bp EXPLORATION (Shah Deniz) Ltd

Shah Deniz Compression Project

Environmental & Social Impact Assessment – Volume 1

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

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UNITS & ABBREVIATIONS

Unit	Full word / phrase
%	percent
‰	per mille (parts per thousand)
Bcf	billion cubic feet
°C	degrees Celsius
cm	centimetre
dB	decibel
dB(A)	A-weighted decibel (provides a measure of the overall level of sound across the audible spectrum with a frequency weighting to compensate for the varying sensitivity of the human ear to sound at different frequencies)
k	kilo
kg/m^3	kilograms per cubic meter
kHz	kilohertz
km	kilometre
km^2	square kilometre
kV	kilovolts
kW	kilowatt
l	litre
m	metre
m^2	square metre
m^3	cubic metre
m/s	metres per second
m^3/hr	cubic metres per hour
mg	milligram
mg/l	milligrams per litre
mm	millimetre
MMSCFD	million standard cubic feet per day
MW	megawatt
ng	nanogram
nm	nautical mile
Pa	pascals
ppm	parts per million
s	second
t	tonne
µg	microgram
µg/m^3	micrograms per cubic metre

Abbreviation	Full word / phrase
ACE	Azeri Central East
ACG	Azeri Chirag Guneshli
ADD	Acoustic deterrent device
ADR	Agreement Concerning the International Carriage of Dangerous Goods by Road
AGT	Azerbaijan-Georgia-Turkey
AIOC	Azerbaijan International Operating Company
ANAS	Azerbaijan National Academy of Sciences
As	Arsenic
ASMA	Azerbaijan State Maritime Administration
ATA	Amec-Tekfen-Azfen
AZE	Alliance for Zero Extinction
AZN	Azerbaijani Manat
AzRB	Azerbaijan Red Book
Ba	Barium
BDJF	Baku Deep Water Jacket Factory
BOD	Biochemical oxygen demand
BTC	Baku-Tbilisi-Ceyhan
CA	Central Azeri
CAPEX	Capital expenditure
CCME	Canadian Council of Ministers of the Environment
Cd	Cadmium
CDV	Canine distemper virus
CH_4	Methane
CITES	Convention on International Trade in Endangered Species
CO	Carbon monoxide
Co	Cobalt
CO_2	Carbon dioxide
COD	Chemical oxygen demand
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
COP	Chirag Oil Project
CR	Critically Endangered (IUCN Red List)
Cr	Chromium
Cu	Copper
CWAA	Central Waste Accumulation Area
CWP	Compression and Water Injection Platform
DBA	Derrick Barge Azerbaijan
DD	Data Deficient (IUCN Red List)
DDT	Dichlorodiphenyltrichloroethane
DWG	Deep Water Gunashli
EA	East Azeri
E&P	Exploration and production

Abbreviation	Full word / phrase
EBSA	Ecologically & Biologically Significant Area
EDP	Enterprise Development Programme
EIA	Environmental Impact Assessment
EMP	Environmental Monitoring Programme
EMS	Environmental Management System
EN	Endangered (IUCN Red List)
ENT	Environmental Technical Note
EOP	Early Oil Project
EQAA	European Quality Assurance Agency
ERMP	Employee Relations Management Plan
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
ESMS	Environmental and Social Management System
EU	European Union
EUWI+	European Union Water Initiative Plus
FAO	Food and Agriculture Organization
FCG	Flood, clean and gauge
Fe	Iron
GDP	Gross domestic product
GHG	Greenhouse gas
GII	Gender inequality index
GIS	Gas insulated switchgear
GTG	Gas turbine generators
HDI	Human development index
HDPE	High-density polyethylene
Hg	Mercury
HMCS	Harmonised Mandatory Control Scheme (under OSPAR)
HP	High pressure
HSE	Health, safety and environment
HSSE	Health, safety, security and environment
HUC	Hook-up and commissioning
HVAC	High voltage alternating current
IADC	International Association of Drilling Contractors
IAGC	International Association of Geophysical Contractors
IBA	Important Bird Area
ICSS	Integrated control and safety system
ICT	Information and communications technology
IDP	Internally displaced person
IoAE	Institute of Archaeology and Ethnography
IOGP	International Association of Oil & Gas Producers
IUCN	International Union for Conservation of Nature

Abbreviation	Full word / phrase
JNCC	Joint Nature Conservation Committee
KBA	Key Biodiversity Area
LC	Least Concern (IUCN Red List)
LMF	Labour Management Forum
LP	Low pressure
LRTAP	Long-range transboundary air pollution
MAC	Maximum allowable concentration
MARPOL	International Convention for the Prevention of Pollution from Ships
Max	Maximum
MDL	Minimum detection limit
MEG	Monoethylene glycol
MENR	Ministry of Ecology and Natural Resources
MES	Ministry of Emergency Situations
MIA	Ministry of Internal Affairs
Min	Minimum
MMO	Marine Mammal Observer
Mn	Manganese
MoCT	Ministry of Culture and Tourism
MSDS	Material Safety Data Sheet
MTP	Marine Transport Police
NCD	Non-communicable disease
NDT	Non-destructive testing
NGO	Non-governmental organisation
Ni	Nickle
NMFS	National Marine Fisheries Service
NMVOC	Non-methane volatile organic compound
NO	Nitrous oxide
NO_2	Nitrogen dioxide
NOx	Nitrogen oxides
NPD	National pollutant discharge
NT	Near Threatened (IUCN Red List)
NUI	Normally unattended installation
OMS	Operating Management System
OPRC	Oil Pollution Preparedness, Response and Co-operation
OSCP	Oil Spill Contingency Plan
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OSRL	Oil Spill Response Ltd.
PAH	Polycyclic aromatic hydrocarbon
Pb	Lead
PCA	Partnership and Cooperation Agreement
PCDP	Public Consultation and Disclosure Plan

