary of impact and standard mitigation assumed to be implemented	Magnitude of impact	Significance
Human health receptors (construction workers)	Low	This impact involves the potential ingestion or contact with contaminated soils and arising, or inhalation of dust during construction. It is assumed that standard safe construction practices are implemented, such as personal protective equipment (gloves, masks), damping of dust and safe systems of work will be in place by the supervising construction managers.	Negligible	Slight adverse (not significant)

Human health receptors (nearby site users)	Low	Construction activities have the potential to mobilise contaminants that may become wind-blown dusts and impact on adjacent land users principally via inhalation. It is assumed that, where identified as necessary, soils will be damped down to limit windblown dust and constraints in place to avoid neighbouring site users being present.	Moderate adverse	Slight adverse (not significant)
Groundwater	Medium	Construction activities have the potential of mobilising contaminants and creating preferential contamination transport pathways, such as piles that could expose groundwater to contaminants. It is assumed that good practice is in place to limit any disturbance and creation of pathways. The review of 2022 GI data also suggests the presence of few contaminants in soil that could mobilise. Whilst soils currently in connection with groundwater were identified to contain some metals and chloride above human health criteria, these were not identified in groundwater at unacceptable concentrations, suggesting the risk of significantly affecting groundwater quality is low.	Minor adverse	Slight adverse (not significant)
Surface water	Low	The site does not include any protected sites for ecology and or any areas of surface water dependence	No change	Not Significant

Source: Mott MacDonald, 2025

Operation impacts

6.9.1 Any adverse impacts during the operation of the Project would be managed via standard mitigation practices for an operational scheme such as drainage design, hazardous materials storage containment, inspection and spills/leakage response and suitable disposal and discharge of effluent. Impacts due to wastewater discharge and freshwater intake have been scoped out of this assessment as the use of freshwater will be minimal and wastewater discharge is considered in Section 6.2. The operational impacts of the Project are therefore summarised in Table 6.59.

Table 6.59: Summary of operational impacts

Receptor	Sensitivity	Summary of impact	Magnitude of impact	Significance
Human health receptors (site end users)	Low	It is assumed that safe operational practices are employed, and that the construction of the Project will limit exposure to any residual contamination in soils or groundwater by effectively introducing a barrier by means of hardstanding. The existing gas and vapour monitoring does not suggest concentrations are such that these could be a risk to human health in buildings after construction.	Minor beneficial	Slight beneficial (not significant)

Built environment	Low	Below ground construction materials such as piles, pipeline and concrete structures may be exposed to chemical attack due to aggressive ground conditions, although only chloride was identified. It is assumed that construction materials will consider the location of the Project close to the coast and the saline conditions.	Negligible adverse	Slight adverse (not significant)

Source: Mott MacDonald, 2025

Assumptions and limitations

6.9.2 It is assumed that standard construction practices will ensure the health and safety of construction workers and that safe systems will be in place to limit impacts to human health of those outside the Project site, such as PPE and containment of the Project site and any excavated material.

6.9.3 It is assumed that during construction any hazardous materials will be stored appropriately, and waste will be disposed of in accordance with suitable procedures.

6.9.4 It is assumed that an emergency response plan will be in place to address any accidental spills or leaks of wastewater. This plan will include procedures for containment, cleanup, and notification of relevant authorities

6.9.5 It is assumed that temporary sanitation facilities will be provided for construction workers. These facilities will be regularly maintained, and the wastewater will be treated and disposed of in accordance with environmental standards.

6.9.6 It is assumed that during operation regular maintenance of wastewater treatment systems will be conducted to ensure optimal performance and compliance with discharge standards. This includes routine inspections, cleaning, and replacement of worn-out components.

6.9.7 It is assumed that the plant does not have a dedicated WWTP for sewage during the operation phase. Instead, liquid wastes, including sewage, are disposed of through direct connection with the municipality or via road tanker.

6.9.8 The assessment is based on data available only. This includes 2022 GI data and two gas and vapour monitoring analysis. It should be noted that these may not be sufficient to fully categorise the Project site conditions and risks may still exist from areas not currently included in the GI or monitored.

Summary

6.9.9 No significant impacts were identified using the current data available and therefore no specific mitigation other than standard practices for safe working and training for plant operators have been identified.

6.10 Solid Waste and Material Management

Identification of impact

6.10.1 There is a potential impact stemming from materials handling and storage and waste generated during the construction and operational phases of the Project. Large quantities of waste are expected to be generated from the early works dredging activities, earthworks from excavation activities, surplus of materials and packaging waste. The mismanagement of these activities and materials will be the principal cause to the potential impacts associated with solid waste and materials. Material and substances could potentially escape into the surrounding environment, impacting the soil, groundwater, surface water, air quality, flora and fauna and could have adverse effects on human health.

6.10.2 This assessment has not considered the effects of soil and groundwater contamination or dredging (such as impact on groundwater, human health, and marine impacts) as these have been considered within Soil, Hydrology and Contamination (Section 6.9) and Marine Environment (Section 6.2). Where potential impacts from contaminated land is identified, this chapter addresses the management of this waste or material only.

6.10.3 Disposal of waste to landfill sites will cause permanent reduction of the available landfill void capacity and thus adversely impact the landfills. The environmental impacts applicable to Solid Waste and Material Management is stated in Table 6.60.

Table 6.60: Receptor sensitivity criteria applicable to the Project

Element	Direct Impacts	Adverse Effects	Indirect Impacts
Materials	Material mismanagement	Mismanagement of materials, resulting in the temporary or permanent degradation of the natural environment	Release of greenhouse gas emissions (through transportation) Visual Impacts, noise, vibration, disruption to traffic and other potential causes of nuisance Human Health
Waste	1.Waste mismanagement 2.Generation and disposal of waste	Mismanagement of waste arising, resulting in the temporary or permanent degradation of the natural environment. Reduction in landfill capacity Unsustainable use or loss of resources to landfill that results in the temporary or permanent degradation of the natural environment	Release of greenhouse gas emissions (through transportation and management) Visual Impacts, noise, vibration, disruption to traffic and other potential causes of nuisance

Source: Institute of Environmental Management and Assessment (IEMA) guide to: Materials and Waste in Environmental Impact Assessment (2020)

Assessment criteria

6.10.4 The assessment of impacts from solid waste and materials management has been conducted based on available project information and a desk-based review of publicly accessible information regarding waste management. The methodology for the management of material and solid waste for the construction and operational phases has been based on two different sets of criteria.

- Mismanagement of material and waste
- The Institute of Environmental Management and Assessment (IEMA) guidelines on landfill void capacity.

6.10.5 The criteria stated for sensitivity and magnitude has been used to assess:

- Mismanagement of materials
- Mismanagement of waste

6.10.6 IEMA guide to: Materials and Waste in Environmental Impact Assessment criteria have been stated in Table 6.64 to Table 6.65. The lack of data on landfill void capacity and landfill diversion in Qatar limits the assessment of environmental impacts for waste generation, based on landfill void capacity, thus this assessment is formed on professional judgement and based on other projects of similar size and nature.

6.10.7 For this impact assessment, the following actions have been taken:

- Review of key activities for construction and operational phases for generation of waste and material handling.
- Identification of key waste streams and material used during construction and operational phases.
- Identification of areas of key concern due to their environmental and social significance.
- Estimates and quantification of waste streams.
- Identification of suitable waste management procedures including review and implementation of suitable waste management hierarchy.
- Identification of licensed and suitable waste disposal sites for waste generated during construction and operational phases.
- Identification of transportation requirements for waste disposal as a result of construction and operation of the Project.

6.10.8 Professional judgement has been considered to provide an assessment of effects based on several factors, including:

- The availability of the material resources
- The type of storage and handling required for the materials and waste
- The type of waste generated, e.g. inert, non-hazardous, hazardous
- The availability of suitable facilities within close proximity to the project to treat the waste generated.
- Compatibility of the best practicable environmental option (BPEO) for the waste within the context of the waste hierarchy, i.e. whether generation of the waste can be minimised, the waste can be recycled, landfilled etc.

6.10.9 In line with the impact assessment methodology provided in the Section 6.1 above, the criteria for determining the importance (sensitivity) and magnitude of solid waste receptors are outlined in Table 6.61 and Table 6.62 respectively.

Table 6.61: Receptor sensitivity criteria

Receptor sensitivity	Description
High	Waste and/or raw materials handling related incident impacts on a vulnerable receptor (human or ecological) with little or no capacity to absorb proposed changes or minimal opportunities for mitigation.
Medium	Waste and/or raw materials handling related incident impacts on a vulnerable receptor (human or ecological) with limited capacity to absorb proposed changes or limited opportunities for mitigation.
Low	Waste and/or raw materials handling related incident impacts on a vulnerable receptor (human or ecological) with some capacity to absorb proposed changes or moderate opportunities for mitigation.
Negligible	Waste and/or raw materials handling related incident impacts on a vulnerable receptor (human or ecological) with good capacity to absorb proposed changes or/ and good opportunities for mitigation.

Source: Mott MacDonald, 2025

Table 6.62: Magnitude of Impact criteria

Magnitude of impact (change)	Description
Major	Mismanagement of waste generated and/or raw materials results in a significant incident which potentially causes a fundamental change to the specific environmental conditions assessed resulting in long term or permanent change, typically widespread in nature (regional, national and international) and would require major intervention to return to baseline; exceedance of national standards and limits.
Moderate	Mismanagement of waste generated and/or raw materials results in an incident that potentially causes a detectable change to the specific environmental conditions assessed resulting in non-fundamental temporary or permanent change.
Minor	Mismanagement of waste generated and/or raw materials results in an incident that potentially causes a detectable but minor change to the specific environmental conditions assessed.

Source: Mott MacDonald, 2025

6.10.10 Significance of potential effects will be determined by cross referencing the ascribed sensitivity of the receptor with the magnitude of impact as shown in Table 6.63. Note that due to the final use for the site and the proximity to the Arabian Gulf (and likely saline impacts on groundwater quality), only the medium and low sensitivity receptors will be considered.

6.10.11 Significant impacts potentially relevant to this Project are also shown in bold.

Table 6.63: Significance of impact

		Magnitude of impact				
		No change	**Negligible**	**Minor**	**Moderate**	**Major**
Value / Sensitivity	**Very high**	Neutral	Slight	Moderate / Large	Large / Very Large	Very Large
	High	Neutral	Slight	Slight / Moderate	Moderate / Large	Large / Very Large
	Medium	Neutral	Neutral / Slight	Slight	**Moderate**	**Moderate / Large**
	Low	Neutral	Neutral / Slight	Neutral / Slight	Slight	Slight / Moderate

Source: Mott MacDonald, 2025

6.10.12 The criteria for assessing sensitivity and magnitude for waste according to IEMA guidelines are provided in Table 6.64 and Table 6.65 respectively:

Table 6.64: IEMA guidance for assessing sensitivity for waste management

Sensitivity category	Description
Negligible	For waste management, across construction and/or operation phases, the baseline/future baseline of regional (or where justified, national) inert, non-hazardous, and hazardous landfill void capacities are expected to remain unchanged or are expected to increase through a committed change in capacity.
Low	For waste management, across construction and/or operation phases, the baseline/future baseline of regional (or where justified, national):

Sensitivity category	Description
	Inert and non-hazardous landfill void capacity is expected to reduce minimally: by less than 1% as a result of wastes forecast. Hazardous landfill void capacity is expected to reduce minimally: by less than 0.1% as a result of wastes forecast.
Medium	For waste management, across construction and/or operation phases, the baseline/future baseline of regional (or where justified, national): Inert and non-hazardous landfill void capacity is expected to reduce noticeably: by 1% – 5% as a result of wastes forecast. Hazardous landfill void capacity is expected to reduce noticeably: by 0.1% – 0.5% as a result of wastes forecast.
High	For waste management, across construction and/or operation phases, the baseline/future baseline of regional (or where justified, national): Inert and non-hazardous landfill void capacity is expected to reduce considerably: by 6% – 10% as a result of wastes forecast. Hazardous landfill void capacity is expected to reduce considerably by: 0.5% – 1% as a result of wastes forecast.
Very high	For waste management, across construction and/or operation phases, the baseline/future baseline of regional (or where justified, national): Inert and non-hazardous landfill void capacity is expected to reduce very considerably (by greater than 10%); end during construction or operation; is already known to be unavailable; or would require new capacity or infrastructure to be put in place to meet forecast demand. Hazardous landfill void capacity is expected to reduce very considerably (by greater than 1%); end during construction or operation; is already known to be unavailable; or would require new capacity or infrastructure to be put in place to meet forecast demand.

Source: IEMA guide to: Materials and Waste in Environmental Impact Assessment (2020)

Table 6.65: IEMA guidance for assessing magnitude for waste management

Magnitude category	Description
No change	For waste management: based on landfill void capacity for inert, non-hazardous and hazardous waste, zero waste generation and disposal from the development.
Negligible	For waste management: based on landfill void capacity, the development will reduce: Regional or, where justified, national landfill void capacity baseline** for inert and non-hazardous by less than 1%. National landfill void capacity baseline for hazardous waste** by less than 0.1%.
Minor	For waste management: based on landfill void capacity, the development will reduce: Regional or, where justified, national landfill void capacity baseline** for inert and non-hazardous by 1% – 5%. National landfill void capacity baseline** for hazardous waste by 0.1% – 0.5%.
Moderate	For waste management: based on landfill void capacity, the development will reduce: Regional or, where justified, national landfill void capacity baseline** for inert and non-hazardous by 6% – 10%.

Magnitude category	Description
	National landfill void capacity baseline** for hazardous waste by 0.5% – 1%.
Major	For waste management: based on landfill void capacity, the development will reduce: Regional or, where justified, national landfill void capacity baseline** for inert and non-hazardous by greater than 10%. National landfill capacity baseline** for hazardous waste by greater than 1%.

Source: IEMA guide to: Materials and Waste in Environmental Impact Assessment (2020)

*Notes: ** Estimated as the worst-case scenario, during a defined construction and/or operational phase.*

6.10.13 The significance of effects threshold defined by IEMA (2020) are presented in Table 6.66. The environmental effects based on the effect threshold are considered as Significant for effect thresholds Moderate or above.

Table 6.66: Effect thresholds defined by IEMA for waste management

	Magnitude of impact					
Sensitivity (or value) of receptor		**No change**	**Negligible**	**Minor**	**Moderate**	**Major**
	Very high	Neutral	Slight	Moderate or large	Large or very large	Very large
	High	Neutral	Slight	Slight or moderate	Moderate or large	Large or very large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or large
	Low	Neutral	Neutral or slight	Neutral or slight	Slight	Slight or moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight

Source: IEMA guide to: Materials and Waste in Environmental Impact Assessment (2020)

Assumptions and limitations

6.10.14 The baseline characterisation has been established with limited, available information to date and may evolve as more information and additional assessments become available.

6.10.15 Whilst materials to be used and wastes to be generated during the different phases of the proposed Project have been identified at a high level, exact quantities of wastes and materials have not been defined and may be subject to change following detailed design.

6.10.16 The assessment will be based on the criteria set up in Table 6.61, Table 6.62 and Table 6.63 for mismanagement of materials and waste. For disposal of waste, IEMA's guidance set out in Table 6.64, Table 6.65 and Table 6.66 for landfill void capacity and landfill diversion will not be used for the assessment of impacts on the environment as there is no available data for these in Qatar. Professional judgement will be used to apply the guidance for mismanagement of materials and waste for the impact assessment.

6.10.17 If the information regarding the recovery and diversion from landfill volumes or weights is unavailable, the impact assessment will be based on the likely composition of a waste stream and reasonable assertions will be made on disposal.

6.10.18 The information provided by the Client at the time of drafting this Chapter has been used to assess the materials management and storage for the Project and the waste that may be generated by the Project.

6.10.19 It is assumed that the Project will aim to minimise the generation of waste. It is assumed that all site-won topsoil will be suitable for reuse on-site or on projects locally. It is assumed that all vegetation and made ground waste will be sent to local waste infrastructure for treatment and reuse and thus will not require to be landfilled.

6.10.20 It has been assumed that all remaining waste identified for disposal will be sent to landfill.

6.10.21 Information on permitted capacity of waste management facilities has been used in the assessment, based on current publicly available data (at the time of writing). However, it should be noted that the capacity information obtained from the desk-based study for the previous RAF site does not necessarily mean that the capacity detailed would be available for use by the Project.

6.10.22 It is assumed that waste will be appropriately managed during construction and operation, meeting any local legal and international requirements.

Construction phase impact

6.10.23 The construction phase for the Project will entail all preparations necessary to achieve operational phase. The site preparation and development include clearance of all waste, stones and metals, followed by excavation, backfilling, grading, levelling and the construction of the IWPP.

6.10.24 Excavation activities include:

- Deep excavation area: Seal pit/Sea water pump station
- Seal pit [L68m x W60m x 7.65m depth (from EL+1.10)]
- Sea water pump station [L100m x W75m x 11.65m depth (from EL+1.10)

6.10.25 A laydown area of 87,500m^2 exterior to the IWPP plant will be required to perform the works of the water island.

6.10.26 The main waste generated will be excavation spoil and will be disposed off-site. Appropriate storage will be provided on site to avoid impacts on air quality and marine environment that includes watering down during strong wind periods.

Construction Phase Impact - Materials

6.10.27 A summary of the construction impacts, based on the mismanagement of materials, their effects and likely significance before the application of mitigation is outlined in Table 6.67.

Table 6.67: Summary of significance assessment of potential unmitigated impacts based on mismanagement of material during the construction phase*

Activity	Potential Impact	Adverse/ Beneficial	Permanent/ Temporary	Impact Magnitude	Receptor Sensitivity	Impact Evaluation	Significance of Effect
Construction							
Material Handling	Contamination of environments (specifically surface watercourse, groundwater,	Adverse	Temporary	Moderate	Low	Minor	Not significant

Activity	Potential Impact	Adverse/ Beneficial	Permanent/ Temporary	Impact Magnitude	Receptor Sensitivity	Impact Evaluation	Significance of Effect
	marine environment and the ground) due to leakage and spillage of materials associated with poor handling and storage arrangements						
	Contamination of material due to improper handling/storage	Adverse	Temporary	Minor	Low	Minor	Not significant
Spoil handling and disposal	Ineffective spoil/excavated material handling, storage and disposal causing contamination of environment	Adverse	Temporary	Moderate	Low	Minor	Not significant

Source: Mott MacDonald, 2025 *Based on professional judgement

Construction Phase Impact - Waste generation

6.10.28 The key solid waste streams that are envisaged to be generated during the construction of the Proposed project include:

Inert waste:

- Construction material (e.g., concrete spills, cement, steel, bricks, etc. that are brought to site and not used)
- Demolition waste such as concrete and asphalt
- Packaging material (paper and cardboard, plastic wrappings)
- Scrap metals

Non-hazardous waste:

- Scrap wood (pallets, timber, green waste)
- Domestic wastes such as paper, kitchen wastes, food wastes from workforce welfare and accommodation facilities
- Excavated materials (spoil)
- Dredged materials (spoil)
- Plastic or metal-based packaging
- Tyres

Hazardous waste

- Surplus of waste chemicals, oils, paints, solvents, lubricants, hydraulic fluids and their containers
- Contaminated oily rags
- Contaminated excavated or dredged materials (spoil)
- Contaminated/hazardous demolition waste
- Batteries
- Fluorescent tubes
- Cable containing substances
- Oily debris from worksites
- Contaminated soils (potentially from leakage and spillage)
- Spill cleanup materials from oil and fuel
- Waste Electronics and Electrical Equipment (WEEE) (instruments, electronic) containing hazardous substances

6.10.29 In addition, inert, non-hazardous and hazardous waste is also anticipated to be generated from the dredging vessels.

6.10.30 For waste generated from excavation, indirect adverse effects may arise from embedded carbon, greenhouse gases, haulage, noise, dust, nuisance, vehicle emissions and water pollution.

6.10.31 The percentage of waste expected to be recovered or recycled during the construction phase of the Project:

- Concrete: 0%
- Steel: 95%
- Packaging: 90%

6.10.32 The volume of waste (disposal soil) expected to be sent to landfill during construction is approximately 160,000m^3 (on shore) and is likely to be silty sand, limestone. Measures will be taken to mitigate the adverse effects on the environment from the generation of solid waste and its disposal during the construction phase and site preparation of the proposed Project.

6.10.33 A summary of the construction impacts, based on the generation and mismanagement of waste, their effects and likely significance before the application of mitigation is outlined in Table 6.68.

Table 6.68: Summary of significance assessment of potential unmitigated impacts based on mismanagement of material during the construction phase*

Activity	Potential Impact	Adverse/ Beneficial	Permanent/ Temporary	Impact Magnitude	Receptor Sensitivity	Impact Evaluation	Significance of Effect
Construction							
Material Handling	Contamination of environments (specifically surface watercourse, groundwater, marine environment and the ground) due to leakage and	Adverse	Temporary	Moderate	Low	Minor	Not significant

Activity	Potential Impact	Adverse/ Beneficial	Permanent/ Temporary	Impact Magnitude	Receptor Sensitivity	Impact Evaluation	Significance of Effect
	spillage of materials associated with poor handling and storage arrangements						
	Contamination of material due to improper handling/storage	Adverse	Temporary	Minor	Low	Minor	Not significant
Spoil handling and disposal	Ineffective spoil/excavated material handling, storage and disposal causing contamination of environment	Adverse	Temporary	Moderate	Low	Minor	Not significant

**Based on professional judgement*

6.10.34 IEMA guidance for environmental impact assessment for disposal of waste, require information of available landfill void capacities within the region. Mitigation measures will be implemented on all aspects of the Project to reduce the effects of waste generation by the Project during the construction phase. Potential impacts are not expected to be significant provided GIIP for waste management and disposal is adhered to throughout the construction phase of the Project.

6.10.35 In the absence of information for available regional landfill void capacities and the quantities of waste arisings, it is anticipated that after the application of mitigation for the construction phase, the disposal of waste from the Project is unlikely to have a significant effect on regional landfill void capacities. Therefore, based on mismanagement criteria, for the construction phase, the sensitivity of effect from disposal of waste is likely to be Medium, the magnitude will be Minor, effects are likely to be Slight and thus not significant.