Abbreviation	Full word / phrase
PCWU	Production compression water injection and utilities
PDQ	Production drilling and quarters
PFOC	Power and fibre optic cable
PIMS	Pipeline integrity management system
PLBH	Pipelay barge Israfil Huseynov
PLM	Pigging loop module
PLONOR	Pose Little or No Risk substance
PLR	Pig launcher and receiver
PM_{10}	Particulate matter
PNEC	Predicted No Effect Concentration
PR	Production riser
PSA	Production Sharing Agreement
PTS	Permanent threshold shift
QU	Quarters and utilities
RFSA	Ready for sail away
rms	Root-mean-square
ROV	Remotely operated vehicle
RoW	Right of way
SBS	State Border Service
SCP	South Caucasus Pipeline
SCV	Subsea construction vessel
SD	Shah Deniz
SD1	Shah Deniz 1
SD2	Shah Deniz 2
SDA	Shah Deniz Alpha
SDB	Shah Deniz Bravo
SDC	Shah Deniz Compression
SDG	Sustainable development goal
SEA	Strategic Ecological Assessment
SEL	Sound exposure level
SF	Sangevar Fault
SIF	Safety instrumented function
SMA	State Maritime Administration
SME	Small and medium enterprises
SO_2	Sulphur dioxide
SOCAR	State Oil Company of the Azerbaijan Republic
SOLAS	International Convention for the Safety of Life at Sea
SO_x	Sulphur oxides
SPL	Sound pressure level
SPS	Shelfprojectsroi
SQGs	Soil quality guidelines

Abbreviation	Full word / phrase
SSES	Stakeholder and socio-economic survey
SSIV	Subsea isolation valve
SSPA	Seal Special Protected Area
ST	Sangachal Terminal
STCW	Standards of Training, Certification and Watchkeeping for Seafarers
STEL	Sangachal Terminal Electrification project
STEM	Science, technology, engineering and mathematics
STP	Sewage treatment plant
SWAP	Shallow Water Absheron Peninsula project
TAR	Turnaround
TPH	Total petroleum hydrocarbons
TRACECA	Transport Corridor Europe-Caucasus-Asia
TSS	Total suspended solids
TTS	Temporary threshold shift
UCM	Unresolved complex mixture
UHR	Ultra-high resolution
UK OCNS	United Kingdom Offshore Chemical Notification Scheme
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNFPA	United Nations Population Fund
UNICEF	United Nations International Children's Emergency Fund
USD	United States Dollar
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VU	Vulnerable (IUCN Red List)
WA	West Azeri
WBM	Water based muds
WC	West Chirag
WCF	West Caspian Fault
WHO	World Health Organisation
WTN	Waste Transfer Note
Zn	Zinc

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Non-Technical Summary

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NON-TECHNICAL SUMMARY

This Non-Technical Summary (NTS) presents a concise overview of the Environmental and Social Impact Assessment (ESIA) prepared for the proposed Shah Deniz Compression (SDC) project located in the Shah Deniz (SD) Contract Area. It is intended to provide a summary of the project design and activities, the issues considered in the ESIA and of the main conclusions with respect to the potential environmental and social impacts and their mitigation. Detailed technical descriptions of modelling studies, proposed mitigation and monitoring activities are presented in the main sections of the ESIA.

N.1 Introduction

The SD Contract Area, which covers an area of approximately 860 km^2, is located approximately 70 km southeast of Baku. The development of the Contract Area has been pursued in phases which, to date, has included Shah Deniz Stage 1 (SD1) and Shah Deniz Stage 2 (SD2). Operations at the SD field began in 2006 with the start-up of production from the Shah Deniz Alpha (SDA) platform, as part of SD1. The Shah Deniz Bravo (SDB) platform was developed under SD2 and began production in 2018.

The SDC project represents the next stage of development of the SD Contract Area. Figure N.1 shows the location of the proposed SDC facilities and infrastructure.

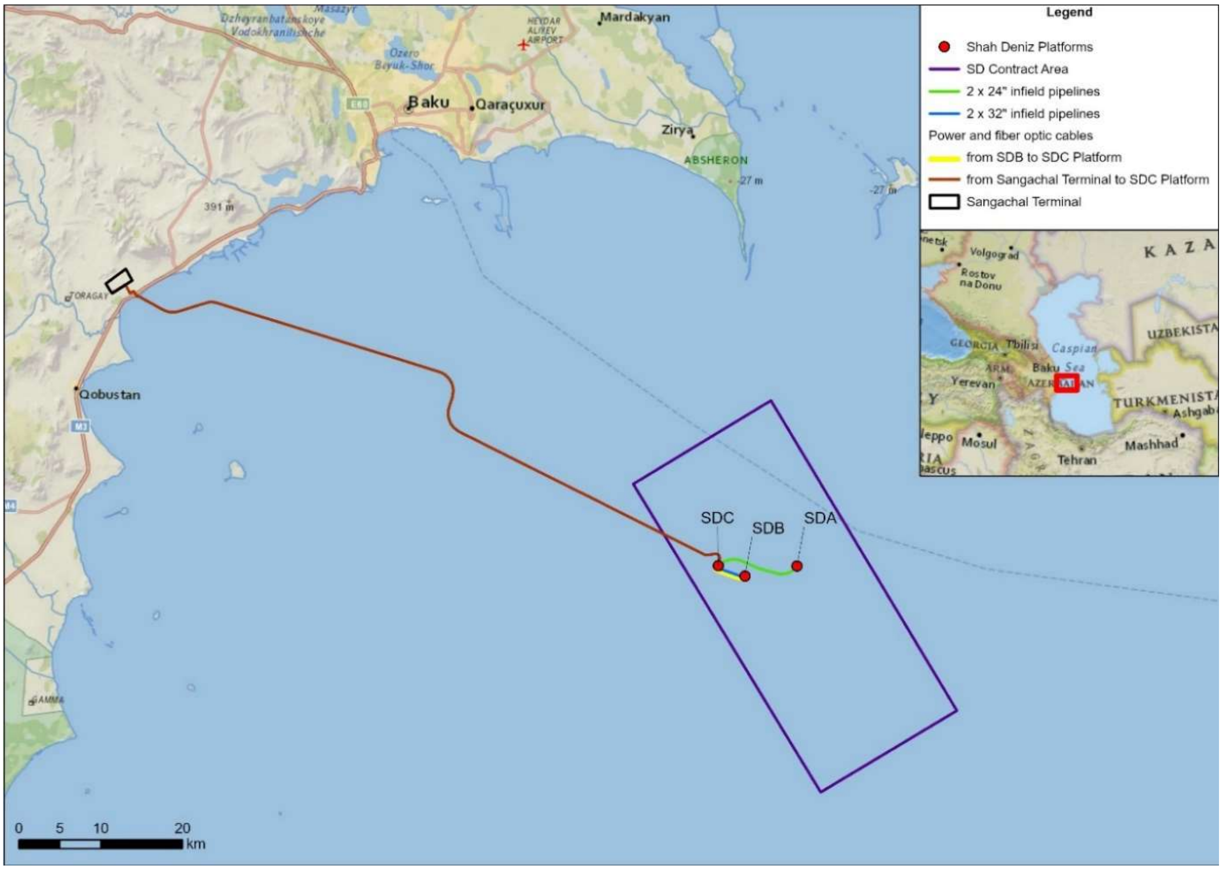

Figure N.1: Location of Shah Deniz Contract Area and proposed SDC facilities / infrastructure

Note: SDA platform, SDB platform and Sangachal Terminal already in existence.

N.2 Project Overview

The SDC project involves the installation of compression facilities offshore in the SD Contract Area is order to access and produce low pressure gas reserves in the field and maximise recovery of resources.

The project comprises:

- an electrically powered Normally Unattended Installation (eNUI) (i.e. the unmanned Shah Deniz Compression (SDC) platform)
- infield subsea gas pipelines to / from the existing SDA and SDB platform gas export lines
- a combined power and fibre optic cable (PFOC) from Sangachal Terminal to the SDC platform to power the facility, and a back-up interconnector PFOC from SDB to SDC platform.

The SDC platform will serve as a host facility for SDA and SDB gas compression. It will be located approximately 3 km from SDB platform in 85 m water depth. Gas from SDA and SDB will be compressed at SDC before exporting it to Sangachal Terminal, utilising the existing SDA and SDB gas export pipelines, see Figure N.2.

Brownfield works will be undertaken at SDA, SDB and Sangachal Terminal. No new infrastructure will be required at Sangachal Terminal (other than installation of power receiving and transfer kit) and there will be no expansion of the terminal area.

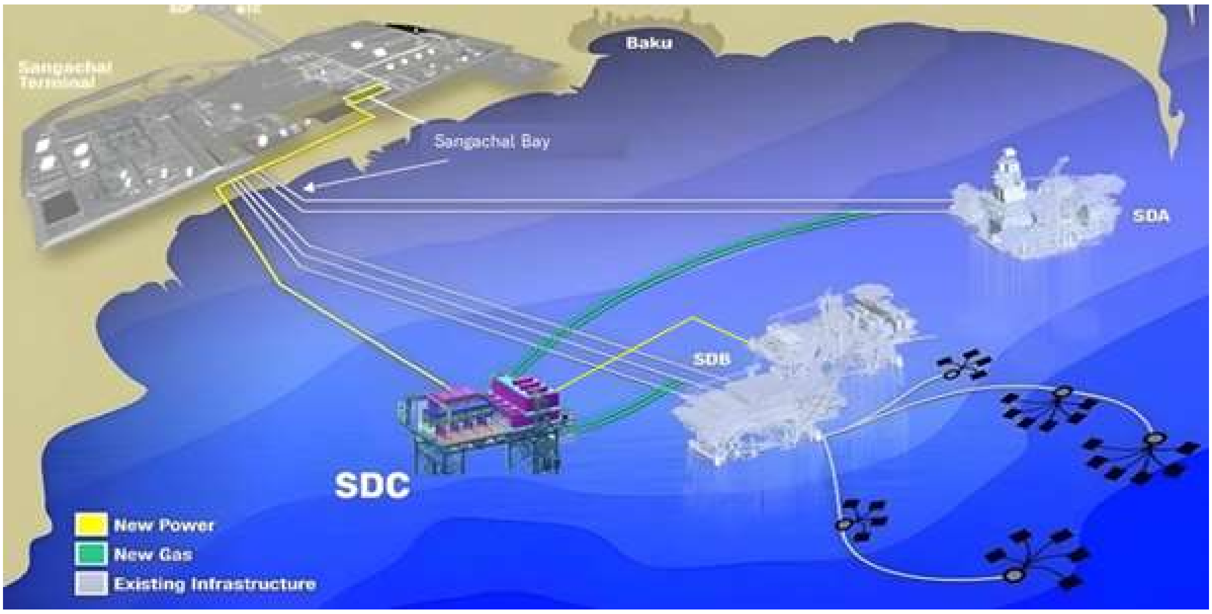

Figure N.2: Schematic of proposed SDC facilities

A schedule for the SDC project activities is provided in Figure N.3 and supports a first gas date of mid 2029 from SDA platform and mid 2030 from SDB platform. The majority of the onshore construction and commissioning activities at the construction yards are expected to occur between 2026 and 2028 based on the current schedule.