Operational phase impact

Operational Phase Impact - Materials

6.10.36 Materials that will need to be managed during the operation phase of the Project will include equipment for the power and desalination plant and includes materials used for the operation of the power and water plant. The materials anticipated to be used is initially outlined in Table 6.69.

6.10.37 Materials considered to be of a hazardous nature are identified in Table 6.69 and will require special consideration, particularly any final treatment and disposal options. Some materials will have a known consumption and storage volume whereas the consumption and volume of other materials will be dependent on routine maintenance and outage activities, therefore it is difficult to give exact quantities for all materials.

6.10.38 If materials are not appropriately stored and contained, it could result in contamination of the environment. In addition, hazardous materials may pose environmental, health and safety hazards if not stored in an appropriate manner.

Table 6.69: Material/Chemicals to be used during the operation of the Project facility

Material/Chemical	Use/Purpose	Hazard	
Scale Inhibitor	Water treatment	Flammable	Eye & Skin irritant
Hydrochloric Acid (32%)	Water treatment	Toxic Corrosive	Eye & Skin irritant
Caustic Soda (25%)	Water treatment	Toxic Corrosive	Eye & Skin irritant
Ferric Chloride/Coagulant (40%)	Water treatment	Corrosive	Eye & Skin irritant Danger to environment
Sodium Hypochlorite (12.5%)	Water treatment	Toxic	Eye & Skin irritant Danger to environment
Anionic Polymer (Flopam AN 934 AB20)	Water treatment	Toxic	NA
Cationic Polymer (NEILCP 151)	Water treatment	Toxic	Eye & Skin irritant
Sodium Bisulfite	Water treatment	Toxic	Eye & Skin irritant Other
Hydrated Lime	Water treatment	Toxic	Eye & Skin irritant Danger to environment Other
Cationic Resin (AmberLite™ IRC120 H Ion Exchange Resin)	Water treatment	Corrosive	Eye & Skin irritant
Anionic Resin (AmberLite™ IRA402 Cl Ion Exchange Resin)	Water treatment	NA	NA
Buffer Solution (pH 10)	Laboratory reagent	Toxic	Toxic when ingested
Bromocresol Green pH Indicator Analytical Reagent (AR)	Laboratory reagent	NA	NA
Ethanol Absolute Anhydrous	Laboratory reagent	Toxic Flammable	Carcinogen Eye & Skin irritant Danger to environment
Oxalic Acid Universal Reagent (UR)	Laboratory reagent	Corrosive	Eye & Skin irritant Danger to environment
Sodium Hydrogen Sulphite AR	Laboratory reagent	NA	Other
Sodium Nitrite UR	Laboratory reagent	Toxic	Eye & Skin irritant Other
Ethylene Diamine Tetra Acetic Acid	Laboratory reagent	Acute toxicity	Eye & Skin irritant Danger to environment
Methyl Red pH Indicator (pH 4.2-6.3)	Laboratory reagent	Irritant	Eye & Skin irritant Danger to environment
Potassium Iodide	Laboratory reagent	Acute toxicity	Other
Ammonium Ferrous Sulphate	Laboratory reagent	Irritant	Eye & Skin irritant
Potassium Iodate	Laboratory reagent	Oxidative Acute toxicity Irritant	Eye & Skin irritant Other

Material/Chemical	Use/Purpose	Hazard	
Iron (III) Ammonium Sulphate	Laboratory reagent	Toxic	Eye & Skin irritant
Phenol Crystals	Laboratory reagent	Toxic Corrosive	Danger to environment Other
Sodium Hypochlorite Solution (4-6%)	Laboratory reagent	Corrosive	Eye & Skin irritant Other
Mercuric Nitrate Monohydrate	Laboratory reagent	Toxic	Eye & Skin irritant Danger to environment Other
Ammonia Solution 25%	Water treatment Laboratory reagent	Corrosive	Eye & Skin irritant Danger to environment Other
Starch Soluble AR	Laboratory reagent	NA	NA
Acetone AR	Laboratory reagent	Flammable	Eye & Skin irritant Other
Potassium Hydroxide Pure Pellets AR	Laboratory reagent	Corrosive	Eye & Skin irritant Other
Potassium Sulphate AR	Laboratory reagent	NA	NA
Sodium Chloride AR	Laboratory reagent	NA	NA
Acetic Acid Glacial AR	Laboratory reagent	Toxic Flammable Corrosive	Eye & Skin irritant Other
Sodium Hydrogen Sulphate Monohydrate	Laboratory reagent	Toxic Corrosive	Eye & Skin irritant
Bromophenol Blue AR, American Chemical Society (ACS) Grade	Laboratory reagent	NA	NA
Glycerol AR	Laboratory reagent	NA	NA
Ammonium Molybdate AR	Laboratory reagent	Toxic	Danger to environment
Ammonium Chloride AR	Laboratory reagent	Toxic	Danger to environment
Silver Nitrate AR	Laboratory reagent	Corrosive	Danger to environment Other
Sodium Hydrogen Carbonate UR	Laboratory reagent	NA	NA
Nitric Acid (69-72%) AR	Laboratory reagent	Corrosive	Eye & Skin irritant Other
Methyl Orange (pH indicator)	Laboratory reagent	Toxic	NA
Aniline AR	Laboratory reagent	Toxic Corrosive	Carcinogen Eye & Skin irritant Danger to environment

Material/Chemical	Use/Purpose	Hazard	
			Other
Hydrochloric Acid (35-38%) AR	Laboratory reagent	Toxic Corrosive	Eye & Skin irritant Other
Barium Chloride Dihydrate	Laboratory reagent	Toxic	Eye & Skin irritant Danger to environment
Sodium Sulphite Anhydrous AR	Laboratory reagent	Irritant	Eye & Skin irritant Other
Buffer Solution (pH 4)	Laboratory reagent	NA	NA
Buffer Solution (pH 7)	Laboratory reagent	NA	NA
Ammonia Solution 25% UR	Laboratory reagent	Corrosive	Eye & Skin irritant Danger to environment Other
Merck Potassium Permanganate AR	Laboratory reagent	Irritant	Eye & Skin irritant Danger to environment Other
Sulphuric Acid 98% AR	Laboratory reagent	Corrosive	Carcinogen Eye & Skin irritant Danger to environment Other
Z0K Cleaning Fluid for Compressors of Gas turbine Engines	Water treatment	Corrosive	Eye & Skin irritant
Caustic Flakes	Water treatment	Toxic Corrosive	Eye & Skin irritant
Trisodium Phosphate	Water treatment	Corrosive	Eye & Skin irritant Danger to environment
O_2 Scavenger 25%	Water treatment	Corrosive	Eye & Skin irritant Other
Corrosion inhibitor (EC-162)	Water treatment	Toxic	Eye & Skin irritant
Biocide (EC-401)	Water treatment	Toxic	Eye & Skin irritant
Ammonia Solution 8%	Water treatment Laboratory reagent Other	Corrosive	Eye & Skin irritant Danger to environment Other

Source: Sumitomo, 2025

6.10.39 Exact sourcing, storage location, and the handling of materials will be included as part of the materials management component of the material management plan which will be developed by the Contractor.

6.10.40 As with construction, the reuse of materials will be explored, based on the facilities available in the area and applicable waste legislation.

6.10.41 The appropriate management and storage of materials during the operation of the facility is essential to mitigate the effects on the environment.

6.10.42 A summary of the operational impacts, based on the mismanagement of materials, their effects and likely significance before the application of mitigation is outlined in Table 6.70.

Table 6.70: Summary of assessment of impacts based on mismanagement of material during the operational phase*

Activity	Potential Impact	Adverse/ Beneficial	Permanent/ Temporary	Impact Magnitude	Receptor Sensitivity	Impact Evaluation	Significance of Effect
Operation							
Material Handling and Storage	Contamination of environments (specifically surface watercourse, groundwater, marine environment and the ground) due to leakage and spillage of materials associated with poor handling and storage arrangements	Adverse	Temporary	Moderate	Low	Minor	Not significant
	Contamination of material due to improper handling /storage	Adverse	Temporary	Minor	Low	Minor	Not significant

Source: Sumitomo Corporation, 2025

*Based on professional judgement

Operational Phase Impact - Waste generation

6.10.43 The key solid waste streams that are envisaged to be generated during the operation of the proposed Project are listed below. The exact volume and composition will vary depending on the operating condition so cannot be provided at this stage.

Inert waste, such as:

- Construction material for maintenance works (e.g., concrete, cement, steel, bricks etc that are brought to site and not used)
- Packaging material (paper and cardboard, plastic wrappings)

Non-Hazardous waste, such as:

- Materials from seawater intake screens
- Salt and chlorine by-products of desalination (considered within the marine Section 6.2)
- Domestic wastes such as paper, kitchen wastes and food wastes from kitchen and worker facilities
- Wood (pallets, timber, green waste)
- Scrap metal, plastics from maintenance activities
- Materials and chemicals required for operation of desalination plant

Hazardous waste, such as:

- Oily sludge from drainage facilities/systems
- Sludge or activated carbon from wastewater treatment plant
- Process chemicals, waste oils, paints, lubricants, solvents containers
- Maintenance wastes such as oily wastes, rags and filters
- Batteries
- Fluorescent tubes
- Waste electronics and electrical equipment (WEEE) (instruments, electronic) containing hazardous substances
- Contaminated packaging
- Contaminated effluents/materials from spills, leakages and/or accidental discharge

6.10.44 The percentage of waste expected to be recovered or recycled and the volumes of waste to be sent to landfills during the operational phase of the proposed Project is not yet known as this is dependent on the operating condition of the facility.

6.10.45 A summary of the operational impacts, based on the generation and mismanagement of waste, their effects and likely significance before the application of mitigation is outlined in Table 6.71.

Table 6.71: Summary of significance assessment of potential unmitigated impacts based on generation and mismanagement of waste during the operation phase

Activity	Potential Impact	Adverse/ Beneficial	Permanent/Temporary	Impact Magnitude	Receptor or Sensitivity	Impact Evaluation	Significance of Effect
Operation							
Waste generation, handling, and storage (from land platform construction) Hazardous and non-hazardous	Contamination of environments (specifically surface watercourse, groundwater, marine environment and the ground) due to leakage and spillage of	Adverse	Temporary	Major	Medium	Major	Significant

Activity	Potential Impact	Adverse/ Beneficial	Permanent/Temporary	Impact Magnitude	Receptor Sensitivity	Impact Evaluation	Significance of Effect
	wastes associated with poor handling and storage arrangements						
	Fugitive emissions, such as dust, associated with the handling and storage of some waste streams	Adverse	Temporary	Minor	Low	Negligible	Not significant
	Visual amenity impacts associated with poor storage of waste at workplace	Adverse	Temporary	Minor	Low	Negligible	Not significant
	Health and safety hazards due to inappropriate handling and storage of waste particularly hazardous waste	Adverse	Permanent	Major	Medium	Major	Significant
Final waste disposal	Pressure on existing landfill capacities within the State of Qatar	Adverse	Permanent	Minor	Medium	Negligible	Not significant
	Increased travelling from	Adverse	Temporary	Minor	Low	Negligible	Not significant

Activity	Potential Impact	Adverse/ Beneficial	Permanent/Temporary	Impact Magnitude	Receptor or Sensitivity	Impact Evaluation	Significance of Effect
	transporting waste from the Project site						

Source: Sumitomo Corporation, 2025

*Based on professional judgement

6.10.46 IEMA guidance for environmental impact assessment for disposal of waste, require information of available landfill void capacities within the region. Mitigation measures will be implemented on all aspects of the Project to reduce the effects of waste generation by the proposed Project during the operational phase. Potential impacts are not expected to be significant provided GIIP for waste management and disposal is adhered to throughout the operational phase of the Project.

6.10.47 In the absence of information for available regional landfill void capacities and the quantities of waste arisings, it is anticipated that after the application of mitigation for the operational phases, the disposal of waste from the Project is unlikely to reduce the regional landfill void capacity. So based on IEMA guidance, for operational phase, the sensitivity of effect from disposal of waste is likely to be Low, the magnitude will be Negligible, effects are likely to be Neutral or Slight and thus not significant.

Summary of impacts

6.10.48 The impacts from solid waste and materials management during the construction and operation phase of the Project will not be significant once mitigation measures are introduced. The findings of this assessment are summarised in Table 6.72.

Table 6.72: Summary of impacts and significant effects

Activity	Project Phase	Impact	Sensitivity	Magnitude	Impact Evaluation	Mitigation Measures	Significance of Effect
Spoil handling & disposal	Construction	Disposal of spoil and excavation material causing contamination of environment	Low	Moderate	Minor	Where possible, spoil material will be used as construction material Material that cannot be re-used, disposal method will be in spoil disposal sites that are MoECC certified	Significant
Materials management & storage	Construction Operation	Spills and leakages of hazardou	Low	Moderate	Minor	Material management and storage areas will be introduced and	Not Significant

Activity	Project Phase	Impact	Sensitivity	Magnitude	Impact Evaluation	Mitigation Measures	Significance of Effect
		s materials that can affect the environment				specially designed with considerations to: Located away from sensitive receptors Prevention from being spoiled Unlikely to be damaged Safely and easily accessible PPE located near by Bunded and located next to spill kits	
Waste generation, management & storage	Construction Operation	Contamination of environment due to leakage and spillage of wastes associated with poor handling and storage	Medium	Major	Major	Construction phase WMP Operational WMP Waste hierarchy with avoidance of waste is preferable On site storage facilities designed to include:	Significant
		Fugitive emissions such as dust and odour	Low	Minor	Negligible	Separate storage for hazardous & non-hazardous waste	
		Visual amenity impacts associated with poor storage of waste	Low	Minor	Negligible	Separate skips for each waste stream to allow for segregation All skips to have suitable cover	Not significant
		Health and safety hazards due to inappropr	Medium	Major	Major	Liquid waste/oil/chemicals to be stored in bunded areas with 110% of	Significant

Activity	Project Phase	Impact	Sensitivity	Magnitude	Impact Evaluation	Mitigation Measures	Significance of Effect
		iate handling and storage of waste particularly hazardous waste				total storage volume Spill kits easily accessible	
Final waste disposal	Construction Operation	Use of landfill where avoidance is not possible	Low	Minor	Negligible	Characterise each waste stream as hazardous or non-hazardous Minimise waste generation Where waste generation is unavoidable, re-use, recycling and recover in line with best practices Locally available facilities for recycling, recovery and disposal should be MoECC certified	Not significant
		Increased travelling from transporting waste from the Project site	Low	Minor	Negligible	Facilities to be in close proximity to Project site	Not significant

Source: Mott MacDonald, 2025

6.11 Landscape and Visual Impact

Methodology

6.11.1 This assessment evaluated the effects of construction activities, such as machinery and temporary structures, as well as operational activities, including permanent structures and lighting, on the landscape character and visual amenity. Using professional judgment, the magnitude and significance of these impacts are defined, considering the sensitivity of the landscape and the extent of change, considering how the project may alter the visual and aesthetic qualities of the area.

Construction impacts

6.11.2 During the construction phase due to the machinery and equipment to be used (i.e potential for high cranes and night illumination), these may have the potential to negatively impact the existing landscape. However, since the Project is located on a previously developed industrial site and within the existing RAF Complex the significance of the visual impact is not considered to be high.

6.11.3 The inhabitants of Al Wakrah may be attributed a high sensitivity level, however, since the Complex already forms part of their visual landscape, and the construction is considered to be in line with existing impacts, and sensitivity is considered low.

Operational impacts

6.11.4 The impact during operation is considered to be negligible for the Project due to the industrial history of the site and proximity to the wider Complex.

6.11.5 The inhabitants of Al Wakrah may be attributed a high sensitivity level, however, since the Complex already forms part of their visual landscape, and the operation is considered to be in line with existing impacts, and sensitivity is considered low.

6.12 Transport

Methodology

6.12.1.1 This assessment examined the impact of construction activities, such as the increase in vehicular movements and material delivery trucks, as well as operational activities, including the rise in traffic from employees and service vehicles, on the transport network. By employing professional judgment, the magnitude and significance of these impacts was predicted. The evaluation considered the sensitivity of the transport network and the extent of change, and how the Project may influence traffic volumes, congestion, and the capacity of the existing infrastructure.

Construction impacts

6.12.2 The traffic from construction activities will include vehicular movements, and materials delivery trucks, waste transport trucks, soil transport trucks and vehicles for other purposes. Traffic is expected to be impacted temporarily during construction works due to increased vehicular traffic from trucks, plants, buses, machines and workers movement. it is expected that the impact from these vehicular emissions is slight, short term and intermittent in nature.

Operational impacts

6.12.3 During operation it is anticipated that there would be a small increase in vehicle traffic compared to the current baseline, due to increased vehicular traffic from trucks, plants, buses, machines and workers movement. However, due to the existing industrial nature of the site and surrounding area the operational increases are anticipated to be negligible.

6.13 Ecosystem services

Impact assessment methodology

6.13.1 The methodology aligns with the internationally recognized standards and guidelines set out in Section 4. Firstly, the relationship between nature and human good quality of life was established using the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) (IPBES, Conceptual Framework, 2013). IPBES is an independent intergovernmental body with nearly 140 member states established to strengthen the science-policy interface for biodiversity and ecosystem services, for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development. It is recognised as a leading authority in collating decision-relevant information on biodiversity and ecosystem services at a global scale.

6.13.2 The Natural Capital Protocol (Coalition Capitals, 2016) provides a systematic framework for understanding the generation of value from natural capital stocks through flows of ecosystem services, and guidance on carrying out a natural capital and ecosystem services assessment. The methodology adopted in this baseline assessment is aligned with the early stages of the Natural Capital Protocol, which provide guidance on identifying natural capital assets and ecosystem services to include in assessments.

6.13.3 The classification of natural capital stocks and ecosystem services used in the baseline assessment follows international best practice standards and literature, with natural capital classified according to the framework in Leach et al. 2019 (Leach, et al., 2019) and ecosystem services according to the latest version (version 5.1) of the Common International Classification of Ecosystem Services (European Environment Agency, 2018). Leach et al. 2019 provides a systematic and transparent framework for classifying natural capital assets to use as the basis of assessments. CICES is designed to help measure, account for, and assess ecosystem services, to standardise the way ecosystem services are described. It was originally developed in the context of work on the United Nations System of Environmental-Economic Accounting (UN SEEA) and has been widely adopted in ecosystem services research and practice. The CICES classification includes provisioning, regulating and cultural ecosystem services, but not supporting ecosystem services. This is in order to avoid double-counting of benefits in ecosystem services assessments, as the value provided by supporting services will be captured as part of the benefits of other ecosystem services (as supporting services by definition underpin delivery of other ecosystem services), while noting IPBES NCP approach discussed previously.

6.13.4 Lastly, the International Finance Corporation's Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (IFC PS6) (IFC, 2019) is a key driver for development projects adopting a natural capital approach and undertaking an ecosystem services assessment. IFC PS6 is seen as a leading development finance biodiversity safeguarding standard, and compliance is often required for development projects to access finance. One of the three objectives of IFC PS6 is to maintain the benefits from ecosystem services, noting that ecosystem services are often underpinned by biodiversity. Where ecosystem services are likely to be impacted by a project, IFC PS6 requires a systematic review of priority ecosystem services considering project impacts and dependencies. Additionally, IFC PS4 and 5 also require consideration of ecosystem services, IFC PS4 requires projects to assess and mitigate any negative impacts on ecosystem services that could affect community health and safety and IFC PS5 requires that projects must restore or replace ecosystem services that are lost due to land acquisition or resettlement. The review of ecosystem services is presented in this baseline assessment.

6.13.5 Furthermore, the Equator Principles (The Equator Principles Association, 2020) act as a financial industry benchmark for determining, assessing and managing environmental and social risks in projects, and promote comprehensive assessment to avoid negative impacts on ecosystems and communities, which an ecosystem service assessment attempts to link together.

Identification of impacts

6.13.6 As the basis for identifying impacts on ecosystem services, a natural capital and ecosystem services baseline was developed, with the associated map and further detail provided in section 6. Using the natural capital baseline map, a spatial overlay was conducted in GIS to identify the area of each natural capital stock from the baseline that overlapped directly with the Project components (and so would be permanently lost) and those stocks that fell within the 1km buffer (and so may be temporarily or permanently impacted).

6.13.7 The impact assessment considered changes in ecosystem services delivery compared to the baseline. The approach was qualitative and assessed the relationship between changes in the area of the stock and change to ecosystem service delivery based on academic literature, Project documentation and expert judgement. It considered impacts in the construction and operational phases. Potential management, mitigation and monitoring approaches to reduce impacts, and any residual impact, were also assessed qualitatively based on project documentation, expert judgement and academic literature.

6.13.8 The Project will cause a direct and permanent loss of some natural capital stocks of the terrestrial habitat, specifically areas of sparse vegetation and soils. Impact on the marine habitats will include temporary and permanent disturbance of marine sediments and associated fish populations during construction and permanent loss of open marine water habitats in the immediate footprint of the refurbished intake and new outfall of the Project. Open marine water will still be present in the footprint of the new outfall pipe; however the temporary dredging and permanent operation of the outfall pipe will cause persistent anthropogenic disturbance to the marine environment. Therefore, for the purposes of the ecosystem services assessment, open marine water stocks located within the footprint of the outfall pipe were also considered to be permanently lost. Although the actual loss of open marine water areas is somewhat limited indirect impacts from sedimentation, changed water quality, and habitat disturbance are expected to extend throughout the marine environment within the AoI.

Sensitive receptors

6.13.9 The impact assessment considered ecosystem services as the final receptors that may change as a result of the Project, but through the direct receptor of natural capital stocks. All natural capital stocks identified in the baseline, set out in section 6, have the potential to change as a result of the Project, and stocks in both the terrestrial and marine environments are expected to be permanently lost.

6.13.10 The sensitivity of ecosystem services to changes in natural capital stocks as a result of the Project was assessed qualitatively. Two key aspects were considered:

- The ability of natural capital stocks to withstand and recover from changes
- The importance of the natural capital stocks in the locations impacted by the Project for providing the ecosystem service, and the extent to which it could be provided by displaced stocks and/or the level of provision maintained to the same beneficiaries by the same types of stock in surrounding locations.