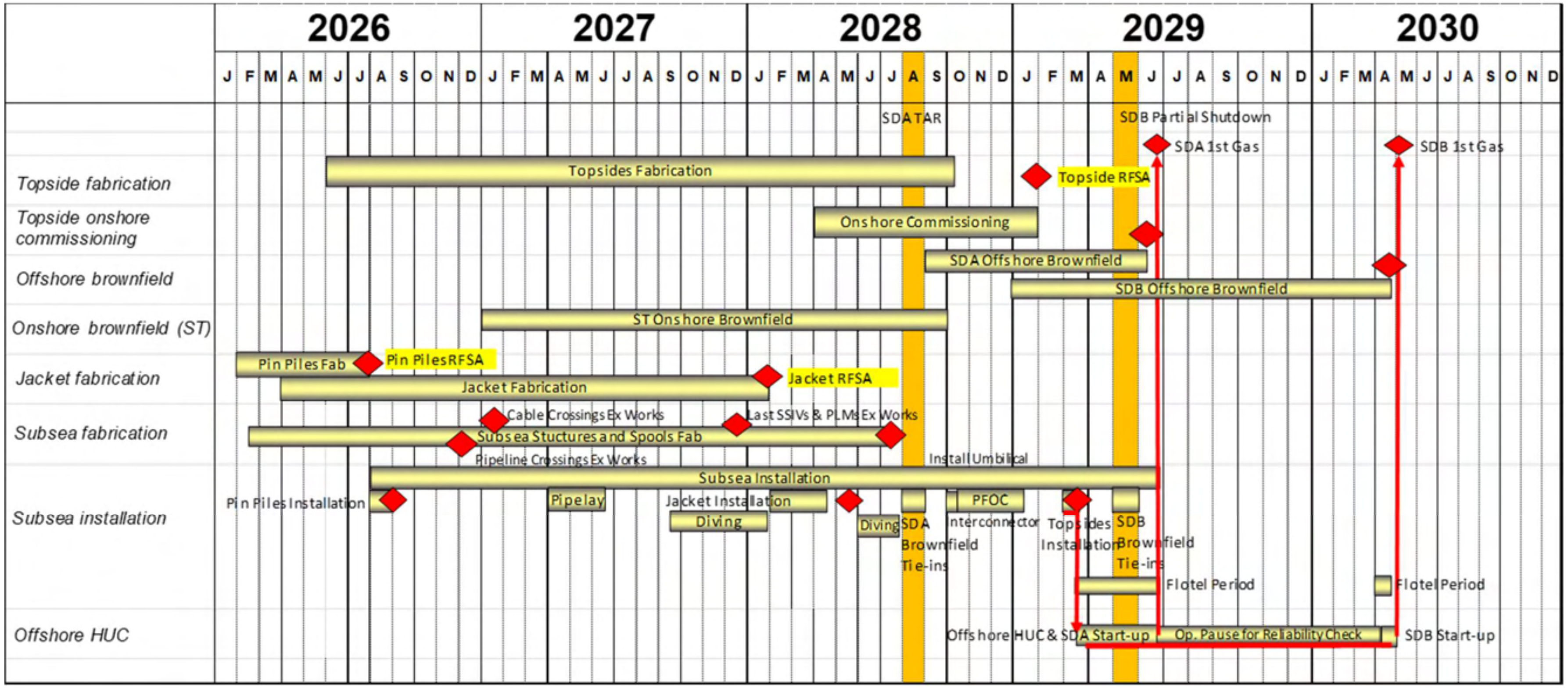

Figure N.3: Estimated SDC project schedule

Notes: RFSA – ready for sail away; TAR – turnaround (scheduled event where facility is taken offline for extended work); PFOC – power and fibre optic cable.

The environmental and social impacts associated with each project phase[1] have been assessed in accordance with the methodology presented below. The volumes of emissions, discharges and wastes associated with each phase have also been estimated.

N.3 Assessment Methodology

The ESIA process (see Figure N.4) constitutes a systematic approach to the evaluation of a project and its associated activities throughout the project lifecycle. The overall aim is to identify, reduce and effectively manage potential negative environmental and social impacts arising from the SDC project activities.

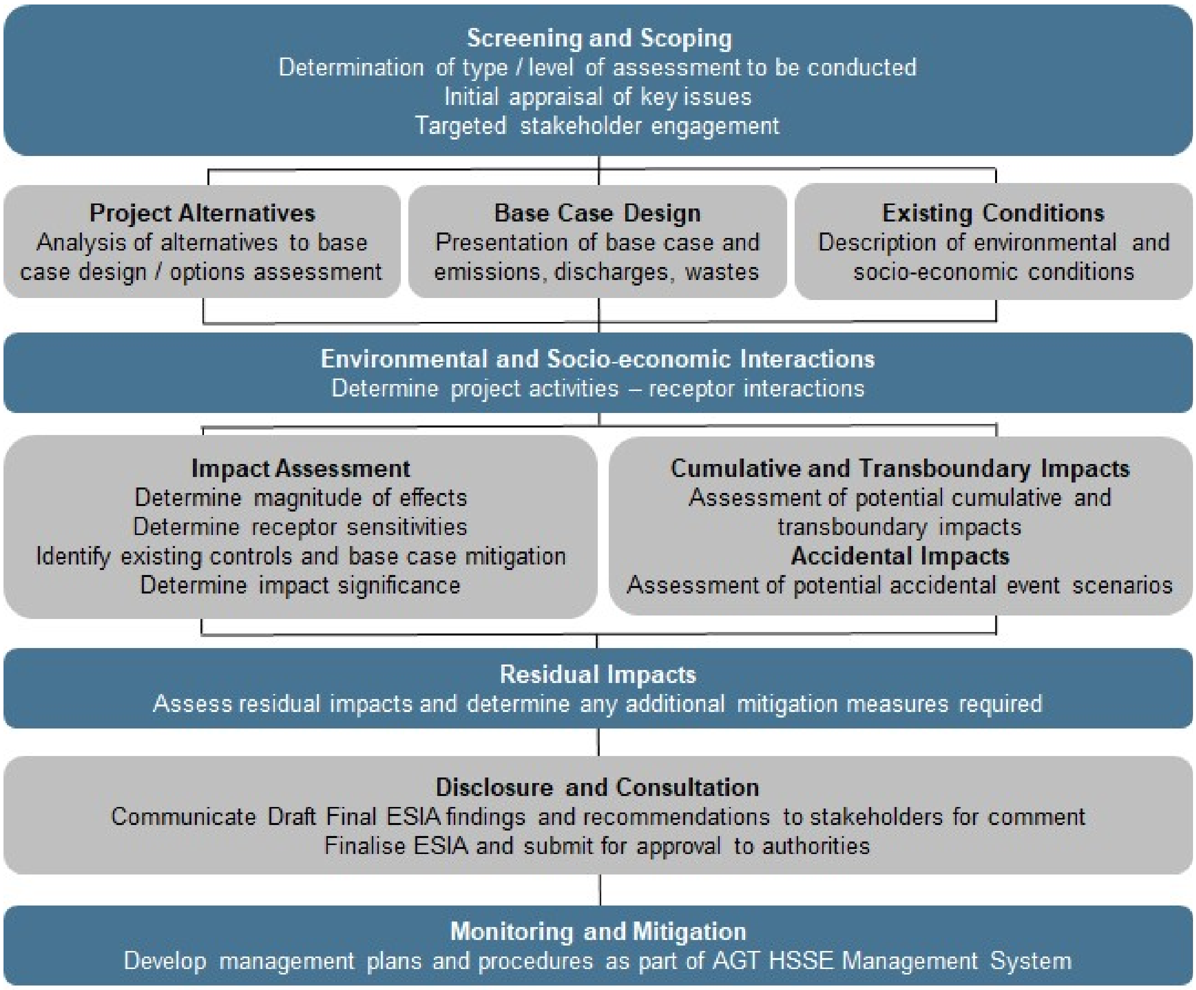

Figure N.4: ESIA process

Assessment of SDC project impacts has been undertaken based on identified SDC project activities and events for each phase that have the potential to interact with the environment. The expected significance of the impact has been assessed taking into account:

- Magnitude **of effect** evaluated according to the following criteria:
  - the nature and size of the change
  - the geographical extent of the change

[1] See Section N.6 for a description of the project phases.