6.13.11 The most sensitive ecosystem services were those provided by the most vulnerable stocks and for which the specific stocks impacted by the Project were important in provision of the service. For most ecosystem services, the amount (area) of the stock strongly affects the level of service provision, and so the area of stock impacted by the Project is an important aspect in consideration of importance of the stock. However, even impacts on stocks where there is a very small area of a certain type may have important ecosystem service implications, particularly if the change is significant in the context of remaining stock in the wider landscape.

Assumptions and limitations

6.13.12 The assessment of impacts on ecosystem services was carried out against the natural capital baseline, and so the limitations and assumptions outlined in the ecosystem services baseline of section 6 also apply to the impact assessment.

6.13.13 The ecosystem services assessment considered the changes in natural capital stocks associated with the Project AoI. Any temporary facilities, access channels or roads that will be used for construction have not been included in the ecosystem services assessment, as at the time of the assessment their locations are unknown. Temporary adverse impacts caused by construction activities have not been considered separately, and it is assumed that there will be no temporary loss of natural capital stocks. Any long-term adverse impacts are assumed to be localised to the area that is approximately 1km outside the boundaries of the Project components.

Impact Assessment

Construction phase

6.13.14 During the construction phase, the Project will include significant land clearance, excavation, and earthmoving activities, building and infrastructure construction, and installation of marine intake and outfall systems. While the footprint of the Project largely consists of built-up area, construction activities will result in the permanent removal of terrestrial natural capital stocks, including significantly modified habitat with bare/sparce vegetation and soils. Construction activities undertaken in the marine environment will include dredging activities, seabed excavation, and refurbishment of the existing intake system and installation of an outfall pipeline, resulting in direct habitat loss and increased turbidity and sedimentation.

Table 6.73: Potential construction phase impacts on ecosystem services identified within the AoI

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
Provisioning (Biotic)			
1.1.1.1	Cultivated terrestrial plants for nutritional purposes	Agriculture and cropland	Construction activities may generate dust which could settle on nearby agriculture and cropland. This could reduce photosynthesis efficiency, potentially impacting crop growth and yield, although the effects are expected to be minor and temporary given the project’s industrial setting.
Regulation & Maintenance (Biotic)			
2.1.1.1	Bio-remediation by micro-organisms, algae, plants, and animals	Fish (and other marine species); seagrass bed	Plankton and other species of marine organisms, such as relatively sedentary macro-invertebrate communities on the seabed, will be displaced and destroyed by the dredging to establish the outfall pipeline. This will lead to a reduction in the bio-remediation services that these species provide to the waters surrounding the Project. Given the distance separating the

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
			identified seagrass from the construction activities, it is unlikely that temporary increases in turbidity and sedimentation will impact these stocks.
2.1.1.2	Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals	Fish (and other marine species); seagrass bed	The benthic macro-invertebrate community and plankton in the water column provide filtration services that contribute to good water quality. However, construction activities, including construction of the outfall pipeline, are expected to have negative impacts on these species, such as habitat loss, entrainment during dredging, increasing suspended sediment and turbidity and depleting dissolved oxygen, with resulting negative impacts to the filtration services that they provide. Given the distance separating the identified seagrass from the construction activities, it is unlikely that temporary increases in turbidity and sedimentation will impact the health and composition of these stocks.
2.1.2.2	Noise attenuation	Herbaceous vegetation	Herbaceous vegetation has been identified within the the Project AoI and outside the Project footprint, and therefore temporary construction clearance is not anticipated. Excessive dust deposition due to construction of the Project may result in adverse effects. However, given the distance separating the herbaceous vegetation from the Project footprint, it is unlikely that temporary construction activities will alter the health and composition of the herbaceous vegetation.
2.1.2.3	Visual screening	Herbaceous vegetation	Herbaceous vegetation has been identified within the Project AoI and outside the Project footprint, and therefore temporary construction clearance is not anticipated. Excessive dust deposition due to construction of the Project may result in adverse effects. However, given the distance separating the herbaceous vegetation from the Project footprint, it is unlikely that temporary construction activities will alter the health and composition of the herbaceous vegetation.
2.2.1.1	Control of erosion rates	Herbaceous vegetation; permanent surface waterbody	Temporary construction clearance along the shoreline, and/or changes in the surrounding habitat such as changes in the natural flow of water, salinity or excessive dust deposition due to construction of the Project, may alter the health and composition of the permanent surface waterbodies adjacent the Project footprint, leading to potential reductions in provision of this ecosystem service. Given the distance separating the herbaceous vegetation from the Project footprint, it is unlikely that construction activities will impact the health and composition of these stocks and the provision of this ecosystem service.

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
2.2.1.2	Buffering and attenuation of mass movement	Herbaceous vegetation; permanent surface waterbody	Temporary construction clearance along the shoreline, and/or changes in the surrounding habitat such as changes in the natural flow of water, salinity or excessive dust deposition due to construction of the Project, may alter the health and composition of the permanent surface waterbodies adjacent the Project footprint, leading to potential reductions in provision of this ecosystem service. Given the distance separating the herbaceous vegetation from the Project footprint, it is unlikely that construction activities will impact the health and composition of these stocks and the provision of this ecosystem service.
2.2.1.3	Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	Herbaceous vegetation; permanent surface waterbody	Temporary construction clearance along the shoreline due to construction of the Project may alter the health and composition of the permanent surface waterbodies adjacent the Project footprint. These impacts could adversely affect the provision of natural flood protection along the coast. Furthermore, Project construction activities, such as discharges from construction sites and potential pollution events could impact surrounding habitat, including the herbaceous vegetation, further reducing the regulation of water flows, increasing surface runoff and reducing groundwater recharge during construction.
2.2.1.4	Wind protection	Herbaceous vegetation	Herbaceous vegetation has been identified within the Project AoI and outside the Project footprint, and therefore temporary construction clearance is not anticipated. Excessive dust deposition due to construction of the Project may result in adverse effects. However, given the distance separating the herbaceous vegetation from the Project footprint, it is unlikely that temporary construction activities will alter the health and composition of the herbaceous vegetation.
2.2.2.1	Pollination (or 'gamete' dispersal in a marine context)	Open marine water	Construction activities, including habitat disturbance and dredging to establish the outfall pipeline, are expected to temporarily increase sediment and turbidity in the open marine water. These temporary effects may act as a biophysical barrier to gamete dispersal for marine species that use coastal and sand bank habitats around the Project site as spawning and nursery grounds.
2.2.2.3	Maintaining nursery populations and habitats (Including gene pool protection)	Seagrass bed; open marine water; permanent surface waterbody; fish (and other marine species)	Coastal and sand bank habitats that provide spawning and nursery ground for marine species (including commercially important species of fish, shrimp and crab) will be temporarily cleared and degraded due to construction of the Project, including refurbishment of the existing intake system and installation of an outfall pipeline. Given the distance separating the identified seagrass from the Project, it is unlikely that temporary

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
			construction activities will impact the health and composition of these stocks.
2.2.5.2	Regulation of the chemical condition of salt waters by living processes	Seagrass bed; fish (and other marine species)	Phytoplankton and other marine algae, which help maintain the chemical balance of saltwater environments, will be displaced due to construction of the outfall pipeline, however plankton are highly resilient and likely to recover quickly from disturbances. Given the distance separating the identified seagrass from the Project, it is unlikely that temporary construction activities will impact the health and composition of these stocks.
2.2.6.1	Regulation of chemical composition of atmosphere and oceans	Seagrass bed; herbaceous vegetation; agriculture and cropland; permanent surface waterbody	Phytoplankton communities, which provide a carbon sequestration service, will be displaced due to construction of the outfall pipeline, however these communities are resilient and likely to recover quickly from disturbances. Given the distance separating the identified agricultural land and seagrass from the Project, it is unlikely that temporary construction activities will impact the health and composition of these stocks.
Cultural (Biotic)			
3.1.1.1	Characteristics of living systems that that enable activities promoting health, recuperation or enjoyment through active or immersive interactions	Open marine water; fish (and other marine species)	Open marine water areas adjacent to construction activities will face restrictions temporarily reducing opportunities for active recreational activities such as swimming and boating. Furthermore, displacement or disturbance of fish and marine species could temporarily reduce the attractiveness and suitability of these waters for recreational fishing and diving activities.
3.1.2.1	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Seagrass bed; open marine water; permanent surface waterbody; fish (and other marine species)	Open marine water and fish and other marine organisms will be displaced as a result of construction activities, and the condition of terrestrial natural capital stocks in the Project AoI may be temporarily affected. However, the capacity of stocks to provide this service is not expected to be changed by Project construction activities.
3.1.2.4	Characteristics of living systems that enable aesthetic experiences	Open marine water; fish (and other marine species)	Temporary construction disturbances could reduce the attractiveness and suitability of open marine water for observational recreational activities. Fish and marine species disturbed or displaced by the construction activities might temporarily reduce observational opportunities such as wildlife watching and photography during the construction phase.
3.2.2.1	Characteristics or features of living systems that have an existence value	All stocks present within AoI	Species that have existence value, including plant and animal species in the terrestrial and marine environments, will be destroyed and disturbed by Project construction. Effects on this ecosystem service are likely to be larger in the marine environment and closer to the Project site, and smaller in the terrestrial environment

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
			where only minor potential effects on the condition of stocks are anticipated due to the Project.
3.2.2.2	Characteristics or features of living systems that have an option or bequest value	All stocks present within AoI	Species that have option and bequest values, including plant and animal species in the terrestrial and marine environments, will be destroyed and disturbed by Project construction. Effects on this ecosystem service are likely to be larger in the marine environment and closer to the Project site, and smaller in the terrestrial environment where only minor potential effects on the condition of stocks are anticipated due to the Project.
Provisioning (Abiotic)			
4.2.1.1	Surface water for drinking	Open marine water	The construction activities will result in increased turbidity and sedimentation that could temporarily reduce the quality of open marine water in proximity to the Project. However, these temporary effects will not reduce the provision of this ecosystem service.
4.2.1.2	Surface water used as a material (non-drinking purposes)	Open marine water	Construction activities associated with temporary clearance along the shoreline, refurbishment of the intake system and installation of the outfall pipeline may increase sedimentation and turbidity and reduce the quality and availability of open marine water for industrial uses, such as cooling for nearby facilities like A1, A2, potentially necessitating temporary reliance on alternative sources during construction.
Regulation & Maintenance (Abiotic)			
5.1.1.1	Dilution by freshwater and marine ecosystems	Open marine water	Construction activities that increase sedimentation and turbidity will temporarily diminish the natural dilution capacity of open marine waters. This reduction will affect their ability to disperse pollutants effectively, leading to a temporary decline in overall water quality.
5.1.1.3	Mediation by other chemical or physical means (e.g. via Filtration, sequestration, storage or accumulation)	Open marine water	Pollution of coastal water may be increased by construction activities such as discharges from construction sites and potential pollution events, saturating the capacity of open marine water to safely accumulate this waste.
5.2.1.2	Liquid flows	Open marine water, permanent surface waterbody	Outfall/intake pipeline construction activities will temporarily alter local hydrodynamics in open marine waters affecting natural liquid flow and sediment transport patterns. Furthermore, terrestrial construction activities might temporarily affect permanent surface water bodies, altering natural liquid flow regimes during construction.
Cultural (Abiotic)			

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
6.1.1.1	Natural, abiotic characteristics of nature that enable active or passive physical and experiential interactions	Open marine	Construction of the Project will inject new temporary elements into the existing landscape and visual environment, impacting the aesthetics of the site and potentially reducing the appeal of the seascape for coastal recreational activities such as fishing and boating.
6.2.2.1	Natural, abiotic characteristics or features of nature that have either an existence, option or bequest value	Open marine water, permanent surface waterbody	Resonance of natural ecosystems from the perspective of culture and heritage is often affected by the state of disturbance of these systems, so Project construction activities are likely to have a negative effect on this ecosystem service. Abiotic natural capital stocks are often associated with lower existence and bequest values than biotic stocks, reducing these effects compared to the equivalent biotic ecosystem services (CICES codes 3.2.2.1 and 3.2.2.2, set out above).

Source: Mott MacDonald, 2025

Operational phase

6.13.15 The operational phase of the Project will include continuous seawater intake through offshore structures to support both desalination and power generation activities, while the desalination activities will also produce concentrated brine discharge back into the marine environment. Regular emissions from turbine operations, noise generation from routine operation and maintenance of the facilities, such as pumps and compressors, as well as an increased visual impact on the landscape will occur. The permanent effects associated with the operational phase of the project have the potential to impact various ecosystem services, as detailed in the impact assessment in Table 6.74.

Table 6.74: Potential operational phase impacts on ecosystem services identified within the AoI

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
Provisioning (Biotic)			
1.1.1.1	Cultivated terrestrial plants for nutritional purposes	Agriculture and cropland	The Project is not expected to result in the permanent loss of agriculture and cropland stocks identified within the AoI and therefore impacts on the provisioning of this ecosystem service are likely to be minimal.
Regulation & Maintenance (Biotic)			
2.1.1.1	Bio-remediation by micro-organisms, algae, plants, and animals	Fish (and other marine species); seagrass bed	Continuous brine discharge from the seawater desalination operations will permanently alter the salinity and temperature conditions of marine environments in proximity to discharge points and further afield. Benthic macro-invertebrate communities destroyed or degraded during construction will be permanently lost, plankton communities may have greater resilience but will remain vulnerable to continuous disturbance, and the operational discharge of pollutants may

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
			permanently alter the health and composition of seagrass beds. Operational impacts are likely to put continuous pressure on species providing bio-remediation services.
2.1.1.2	Filtration/sequestration/storage/accumulation by micro-organisms, algae, plants, and animals	Fish (and other marine species); seagrass bed	Continuous brine discharge from the seawater desalination operations will permanently alter the salinity and temperature conditions of marine environments in proximity to discharge points and further afield. Benthic macro-invertebrate communities destroyed or degraded during construction will be permanently lost, plankton communities may have greater resilience but will remain vulnerable to continuous disturbance, and the operational discharge of pollutants may permanently alter the health and composition of seagrass beds. Operational impacts are likely to put continuous pressure on species providing filtration, sequestration, and accumulation services.
2.1.2.2	Noise attenuation	Herbaceous vegetation	The Project is not expected to result in the permanent loss of herbaceous vegetation within the AoI and therefore impacts on the provisioning of noise attenuation services are likely to be minimal.
2.1.2.3	Visual screening	Herbaceous vegetation	The Project is not expected to result in the permanent loss of herbaceous vegetation within the AoI and therefore impacts on the provisioning of visual screening services are likely to be minimal.
2.2.1.1	Control of erosion rates	Herbaceous vegetation; permanent surface waterbody	Permanent changes to the coastal habitats, including impacts to surface waterbodies along the shoreline, may result in reduced control of erosion by natural capital stocks. Localised loss of natural erosion control services will likely be compensated by permanent manmade structures, such as foundation established by the Project. The Project is not expected to result in the permanent loss of herbaceous vegetation within the AoI.
2.2.1.2	Buffering and attenuation of mass movement	Herbaceous vegetation; permanent surface waterbody	Permanent changes to the coastal habitats, including impacts to surface waterbodies along the shoreline, may result in reduced buffering and attenuation of mass movement by natural capital stocks. Localised loss of natural regulation services will likely be compensated by permanent manmade structures, such as foundation established by the Project. The Project is not expected to result in the permanent loss of herbaceous vegetation within the AoI.
2.2.1.3	Hydrological cycle and water flow regulation (Including flood control, and coastal protection)	Herbaceous vegetation; permanent surface waterbody	Permanent operational infrastructure can alter the local hydrological cycle by reducing natural vegetation cover and increasing impermeable surfaces, contributing to a potential increase in local flood risk. Permanent increase in discharged water from the Project is likely to further impact upon coastal habitats.

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
2.2.1.4	Wind protection	Herbaceous vegetation	The Project is not expected to result in the permanent loss of herbaceous vegetation within the AoI and therefore impacts on the provisioning of wind protection services are likely to be minimal.
2.2.2.1	Pollination (or 'gamete' dispersal in a marine context)	Open marine water	Continuous brine discharge into open marine water permanently alters local marine water conditions, including salinity, temperature, and currents. These changes to the marine environment may serve as biophysical barriers to gamete dispersal of marine species. This impact will persist through the operational phase.
2.2.2.3	Maintaining nursery populations and habitats (Including gene pool protection)	Seagrass bed; open marine water; permanent surface waterbody; fish (and other marine species)	Coastal and sand bank habitats that provide spawning and nursery ground for marine species (including commercially important species of fish, shrimp and crab) will be temporarily cleared and degraded during construction of the Project, with impacts expected to become permanent around the intake and outfall structures. Continuous brine discharge during plant operations will affect seagrass beds, open marine water, and permanent surface water bodies permanently degrading their ecological function as nursery habitats. Fish and marine species reliant on these habitats will potentially be displaced due to reduced nursery habitat availability and quality, negatively affecting their overall population stability.
2.2.5.2	Regulation of the chemical condition of salt waters by living processes	Seagrass bed; fish (and other marine species)	Continuous operational brine discharge will permanently alter chemical conditions in marine ecosystems significantly impacting the chemical regulatory functions provided by seagrass beds and fish populations. Continuous adverse impacts on these natural regulatory services will permanently affect local water quality and marine ecosystem stability.
2.2.6.1	Regulation of chemical composition of atmosphere and oceans	Seagrass bed; herbaceous vegetation; agriculture and cropland; permanent surface waterbody	Phytoplankton communities providing this service are relatively resilient but will remain vulnerable to disturbance from operational activities. Continuous brine discharge into open marine water permanently alters local marine water conditions and is likely to have adverse impacts on the health and composition of the seagrass beds. The These adverse impacts will reduce the capacity of these stocks to provide the regulating service. The Project is not expected to result in the permanent loss of herbaceous vegetation and agricultural stocks within the AoI and therefore impacts on the regulating services provided by these stocks are likely to be minimal.
Cultural (Biotic)			
3.1.1.1	Characteristics of living systems that that enable activities promoting health, recuperation or	Open marine water, Fish and other marine species	The permanent aboveground infrastructure to be delivered by the Project will displace any public access to open marine waters within the AoI, however current recreational activities

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
	enjoyment through active or immersive interactions		along the coastline appear to be limited within the AoI. Continuous brine discharge into open marine water permanently alters local marine water conditions, which can permanently reduce the attractiveness and suitability of the water for recreational fishing, diving activities, and beach camping opportunities.
3.1.2.1	Characteristics of living systems that enable scientific investigation or the creation of traditional ecological knowledge	Seagrass; open marine water; permanent surface waterbody; fish (and other marine species)	While some stocks of open marine water, seagrass beds, fish and other marine organisms will be permanently impacted by the change in water conditions caused by the brine discharge, there will be minimal impacts on the characteristics of living systems that enable scientific investigation and the creation of traditional ecological knowledge in the Project's operational phase.
3.1.2.4	Characteristics of living systems that enable aesthetic experiences	Open marine water; fish (and other marine species)	Aesthetic experience derived from natural ecosystems often depend on the condition of these systems. While some stocks of open marine water, fish and other marine organisms will be permanently impacted, and there will be disturbance to stocks in the Project AoI in the operational phase (particularly marine stocks), the provision of this service was considering relatively low in the existing baseline and therefore permanent impacts are expected to be minimal.
3.2.2.1	Characteristics or features of living systems that have an existence value	All stocks present within AoI	Species that have existence value, particularly fish and other marine organisms, will be permanently destroyed and displaced by the Project, particularly in the marine environment. These impacts will occur predominantly in the construction phase and will persist into the Project's operation through the continuous brine discharge.
3.2.2.2	Characteristics or features of living systems that have an option or bequest value	All stocks present within AoI	Species that have option or bequest value, particularly fish and other marine organisms, will be permanently destroyed and displaced by the Project, particularly in the marine environment. These impacts will occur predominantly in the construction phase and will persist into the Project's operation through the continuous brine discharge.
Provisioning (Abiotic)			
4.2.1.1	Surface water for drinking	Open marine water	The operation of the Project will result in permanently improved access to drinking water for nearby communities. The Project will use the natural capital stocks within the AoI, specifically the open marine water, and through human-facilitated processing, permanently increase the provisioning of this ecosystem service.
4.2.1.2	Surface water used as a material (non-drinking purposes)	Open marine water	The operation of the Project will result in permanently improved access to non-drinking water, including to support power generation, for nearby communities. Recycled water may be used as irrigation, further supporting increases in food provisioning services in the area. The Project will use the natural capital stocks within

CICES v5.1 code	Class	Associated natural capital stocks	Project impacts on ecosystem services
			the AoI, specifically the open marine water, and through human-facilitated processing, permanently increase the provisioning of this ecosystem service.
Regulation & Maintenance (Abiotic)			
5.1.1.1	Dilution by freshwater and marine ecosystems	Open marine water	Project operations, including continuous brine discharge into open marine water that will permanently alter local marine water conditions, can permanently diminish the natural dilution capacity of open marine waters. This reduction will affect the ability of the open marine water to disperse pollutants effectively, leading to a potential decline in overall water quality.
5.1.1.3	Mediation by other chemical or physical means (e.g. via Filtration, sequestration, storage or accumulation)	Open marine water	Pollution of coastal water may be increased by operational activities, such as the continuous brine discharge, saturating the capacity of open marine water to safely accumulate and mediate waste.
5.2.1.2	Liquid flows	Open marine water, permanent surface waterbody	Operational intake and discharge pipeline may permanently alter marine hydrodynamic conditions, including currents, sediment transport, and overall liquid flow patterns in open marine water. Furthermore, terrestrial construction activities may permanently affect permanent surface water bodies, altering natural liquid flow regimes during operation.
Cultural (Abiotic)			
6.1.1.1	Natural, abiotic characteristics of nature that enable active or passive physical and experiential interactions	Open marine water	The Project will change the baseline landscape and visual environment, impacting the aesthetics of the site. Given the current existing baseline consists largely of built-up area and bare ground / sparse vegetation, the current recreational activities along the coastline are likely to be limited within the AoI. However, the permanent change in the landscape and visual environment could potentially reduce the appeal of the seascape for coastal recreational activities such as fishing, boating, and beach camping.
6.2.2.1	Natural, abiotic characteristics or features of nature that have either an existence, option or bequest value	Open marine water, permanent surface waterbody	Some ongoing disturbance to stocks providing this service is likely due to operation of the Project, for example the change in conditions of the open marine water, slightly diminishing its value. However, remaining stocks will still possess this service and it will still be provided in the operational phase of the Project.

Source: Mott MacDonald, 2025

6.13.16 Discharges from the desalination plant, such as brine and chemical residues, could alter the salinity and temperature of open marine waters (2.2.2.1). This may impact fish and other marine organisms (2.1.1.1, 2.1.1.2) and seagrass (2.2.5.2, 2.6.1), potentially reducing biodiversity, altering food chains, and degrading habitat quality. Mitigation measures, such as controlled discharge and monitoring programs, will be essential to minimize negative effects.

Summary of impacts (pre-mitigation)

6.13.17 The Project's construction phase includes extensive site preparation activities, clearing vegetation, earthworks, dredging, excavation, and infrastructure installation including seawater intake and discharge pipelines. These activities are expected to both temporarily and permanently affect ecosystem services. Temporary construction activities are expected to have adverse impacts on marine ecosystems following increased sedimentation, turbidity and potential discharges, resulting in a reduced capacity for stock to provide regulation and maintenance services. Temporary impacts to the marine ecosystem may result in the disturbance and displacement of fish and other marine species, reducing the attractiveness and capacity of the area to support recreational activities such as fishing, boating, diving and beach camping.

6.13.18 The Project's operational phase includes both electricity production and seawater desalination via reverse osmosis will have continual effects on both marine and terrestrial ecosystem services. Long term brine discharge could change salinity and temperature, therefore compromising the capacity of marine ecosystems to offer important services including chemical control of marine waters, nursery habitat maintenance, bio-remediation, and pollution dilution. Impacts to terrestrial natural capital stocks along the coastline could adversely impact the provision erosion control, water flow and flood regulation services. Project operations also have the potential to hinder recreational opportunities and lower the non-use values (existence, option, and bequest) associated with the natural ecosystems.

6.14 Cumulative Impacts Assessment

Methodology

6.14.1 This Cumulative Impact Assessment (CIA) follows six steps outlined in the IFC CIA Good Practice Handbook.

1. **Step 1: Scoping**
   - Determine spatial and temporal boundaries of the CIA, and identify the ultimate receptors of the combined impacts, known as valued environmental and social components (VECs)
2. **Step 2: VEC Baseline Determination**:
   - Combine information on the baseline status of the selected VECs, describing their current conditions, spatial boundaries, potential response to Project-related stresses/impacts, and assess trends
3. **Step 3: Assessment of Contribution**:
   - Building on information of the baseline status of the selected VECs from information in Section 6, assess potential contributions from Project-related stresses/impacts
4. **Step 4: Future Conditions Assessment**:
   - Assess the future conditions of the selected VECs due to cumulative impacts of the Project with other developments within appropriate spatial and temporal boundaries
5. **Step 5: Significance Evaluation**:
   - Evaluate the significance of the cumulative impacts

6. **Step 6: Management Strategies**:
   - Present suggestions based on the Project's level of impact on the defined short list of VECs. Providing proportionate mitigation measures to mitigate impacts.

6.14.2 The Environmental Consultant has communicated with certain stakeholders prior to the Project kick-off. This process aided the gathering of information about the surrounding facilities and the environmental and social baseline. Table 6.75 outlines the conducted consultations.

Table 6.75 Conducted consultations with stakeholders on the ESIA

Stakeholders	Relevance to the Project	Communication and consultation method	Outcome
Qatar Electricity and Water Company (QEWC)	The operator of the surrounding water and power facilities in the Project Area	Private site visit (8th October 2024)	View the Project location along with the surrounding facilities and examine the environmental and social baseline
Ministry of Environment and Climate Change	Authority responsible for receiving, reviewing and approving the ESIA as well as granting the Environmental Permit	Private meeting (25th November 2024)	Discussion on the Scoping Report outcomes and the consideration of certain environmental aspects during the ESIA
		Private meeting (23rd February 2025)	General overview meeting to discuss the project and the associated surveys
Kahramaa	Public corporate body who has a Power and Water Purchase Agreement (PWPA) with the Project Company	Electronic communication (November 2024 and ongoing)	Official sender, receiver and addressee of all formal documents from and to MoECC. They advise and amend formal documents accordingly.

Source: Mott MacDonald, 2025

Limitations

6.14.3 Based on the information available at the time of writing, this assessment considers only existing other developments in the area. Due to the proximity of the project site to Qatar Economic Zone 3, which is a zone that is part of Qatar's broader strategy to diversify its economy with petrochemical, building material, maritime, logistics and food processing industries, it is anticipated that there will be other developments in the vicinity in the future.

6.14.4 Marine surveys were not finalised at the time of writing therefore marine impacts have not been included in the cumulative assessment. Once the marine chapter is concluded, this section will be updated to reflect the marine components as well.

Scoping Phase I – VECs, Spatial and Temporal Boundaries

6.14.5 The initial long list of VECs for this CIA were taken to be all receptors identified by the ESIA assessment topics, including those receptors which had been assessed to have or not have significant effects. This approach was taken to account for the possibility that a combination of effects to one receptor, individually assessed to be not significant, could together result in significant cumulative effects.

6.14.6 From the VEC long list, professional judgement and the following criteria were used to select the applicable VECs:

- Potential to be significantly affected by the Project in some or all phases (construction and operation)
- Identified as already under pressure by other developments and the Project will promote additional stress
- Identified as sensitive and relevant according to professional judgment, or legal requirements (laws and directives)
- VECs assessed as having no significant effects were scoped out.

6.14.7 The final VECs included for this CIA are as follows in Table 6.76:

Table 6.76: VEC long list showing which VECs have been scoped in and out for the Cumulative Impact Assessment

Receptor Name	Scoped in/out
Habitats - Seagrass beds	Scoped in for potential cumulative impacts from salinity increases, water quality, sediment dispersion and underwater noise.
Habitats - Mangroves	Scoped in for potential cumulative impacts from salinity increases, water quality, sediment dispersion and underwater noise.
Habitats – Oyster Reefs	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Habitat-Coral patch reefs	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Migratory Species – Turtles	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Commercially important Fish	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Sharks	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Recreationally important fish	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Fish of conservation concern	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Marine mammals	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Solitary coral species – Seagrass dependant	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Infaunal invertebrates	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Plankton	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Al Wakrah Municipality (5 km)	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.

Al-Wakra Metro Station (2.5 km),	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Al-Wakrah Beach Camping (1.5 km)	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.
Al-Wakrah Celebration Halls (1.4 km)	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.
Bare / sparse vegetation	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant. Due to the project footprint being an existing industrial area with recently completed decommissioning.
Barwa Village (3.9 km)	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.
Birds	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant. Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. No nesting habitat will be impacted by this Project. It is likely that the disturbance will not significantly differ from the baseline.
Coastal Birds	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive.
Coastal Environment	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Cropland	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Doha Metro Depot (1.9 km)	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Flora	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
GAC Doha Main Office (1.7 km)	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.
Groundwater	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Herbaceous vegetation	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Herpetofauna	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Historic buildings within Al Wakrah (3.5 km)	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Historical fish traps that have been identified within the intertidal environment to the east of the project	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Project Infrastructure	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.

Mammals (including bats)	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Migratory birds	Scoped in as temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. Loss of potential wintering habitat due to modification of the coastal environment, may also reduce important roosting locations for these species.
Mosque (Masjid Ali Bin Abdullah Al-Abbas) (1.8 km)	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.
Qatar Economic Zone 3	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.
QEWC Staff Accommodation (sensitive receptor)	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.
Ras Abu Fontas beach	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.
Surrounding ground	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Surrounding water and power plants (<1km)	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Unknown archaeology	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.
Workers village camp (1.7 km)	Scoped in for potential cumulative impacts from air quality, noise, traffic and socioeconomic impacts during construction and operation.

Source: Mott MacDonald, 2025

Spatial and temporal boundaries of this CIA and existing and foreseeable future developments

6.14.8 The geographic and temporal extent of cumulative impacts is likely to be different to the area of influence (AoI) as defined in the individual ESIA topic assessments. According to the IFC CIA Good Practice Handbook, the initial boundaries set by guidance and professional judgment can be revised when considering cumulative impacts, as surrounding developments and their impacts are also considered. Therefore, the boundaries for this CIA were determined according to the identification of VECs, the consideration of the surrounding developments and professional judgement following the process below:

- Verification of Project AoI determined in the Project's ESIAs.
- Determination of the preliminary boundaries according to the Project's significant impacts on the relevant VECs
- Identification of the existing developments located within the boundaries of the Project and that could potentially affect the relevant VECs
- Final assessment of the geographic and temporal boundaries, if necessary, after assessment of the cumulative impacts.

6.14.9 Based on these analyses as listed above, at this stage, the preliminary spatial boundary for each relevant VEC is considered to be 2km for terrestrial impacts, and 5km for social impacts.

6.14.10 This will be confirmed in Table 6.77 of this CIA Report during the description of the existing conditions of the relevant VECs and the assessment of cumulative impacts and significance. Regarding the preliminary temporal boundary, the CIA used the time frame expected for the complete life cycle of the Project, thus, the preliminary temporal boundary for this CIA ranges from 2025 to 2054.

6.14.11 During this timeframe and in this geographic area, Project's impacts on final VECs can interact with the other developments' impacts and potentially result in cumulative impacts.

Spatial Boundary

6.14.12 The Project area includes power and desalination plants owned and operated by Qatar Electricity and Water Company (QEWC), Raf A1, Raf A2, Raf A3, Raf B, Raf B1, and Raf B2 stations at Ras Abu Fontas complex.

6.14.13 The Project will be located immediately to the north/east of the Qatar Economic Zone 3 (QEZ-3). QEZ-3 covers an area of 44km^2, the largest of Qatar's economic zones. This zone supports Qatar's broader strategy to diversify its economy with petrochemical, building material, maritime, logistics and food processing industries.

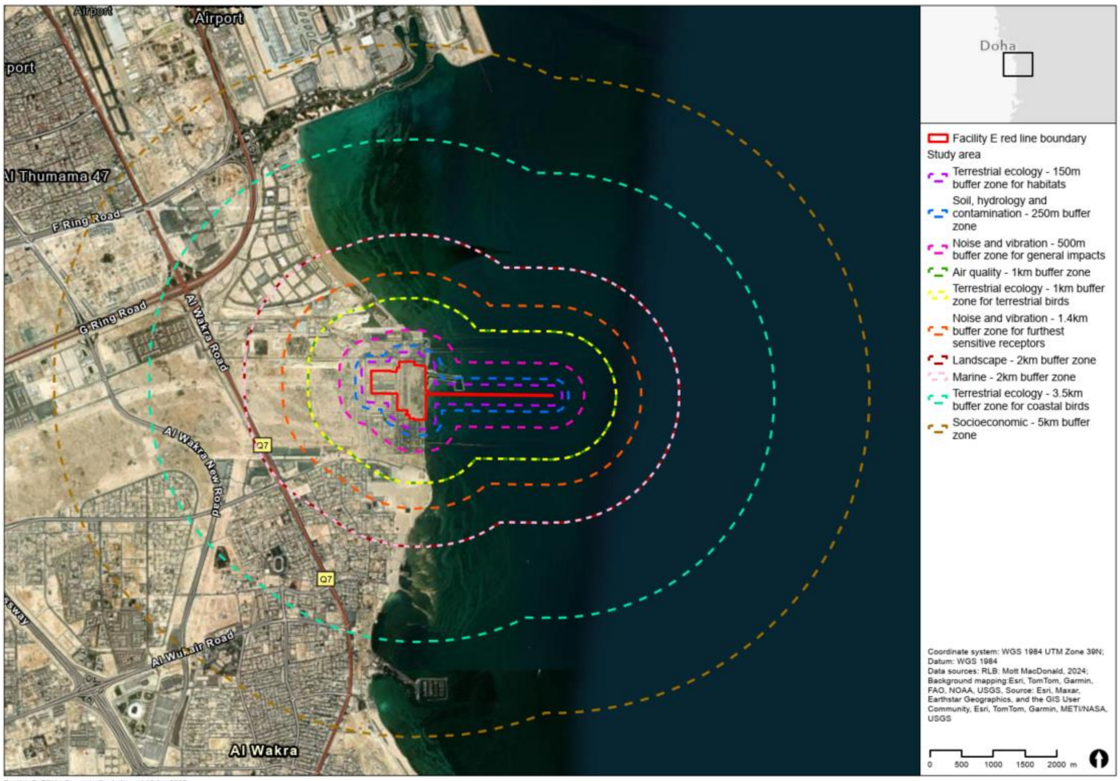
6.14.14 The Project aligns with Qatar National Vision 2030, which emphasizes environmental and social development alongside economic growth.

6.14.15 Table 6.77 below includes the defined AoI from each assessment included in the ESIA.

Table 6.77 Defined AoI from each assessment included in the ESIA

Discipline	AoI
Marine environment	2km
Air quality	1km
Climate resilience and Greenhouse Gas (GHG) emissions	-
Socioeconomic, including Occupational H&S	5km
Noise and vibration	500m
Cultural heritage and archaeology	-
Terrestrial ecology	1km (Coastal bird 3.5km)
Ecosystem Services	1km
Soil, hydrology and contamination	250m
Solid waste and material management	-
Landscape and visual impact	2km
Transport	-

Figure 6.17 Defined AoI from each assessment included in the ESIA



Source: Mott MacDonald, 2025

Step 2: Scoping Phase II – Other Activities and Environmental Drivers

6.14.15.1 The Project area includes power and desalination plants owned and operated by Qatar Electricity and Water Company (QEWC), Raf A1, Raf A2, Raf A3, Raf B, Raf B1, and Raf B2 stations at Ras Abu Fontas complex.

6.14.15.2 The first phase of the Raf A facility was commissioned in 1977, and the station was finally completed in 1993 with an electricity generating capacity of 497 MW and a desalination plant capable of producing 55 MIGD.

6.14.15.3 Raf B facility comprises the existing Raf B, Raf B1, and Raf B2 plants. The Raf B station was designed to be capable of an extension to 1,000 – 1,100 Mega Watts (MW) and 60 MIGD total production Capacities.

6.14.15.4 In 1981, the Qatari government installed eight desalination units in Ras Abu Fontas A, with each individual unit possessing a daily capacity of 4 million gallons. This capacity was eventually raised to 55 million gallons per day. The introduction of Ras Abu Fontas A1 saw daily capacity increased by 45 million gallons. Ras Abu Fontas A2 desalination plant had a daily capacity of 36 million gallons. In September 2016, Ras Abu Fontas A3 desalination plant became operational with a capacity of 22 million gallons per day. However, after being expanded in April 2017, its capacity was raised to 36 million gallons per day.

Establish Information on Baseline Status of VECs

6.14.15.5 A summary of the baseline conditions assessed in the ESIA are included in Table 6.78.

6.14.16 Table 6.78 below comprises the long list of VECs, including the level of the Project's impact identified, and a summary of the impacts.

Table 6.78: Long list of VECs

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
Marine	Within the AoI there are small areas of sea grass to the north, approximately 100m from the proposed outfall, there is a further larger area of seagrass located to the north of Doha internation Airport 3 km to the north of the project site. The seagrass species present are highly sensitive to changes in water quality, including heavy metals, salinity, thermal changes, and suspended sediment. There are also mangroves confirmed 3.5 km to the south of the project, which serve as crucial spawning and nursery areas for various marine	M1	Habitats - Seagrass beds	Scoped in for potential cumulative impacts from salinity increases, water quality, sediment dispersion and underwater noise.	-	According to the significance criteria adopted for this assessment the following impacts have been assessed: Minor impacts are anticipated due to changes in temperature of the marine environment. Not Significant impacts are anticipated due to: Hydrological process changes - Impingement and entrainment of marine biota, Hydrological process changes - Circulation changes, Salinity changes, and Water quality - contaminants
		M2	Habitats - Mangroves	Scoped in for potential cumulative impacts from salinity increases, water quality, sediment dispersion and underwater noise.	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		M3	Habitats – Oyster Reefs	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		M4	Habitat-Coral patch reefs	Scoped out as Previous surveys indicated that the majority of the area comprises relic reef and rock, making extensive shallow corals unlikely, and therefore Project's impact assessed as negligible, not under pressure and not	-	According to the significance criteria adopted for this assessment the following impacts have been assessed: Not Significant - Hydrological process changes - Impingement and entrainment of marine biota Not Significant - Hydrological process changes - Circulation changes Not Significant - Salinity Minor - Temperature Not Significant - Water quality - contaminants

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
	organisms, are also sensitive to changes in sea water temperature and salinity. Previous surveys indicated that the majority of the area comprises relic reef and rock, making extensive shallow corals unlikely, though they are known in the wider area. The Hawksbill turtle have been tracked visiting the potential discharge area, although it is not part of known foraging aggregations. The predicted discharge dispersion area lies outside internationally recognized important marine mammal areas (IMMAs) but between the Gulf of Salwa IMMA and the Southern Gulf and Coastal Waters IMMA, indicating			sensitive nor relevant.		
		M5	Migratory Species – Turtles	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		M6	Commercially important Fish	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment the following impacts have been assessed: Not Significant - Hydrological process changes - Impingement and entrainment of marine biota Not Significant - Hydrological process changes - Circulation changes Not Significant - Salinity Minor - Temperature Not Significant - Water quality - contaminants
		M7	Sharks	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		M8	Recreationally important fish	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment the following impacts have been assessed: Not Significant - Hydrological process changes - Impingement and entrainment of marine biota Not Significant - Hydrological process changes - Circulation changes Not Significant - Salinity Minor - Temperature Not Significant - Water quality - contaminants
		M9	Fish of conservation concern	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment the following impacts have been assessed: Not Significant - Hydrological process changes - Impingement and entrainment of marine biota Not Significant - Hydrological process changes - Circulation changes Not Significant - Salinity Minor - Temperature

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
	potential for cetaceans to travel through or opportunistic ally forage in the area.					Not Significant - Water quality - contaminants
		M10	Marine mammals	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		M11	Solitary coral species – Seagrass dependant	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		M12	Infaunal invertebrates	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		M13	Plankton	Scoped out as Project's impact assessed as negligible, not under pressure and not sensitive nor relevant.	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
Air Quality	The baseline air quality assessment shows that the ambient air quality in the Project area is generally within the national standards for key pollutants such as nitrogen dioxide (NO_2), sulphur dioxide (SO_2), and particulate matter (PM_{10}). However,	R1	School	Not Significant	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		R2	Al Wakrah Residential 1	Not Significant	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		R3	Al Wakrah Residential 2	Not Significant	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are 'not significant'
		R4	Barwa Village	Not Significant	-	According to the significance criteria

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
	there are occasional exceedances in PM_{10} levels, which are likely due to construction activities and vehicular emissions in the area					adopted for this assessment, the impacts associated with all scenarios are ‘not significant’
		R5	Workers Accommodation 1	Not Significant	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are ‘not significant’
		R6	Workers Accommodation 2	Not Significant	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are ‘not significant’
		R7	Al Wakrah Celebrations Hall	Not Significant	-	According to the significance criteria adopted for this assessment, the impacts associated with all scenarios are ‘not significant’
Climate Resilience and Greenhouse Gas (GHG) emissions		C1	Workforce	Major	-	Raising air temperature – heat stress, reduced equipment efficiency Increasing Specific humidity – Higher heat index, corrosion. Extreme weather events - Multi hazard events, long duration outages.
		C2	Infrastructure	Moderate	-	Raising air temperature – heat stress, reduced equipment efficiency Changing precipitation and flood risk – flooding, drainage overload, access disruption. Increased wind and storm - Storm damage to infrastructure and operation. Sea level rise - Erosion, saltwater intrusion. Extreme weather events - Multi hazard events, long duration outages.
		C3	Operation	Moderate	-	Changing precipitation and flood risk – flooding,

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
						drainage overload, access disruption. Extreme weather events - Multi hazard events, long duration outages.
		C4	Coastal Environment	Not Significant	-	Increased wind and storm - Storm damage to infrastructure and operation. Extreme weather events - Multi hazard events, long duration outages.
		C5	Marine Environment	Major	-	Sea level rise - Erosion, saltwater intrusion. Increased sea temperature – Coral bleaching, fouling, reduced cooling efficiency. Extreme weather events - Multi hazard events, long duration outages.
		C6	Surrounding Area	Moderate	-	Changing precipitation and flood risk – flooding, drainage overload, access disruption. Extreme weather events - Multi hazard events, long duration outages.
Socioeconomic, including community and occupational Health and Safety	The Project area is characterised by a mix of residential, commercial, and industrial land uses. The local economy is primarily driven by the energy and water sectors, with a significant portion of the workforce employed in these industries.	S1	Surrounding water and power plants (<1km)	Major	+	The project will lead to an infrastructure development, particularly in terms of utilities such as better water and power supply and human resources up-skilling.
		S2	Al-Wakrah Celebration Halls (1.4km)	Minor	-	The community security may be impacted due to the high influx of workers which can cause, at any time, social tensions.
		S3	Residential area (1.5 km)	Minor	-	The community security may be impacted due to the high influx of workers which can cause, at any time, social tensions.
		S4	Al-Wakrah Beach Camping (1.5 km)	Minor	-	The community security may be impacted due to the high influx of workers which can cause, at any time, social tensions.
		S5	GAC Doha Main Office (1.7 km)	Minor	-	Expected roads closures, traffic and accessibility issues. In addition to noise