- the duration, frequency and reversibility of the change
- relevant legislative or policy standards or guidelines.

Magnitude is scored from 1 (very low) to 4 (high), based on definitions provided in the ESIA. A rating of 0 is provided for beneficial (positive) effects.

- Receptor **sensitivity** which takes into account:
  - its local, regional, national and international designations
  - its importance to the local or wider community
  - its economic value.

Sensitivity is scored from 1 (very low) to 4 (high), based on definitions provided in the ESIA.

Impact significance, as a function of the magnitude of effect and receptor sensitivity, is subsequently ranked as negligible, minor, moderate or major for adverse impacts as presented in Figure N.5.

Significance			Sensitivity rating			
			Very low	Low	Medium	High
		0 Positive	1	2	3	4
Magnitude rating	Very low	1	1 Negligible	2 Negligible	3 Minor	4 Minor
	Low	2	2 Negligible	4 Minor	6 Moderate	8 Moderate
	Medium	3	3 Minor	6 Moderate	9 Moderate	12 Major
	High	4	4 Minor	8 Moderate	12 Major	16 Major

Figure N.5: Impact significance matrix

The SDC project impact assessment process has benefited from the fact that offshore Shah Deniz and Azeri Chirag Guneshli (ACG) Contract Area[2] discharges and emissions have been comprehensively studied and characterised during the operational phases of the existing SD and ACG facilities. As a result, impacts have been evaluated and understood to a far greater extent than is typically possible.

The evaluation of impacts for the SDC project has been based on three principal sources of information:

- previous environmental risk assessments, including results of toxicity tests and modelling studies which are applicable to the SDC project

[2] The ACG Contract Area is also operated by bp and is located approximately 100 km east of the SD Contract Area in Azerbaijani waters of the Caspian.

- SDC specific supporting studies, including air quality and noise screening assessments, underwater sound modelling, pipeline and subsea pre-commissioning and commissioning discharge modelling, and literature reviews commissioned from local specialists on the topics of fish and fisheries, birds and Caspian seals
- results from the bp Azerbaijan Georgia and Turkey (AGT) Region Environmental Monitoring Programme (EMP)[3] this included project specific monitoring (at the proposed offshore location of the SDC platform in August 2023); regional monitoring to identify and quantify environmental trends; nearshore monitoring in Sangachal Bay; and onshore / coastal monitoring in the vicinity of Sangachal Terminal.

N.4 Policy, Regulatory and Administrative Framework

The assessment has also included examination of how agreements, legislation, standards and guidelines apply to the project.

The detailed legal regime for the joint development and production sharing of the Shah Deniz field is set out within the Production Sharing Agreement (PSA) signed by bp and its co-venturers and the State Oil Company of the Azerbaijan Republic (SOCAR) in June 1996 and enacted into law in October 1996.

The PSA states that the "*contractor shall conduct the petroleum operations in a diligent, safe and efficient manner in accordance with the Environmental Standards … to minimise any potential disturbance to the general environment, including without limitation the surface, subsurface, sea, air, lakes, rivers, animal life, plant life, crops, other natural resources and property*". It also requires the contractor to "…*comply with the present and future Azerbaijani laws or regulations of general applicability with respect to public health, safety and protection and restoration of the environment to the extent that such laws and regulations are no more stringent than the Environmental Standards*".

Environmental standards and practices are specified in Appendix 9 of the Shah Deniz PSA.

The project also takes into account a wide range of international and regional environmental conventions and commits to comply with the intent of current national legislative requirements where those requirements are consistent with the provisions of the PSA, and do not contradict, or are otherwise incompatible with, international petroleum industry standards and practice.

It should be noted that approved ESIAs act as legal permits for bp to operate within Azerbaijan. As such the SDC project will also adhere to the framework of environmental and social standards and commitments within this ESIA once approved by the Ministry of Ecology and Natural Resources (MENR).

N.5 Options Assessed

The key options assessed during the SDC project design development have focused on:

- concept selection and definition
- the selection of a suitable location within the SD Contract Area to site the offshore platform
- platform design and simplification

[3] Survey data has been collected under the AGT EMP from 2004 to date and overseen by stakeholder representatives including SOCAR, ministerial bodies, and the Azerbaijan National Academy of Sciences (now the Azerbaijan Ministry of Science and Education).

- platform power source selection
- infield pipeline routing.

Throughout the design development, environmental evaluation of the project options was undertaken alongside technical and economic evaluation and consultation with stakeholders including SOCAR and the SD partners.

The concept selection was primarily informed by proximity to other existing SD infrastructure; seabed / subsurface conditions; the need to simplify the platform for unmanned operation and economic efficiency; and the goal of providing electrical power to the SDC platform in synergy with other project goals such as bp's Net Zero Aim 1, which envisages bp becoming net zero across its operations on an absolute basis by 2050 or sooner.

The option of not developing the SDC project was also considered. The decision to not proceed would result in a reduction of potential revenues to the Azerbaijan government (the SDC project enables bp to maximise recovery of resources from the field) with a resultant inability to deliver the associated benefits to the Azerbaijan economy. Pursuing the SDC project will result in employment creation for national citizens during the design, construction, and to a lesser extent operational phases of the development, as well as increased use of local facilities, infrastructure and suppliers. The option of not proceeding was therefore disregarded when considered against these socio-economic benefits.