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
						formation and dust movement/dispersion
		S6	Workers village camp (1.7 km)	Minor	-	The community security may be impacted due to the high influx of workers which can cause, at any time, social tensions.
		S7	Mosque (Masjid Ali Bin Abdullah Al-Abbas) (1.8 km)	Minor	-	The community security may be impacted due to the high influx of workers which can cause, at any time, social tensions.
		S8	Schools (Al-Wakrah Independent Preparatory School, Saud Bin Abdulrahman Boys Independent School, The English Modern Kindergarten) (1.8 km)	Minor	-	The community security may be impacted due to the high influx of workers which can cause, at any time, social tensions
		S9	Doha Metro Depot (1.9 km)	Minor	-	Expected roads closures, traffic and accessibility issues. In addition to noise formation and dust movement/dispersion
		S10	Al-Wakra Metro Station (2.5 km),	Minor	-	Expected roads closures, traffic and accessibility issues. In addition to noise formation and dust movement/dispersion
		S11	Fahes Al-Wakrah Petrol Station (2.5 km)	Minor	-	Expected roads closures, traffic and accessibility issues. In addition to noise formation and dust movement/dispersion
		S12	Restaurants, Markets and Bank on public road (2.8 km)	Minor	-	Expected roads closures, traffic and accessibility issues. In addition to noise formation and dust movement/dispersion
		S13	Residential buildings including Barwa Village (3.4 km)	Minor	-	Expected roads closures, traffic and accessibility issues. In addition to noise formation and dust movement/dispersion
Noise and	The baseline noise and vibration	NML-01	Near Doha Metro Depot	Not Significant	-	The noise levels produced at any of the three identified noise sensitive

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
Vibration	assessment indicate that the existing noise levels in the Project area are generally within the national standards for residential, commercial, and industrial zones. However, there are occasional exceedances in noise levels, particularly during peak traffic hours and construction activities.	NML-02	Mosque near QEWC Staff Accommodation	Not Significant	-	receptor will be both below the existing measured noise levels in the area and both the day and night threshold noise level stated in BS 5228
		NML-03	QEWC Staff Accommodation (sensitive receptor)	Not Significant	-	
		NML-04	Near road at northwest of site	Not Significant	-	
		NML-05	Ras Bu Fontas beach	Not Significant	-	
		NML-06	Al Wakrah residential area (sensitive receptor)	Not Significant	-	
		NML-07	Al Wakrah Celebration Hall Complex in residential area (sensitive receptor)	Not Significant	-	
		NML-08	Within the proposed Project site boundary	Not Significant	-	
		NML-09	Near road at west of site	Not Significant	-	
		NML-10	Near road at southwest of site	Not Significant	-	
		NML-11	Northeast of Al Wakrah residential area	Not Significant	-	
		NML-12	Al Wakrah beach camping site	Not Significant	-	
Cultural Heritage and Archaeology	The baseline cultural heritage and archaeology assessment identifies several sites of historical and cultural significance in the Project area. These include ancient settlements, burial sites, and artifacts.	H1	Historic buildings within Al Wakrah	Not Significant	-	No impacts anticipated due to distance, screening and negligible change to site character or visual profile
		H2	Historical fish traps that have been identified within the intertidal environment to the east of the project	Not Significant	-	Potential damage to weir fish traps during works associated with construction of new outfall and associated dredging
		H3	Unknown archaeology	Uncertain	-	Potential impact to archaeological deposits, if present. Impacts could result from compaction, due to pressure from

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
	The assessment emphasizes the need for careful management and protection of these sites during the Project development.					stockpiling or compounds, or subsurface disturbance, such as from excavation, in previously undisturbed areas
Terrestrial Ecology	The baseline biodiversity assessment identifies several key species and habitats in the Project area. The marine environment supports a variety of fish species, corals, and seagrasses, while the terrestrial environment includes vegetation and animal species adapted to the arid conditions. The assessment highlights the presence of critical habitats and the need for conservation measures.	T1	Cropland	Not significant	-	The AoI is significantly modified. Cropland is outside of the Project boundary and makes up a small percentage of the AoI (0.3%). No direct impact is anticipated, dust through movement of heavy machinery may impact crops. These habitats and flora that are outside of the Project boundary and are not likely to be impacted as a result of operation. There may be some dust as a result of road tankers to and from the Project site, but this is not likely to be significantly increased from baseline.
		T2	Herbaceous vegetation	Not significant	-	The AoI is significantly modified. Herbaceous vegetation is outside of the Project and makes up a small percentage of the Project footprint (0.3%). No direct impact is anticipated, however, dust through movement of heavy machinery may impact herbaceous vegetation. These habitats and flora that are outside of the Project boundary and are not likely to be impacted as a result of operation. There may be some dust as a result of road tankers to and from the Project site, but this is not likely to

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
						be significantly increased from baseline.
		T3	Bare / sparse vegetation	Minor	-	The AoI is significantly modified. Bare earth and sparce vegetation makes up 31.7% of the terrestrial habitat under the Project AoI. A total of 31ha of bare/sparce vegetation will be lost. The remaining bare earth and sparce vegetation within the AoI may be indirectly impacted by dust through movement of heavy machinery. These habitats and flora that are outside of the Project boundary and are not likely to be impacted as a result of operation. There may be some dust as a result of road tankers to and from the Project site, but this is not likely to be significantly increased from baseline.
		T4	Mammals (including bats)	Minor	-	Temporary disturbance from noise and vibration due to the movement of construction traffic, ground clearance and excavations. There is a probability of injury or death of terrestrial mammals due to the presence of burrows under the Project footprint. These could also be entrapped during open excavations or involved in collisions with heavy machinery during construction. However, the magnitude of this impact is minor as there is suitable habitat for small burrowing mammals in the surrounding areas. There are no suitable roosting habitats for bats within the AoI. Bat roost sites will not be impacted during construction however, passing bats could be impacted by artificial light pollution

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
						within the AoI at night. The magnitude of this impact is also considered minor due existing disturbance in the surrounding areas. No further clearance work is expected during operation. There may be some noise disturbance during operation from the sea water pump and generators. Also, potential injury/death to small terrestrial mammals as a result of road tankers to and from the Project site, but this is not likely to be significantly increased from baseline. Passing bats could be impacted by artificial light pollution within the AoI at night. The magnitude of this impact is also considered minor due existing disturbance in the surrounding areas.
		T5	Non-migratory Birds	Minor	-	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. No nesting habitat will be impacted by this Project. It is a coastal species, and the Project could impact the Arabian Gulf through pollution if not properly managed. Modification of the coastal environment if present may also impact this species, although it is considered a vagrant so unlikely to be present. Expected operation impacts are from additional Project lighting, noise, and air emissions which can disturb these species during migration but given the urban location of the Site is not likely to be significantly increased from baseline. Birds

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
						assessed: Great Knot, Steppe Eagle and Saker Falcon, Greater Spotted Eagle, Eastern Imperial Eagle and Asian Houbara, Grey Plover, Curlew Sandpiper and Broad-billed Sandpiper, Socotra Cormorant, White-cheeked Tern.
		T6	Coastal Birds	Minor	-	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. No nesting habitat will be impacted by this Project. It is a coastal species, and the Project could impact the Arabian Gulf through pollution if not properly managed. The species could also be present within the nearby mangroves and if these are adversely impacted could also impact Socotra Cormorant. Expected operation activates such as additional Project lights, noise, and air emissions can disturb Socotra Cormorant if present. In addition, the pumping of seawater from the Arabian Gulf and pollution risks during operation could also indirectly impact Socotra Cormorant due to impact on fish numbers and water quality which could degrade supporting habitat.
		T7	Migratory birds	Minor	-	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. Loss of potential wintering habitat due to modification of the coastal environment, may also reduce important roosting.

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
						Expected operation impacts are from additional Project lighting, noise, and air emissions which can disturb these species during migration but given the urban location of the Project is not likely to be significantly increased from baseline.
		T8	Birds	Not significant	-	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. Nesting habitat through loss of trees within the Project boundary will be impacted by this Project. It is likely that the disturbance will not significantly differ from the baseline. Expected operation activates such as additional Project lights, noise, and air emissions can disturb resident and migratory birds. No further clearance work is expected during operation therefore, no additional nesting habitat is to be lost.
		T9	Herpetofauna	Minor	-	Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. There is a low probability of injury or death to terrestrial reptiles becoming trapped in open excavations during excavation of the pipes or due to movement of heavy machinery during construction activities. If Egyptian Spiny Tailed Lizard are present, there is a moderate probability of injury or death during ground clearance and excavations as this

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
						species digs burrows in sandy compacted soil in which the majority of the site consists of.
Soil, Hydrology and contamination	The baseline soil and hydrology assessment identifies the key soil types and hydrological features in the Project area. The soil is predominantly sandy and saline, with low organic content. The hydrology assessment highlights the presence of groundwater resources and the potential for contamination from industrial activities.	W1	Groundwater	Not Significant	-	Impacts will be temporary, minor and in line with existing site use.
		W2	Marine environment	Not Significant	-	Impacts will be temporary, minor and in line with existing site use.
		W3	Surrounding ground	Not Significant	-	Impacts will be temporary, minor and in line with existing site use.
		W4	Local residential areas	Not Significant	-	Impacts will be temporary, minor and in line with existing site use.
Landscape	The immediate surrounding landscape of the RAF Complex is generally dry and flat and there is no agricultural activity in the vicinity with a defined security zone around the plant and a significant area of the land to the south and west of the	L1	Al Wakrah Municipality	Not Significant	-	In consideration of the scope and scale of anticipated impacts on the existing site character and surrounding area, no further mitigation is necessary to complete the project. The residual impact on landscape quality and visual amenity will be neutral.

VECs	Discipline Baseline	ID	Receptor Name	Significance of Anticipated Effect	+/-	Description
	plant having been cleared.					
Transport	The project will be located immediately to the north/east of the Qatar Economic Zone 3, and within the existing Ras Abu Fontas industrial complex with existing and operational Ras Abu Fontas plants A1, A2 and A3 to the north and plants B and B2 to the south.	T1	Al Wakrah Municipality	Moderate	-	Traffic is expected to be impacted temporarily during construction works due to increased vehicular traffic from trucks, plants, buses, machines and workers movement. Surrounding communities have potential to be impacted during construction due to increases in noise and air pollution associated with construction activities and increases in vehicle movements to site.
		T2	Qatar Economic Zone 3	Moderate	-	Traffic is expected to be impacted temporarily during construction works due to increased vehicular traffic from trucks, plants, buses, machines and workers movement. it is expected that the impact from these vehicular emissions is slight, short term and intermittent in nature. Surrounding communities have potential to be impacted during construction due to increases in noise and air pollution associated with construction activities and increases in vehicle movements to site.

Source: Mott MacDonald, 2025

Assessment of cumulative impacts

6.14.17 This Section presents an assessment of the future conditions of the selected VECs, as a result of cumulative impacts of the Project with other developments within reasonable spatial and temporal boundaries. Table 6.79 describes the key potential impacts that could affect the long-term sustainability of the VECs, if these impacts interact with each other, and we also determine the significance of impacts based on an analysis of the impacts in combination to verify if cumulative changes are a concern.

Table 6.79 Step 4,5,6 Cumulative impacts, their significance and proposed mitigation measures

VEC	Baseline	Cumulative Impacts	Significance	Mitigation Measures

Habitats - Seagrass beds	Within the AoI there are small areas of sea grass to the north, approximately 100m from the proposed outfall, there is a further larger area of seagrass located to the north of Doha internation Airport 3 km to the north of the project site. The seagrass species present are highly sensitive to changes in water quality, including heavy metals, salinity, thermal changes, and suspended sediment.	**Construction**
		
		During construction no significant cumulative impacts are anticipated due to seagrass meadows within the AoI.
		
		Operation
		
		During operation throughout the lifetime of the project projected climate change driven sea surface temperatures are projected to rise by 4.3°C near Qatar by 2100, with annual increases of 0.61°C per decade likely to push both species of seagrass present in the area outside on their normal temperature range, this in combination with the potential temperature increases associated with the operation of the project and surrounding active plants are considered to result in major cumulative impacts on seagrass populations within the AoI.
			Construction
			
			Not significant
			
			Operation
			
			Major
				Mitigation measurements to reduce impact magnitudes include:
				• Use of a directional multijet dispersion heads to both direct the reject brine away from confirmed seagrass of coral habitats and increase the mixing.
				• Aeration of the discharge stream to improve dissolved oxygen saturation prior to or during release.
				• Monitoring of actual temperature changes and biodiversity receptors of medium sensitivity or greater during operations.
				• Contribution towards seagrass restoration programmes to improve seagrass conditions across Qatar which may include:
				  ○ Pollution reduction programmes to improve water quality and reduce marine litter that effect seagrass beds.
				  ○ Use of advanced moorings to reduce scarring from vessels in existing beds in wider Qatar
				  ○ Planting where locations

VEC	Baseline	Cumulative Impacts	Significance	Mitigation Measures
				prove technically feasible after studies undertaken. Form and nature of contribution will be agreed with the MoECC. • Reduction in any additional discharge rates (cooling water or wastewater) nearby or discharge direction during any marine heatwave that might be exacerbated by flow changes as necessitated by the confirmed receptors. • Contribute to studies on thermotolerant species and support development of schemes for coral resilience building (thermally tolerant coral nurseries, restoration in potential thermal refugia). Form and nature of contribution will be agreed with the MoECC. • Provision of fish ecological enhancement structures outside of modelled increased temperature areas to offset effects where medium sensitivity features are confirmed dependent upon area of effect.. • *Mitigation measures to be discussed with MoECC once survey results have been obtained to agree monitoring approaches.*

VEC	Baseline	Cumulative Impacts	Significance	Mitigation Measures
Habitats - Mangroves	There are also mangroves confirmed 3.5 km to the south of the project, which serve as crucial spawning and nursery areas for various marine organisms, are also sensitive to changes in sea water temperature and salinity.	**Construction** During construction no significant cumulative impacts are anticipated due to mangroves within the AoI, due to the distance (3.5 km) to the mangroves from the project site and the short temporal scope of construction works. **Operation** During operation throughout the lifetime of the project projected climate change driven sea surface temperatures are projected to rise by 4.3°C near Qatar by 2100, with annual increases of 0.61°C per decade which has the potential to impact the mangroves to the south of the project, however due to the distance from the proposed project no significant cumulative impacts are anticipated due to the brine discharge during operation of the project.	**Construction** Not significant **Operation** Not significant	No significant impacts are anticipated therefore no further mitigation measures are required.
Al Wakrah Municipality (5 km) Al-Wakrah Beach Camping (1.5 km)	The proposed site for the Project will be located approximately 3.5km south of Doha city on the east	**Construction** Surrounding communities have potential to be impacted during construction due to increases in noise	**Construction** Moderate **Operation**	Appointment of site security to assure physical safety and to address, raise or resolve conflicts occurring on site. Development of traffic management plans for the use of the main road: e.g. the

VEC	Baseline	Cumulative Impacts	Significance	Mitigation Measures
Al-Wakrah Celebration Halls (1.4 km) Barwa Village (3.9 km) GAC Doha Main Office (1.7 km) Mosque (Masjid Ali Bin Abdullah Al-Abbas) (1.8 km) QEWC Staff Accommodation Workers village camp (1.7 km) Ras Bu Fontas beach	coast of Qatar and less than 1km north of the outskirts of Al Wakrah town. The site will be immediately to the south of the Qatar Metro Depot.	and air pollution associated with construction activities and increases in vehicle movements to site. Due to the scale of the construction works required and the 6000 workforce required, moderate cumulative impacts are exacted during the construction phase. **Operation** Due to the existing industrial nature of the area and distance to residential receptors there are no cumulative impacts anticipated during operation.	Not Significant	transport of labour, materials and waste during off-peak time. Development of environmental impact mitigation and control measures to prevent construction-related environmental impacts, such as noise and air pollution, from affecting the community.
Migratory Birds	The AoI has the potential to support populations of migratory bird species	**Construction** Temporary disturbance from noise and vibration due to the movement of construction traffic and ground clearance and excavation. Loss of potential wintering habitat due to modification of the coastal environment, may also reduce important roosting locations for these species. Moderate cumulative impacts are therefore anticipated. **Operation** Expected operation impacts are from	**Construction** Moderate **Operation** Not significant	Reinstate habitats after works have been completed (where applicable – e.g. excavations). Minimise noise and vibration disturbance through best practice and timing of such works (construction traffic movements, ground clearance, excavation, etc.) Minimise the impacts of artificial lighting (using methods such as directional lighting, ensuring no unnecessary lighting is shone to the surrounding area), noise and air emissions to relevant bird species (steppe eagle, greater spotted eagle, eastern imperial eagle, Asian houbara, grey plover, Socotra cormorant and white-cheeked tern).

VEC	Baseline	Cumulative Impacts	Significance	Mitigation Measures
		additional Project lighting, noise, and air emissions which can disturb these species during migration but given the urban location of the Project is not likely to be significantly increased from baseline, therefore cumulative impacts during operation are considered to be not significant.		

7 Environmental, Social Management and Mitigation

7.1 Environmental and social mitigation measures

Air Quality

Construction phase

7.1.1 The following mitigation measures (which are in accordance with the IFC EHS General Guidelines - Air Emissions and Ambient Air Quality (2007)) for controlling air quality impacts will be incorporated into the construction phase:

- Minimising dust from material handling sources, such as conveyors and bins, by using covers and/or control equipment (water suppression)
- Minimising dust from open sources, including storage piles, by using control measures such as appropriate locations, installing enclosures and covers and increasing the moisture content
- Dust suppression techniques should be implemented, such as applying water or non-toxic chemicals to minimise dust from vehicle movements
- Manage emissions from mobile sources as per the EHS Guidelines for Air Emissions and Ambient Air Quality including:
  - Contractors are required to use modern, well-maintained vehicles that comply with applicable emission limits
  - Introduce and enforce a 'no idling' policy
  - Regardless of the size or type of vehicle, fleet owners / operators should implement the manufacturer recommended engine maintenance programs
  - Drivers should stick to demarcated and levelled construction routes
  - Minimise speeds on site to <20kmph
  - Drivers should be instructed on the benefits of driving practices that reduce both the risk of accidents and fuel consumption, including measured acceleration and driving within safe speed limits
- No open burning of solid waste
- Planning land clearing, removal of topsoil and excess materials, location of haul roads, tips and stockpiles, and blasting with due consideration to meteorological factors (e.g. precipitation, temperature, wind direction, and speed) and location of sensitive receptors. For example, minimise groundworks during periods of high wind (e.g. >20kph) and vegetating exposed surfaces of stockpiled materials
- Ensure grievance mechanism is in place so if air issues such as dust occur, communities can report them to the Project Company.

Operational phase

7.1.2 No combustion mitigation measures in addition to those already accounted for within the dispersion modelling are proposed. The following key design features have been accounted for:

- Appropriate abatement methods in the gas turbines to meet the specified emission limits (27ppm in open cycle mode and 9ppm in combined cycle mode)
- A main exhaust stack height of 60m for the HRSG and a bypass stack height of 45m have been proposed to ensure effective dispersion of emissions

Monitoring

7.1.3 It is a requirement of the IFC EHS Guidelines for Thermal Power Plants (2008) to undertake continuous stack emissions monitoring, periodic emissions testing and ambient air quality monitoring for all combustion turbine projects firing on natural gas with a thermal input greater than 50MWth. It is also anticipated that the MoECC may request monitoring during the operational period of the plant.

Stack Emission Monitoring

7.1.4 A continuous emissions monitoring system (CEMS) will be installed to monitor NOx emissions. Stack emissions will also be tested annually to validate the CEMS monitoring results.

Ambient Air Quality Monitoring

7.1.5 The IFC EHS guidelines require that if impacts are greater than 25% of relevant short term ambient standards or if the plant is equal to or larger than 1,200MWth, typically a minimum of two continuous ambient air quality monitoring stations are required to be installed in the vicinity of the plant.

7.1.6 As shown in Section Table 6.17 to Table 6.20 PCs are below 25% of relevant short term ambient standards however the Project is greater than 1,200MWth in size. Therefore, continuous ambient air quality monitoring of NO_2 will be undertaken in line with international best practice methods.

7.1.7 One monitoring station should be located within the likely worst case impact area and/or worst-case sensitive receptor. The second should be located at a background site, away from the proposed Project's area of impact. Exact monitoring locations will be specified in a defined monitoring strategy in coordination with the MoECC and will be influenced by a number of factors including security and availability of power.

Marine

7.1.8 The marine surveys and information are still being finalised and therefore this will be included as part of the updated revision.

7.1.9 Mitigation measures to reduce impact magnitude below significant levels during construction include:

- Minimising the volume of material to be removed by the minimum amount possible to meet the engineering requirements
- Use of a backhoe dredger with a closed bucket to minimise the level of sediment disturbance and its re-suspension
- Use of silt curtains to screen off flows going around the outfall pipelines away from seagrass and coral receptors
- Undertaking dredging outside of critical spawning periods for species confirmed during surveys.
- Monitoring of suspended sediment during dredging so that they do not exceed a specific limit beyond the end of the existing outfall, the exact threshold to be developed based upon the confirmed receptors in the survey in agreement with MoECC though a 30mg/l limit is proposed as an interim

- Undertaking dredging during calm wind and neap tides to minimise the extent of dispersion of suspended sediments. This will be identified as part of dispersion modelling included in Appendix N
- Undertaking dredging outside of critical spawning periods for species confirmed during surveys
- As far as practicable construction operations will be conducted during daylight hours
- Where artificial lighting is required sensitive lighting techniques such as directional and hooded lighting will be adopted to reduce any disturbance to birds, marine mammals and fish during night-time. If any artificial lighting is required on the foreshore (or from e.g., site cabins towards the foreshore) this will be directional or utilising lighting hoods to direct light spill away from any bird roosting or foraging areas, including open water areas
- All vessels will implement MARPOL ballast water management convention (2017)
- Use of certificated imported materials (e.g. Non-marine sources of rock or heat-treated) will minimise the risk of introducing invasive species into the marine environment
- Fill material should not be procured from sites / areas known to have presence of invasive species and should be screened ahead of use
- The number of vehicles used on site and the frequency at which they enter the intertidal area should be limited (vehicles should only enter the intertidal area on an ebb tide when there is a suitable dry area available for working)
- A stringent system of vehicle maintenance and cleanliness should be implemented during construction works, including frequent vehicle washing between road and beach access. Where it is necessary to move anything on or off site and where plant machinery is to be moved from one part of the wite to another, biosecurity measure should be applied in line with 'Check-Clean-Dry' recommendations from the Non-native species secretariat (Available at http://www.nonnativespecies.org/checkcleandry/index.cfm). This would involve washing down, visual inspection, disinfection and / or thorough drying
- Boot washing as well as equipment cleaning facilities (with a biocide such as Virkon) should be provided and carried out when entering and exiting marine areas of the site
- Bunded tanks, drum pallets and drip trays will be used, and all stored on impermeable bases away from drains
- COSHH materials will be stored in a suitable locked container
- Spill kits will be available on all plant / machinery and centrally in each area
- The workforce will be trained in the use of spill kits and training is updated throughout the works
- Toolbox talks covering the refuelling procedure including the emergency spill procedure will be provided to personnel responsible for refuelling plant and equipment
- Visual inspections of plant before and after each shift will take place, with any potential for leaks or spills to be corrected before use of plant
- Materials will not be stored within 10m of a watercourse or a surface water drain

- A COSHH waste bin will be present in the site compounds
- All drums, barrels, tanks, and bowsers >200l, and associated pipework will be bunded and stored more than 10m from any waterbody or surface water drain
- Any tap of valve permanently fixed to bowsers or tanks will be fitted with a lock and locked when not in use
- Drip trays will be placed at the point where oils / fuels are transferred from one container to another
- Oil / fuel storage and fuelling areas will be located on impermeable surfacing >10m from a waterbody or a surface water drain, will be locked when not in use and will be away from transport routes to avoid collisions
- Drip trays will be used to collect minor leaks and spills under static plant, which will be kept empty of water
- Emergency spillage response plans will be prepared, with all staff trained in the plan and spill drills carried out
- In the event of a spillage, personal protective equipment will be worn as appropriate
- Grout / concrete will not be mixed within 10m of water body or a surface water drain
- All cement or concrete washout will be poured into a skip positioned on a waterproof membrane and bunded to contain any leakage from the skip, which will be appropriately disposed of off-site. The skip will be kept >10m from a waterbody or surface water drain and be in a suitable condition to prevent rainwater collecting
- Plant servicing will only be carried out in compounds >10m from waterbodies or surface water drains in an impermeably surfaced area, or over a drip tray
- No materials will be stored within the marine environment or intertidal area
- Tracking of vehicles across the intertidal area will be minimised as much as possible
- The site manager will monitor weather forecasts, and any works will be suspended when flooding is forecasted and all materials, waste and equipment will be moved to high ground to prevent any pollutants mobilising
- Suitable waste disposal facilities will be located on board each of the vessels utilised for the projects
- Each vessel utilised for the project will have its own spill kit and staff on the vessel will be trained in how to utilise this spill kit.

7.1.10 Mitigation measures to reduce impact magnitude below significant levels during operation include:

- Use of existing intake heads and structure to minimise differences in intake velocity and reduce entrainment of smaller organisms
- Use of a coarse screening to prevent entry of larger marine fauna entering the intake gallery
- Seasonal restrictions on operations intake rate during peak spawning or larval periods for receptors confirmed by monitoring surveys as representing medium sensitivity receptors or above

- Regular maintenance and biological monitoring of intake systems are necessary to assess biological load and adjust mitigation strategies as needed. Particularly of concern is reducing intakes temporarily where significant sargassum blooms or other mass occurring species would require unsustainable levels of biocide processing or cause operational issues.

Climate Resilience and Greenhouse Gases

7.1.11 To address and mitigate the adverse impacts identified in the climate resilience impact assessment, the following strategies and measures are proposed. These efforts aim to prevent, minimise, or offset potential climate-related risks and enhance the facility's overall resilience to climate change.

Operation phase mitigation measures

Rising air temperatures

- Installing enhanced cooling systems to manage the temperature of critical components and ensure continued efficient operation particularly during the summer months (June to September).
- Utilising heat recovery systems to improve energy efficiency while reducing the increased thermal load on the plant.
- Selection of improved insulating materials during plant detail design to minimise heat loss and maintain optimal operating temperatures.
- Conduct frequent maintenance checks to identify any potential heat related defects within the facility's different operational components.
- Implement efficient water management practices to ensure the required cooling takes place, as well as to minimise potential losses during the reverse osmosis process.
- Ensure that areas occupied by staff are temperature controlled in order to reduce the risk of heat stress and other high temperature related illnesses that may occur.

Increased precipitation and flood risk

- Build and maintain adequate water storage, drainage, and detention basins to divert excessive surface waters, resulting in increased precipitation periods.
- Develop and implement comprehensive emergency response plans to address potential flooding scenarios.
- Usage of water-resistant materials to reduce potential degradation of operational components while also reducing the need for replacements due to damages from rain or flooding.
- Construction of flood barriers as a physical means to protect the facility infrastructure from increased flood waters.
- The use of permeable paving materials connecting different sections of the facility to enhance water absorption and reduce the probability of pooling.

Sea level rise

7.1.12 Sea level rise shares several common mitigation measures with increased precipitation and flood risk, most importantly:

- The construction of flood barriers should be made based on the results of a more detailed flood risk assessment study.

Rising sea temperature

- Installation of cooling systems, particularly with regards to the incoming seawater to be treated to reduce the scaling and other negative impacts listed during the impact assessment.
- Usage of heat exchangers to efficiently dissipate the heat.
- Regular seawater temperature monitoring to ensure that incoming water, both for treatment and cooling, is within desired operational parameters.
- Modifying operational schedules to avoid peak heat periods and reduce thermal stresses on the facility.

Increased humidity

- Usage of corrosion resistant materials wherever possible due to the increased corrosion risks brought on by operations within humid environments.
- Improved ventilation and humidification control (such as air conditioning) in order to control humidity particularly within closed operational spaces, reducing moisture levels as well as improving operating conditions both for workers and operational components.
- Application of protective coatings and sealants to equipment to prevent infiltration of moisture and associated damage or inefficiencies that may result from them.

Extreme weather events

7.1.13 In addition to the previously mentioned mitigation measures, the following additional measures may help reduce the impact of extreme weather events on the facility and associated nearby areas.

- Installing air filtration systems capable of protecting gas turbines from dust and particulates, particularly in the event of dust storms.
- Ensuring the facility is designed to handle high wind speeds through reinforced structures and secure anchoring.
- Ensuring an emergency response plan is developed in coordination with the relevant authorities.
- Installation of backup power systems and alternative water sources in order to ensure the facility's continued operation in the event of a critical failure caused by extreme weather events.

7.1.14 Maintain early warning systems through collaboration with relevant authorities such as coastal authorities, meteorological experts etc in order to detect and respond to extreme weather events promptly.

Greenhouse Gas (GHG) emissions

Monitoring and reporting

7.1.15 In order to maintain the relevance of this impact assessment, it is recommended that periodical monitoring and reporting is conducted. The different climate related impacts mentioned in this assessment should be revisited and monitored periodically to determine if any unforeseen impacts are affecting the operations of the Project.

7.1.16 Transitional impacts should be revisited as the regulatory landscape continues to evolve with the impact of future legislation being taken into account to ensure that the necessary changes can be accounted for the facility to operate within the required national requirements.

7.1.16.1 To address the adverse impacts identified in the GHG impact assessment, we propose the following strategies and measures. These initiatives are designed to prevent, reduce, or offset climate-related risks while improving the facility's overall emissions performance**.**

Construction phase mitigation measures

- The use of fuel-efficient or solar powered construction equipment and machinery wherever possible.
- Procurement of low carbon concrete and steel, making use of recycled and local materials wherever applicable.
- The use of minimal inverse/ low carbon construction methods where applicable
- Use best practice for resource efficiency to reduce GHG emissions.

Operation phase mitigation measures

- Allocate a space with the Project boundary for potential future CCUS implementation.
- Study the potential to use renewable energy to provide the electricity input needed for the operation of Facility E.
- Conduct regular performance checks and maintenance of turbines to ensure optimal performance and identify issues that may lead to greater emissions.
- Study the potential of switching to more low-carbon fuel alternatives such as hydrogen or biogas.
- Installation of continuous emissions monitoring systems (CEMS) to track real-time GHG emissions and identify any exceedances and address carbon hotspots that may occur.
- Invest in certified carbon offsetting programmes such as Verified Carbon Standards (VCS) or Gold Standard to compensate for unavoidable emissions or build own offsetting portfolio.

Transitional risks mitigation measures

- Use transparent and proactive communications measures and engage stakeholders to manage reputational risk.
- Allocate space within the Project boundary for future CCUS implementation in order to accommodate future plans.
- Engage in periodic and regular emissions reporting once Facility E is operational in order to measure its performance and evaluate its contribution towards Qatar's national goals.
- Proactively engage with the government of Qatar to understand upcoming planned regulations in order to respond to shifting legislative landscapes should changes arise.
- Take measures to improve operational flexibility to accommodate further renewables penetration into the energy mix throughout the facility's operational lifespan.

Alternatives analysis

7.1.16.2 Several potential alternatives, both from a perspective of fuels as well as energy production technologies, have been identified.

Alternative fuel sources

7.1.16.3 One potential alternative lies in the use of hydrogen as a substitute for natural gas. While natural gas combustion is known to emit roughly 2.75kg of CO_2 per cubic meter (IPCC, 2006), the results of hydrogen combustion is water (H_2O). In order to assess the emissions of hydrogen however, the source of energy used for the production process must then be taken into account. The use of renewable energy such as solar to power the electrolysis process used in green hydrogen production would result in significant reductions of GHG emissions. While this does sound attractive from an emissions perspective, current barriers revolve around the high costs involved in green hydrogen production. The International Energy Association (IEA) estimated in 2019 that the cost to produce hydrogen using low-carbon electricity (such as solar PV) ranges from 3.2 – 7.7 USD/kg which is significantly higher than if produced through natural gas combustion alone at 0.7-1.6 USD/kg (International Energy Association, 2020).

Solar PV

7.1.16.4 As seen in the market risk baseline, the global average cost of solar energy has substantially dropped during the period of 2010 to 2023, from 0.46 USD/KWh to 0.044 USD/KWh. While this does sound attractive at face value, in the absence of large-scale energy storage systems the variability of renewable energy requires a more conventional sources of power such as that provided by Facility E to serve as a baseline energy source. Qatar recently completed a new solar PV plant with a 800MW capacity, with an additional 875 MW capacity of solar currently under development. While the 800MW of solar installed capacity represented 7% of the total installed capacity mix, in reality this resulted in 8.36 GWh of electricity produced in 2022 corresponding to 0.015% of Qatar's electricity production that year. This indicates that significant investment in additional solar projects as well as large scale energy storage would be required to completely replace the 2.4GW capacity offered by facility E, thus making it unfeasible.

Nuclear power

7.1.16.5 Nuclear power provides many benefits from a decarbonisation and climate change mitigation perspective. With a high energy output compared to a low fuel requirement, as well as minimal CO_2 emissions, nuclear power provides potential avenue for reliable and low carbon emitting energy (IPCC, 2014). According to the Nuclear Energy Agency (Nuclear Energy Agency, 2020) the levelised cost of electricity (LCOE) of nuclear power in the United States of America in 2020 was 33.25 USD/MWh produced for a 1000MW nuclear power plant operating in Long Term Operating (LTO) conditions. Similarly for the same year, the LCOE of a 727MW capacity CCGT gas facility was 44.98 USD/MWh and rises to 70.34 USD/MWh for a 646MW CCGT facility with CCUS integrated. While from a cost perspective this may seem attractive, environmental considerations particularly with regards to the disposal of radioactive waste, high upfront costs to develop nuclear facilities, long construction times as well as international regulations make this less feasible for Qatar.

Wind

7.1.16.6 While Qatar currently does not have any large scale installed wind capacity, with 0 MW in 2022 according to IRENA (IRENA, 2024), feasibility studies have been conducted to consider the installation of wind turbines. As part of the QNRES, a detailed techno-economic assessment was conducted on Qatar's existing renewable resources. While the study concluded that almost the entire area of Qatar would allow for acceptable wind power density (>300 W/m2), the feasibility study shortlisted Solar PV and Concentrated Solar Power (CSP) as the most attractive technologies that can be commercially deployed in Qatar. Similarly, according to the Asia Wind Energy Association (Asia Wind Energy Association, n.d), wind speeds in Qatar are moderate and more suited for small wind turbine generates used for locally in cases such as water pumping or generating electricity in remote locations and on isolated farms rather than large scale projects.

Monitoring and reporting

7.1.16.7 To maintain the relevance of this impact assessment and comply with EP4 requirements (Equator Principles Association, 2020), a GHG reporting and monitoring plan should be established for Facility E that tracks direct CO_2 emissions from the facility's operations based on IPCC guidelines and should be reported on an annual basis. Additionally, if the EP4 stated limit of 24,000TCO_2e emissions per year is exceeded, then it is encouraged to publicly disclose greenhouse gas emissions to ensure transparency and credibility

Social

7.1.16.8 To prevent, minimize or offset the adverse labour related impacts, mitigation measures were identified in accordance with the national regulations and laws, international best practices and the World Bank ESSs.

Construction Phase

7.1.17 **Mitigation measures on socioeconomic during construction phase**

7.1.18 Regarding the potential impacts of the Project on the socioeconomic baseline, the mitigation measures are:

- Implementation of comprehensive environmental and social management plans and frameworks including Stakeholder Engagement Plan and a grievance mechanism that contributes to the development and wellbeing of individuals and the community and eventually the overall quality of life, by respecting the social sensitivities and protecting local communities from risks and impacts preserving the local infrastructure, social facilities and improving them where required.
- Aim towards the acquirement of talents and improvement of the individuals through effective hiring and training.
- Active community engagement during all Project phases to ensure maximum benefit to the community.

Mitigation measures on Community Health, Safety and Security (CHSS) during construction phase

7.1.18.1 Regarding the potential impacts of the Project on community health, safety and security level, the mitigation measures are:

- Implementation of proper HR management system that assures compliance with national and international laws and regulations, workers' training in all necessary areas such as health and safety, In addition to proper handling and management of workers' grievances.
- Appointment of site security - in line with the World Bank ESS 4 and GIIP - to assure physical safety and to address, raise or resolve conflicts occurring on site.
- Development of traffic management plans for the use of the main road: e.g. the transport of labour, materials and waste during off-peak time.
- Development of environmental impact mitigation and control measures to prevent construction-related environmental impacts, such as noise and air pollution, from affecting the community.

Labour and Working Conditions including Occupational Health and Safety (OHS) during construction phase

7.1.18.2 Regarding the potential impacts of the Project on labour and working conditions during the construction phase, the following mitigation and enhancement measures will be applied, but not limited to the following:

- Development and implementation of a Project-specific Environment and Social Management Plan (ESMP).
- Development and implementation of a Project-specific Construction Environment Management Plan (CEMP).
- Development and implementation of a Project-specific Waste Management Plan.
- Development and implementation of a Project-specific Stakeholder Engagement Plan.

- Providing an accessible grievance mechanism to workers and contractor and sub-contractor workers through which they can raise their concerns and suggestions, that also includes a channel to receive and address confidential complaints related with SEA/SH with special measures in place.
- Development of a Code of Conduct for workers and ensuring that it includes appropriate and proportional security measures for women workers (if any) (i.e. lighting, alarms, separate toilets).
- Ensuring that the main contractor and its subcontractors follow laws and regulations in the employment of construction workers, such as no employed worker should be less than 18 years old, all of the workers should have a work permit issued legally by the relevant national authority, no forced labour should be applied and tolerated by the main contractors and the third parties, all acts of misconduct and inappropriate behaviour should be prohibited.
- Ensuring the Contractor's child labour policies and Qatari legislation are followed, and labour practices will be internally audited, and the Project Company will employ a third party auditor company to be externally audited annually.
- Ensuring security forces are employed and managed in line with the World Bank ESS 4, Good International Industry practice (GIIP) and security measures are properly implemented in the Project site.
- Adherence that the Consortium and Contractor's policies on misconduct and inappropriate behaviour are upheld and ensuring its implementation by the contractors and sub-contractors.
- Ensuring vulnerable workers as specified in the World Bank ESS2 and identified within the scope of the Project (i.e. women, disabled, migrant workers) are protected and are not discriminated.
- Ensuring the use of all forms of child and forced labour is prevented in contractor/subcontractor companies as well as the supply chain.
- Development and implementation of an Accommodation Management Plan/Procedure including a procedure for managing the off-site accommodation of workers.
- Ensuring the off-site accommodation conditions are in compliance with the World Bank ESS 2 requirements.
- Development of an Employment and Procurement Strategy to ensure maximisation of opportunities for local people and businesses.
- Implementing procedures to confirm workers are fit for work before they start work.
- The contractor and its subcontractors will be required to follow the requirements of the Project. Contracts to be signed with subcontractors will include EHS requirements.
- Contractors will develop Labour Management Plans based on the Project Human Resources Management Plan/Labour Management Procedures (HRMP/LMP).
- All workers health-related issues to be covered under the national Hamad Medical Corporation.
- Conduction of annual external audits by the means of assuring that no child or forced labour has been employed on the Project directly or through supply chain and that all labours are permitted to work legally.
- The mitigation measures that will be applied to reduce or avoid the potential occupational health and safety risks during the construction phase will include but not be limited to the following:
    - Implementation of good site management practice (training and qualification of staff, appropriate work standards) to reduce occupational health and safety

risks. The Contractor will ensure that all work will be carried out in a safe and disciplined manner and is designed to minimize the risks on neighbouring residents and environment.

- Ensuring that necessary fencing is installed around the Project site during construction.
- Implementation of the Occupational Health and Safety Management Plan.
- Conducting risk assessments.
- Implementation of the Emergency Preparedness and Response Plan.
- Conducting regular drills.
- Ensuring supply and use of appropriate PPE in line with international best practice and national legislation.
- Providing regular trainings and toolbox talks to workers and subcontractor workers on the possible risks regarding the work site and works to be carried out (including key rules and regulations to follow) and keeping training records.
- Keeping accident records (fatalities, lost time incidents, near misses, any significant events including spills, fire, outbreak of pandemic or communicable diseases, social unrest).
- Regular inspection of equipment and vehicles.
- Definition of the relevant monitoring parameters and implementation of regular monitoring of the occupational health and safety performance of employees and subcontractors.
- The subcontractors will also be required to follow the requirements of the Project. Contracts to be signed with subcontractors will include EHS requirements.
- The Contractor will ensure a safe working environment for the workers and appropriate signposting of the sites will be provided.
- The Contractor will assign at least one full-time OHS specialist with relevant certification and experience in charge of OHS management on site.

Operation Phase

7.1.19 Mitigation measures on socioeconomic during the operation phase

- Technically maintain optimal and sustainable operation of the facility to preserve the infrastructure and improve where required.
- Active community engagement and the establishment of continuous community educational programs to raise awareness and positively impact individually or in collaboration with other entities or NGOs.
- Employ and manage human resources in a manner that positively influences and enhances the socioeconomic conditions of the community.
- Clear grievance mechanism and accessibility to grievance form while maintaining continuous engagement.

Mitigation measures on Community Health, Safety and Security (CHSS) during operation phase

- Implement a Community Health and Safety Management Plan to identify, assess and manage the risks which have potential impact to the community.
- Implement an Emergency Response and Preparedness Plan for instances when disastrous events happen and how to control.

- Implement Hazardous Material Management Plan and Waste Management to minimise environmental risks and impacts transfer to the community.
- Provide access to health services for regular health checkups in addition to offering health awareness campaigns.
- Provide security forces for the safety of the Project and the community.

Mitigation measures on Labour and Working Conditions including Occupational Health and Safety (OHS) during operation phase

7.1.19.1 To address the potential impacts of the Project on labour and working conditions during operation phase, the following mitigation and enhancement measures will be applied:

- Development and implementation of a Human Resources Management Plan/Labour Management Procedures based on the Project's Labour Management Procedures (addressing issues including non-discrimination and equal opportunity, workers' rights and benefits, right to unionisation, grievance mechanism, child and forced labour) in line with the national and international requirements.
- Providing an accessible grievance mechanism to workers and contractor workers with which they can raise their concerns and suggestions, that also includes a channel to receive and address confidential complaints related with misconduct and inappropriate behaviour with special measures in place.
- Development of a Code of Conduct for workers and ensuring that it includes appropriate and proportional security measures for women workers (i.e. lighting, alarms, separate toilets).
- Certification and human resource management for the laboratories, which are planned to be operated in accordance with the OECD Good Laboratory Practice (GLP).
- Ensuring that the subcontractors follow laws and regulations in the employment of workers.
- Ensuring fair treatment, non-discrimination and equal opportunity of all employees.
- Ensuring vulnerable workers as specified in the World Bank ESS2 and identified within the scope of the Project (i.e. women, disabled, migrant workers) are protected and are not discriminated.
- Ensuring the use of all forms of child and forced labour is prevented in subcontractor companies as well as the supply chain.
- Ensuring security forces are employed and managed in line with the World Bank ESS 4, GIIP, and security measures are properly implemented in the Project site.
- Adherence that the Consortium and Contractor's policies on misconduct and inappropriate behaviour are upheld and ensuring its implementation by the contractors and sub-contractors.
- Establishing of a quota for the employment of women workers to provide gender equality.

7.1.19.2 Regarding the potential occupational health and safety risks during the Project activities, risk assessments will be conducted to determine the complete set of measures required. At a minimum, it is necessary to apply the following mitigation measures:

- Implementation of the following as part of the ESMS: Occupational Health and Safety Management Plan, Emergency Preparedness and Response Plan, Community Health and Safety Management Plan, Hazardous Materials Management Plan, Waste Management Plan.
- Regular monitoring and reporting of the occupational health and safety conditions within the Project including incidents and near misses.

- Providing a Self-Inspection Checklist for the Project personnel to fill the checklist on a regular basis and keeping the records of the checklist.
- PPE will be used to reduce the likelihood of exposure of personnel to both the chemical hazards.
- Implementation of engineering and administrative control measures to avoid or minimize the release of hazardous substances into the work environment keeping the level of exposure below internationally established or recognized limits.

Noise and Vibration

7.1.20 Although the assessment has indicated that impacts due to both construction and operational noise are negligible, the following methods should be considered to ensure these levels are attained.