N.6 Environmental Impact Assessment

Environmental impact assessment has been conducted for the following phases of the SDC project:

- **Construction, installation, hook up and commissioning (HUC)**:
  - onshore construction and commissioning of facilities at the construction yards
  - offshore platform installation and HUC
  - offshore infield pipeline and subsea infrastructure installation and commissioning
  - PFOC installation (offshore, nearshore and onshore[4])
- **Operations**:
  - offshore operations
  - onshore operations (at Sangachal Terminal)
  - electricity import.

Brownfield works at Sangachal Terminal are outside the scope of this ESIA.

In view of the operational lifetime of the SDC platform, and associated infrastructure, it is not currently possible to provide a detailed methodology for the potential decommissioning of the facilities.

N.6.1 Construction, Installation and HUC

Table N.1 presents the residual impacts of the environmental assessment for the construction, installation and HUC phase of the SDC project.

[4] The offshore section is classed as the connection to SDC and the offshore route; the nearshore section is classed as that in Sangachal Bay; and the onshore section is classed as that between the Sangachal landfall and Sangachal Terminal (section of cable within terminal boundary is outside the scope of this ESIA).

Table N.1: Summary of residual environmental impacts for SDC construction, installation and HUC

Receptor	Activity	Scoring		
		Magnitude of effect	Receptor sensitivity	Impact significance
Atmosphere	Emissions from construction yard plant and vehicles	2 - low	2 - low	4 – minor
	Emissions from onshore PFOC installation plant and vehicles	1 – very low	2 – low	2 – negligible
	Emissions from offshore installation and support vessels and helicopters	2 – low	1 – very low	2 – negligible
Terrestrial environment (noise)	Noise from construction yard plant and vehicles, and from commissioning activities (Bayil only)	2 - low	2 - low	4 – minor
	Noise from onshore PFOC installation plant and vehicles	2 – low	2 / 3 – low / medium	4 / 6 – minor / moderate
Marine environment	Infield pipeline and subsea infrastructure commissioning discharges	2 – low	2 - low	4 – minor
	Vessel operational discharges	1 – very low	2 - low	2 - negligible
	Discharge of cement during grouting of piles	1 – very low	2 - low	2 - negligible
	Underwater sound from pin and skirt piling	3 - medium	3 - medium	9 – moderate
	Underwater sound from vessel movements	1 - low	3 - medium	3 – minor
Nearshore / coastal environment (ecology and coastal processes)	Construction of finger pier and nearshore PFOC installation works	2 – low	2 - low	4 – minor
Terrestrial environment (ecology)	Onshore PFOC installation	2 - low	3 - medium	6 – moderate
Terrestrial environment (soil and surface water)	Onshore PFOC installation	2 - low	2 - low	4 – minor
Terrestrial / nearshore environment (cultural heritage)	Onshore PFOC installation	2 – low	2 / 3 – low / medium	4 / 6 – minor / moderate
Note: Brownfield works at SDA and SDB platforms scoped out of full assessment.				

Air quality and noise screening assessments have been conducted for the construction yards, and along the onshore PFOC installation route. These studies demonstrate that potential impacts to onshore human receptors are considered to be negligible to minor. The exception to this is noise impacts from the PFOC landfall construction works which were ranked as minor / moderate. This is due to the close proximity of individual dwellings at the landfall, and rocky stone being present in the area of the beach where the cable route and cable transition pit will be excavated. As a result, construction activities at the landfall, in particular any rock breaking, will be scheduled for the hours of daylight where feasible to minimise noise impacts.

Following installation of the infield pipelines offshore in the SD Contact Area they will be cleaned, gauged and hydrotested[5]. This involves the use of seawater containing preservation chemicals (to prevent corrosion and biological growth). Discharges to sea of treated seawater associated with these activities are anticipated to vary in volume between approximately 0.4 m^3 and 6,416 m^3. Dilution and dispersion modelling has been conducted for the worst case scenarios in terms of volume and flow rate (for flood, clean, gauge scenarios; and dewatering scenarios). Predicted no-effect concentrations were achieved at approximately 250 m from the discharge point (assuming that the chemicals are used up in providing protection to the pipeline and are discharged at 20% of the concentration applied). Under typical use and discharge conditions it is predicted that the plume will occupy a very small volume of the available water column at the discharge location and will rapidly achieve dilution of the hydrotest chemicals to below toxic concentrations (with discharge plumes indistinguishable from the ambient environment at 500 m from the discharge point). Impacts on the marine environment and ecological receptors have therefore been ranked as minor.

Monoethylene glycol (MEG) will be used to dehydrate and condition the new infield gas pipelines resulting in small-scale discharges to the environment ranging from approximately 20 to 130 m^3. MEG is a low toxicity, highly biodegradable substance that is classified as a “Pose Little or No Risk” (PLONOR) substance as defined by OSPAR[6]. MEG is therefore not anticipated to cause a discernible impact on the marine environment or ecological receptors.

Hydraulic fluid (Castrol Transaqua HT2) will also be discharged during commissioning of the pigging loop module (PLM) control valves. Discharge volumes will be very limited ranging from approximately 0.4 to 0.6 m^3. Caspian specific ecotoxicity testing has been carried out on this product and the results indicated low toxicity across all samples tested. As a result Transaqua H2 discharge is not anticipated to cause a discernible impact on the marine environment or ecological receptors.

During SDC platform installation, cement could be discharged during grouting of the platform piles. The volume of cement required will be calculated prior to the start of the activity to minimise excess cement discharges to sea. A grout seal / packer will ensure that as much of the cement grout as possible is retained inside the pile sleeve annulus. The low toxicity of the grout (cement chemicals selected will be ‘Gold’ or ‘E’ category[7], or equivalent toxicity to those previously used), and the fact that cement is designed to set in the marine environment without widespread dispersion, indicates negligible impacts on ecological receptors.

The remaining discharges to sea from construction and installation vessels (treated sanitary waste, galley waste, deck wash water and ballast water) will be small in volume and do not contain

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[5] Involves increasing the pressure of the water in the pipeline systems above design pressure to test for leaks.

[6] The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR). bp has adopted the OSPAR principles as the basis for chemical selection and discharge in its Caspian operations.

[7] Rankings under the OSPAR Harmonised Mandatory Control Scheme (HMCS) / Offshore Chemical Notification Scheme (OCNS).

components of high environmental concern. These discharges, which are monitored in accordance with existing procedures to ensure applicable project standards are met, will be rapidly diluted and are all assessed as having a negligible impact upon ecological receptors in the water column.