7.1.21 Please note that the recommendations below are not exhaustive but are the ones that are most applicable. All sites benefit from general best practice during both construction and operation:

- Regular communication with local residents
- All plant onsite should be the quietest model available and where needed silenced according to the manufacturer's recommendations
- Where practicable construction plant should not be left operating at idle
- When in use any directional aspects to the plant should be directed away from the nearest properties
- Undertaking of the noisier activities during daytime hours and minimising and avoiding where possible any noisier work during the evening
- If undertaking noisy activities at night or in close proximity to a residence is unavoidable consider screening or enclosing the equipment
- Arrange for deliveries of equipment and transport of staff during daytime, avoid where possible the sensitive night-time hours; and
- Consideration of an alternate haul route that is further away from the existing receptors.

Cultural Heritage and Archaeology

7.1.22 The presence and nature of unknown archaeology remains unknown for the Project. As set out in the IFC Performance Standard 8: Cultural Heritage, the project sponsors are responsible for developing provisions for managing chance finds, which will be applied in the event that unexpected archaeological remains are encountered during the construction of the project. In the event that archaeological finds or features are identified during the course of works associated with construction groundworks, an emergency procedure will be required in order to stop work and allow for the assessment of the archaeological potential of the remains. Assessment must be carried out by a designated archaeological professional. If buried archaeological remains are of significance, then a system will be put in place to mitigate harm. This may involve protecting the remains or a system to excavate and record the remains. Therefore, a chance finds procedure will be included within the CEMP.

7.1.23 The details of access routes, compounds and stockpiling locations remain to be finalised and so cannot be assessed by the current assessment. Additional assessment and surveys will be required to identify impacts and appropriate mitigation for cultural heritage receptors that may be impacted by these elements of the construction infrastructure.

7.1.23.1 No significant cultural heritage impacts have been identified so there are no residual effects.

Terrestrial Ecology

Construction Mitigation

7.1.23.2 This section describes mitigation measures for impacts expected during construction for terrestrial ecology.

7.1.23.3 In areas of modified habitat IFC PS6 applies to those areas that include significant biodiversity value, as determined by the risks and impacts identification process. The mitigation is designed to follow the first two steps of the mitigation hierarchy (avoidance and minimisation) as appropriate to the level of impact on these values.

Table 7.1 Mitigation measures for construction phase impacts identified in Section 7.8

Impact	Mitigation measures
Terrestrial Ecology	• A biodiversity specialist should undertake a pre-construction check of the burrows identified during the initial walk-over survey, areas to be excavated to identify any sensitive locations (such as shelters for small mammals and reptiles) and move these to where possible to reduce the possibility of injury/ death during excavation. • Vegetation clearance should be undertaken gradually to enable any small mammals enough time to relocate. Vegetation clearance to be slow and directional, and the Project site should be left for at least 24 hours following vegetation clearance before any excavations. • A biodiversity specialist should also check for the presence of invasive non-native species. If found, measures to reduce their spread should be implemented. • Avoid loss of habitat outside of the construction boundaries: - Use existing roads/tracks where possible for construction vehicles. • Minimise loss of / disturbance to habitats: - Enclose secure fencing sites to ensure that disturbance of off-site areas is reduced. - Restrict activities and waste storage to the project site boundary. - Vehicles to drive according to speed limits to reduce dust and accidental damage to flora/ injury to fauna. • Avoid and minimise changes to water quality (refer to Marine Chapter) • Avoid the spread of invasive non-native species: - A qualified professional should undertake a pre-works check for the presence of any invasive non-native species. If found, measures to reduce their spread should be implemented. o Check and clean equipment, eradicate invasive non-native species, utilising sustainable methods where possible (e.g. avoid use of chemicals/pesticides that do not comply with good international industry practice). • Prevent direct harm to or disturbance to fauna species; - No hunting, capturing or poisoning of fauna - Vehicles to drive according to speed limits - Slow, directional excavations to ensure time for small mammal/ reptiles to move out of the way if present. - Regular checks of open excavations to ensure trapped animals can escape • Reinstate habitats after works have been completed (where applicable – e.g. excavations). • Minimise noise and vibration disturbance through best practice and timing of such works (construction traffic movements, ground clearance, excavation, etc.)

Impact	Mitigation measures
	• Ensure appropriate food waste disposal is undertaken on site. Food waste generated by 6,000 members of staff during construction could attract animals.

Operation Mitigation

Impact	Mitigation measures
Terrestrial Ecology	• Minimise the impacts of artificial lighting (using methods such as directional lighting, ensuring no unnecessary lighting is shone to the surrounding area), noise and air emissions to relevant bird species (steppe eagle, greater spotted eagle, eastern imperial eagle, Asian houbara, grey plover, Socotra cormorant and white-cheeked tern). • Refer to the Marine Chapter for mitigation requirements changes in water quality which could impact coastal birds. • Avoid additional habitat loss/ disturbance: o Enclose secure fencing sites to ensure that disturbance of off-site areas is reduced. o Restrict activities and waste storage to the project site boundary. • Ensure appropriate food waste disposal is undertaken on site during operation.

Source: Mott MacDonald, 2025

Soil, Hydrology and Contaminated Land

7.1.24 The assessment considers environmental constraints and has included, where possible, measures to reduce the potential for likely significant adverse impacts. These are summarised in the following sections

- Primary (or embedded) mitigation measures are those measures forming part of the Project to reduce soil and hydrology effects include the following design measures:
- Installation of gas membrane and venting systems within building foundations to prevent entry and accumulation of ground gas to proposed structures.
- Use of hardcover materials within areas identified to be of contamination concern to sever the long-term pollutant linkage to site end users and reduce downward infiltration.
- Incorporating specification of construction materials to mitigate aggressive ground conditions.
- To mitigate the hazard to future maintenance/service workers associated with the inhalation/ingestion/contact with contamination, the following will be undertaken.
    - Incorporation of a marker membrane to identify the presence of potentially contaminated materials.
    - Removal of bulk contaminated materials, where identified, and replacement with “clean” imported material.

7.1.25 In additional to the above, tertiary mitigation measures are also considered in the assessment of effects. Tertiary mitigation measures are imposed measures which are legal requirements irrespective of the need to undertake an ESIA, for instance, the need to protect the construction workforce from the effects of contamination as part of the Construction (Design and Management) Regulation 2015 (CDM 2015) and the Health and Safety at Work Act 1974.

7.1.26 Table 7.2 and Table 7.3 summarise the appropriate mitigation measures applicable to each identified receptor during construction and operation, respectively.

Mitigation of construction impacts

Table 7.2: Summary of construction impacts mitigation measures

Receptor	Impact	Mitigation measures
Human health receptors (construction workers)	Slight adverse (not significant)	All construction activities will follow the requirements of CDM 2015 and CAR 2012 to effectively manage health and safety of construction workers and prevent spread of pollution to adjacent land users.
Human health receptors (nearby site users)	Slight adverse (not significant)	
Groundwater	Slight adverse (not significant)	Prior to commencement of any groundbreaking activity, the risk to groundwater will be further assessed by undertaking a foundation works risk assessment in accordance with relevant guidance to identify the risks from penetrative ground improvement. This will inform the most appropriate ground penetrative technique, if required, to be used for the construction which will create the least preferential pathways for contamination migration.

Source: Mott MacDonald, 2025

Mitigation of operational impacts

Table 7.3:Summary of operational impacts mitigation measures

Receptor	Impact	Mitigation measures
Human health receptors (site end users)	Slight beneficial (not significant)	The design of the Project is expected to be hard cover effectively severing contact with the any underlying contamination. The design should also include ground gas protection measures (as highlighted in □) for structures when gases are identified to pose a risk.
Built environment	Slight adverse (not significant)	The design will select construction material in line with the contamination status of ground and groundwater and provide additional shielding with protective coating or barriers. Below ground construction materials such as concrete are to be designed to BRE specifications for the anticipated ground conditions.

Source: Mott MacDonald, 2025

Solid Waste and Material Management

Construction

7.1.27 Details on minimisation and management of construction waste for the Project is outlined in the Waste Management Plan (WMP).

7.1.28 The proper storage and segregation of waste arising from the construction is essential for the mitigation, the storage of waste will include:

- Color-coded bins and labelled skips to be provided according to waste classification.
- All recycling containers will be clearly labelled. Containers shall be located in close proximity to the site under construction in which recyclables/salvageable materials will be placed.

7.1.29 Special considerations are required for hazardous waste storage and disposal that include:

Storage

- Stored in sealed containers in a designated area with clear labelling
- Typically stored on-site for up to 90 days

Disposal

- Transported, treated and disposed by MoECC-certified/approved company/facilities.

Dedicated storage for hazardous waste:

- An impermeable dike (bund) with a volume of at least 110% of the largest tank or container to be used for storage, or 25% of the total vessel volume to be stored in the bund, which ever volume is greater, will be constructed around the waste oil and chemical storage area to contain leaks and spills.
- Hazardous waste storage areas will have spill containment systems and be protected to avoid run-off to and from the storage area.
- Perimeter cut off drainage may be constructed to contain leaks, spills, and run off.
- Firefighting equipment will be provided in close proximity to the storage and collection centres.
- Chemical and hydrocarbon absorbent materials will be provided to clean up spills and leaks.
- Sufficient number of skips or other adequate containers will be provided for the collection of the different types of wastes.
- Hazardous waste containers for storage and transport will be appropriately marked and labelled.

7.1.30 Where waste cannot be avoided and must be taken to a facility for disposal, treatment or recycling:

- The appointed contractor will ensure that the facilities have the appropriate permits.
- The suitable facility will be located as close to the works as possible to minimise the impacts of transportation, in particular the release of carbon emissions.
- The appointed contractor will identify the closest and relevant treatment and disposal sites.
- When separate treatment or disposal facilities are required, the facilities used should be in close proximity to each other and long-haul transportation to separate facilities are minimised.

7.1.31 All sub-contractors are expected to ensure all staff will comply with the Waste Management Plan. Orientation (induction) training will be provided to workers regarding proper waste disposal.

Operation

7.1.32 The mitigation of adverse effects on the environment will be undertaken during the operational phase of the proposed Project. The minimisation of waste following the waste hierarchy, with the preferable option to be avoidance of waste, will be implemented for all of phases of the project. Several mitigations to minimise waste generated during construction are also applicable for the operational phase and stated in the Construction phase impact. In addition to this, mitigations will include:

- Detailed breakdown of quantities each waste stream in a quantified waste inventory for the operational phase.
- All municipal solid/non-hazardous waste will be segregated, labelled and stored in accordance with MoECC guidelines.
- The types and quantities of waste generated during operations should be regularly monitored.
- Food establishments should segregate compostable and other food waste for recycling.

7.1.33 Details on minimisation and management of construction waste for the Project is outlined in the WMP.

7.1.34 The proper storage and segregation of waste arising from the construction is essential for the mitigation, the storage of waste will include:

- Color-coded bins and labelled skips to be provided according to waste classification
- All recycling containers will be clearly labelled. Containers shall be located in close proximity to the site under construction in which recyclables/salvageable materials will be placed.

7.1.35 Special considerations are required for hazardous waste storage and disposal:

Storage

- Stored in sealed containers in a designated area with clear labelling
- Typically stored on-site for up to 90 days

Disposal

- Transported, treated and disposed by MoECC certified/approved company/facilities

7.1.36 Dedicated storage for hazardous waste during operation include:

- Hazardous waste must be stored in a secure, designated area to prevent unauthorized access, and the area must be located far from environmentally sensitive zones
- An impermeable dike (bund) with a volume of at least 110% of the largest tank or container to be used for storage, or 25% of the total vessel volume to be stored in the bund, which ever volume is greater, will be constructed around the waste oil and chemical storage area to contain leaks and spills
- Waste must be stored in appropriate, leak-proof containers, with each container clearly labelled to indicate the type of waste and its hazard classification
- To prevent spill incidents, storage areas must have secondary containment systems, such as bunds or spill trays, with a capacity to hold at least 110% of the largest container's volume
- Hazardous waste storage areas will have spill containment systems and be protected to avoid run-off to and from the storage area
- Perimeter cut off drainage may be constructed to contain leaks, spills, and run off
- Storage areas must have adequate ventilation to prevent the buildup of hazardous fumes, along with fire suppression systems or extinguishers for emergency preparedness
- Firefighting equipment will be provided in close proximity to the storage and collection centres
- Chemical and hydrocarbon absorbent materials will be provided to clean up spills and leaks
- Sufficient number of skips or other adequate containers will be provided for the collection of the different types of wastes
- Hazardous waste containers for storage and transport will be appropriately marked and labelled

7.1.37 Where waste cannot be avoided and must be taken to a facility for disposal, treatment or recycling:

- The appointed contractor will ensure that the facilities have the appropriate permits

- The suitable facility will be located as close to the works as possible to minimise the impacts of transportation, in particular the release of carbon emissions
- The appointed contractor will identify the closest and relevant treatment and disposal sites
- Or when separate treatment or disposal facilities are required, the facilities used should be in close proximity to each other and long-haul transportation to separate facilities are minimised
- Hazardous waste must be treated and disposed of at facilities approved by the MoECC, using treatment methods appropriate for each waste type
- Hazardous waste must be transported by authorized carriers, with a documented system in place to track the waste's movement and final disposal
- Treatment processes shall employ technologies and procedures to minimize the volume and toxicity of waste, while maximizing the recovery of recyclable materials
- Emergency response plans must be in place to prevent accidents during operation, with equipment and procedures ready to address spills or leaks immediately

7.1.38 Each type of waste or recyclable material will be handled by separate facilities accordingly.

7.1.39 All sub-contractors are expected to ensure all staff will comply with the Waste Management Plan. Orientation (induction) training will be provided to workers regarding proper waste disposal.

Landscape

Mitigation measures

7.1.40 Opportunities for mitigating the impact of such a large-scale project, in particular given its setting within a wide-open and predominantly flat industrial landscape, are relatively limited therefore mitigation measures can be limited but where practicable, the following mitigation measures should be implemented:

- Maintain good housekeeping of the site and storage areas
- Designation of fenced storage area for equipment materials, waste and spoils
- Provision of barriers and appropriate signage in work areas
- Minimise nuisance from lighting
- Night lighting should be reduced to a minimum, provided health and safety requirements are met.

7.1.41 In consideration of the scope and scale of anticipated impacts on the existing site character and surrounding area, no further mitigation is necessary to complete the project. The residual impact on landscape quality and visual amenity will be neutral.

Transport

Traffic is expected to be impacted temporarily during construction works due to increased vehicular traffic from trucks, plants, buses, machines and workers movement. it is expected that the impact from these vehicular emissions is slight, short term and intermittent in nature. During construction the following mitigation measures are recommended to further reduce potential impacts.

Mitigation Measures

The general mitigation measures are specified below:

- Controlled vehicular movement with adequate supervision
- To ensure that no overloading is done and limit load sizes to avoid spillages
- Vehicle manifest should be maintained and ensure Vehicle emission valid certificates
- Ensure vehicle emission valid certificates
- Preventive maintenance of vehicles and field equipment
- Idling of the lifting cranes and other vehicles will bring in a reduction in mobile emissions
- Specific measures are followed by all drivers (e.g., adherence to site speed limits)
- Health and safety requirements at site entrances and areas where demolition occurs adjacent to the roadway are observed
- Minimisation of vehicle and plant movements
- Identification of appropriate access and egress routes that avoid significant receptors where possible
- Identification of appropriate on-site routes, which should be as direct as possible
- Avoidance of idling vehicles, with engines switched off where stationary and possible
- Schedule off-site traffic outside of peak hours and on well-maintained routes where possible
- Waste collection to be programmed to minimise journeys at peak traffic times; and
- All stockpiles are positioned in suitable locations to maintain all-access, walkways or existing traffic clear of any obstructions.

Ecosystem Services

Mitigation measures

7.1.42 The mitigation measures identified by other sections within this ESIA, particularly by terrestrial ecology and marine ecology will directly contribute to mitigating impacts on ecosystem services during both construction and operational phases of the Project. For example, construction phase mitigation measures to avoid impacts identified by terrestrial ecology include preconstruction biodiversity checks by specialists to identify and relocate sensitive species and habitats where possible, hence minimizing direct harm to fauna and protecting critical habitats. Secure fencing of construction sites, use of existing access tracks, and restricting vehicle movements and waste storage strictly within the Project boundaries will further protect surrounding habitats and the associated services of erosion control, visual screening, and noise attenuation. Also, carefully managing excavation practices—such as slow directional excavation and regular inspection of open trenches—will reduce impacts on small mammals and reptiles, thereby supporting and protecting existing pollination pathways, soil condition, and the biodiversity that underpins the health and condition of the ecosystem.

7.1.43 Measures to protect water quality during construction such as treating intercepted groundwater or surface water before discharge, minimising runoff into ditches and watercourses, and rigorous spill prevention protocols, will help maintain the ecosystem services provided by water bodies, including pollution filtration, flood protection, and nursery habitats for marine species. Air quality mitigations will also be instrumental in protecting ecosystem services related to agricultural productivity and human health. These include dust suppression techniques, covering material handling points and enforcing strict vehicle emission controls. Also, strategic planning of groundworks based on weather conditions, such as minimizing groundworks during periods of high winds and revegetating stockpiled materials, will prevent airborne pollutants from impacting nearby agricultural lands and sensitive ecosystems.

7.1.44 At the time of writing, further surveys of the marine environment were being undertaken to inform the marine impact assessment included within this report. It has been assumed that, subject to the outcomes of these surveys and assessment findings, that appropriate mitigation measures will be adopted for both the construction and operation phases of the Project that reduce the residual magnitude of marine-based impacts to Negligible or Low.

7.1.45 There is also an opportunity to support and enhance both the natural capital stocks delivered as part of the Project land use and the existing natural capital stocks in nearby areas by conduct habitat restoration and revegetation activities. The rehabilitation should prioritize native species that support local biodiversity and ecosystem functions to enhance the provision of ecosystem services. Introducing natural capital stocks that can support local and regional biodiversity conservation efforts could further reduce adverse impacts and enable scientific investigation.

Proposed monitoring

7.1.46 Long-term monitoring is a crucial component of effective environmental policy and management. In terms of natural capital and ecosystem services, long-term monitoring is often needed to measure change in stocks, such as a population of species or the condition of an ecosystem, but also to measure how those entities change in response to management intervention, such as habitat enhancement or degradation. Long-term monitoring is essential to determine if actions taken to manage the environment are effective, and therefore whether decisions made to invest in particular actions are vindicated.

7.1.47 Monitoring for terrestrial and marine ecosystem services should focus on regular assessments of vegetation and habitat condition, including marine water quality and condition. This will involve periodic evaluations typically quarterly during construction and annually during operation to assess the effectiveness of habitat restoration and rehabilitation efforts, in addition to the standard monitoring requirements. Monitoring should also include observing changes in vegetation cover and evaluating habitat condition. as for during operational phase these checks should occur biannually to make sure that services are continually protected.

7.2 Stakeholder Engagement and Grievance Mechanism

Introduction and purpose

7.2.1 This SEP outlines how the Project in Qatar will communicate and engage with stakeholders throughout the project’s lifecycle. The project, developed by a Consortium of International Sponsors led by Sumitomo Corporation, aims to provide up to 2,415 MW of power and 110 MIGD of potable water. The SEP is prepared to meet Qatari regulations and international best practice standards, including the Equator Principles, IFC Performance Standards, World Bank Environmental and Social Standards, and JBIC Guidelines.

7.2.2 The SEP’s primary objectives is to make sure timely and meaningful stakeholder consultation, transparent information disclosure and an accessible grievance mechanism. It follows key principles such as inclusiveness, cultural appropriateness, two-way communication, and continuous improvement. It guides stakeholder involvement starting early in the ESIA process and continuing through construction, operation and eventual decommissioning.

Project overview

7.2.3 The Project will be located in the Ras Abu Fontas complex near Doha, Qatar, on a site previously occupied by the RAF A power plant. The project involves a gas-fired combined cycle power plant and a seawater reverse osmosis desalination plant. Construction is scheduled to begin in August 2025, with first power around April 2028 and full commercial operation by June

2029. The plant will source seawater from the existing RAF A intake, and once operational the project will be owned by Qatar Electricity and Water Company (QEWC).

Regulatory and international requirements

7.2.4 While Qatari legislation does not mandate a formal stakeholder engagement process, international standards do. The Equator Principles, IFC Performance Standards, World Bank Environmental and Social Standards and JBIC Guidelines underscore the importance of meaningful consultation, early disclosure of information, and accessible grievance mechanisms. The project must demonstrate compliance with these standards to secure international financing. Requirements include culturally appropriate consultation, free of intimidation or coercion, and providing communities and workers with means to express concerns.

Previous engagement

7.2.5 Prior communication has largely been through media channels focusing on the bidding process. As the ESIA and project design progress, more structured engagement activities, including formal consultations and disclosures will be conducted.

Stakeholder identification and analysis

7.2.6 Stakeholders include local communities (notably in Al-Wakrah and Doha), governmental authorities (Ministry of Environment and Climate Change, Ministry of Energy Affairs, municipalities, and other relevant ministries), non-governmental organizations, research institutions, and the media. Their interests vary; local communities focus on employment, environmental impacts, and community benefits, while regulators and ministries are concerned with compliance, environmental standards, and alignment with national development goals. The SEP categorises stakeholders to ensure that engagement methods are tailored, accessible and meet their information needs.

Stakeholder engagement activities and methods

7.2.7 Engagement will occur throughout the project lifecycle. During the ESIA phase, Project documents like Non-Technical Summaries (NTS) and mitigation measures will be disclosed in accessible formats. Consultations will take place with authorities, communities, and interested organisations to gather feedback on potential environmental and social impacts. During construction and operation, the Project will maintain an ongoing dialogue. A Community Liaison Officer (CLO) will be appointed to manage communication, address grievances and make sure that stakeholders are kept informed for example through public meetings, media announcements and a project website.

Implementation and responsibilities

7.2.8 The Project Company, once established, will be responsible for implementing the SEP. This includes scheduling consultations, updating stakeholders on project progress, managing the grievance mechanism, and ensuring compliance with national and international requirements. Timelines and responsibilities are clearly defined as the ESIA consultants lead early consultations then the Project Company CLO takes over once the project moves toward construction and operation. Annual and periodic reporting will verify that consultation is meaningful, and concerns are addressed.

Grievance mechanism

7.2.9 A formal grievance mechanism will allow stakeholders to submit complaints, comments and suggestions at no cost and without fear of retribution. The CLO will oversee the process as logging grievances, investigating them and make sure speedy resolution. Confidentiality will be protected, and progress will be communicated regularly. The mechanism covers issues like environmental nuisance, safety hazards, improper conduct and any other concerns arising from project activities.

Monitoring, reporting and continual improvement

7.2.10 The SEP will be periodically reviewed and updated to remain effective and relevant. Engagement activities will be documented including meeting minutes and correspondence logs. Annual reports and sustainability disclosures will track performance against environmental, social and health and safety measures. The monitoring framework ensures that stakeholder feedback leads to tangible improvements in project planning and management.

8 Summary

8.1.1 The following section is a summary of each of the topics. A full environmental and social aspects and impacts register for the construction and operational phases is included in Appendix L.

8.2 Marine

8.2.1 Construction impacts anticipated due to the new pipeline outfalls are habitat loss of marine species where infrastructure is placed and temporary loss during construction where vehicles, barges or vessels are used. Another impact is the increased turbidity from suspended sediment since sediments can be disturbed during the movement of vehicles and vessels in the marine environment when placing infrastructure or the necessary groundworks/ trenching to prepare the pathway for placement. Resulting underwater noise may occur due to rock dumping, dredging or piling activities that can harm or disturb marine organisms. The use of vessels can shadow or introduce artificial light to the seabed and section of the water column which can impact marine organism behaviour and productivity through light changes. Other impacts are the introduction/spread of invasive species through bringing personnel, vessels and equipment from outside and the potential of spills in the marine environment from accidents.

8.2.2 Operational impacts due to the intake of feed water is hydrological process changes which can cause impingement and entrainment of marine biota and circulation changes. Also, the discharge of reject waters (including reverse osmosis concentrate and cooling waters) can impact the water quality through the alteration of salinity and temperature, increase concentration of existing contaminants in feedwater and introduction of contaminants from pre-treatment and maintenance processes consequently causing increased turbidity, toxicity and nutrient changes.

8.3 Air Quality

8.3.1 Although the exact construction methodology had not yet been defined prior to the preparation of the assessment, an assumption was made that the construction phase will include considerable earthworks from the start of construction. The main activities such as site preparation, excavation, earthmoving, road and infrastructure works, plant construction and landscaping will have varying levels of dust raising potential. High dust impacts, classified as major are expected during earthworks and landscaping due to high wind conditions typical in the summer months. The nearest receptor is workers accommodation which is located around 460 metres northwest and is categorised as having low sensitivity due to its distance from the dust sources. Hence the overall significance of construction phase dust emissions is considered a temporary minor adverse effect.

8.3.2 For the operational phase the air quality impacts were assessed across four scenarios involving different stack operations, bypass and Heat Recovery Steam Generator (HRSG) stacks at full and reduced gas turbine loads. Under all assessed scenarios the emissions are predicted to result in impacts classified as not significant indicating minimal or negligible air quality effects during the operation of the Project.

8.4 Climate Resilience and Greenhouse Gas (GHG) Emissions

8.4.1 Climate resilience construction impacts were not considered due to the relatively short timescale of the construction process compared to the long-term climate impacts discussed in the future baseline. As for operation, impacts were assessed based on climate change projections for the period 2060–2079 on the criteria of rising air temperature, change precipitation and flood risk, wind and storm, sea level rise, increased sea temperature, specific humidity, and extreme weather events. Rising air temperatures with average means expected to increase from an average mean of 28°C to an average of 32–33°C and more frequent extreme heat days above 35°C could strain cooling systems, cause material fatigue, and affect workforce productivity and health. Changes in precipitation patterns predict increased intense rainfall events, potentially causing localised flooding, logistical disruptions and equipment damage. Rising sea levels could negatively impact the Project operations leading to issues such as saltwater intrusion into foundations or utility corridors, corrosion of coastal assets and increased maintenance needs due to the coastal nature of the project site. Rising sea temperatures could reduce the Project cooling efficiency, increase biofouling risks and negatively impact reverse osmosis units. Slight increases in humidity when combined with higher temperatures could cause worker heat stress and accelerate corrosion or condensation issues within mechanical and electrical systems. Also, extreme weather events such as intense storms, cyclones, floods, and dust storms present risks of operational disruptions, infrastructure damage, increased maintenance costs, and safety concerns for the Project workforce.

8.4.2 Operational GHG emissions were calculated for both the Project and its predecessor (Facility A) by considering their key natural gas and grid electricity inputs. The operational GHG emissions assessment compared the Project's emissions with the previous facility in the same area (decommissioned Facility A) in terms of scope 1 & 2 showed that the Project total emissions is 3.7 $MtCO_2e$/year compared to the previous facility of 3.5 M tCO_2e/year. While at first glance it may appear that the Project has slightly greater emissions than the previous facility it is important to note that the output of the project is 2415 MW or approximately 21,155,400 MWh per year, far exceeds the output of previous facility during its peak performance in 2014 at 2,931,882 MWh. Also, by dividing the total emissions of each facility by its electricity output, the emissions intensity of the Project is 0.117 tCO_2e/MWh, compared to the previous facility at 1.21 tCO_2e/MWh. Based on the emissions intensity it is observed that the Project produces approximately 10% of the CO2e emissions that previous facility releases per MWh of energy produced.

8.5 Socioeconomic, Including Occupational H&S

8.5.1 The Project might cause both positive and negative impacts during construction to local communities. Positive impacts caused by the Project and the influx of workers include employment generation, increased economic activity will boost local businesses, enhance economic opportunities, and potential improvements to local infrastructure and services through greater demand. Negative impacts include construction activities that are likely to cause increased traffic congestion, raising the risk of accidents, increased noise and vibration levels causing disturbance to community wellbeing, and potential worsen of air quality due to dust emissions. Also, the presence of temporary workers might put strain on local Qatari's healthcare resources, increase the potential for communicable diseases, and contribute to social tension or conflicts with local residents.

8.5.2 Several potential impacts related to labour conditions, health, safety, and security have been identified during the construction of the Project. Workers are exposed to occupational health and safety risks which includes on-site injuries or accidents. Also, if worker accommodation and welfare facilities do not meet the appropriate health, safety, and sanitation standards, this will lead to worsened living conditions for the temporary labour. Also, there are issues of labour rights, such as nonpayment of salaries, unreasonable working hours, or insufficient complaint procedures could negatively affect worker wellbeing and morale.

8.5.3 For the operation phase the local communities experience mostly positive impacts starting from the increase in local employment rates through job opportunities created by the Project, which will increase economic activity and boost local businesses. There will be improvement to local infrastructure in terms of utilities such as better water and power supply and human resources up-skilling. Lastly an increase in goods consumption and demands caused by increase in the number of labourers, although this could be both a positive or negative impact depending on the level of strain and location of strain on the supply chains.

8.5.4 The operational impacts of the Project for labourers are largely around unfair work terms, inadequate grievance mechanisms, or insufficient welfare facilities. There are also potential risks to occupational health and safety. Workers might face risk handling dangerous chemicals, exposure to high noise and heat levels, and possible incidents involving machinery or equipment failure.

8.5.5 The Social section covers socioeconomic, community health, safety and security (CHSS), and labour and their working conditions including occupational health and safety (OHS). All topics are covered in terms of baseline, impacts and mitigation measures.

8.5.6 During construction, negative impacts related to socioeconomic are social disruptions due to high labour influx and resulting environmental impacts, whereas the positive impact is the creation of job opportunities. The boost in the economy due to high demand of local services can be considered as both a positive and a negative impact. In relation to the CHSS, negative impacts include vulnerability to the community security, the spread of communicable diseases and the cause of environmental impacts that can reach to the community if not mitigated. Positive impacts to CHSS are the creation of job opportunities and the increase in supply and demand which is considered as both positive and negative. In relation to labour and their working condition, several social impacts may result in areas of fair treatment, grievance mechanism, child and forced labour, overtime working hours, misconduct and inappropriate behaviour, workers’ accommodation, conflict between workers and overall compliance with the local laws and regulation. Covering the labour aspect, the negative impacts to the occupational health and safety include the use of personal protective equipment (PPE), the possibility of construction accident events and the exposure of labour to the environmental impacts.

8.5.7 During operation, the overall negative impacts include environmental impacts to the labours and community if not mitigated, labour issues similar to the construction phase including social and PPE issues. The major positive impact to the local infrastructure is the improved water and power supply.

8.5.8 The overall recommended mitigation measures fall under implementing effective environmental and social management frameworks and plans.

8.6 Noise and Vibration

8.6.1 During the construction phase the activities such as excavation, earthmoving and the use of heavy machinery like mobile cranes, excavators, diesel generators, trucks, and loaders have the potential to produce noise and ground borne vibrations. However, as no piling is planned and given the proximity of the Project site to sensitive receptor positions offsite, effects due to vibration during construction works and operation, are not expected. The assessment showed the predicted levels at sensitive receptors will be both below the existing measured background noise levels in the area and both the day and night threshold noise level set by BS 5228, indicating negligible significance impacts. Also, additional construction related traffic is expected to cause minor impact in ambient noise given current conditions and distances to nearby receptors.

8.6.2 The main noise impacts during operation are expected to arise due to the operation of the new facilities to be installed within the complex such as seawater pumps, chlorination units, transformers, HRSGs, substations, and stacks were assessed. Each piece of equipment is designed to emit noise no greater than 85 dB(A) at one meter, aligning with stringent Ministry of Environment and Climate Change (MoECC) and Occupational Safety and Health Administration (OSHA) standards. Using acoustic modelling the assessment showed that operational noise levels at the site boundaries remained within the regulatory limits established for industrial and commercial areas. Most residential receptors also met the strictest nighttime criteria, except for one minor exceedance 0.6 dB(A) above the limit at the Qatar Electricity & Water Co. (QEWC) Staff Accommodation which results in a minor localised impact. Overall, the resulting effects from the operational noise will be insignificant.

8.7 Cultural Heritage and Archaeology

8.7.1 No impacts are anticipated to the historic building within Al Wakrah, due to distance, screening and negligible change to site character or visual profile. Offshore works such as constructing the intake/outfall pipe and dredging could harm the historical fish traps in the intertidal zone. While these fish traps sensitivity is unconfirmed any construction impact would be low and not significant. Past construction's ground disturbance likely reduced archaeological sensitivity within the site, though undiscovered archaeological deposits could still exist. Excavation and heavy machinery could potentially damage these deposits causing permanent moderate to major impacts. Further archaeological assessment within the Project’s footprint is required.

8.7.2 As for the operation phase of the Project, it's not anticipated to result in a change to any identified cultural heritage receptors.

8.8 Terrestrial Ecology

8.8.1 The majority of the activities during the construction phase will take place within highly modified habitats characterised by built-up areas or sparse vegetation which reduces the ecological sensitivity of the site. The ground clearance, excavation, use of heavy machinery, waste and materials storage, soil compaction, or drainage management could cause temporary or permanent habitat loss and disturbances impacting terrestrial mammals, birds, reptiles, and invertebrates. Runoff or unintentional chemical leaks into the Arabian Gulf also pose a potential risk of impacting coastal species. Although direct impacts such as habitat loss are mostly limited to areas of sparse vegetation, indirect impacts like dust generation could affect surrounding herbaceous vegetation and cropland. For most terrestrial species the impacts range from minor disturbances to potential injury or mortality of species such as the Egyptian Spiny-tailed Lizard. Coastal bird species such as Socotra Cormorant and migratory shorebirds face minor adverse impacts due to noise disturbance and potential coastal pollution if not mitigated. but overall given existing site conditions and available adjacent habitats the impacts are considered minor and not significant.

8.8.2 During the operational phase the activities such as increased artificial lighting, noise emissions, vehicle movements and seawater pumping operations could cause minor disturbances to resident and migratory wildlife, but no additional habitat loss is expected. Terrestrial mammals (including bats), birds, and reptiles could be disturbed or injured due to vehicle movements and increased lighting and noise. Also, there could minor indirect impacts resulting from changes to marine water quality and fish availability due to seawater intake and potential pollution to species such as the Socotra Cormorant and White-cheeked Tern. Most species and habitats near the site are not expected to experience significant changes compared to the existing baseline conditions and overall impacts during operation remain minor and not significant.

8.9 Soil, Hydrology and Contamination

8.9.1 The section covers the geology, hydrogeology, hydrology, sensitive features, soil quality groundwater quality and ground gas topics. The area of influence considered is 250m. The geology of the Project area is found to comprise of mid Eocene Dammam Foundations which overlies the Rus Formation from the lower Eocene. Confirmed lithologies are the made ground, residual soils, weathered Simsima limestone, Simsima limestone, Midra shale and Rus formation.

8.9.2 Regarding the hydrogeology, the groundwater is found to be relatively shallow. Although the found Simisima limestone and the rus formation are considered bearing aquifers, the Madra Shale and the gypsum layers act as aquitards, therefore inhibiting water flow. The residual soil and the below Simsima limestone are foreseen to have a hydraulic connectivity in the contrary of the existent Midra Shale and gypsum layers. No deeper groundwater was found which may support the assumption that connectivity could exist between the aquifers or could be due to that no groundwater was encountered during the ground investigation. No surface water is found other than the coastal water to the east.

8.9.3 Sensitive features potentially affected are the marine surface water, groundwater, soils and vapours accumulated.

8.9.4 The soil quality, as per PES ESIA 2022, results proved that there is no exceedance in hydrocarbons, Volatile Organic Compounds (VOC), asbestos or microbiological contaminants but slight exceedance in the zinc, copper at some locations and electrical conductivity which is explained as due to the high salinity of the nearby coast. The finding on groundwater quality, as per PES 2022, is that there is exceedance in the chloride level which is also justified by the proximity to the coast. Coliforms were detected at most samples, but no presence of faecal streptococci were found.

8.9.5 The ground gas monitoring as of March 2025 confirmed that the oxygen and nitrogen levels are below work exposure limit (WEL) whereas the VOC are to a certain extent above and within same order of magnitude with the detection limit. Comparing the VOC concentration to the HSE of a workplace showed no exceedance. Evidently, compounds such tetrachloroethene (PCE), trichloroethene (TCE), dichloroethane (DCE), and vinyl chloride (VC) indicated the presence of chlorinated solvents which may be undergoing natural degradation on site. Methane and carbon dioxide were not detected.

8.9.6 During construction, impacts to human health are through the exposure to contaminated soils and dust including wind-blown dust due to contaminants mobilisation, resulting in overall low risk. Groundwater can also be impacted through pile mobilisation however because the presence of few contaminants in soil, the risk level of groundwater contaminated is low resulting in medium overall risk.

8.9.7 During operation, impacts to human health are with low risk especially when safety precautions are implemented. To the built environment, there is a risk that the concrete structures, piles and pipes get chemically attacked due to aggressive ground conditions however, the risk is still considered to be low.

8.9.8 Primarily, impacts can be mitigated through the installation of gas membrane and venting systems within building foundations to prevent entry and accumulation of ground gas to proposed structures, the use of hardcover materials within areas identified to prevent pollutants to reach to the receptors, consider construction materials specification to mitigate aggressive ground conditions, mitigate the hazards for the foreseen maintenance and services workers, incorporate marker membrane for contaminated materials detection and dispose bulk contaminated materials where identified and replace with clean and sustainable ones.

8.10 Solid Waste and Material Management

8.10.1 During construction the waste streams that are anticipated to be generated includes inert wastes such as concrete, steel, asphalt, and packaging materials, non-hazardous waste such as scrap wood, plastics, excavated materials, and general domestic waste from the workforce and lastly hazardous wastes such as chemicals, oils, solvents, batteries, contaminated soils, and oily debris. The volume of waste (disposal soil) expected to be sent to landfill during construction is approximately 160,000m^3 (on shore) and is likely to be silty sand, limestone. Measures will be taken to mitigate the adverse effects on the environment from the generation of solid waste and its disposal during the construction phase and site preparation of the proposed Project. The percentage of waste expected to be recovered or recycled during the construction phase of the Project is:

- Concrete: 0%
- Steel: 95%
- Packaging: 90%

8.10.2 For the construction phase, the sensitivity of effect from disposal of waste is likely to be medium, the magnitude will be minor, effects are thus not significant.

8.10.3 This waste generation could cause temporary major adverse impacts including contamination of soil, groundwater, surface waters, and the marine environment due to spills or leakage as well as permanent major adverse impacts related to health and safety hazards from inappropriate hazardous waste storage. Fugitive emissions, visual disturbances from poor waste storage practices and increased vehicle movements associated with waste transport is also anticipated although these impacts are considered minor and temporary hence not significant.

8.10.4 The operation and maintenance activities of the Project is anticipated to generate waste streams from includes inert waste such as packaging materials and construction materials form maintenance work, non-hazardous domestic waste, operational by products such as sludge, salts, spent membranes, and hazardous wastes including oily sludge, chemical wastewater, electronic waste, and contaminated packaging.

8.10.5 The impacts from these waste generations are similar to those in construction with significant adverse effects arising mainly from contamination of groundwater, surface waters, and marine environments due to improper handling, leakage or spillage of hazardous materials. Health and safety risks associated with inappropriate hazardous waste management represent a major permanent adverse impact. Other anticipated impacts including fugitive emissions, visual amenity disturbances, pressure on landfill capacity, and increased vehicle movements for waste transport are minor, temporary or permanent but overall, not significant.

8.11 Landscape and Visual Impact

8.11.1 During the construction phase due to the machinery and equipment to be used (i.e potential for high cranes and night illumination), these may have the potential to negatively impact the existing landscape. However, since the Project is located on a previously developed industrial site and within the existing RAF Complex the significance of the visual impact is not considered to be high. The inhabitants of Al Wakrah may be attributed a high sensitivity level, however, since the Complex already forms part of their visual landscape, and the construction is considered to be in line with existing impacts, and sensitivity is considered low.

8.11.2 The impact during operation is considered to be negligible for the Project due to the industrial history of the site and proximity to the wider Complex. The inhabitants of Al Wakrah may be attributed a high sensitivity level, however, since the Complex already forms part of their visual landscape, and the operation is considered to be in line with existing impacts, and sensitivity is considered low.

8.12 Transport

8.12.1 The traffic from construction activities will include vehicular movements, and materials delivery trucks, waste transport trucks, soil transport trucks and vehicles for other purposes. Traffic is expected to be impacted temporarily during construction works due to increased vehicular traffic from trucks, plants, buses, machines and workers movement. It is expected that the impact from these vehicular emissions is slight, short term and intermittent in nature.

8.12.2 During operation it is anticipated that there would be a small increase in vehicle traffic compared to the current baseline, due to increased vehicular traffic from trucks, plants, buses, machines and workers movement. However, due to the existing industrial nature of the site and surrounding area the operational increases are anticipated to be negligible.

8.13 Ecosystem Services

8.13.1 The Project's construction phase includes extensive site preparation activities, including clearing vegetation, excavation, and infrastructure installation including seawater intake and discharge pipelines. These activities are expected to both temporarily and permanently affect ecosystem services. Temporary construction activities are expected to have adverse impacts on marine ecosystems following increased sedimentation, turbidity and potential discharges, resulting in a reduced capacity for stock to provide regulation and maintenance services. Temporary impacts to the marine ecosystem may result in the disturbance and displacement of fish and other marine species, reducing the attractiveness and capacity of the area to support recreational activities such as fishing, boating, diving and beach camping.

8.13.2 The Project’s operational phase includes both electricity production and seawater desalination via reverse osmosis will have continual effects on both marine and terrestrial ecosystem services. Long term brine discharge could change salinity and temperature, therefore compromising the capacity of marine ecosystems to offer important services including chemical control of marine waters, nursery habitat maintenance, bioremediation, and pollution dilution. Impacts to terrestrial natural capital stocks along the coastline could adversely impact the provision erosion control, water flow and flood regulation services. Project operations also have the potential to hinder recreational opportunities and lower the non-use values (existence, option, and bequest) associated with the natural ecosystems.

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B. Appendix B – Environmental and Social Management Plan (ESMP)

Please refer to Environment and Social Management Plan (ESMP) (403100049-C001-MML-RP-EN-013).

C. Appendix C – Construction Environmental Management Plan (CEMP)

Please refer to Construction Environmental Management Plan (CEMP) (403100049-C001-MML-RP-EN-010).

D. Appendix D – Operational Environmental Management Plan (OEMP)

Please refer to Operational Environmental Management Plan (OEMP) (403100049-C001-MML-RP-EN-011).

E. Appendix E – Waste Management Plan

Please refer to Waste Management Plan (403100049-C001-MML-RP-EN-007)

F. Appendix F – IBAT Data

Please refer to IBAT Data (403100049-C001-MML-RP-EN-015)

G. Appendix G – Stakeholder Engagement Plan and Grievance Mechanism

Please refer to Stakeholder Engagement Plan and Grievance Mechanism (403100049-C001-MML-RP-EN-001)

H. Appendix H – Survey Reports

Please note that these survey reports are provided as standalone appendices. (403100049-C001-MML-RP-EN-016)

I. Appendix I – Stack Height Determination

Please refer to Stack Height Determination (403100049-C001-MML-RP-EN-017).

J. Appendix J – Air Quality Monitoring Data

Please refer to Air Quality Monitoring Data (403100049-C001-MML-RP-EN-018).

K. Appendix K – CVs of Technical Leads

Please refer to supplementary document: 403100049-C001-MML-RP-EN-019.

L. Appendix L - Soil, Hydrology and Contaminated Land

M. Appendix M – Environmental Social Aspects and Impacts Register

Please refer to Please refer to the Environmental Social Aspects and Impacts Register (403100049-C001-MML-RP-EN-025).

N. Appendix N – Critical Habitats Assessment Technical Note

Please refer to Critical Habitats Assessment Technical Note (403100049-C001-MML-RP-EN-022)

O. Appendix O – Marine Addendum

Please refer to Marine Addendum Technical Note (403100049-C001-MML-RP-EN-023)

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