Underwater sound will result from pile driving activities as part of SDC platform installation, and from construction and installation vessel movements. Propagation modelling of underwater sound has been conducted to estimate distances at which various impacts on marine species may occur. For piling, the modelling results show that seals may experience permanent hearing damage within 1.2 km of the noise source if exposed to the sound for an hour under typical early spring oceanographic conditions, and within 743 m of the noise source in late summer conditions[8]. Temporary hearing loss of seals from piling may occur within 18.6 km of the noise source (in early spring) and 2.4 km (in late summer) if exposed for an hour. For fish, sensitivity varies across species, for the most sensitive species mortality could occur within just 328 m of the noise source, and recoverably injury within 618 m of the noise source if exposed for an hour (with little differences in distances between early spring and late summer). It should be noted that the Caspian seal (IUCN Red List 'Endangered'[9] and included in the Azerbaijan Red Book[10]) is a highly intelligent animal that will rapidly move away from any disturbance or sound. The use of an acoustic deterrent device (ADD) prior to piling activities, and a piling soft-start / slow-start, will alert any seals present, allowing them to leave the area as soon as they detect elevated sound levels and reducing the risk of underwater sound injury. As a result underwater sound impacts from piling on ecological receptors have been ranked as moderate. For project vessel movements, underwater sound impact distances were considerably reduced (in comparison to piling), resulting in impacts on ecological receptors being ranked as minor.

In the nearshore zone, the PFOC between Sangachal Terminal and the SDC platform will be trenched out to the 12.5 m water depth contour (just beyond the shipping lane) to provide protection. In order to carry out PFOC installation in very shallow water it is anticipated that a temporary finger pier will be constructed, extending approximately 300 m into Sangachal Bay. Impacts related to these activities include physical habitat disturbance and smothering, increased turbidity, and changes to coastal processes from the presence of the pier. However, it should be noted that the receptors present in, and adjacent to, the nearshore PFOC installation corridor are common in local coastal waters; and Sangachal Bay is a shallow water environment that is regularly disturbed by wave action with biological communities that are adapted to periodic turbidity. As the finger pier will only stay in place for the duration of the nearshore cable installation works (approximately 6-12 months) the effects on littoral sediment fluxes and current flows are anticipated to be short-term and localised to the immediate surroundings of the structure. Based on the above, the impacts on ecological receptors and coastal processes have been ranked as minor.

In the onshore zone, the PFOC between Sangachal Terminal and the SDC platform will be trenched using open cut methods, and horizontal drilling at road / rail / pipeline crossings. This will require clearance works along the cable right of way (RoW). During these works the vegetation and surface soil will be removed and stored for later reinstatement of the corridor, in order to

[8] Due to an upwardly refracting profile in February and March, levels of noise tend to propagate furthest during these months. By contrast, a downwardly refracting profile prevalent in August means that noise is likely to propagate over significantly shorter distances.

[9] The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. It divides species into nine categories: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct.

[10] Red Book of the Republic of Azerbaijan – Fauna (Third Edition).

maintain the environmental characteristics of the area. Based on the temporary nature of the impacts, and the fact that the PFOC route will follow the existing route of the SD2 gas export pipelines, the magnitude of effect is anticipated to be low. However, the presence of spur-thighed tortoise (IUCN Red List 'Vulnerable' and included in the Azerbaijan Red Book) in the vicinity of the terminal, and cable installation on the eastern fringes of the wetland area to the south of the terminal, has resulted in a receptor sensitivity of medium and an impact significance of moderate. An Ecological and Wildlife Management and Monitoring Plan will be developed and implemented to manage the relocation of any fauna encountered within the areas affected by the cable lay works and will include measures to minimise impacts on the wetland area. Impacts on soil and surface water from the onshore PFOC installation is assessed as minor and no further mitigation is proposed.

The onshore and nearshore PFOC installation works have the potential to disturb unknown artefacts of cultural heritage importance, although the cable route will follow that of the existing SD2 gas export pipelines, which reduces the likelihood of a cultural find. In addition, excavation of the cable transition pit and cable trench at the landfall will require breaking through rocky stone, with potential vibration impacts on the sand cave protected state monument located approximately 300 m to the northwest. Prior to excavation activities at the landfall (and any associated rock breaking) a toolbox talk will be held with site personnel to raise awareness of the proximity of the sand cave, and visual inspection will be made of this feature prior to and during rock breaking activities to monitor any vibrational impacts. Due to the presence of the sand cave, and because the possibility of chance finds cannot be ruled out, the impact significance is ranked as minor / moderate. A watching brief, with representatives from the Institute of Archaeology and Anthropology will be maintained during PFOC groundworks.

Overall, the majority of SDC construction, installation and HUC residual impacts were assessed as negligible or minor. The only moderate impacts were: potential impacts on ecological receptors from piling underwater sound, and impacts on ecological receptors from the onshore PFOC installation works. Minor / moderate impacts were limited to potential noise impacts from PFOC installation at the landfall on human receptors, and potential impacts on cultural heritage in the event of a chance find during onshore PFOC installation and due to the proximity of the sand cave to the landfall site. It is considered that these impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and mitigation measures.

N.6.2 Operations

The SDC platform is an electrically powered unmanned installation that has been simplified to minimise the offshore maintenance burden. As such sources of impact are very limited as there is no discharge of sanitary waste, galley waste, cooling water, produced water, or fire water / firefighting foam from the platform. In addition there is no flaring, no permanent closed drains, and no topside pigging facilities. Drilling activities will not be carried out from the platform, as it is purely for compression facilities only.

The activities / sources of impact remaining from operation of the SDC platform: fugitive emissions; small-scale venting during maintenance; open drains discharge of rainwater and wash down water; small-scale hydraulic fluid releases (Transaqua HT2) from PLM control valves during pigging activities; and periodic vessel maintenance visits have been scoped out of full assessment. Likewise use of existing processing and storage facilities at Sangachal Terminal, and electricity import from the Azerbaijan national grid, have also been scoped out of full assessment due to the limited environmental impacts.

N.7 Socio-economic Impact Assessment

The SDC project is predominantly an offshore development, with the majority of SDC project related activities taking place within the SD Contract Area. Onshore activities are limited to installation of the onshore section of the SDC PFOC from Sangachal Terminal to the landfall, and construction of the jacket, topsides and subsea infrastructure at onshore construction yards. It is anticipated that the same existing onshore construction yards that have been used previously for SD and ACG construction activities will be used for SDC project activities.

A number of SDC project activities have been scoped out of full assessment based on their limited potential to result in discernible socio-economic impacts, or if they have been already assessed in other chapters of the ESIA, these include:

- community disturbance
- community health and safety
- disruption to road and rail users
- access restrictions to the shoreline (Sangachal Bay)
- disruption to commercial fishing and shipping.

With reference to experience gained from previous SD and ACG projects, the following key socio-economic issues have been assessed (see Table N.2):

- employment opportunities during the SDC construction and installation phase (including training and skills development provided to the workforce)
- demanning of the construction workforce after peak employment has been reached.

In addition, the following indirect socio-economic impacts have been discussed:

- procurement of goods and services by the main construction and installation contractors through internal supply chains (increased economic flow)
- potential social conflict from (perceived or actual) competition between individuals seeking jobs.

As potential indirect socio-economic impacts of the SDC project are outside of bp and their main construction contractors' control, and cannot be mitigated to any reasonable extent, the impact assessment provided for indirect impacts is qualitative in nature.

Table N.2: Summary of residual socio-economic impacts for SDC project

Event/ Activity	Scoring		
	Magnitude of effect	Receptor sensitivity	Impact significance
Employment during SDC project construction and installation	0 - positive	4 – high	0 – positive
Demanning following SDC project construction and installation	2 - low	4 – high	8 - moderate

The socio-economic assessment considered that the national workforce to be employed during the SDC project construction phase is likely to peak at approximately 2,600 personnel in 2027. During the operational phase only a limited number of maintenance personnel will be employed by the project as the SDC platform is unmanned. Employment impacts are likely to be distributed within the local area with the majority of employees expected to be recruited from the Baku City economic region (which includes the Sabayil and Garadagh districts). It is anticipated that employment will not require establishment of workforce accommodation, or significant migration of populations to the construction areas.

Every effort will be made to re-hire workers who have demonstrated competence whilst working on previous oil and gas construction projects. Upon hiring workers, a gap analysis will be undertaken by the main construction and installation contractors between relevant competence criteria and the contractor's Training and Development Plan. Where gaps are identified training will be provided to bring each worker up to at least the minimum standards for the role expressed in the Training and Development Plan. It is expected that the employment generated by the SDC project will result in positive impacts to individuals and their households.

As the construction phase will generate temporary employment opportunities, planning for the conclusion of construction workforce contracts will be carefully considered from the start of the SDC project. Measures to mitigate this will include adequate staff communications between the main construction and installation contractors and their workforce which will inform the workforce of project progress and expected completion dates.

The overall socio-economic impacts of the SDC project, particularly from employment creation throughout the construction, installation and HUC phases were assessed as positive. The provision of training and skills development to the workforce, certificates to provide competence for certain types of professional positions, and adequate warning in advance of their position being made redundant, will reduce the impact of demanning to the extent possible. The residual impact is scored as moderate due to the high sensitivity of the receptor.

N.8 Cumulative, Transboundary and Accidental Events

Cumulative and transboundary impacts

Potential cumulative and transboundary impacts have been assessed taking into account the potential for intra-project impacts (interactions between separate SDC project-related impacts), as well as inter-project impacts that take into account other potentially significant projects where the associated impacts may overlap geographically or temporally with SDC project impacts.

Due to the uncertainties with regard to third-party marine projects in the vicinity of the Shah Deniz Contract Area, and the distance to bp's new Memorandum of Understanding (MoU) areas (Karabagh and Ashrafi-Dan Ulduzu Blocks), the cumulative assessment focuses on potential cumulative effects with known activities in the SD and ACG Contract Areas and at Sangachal Terminal (Sangachal Terminal Electrification project).

Cumulative impacts and transboundary effects were considered to be limited to the following:

Underwater sound – cumulative impacts

Long-term seismic acquisition programmes are planned in both the SD and ACG Contract Areas. While there is no bioaccumulation of sound in the marine environment, there is the potential for an additive effect if sounds from one activity coincide and overlap spatially and temporally with other concurrent activities. The main source of underwater sound from the SDC project is underwater piling which is anticipated to take a total of 10 days for the jacket pin piles around August 2026, and 20 days for the jacket skirt piles around March 2028. There is therefore the potential for cumulative underwater sound impacts if seismic survey activities (particularly in the Shah Deniz Contract Area) are carried out concurrently.

The exact timing of seismic survey activities in the SD and ACG Contract Areas are not currently known. As part of bp's simultaneous operations (SIMOPs) planning, seismic survey activities in the Shah Deniz Contract Area will not be conducted at the same time as the piling activities for the SDC project in order to mitigate the potential for underwater sound cumulative impacts on marine fauna.

Greenhouse gasses (GHGs) – cumulative and transboundary impacts

GHG emissions are inherently cumulative, as all emissions have the same impact on the same ultimate receptor. The impact is climate change, or global warming, caused by the radiative forcing effects of GHGs in the atmosphere. The affected receptor is the global climate (hence it is also a transboundary issue) and all the ecosystems and biomes that depend on it.

SDC project operational Scope 1 and Scope 2 GHG emissions[11] per year are estimated as 127 ktonnes CO_2 equivalent, which represents only approximately 3% of the annual operational GHG emissions from bp's activities in Azerbaijan.

During optimise stage efforts were made to simplify the SDC platform and align the project with bp's Net Zero Aim 1 (see Section N.5). As a result operational Scope 1 GHG emissions are very low due to the fact that there is no power generation on the SDC platform, no firewater pumps, and no flare. Scope 2 GHG emissions need to be taken into account when considering cumulative GHG emission impacts. The electrical power demand of the SDC platform during operations phase will be met by utilising existing overhead lines feeding Sangachal Terminal from the national grid operated by Azerenergy, with a PFOC out to the platform. However, it should be noted that total operational GHG emissions from the SDC project (Scope 1 and Scope 2) are still considerably lower than those associated with bp's previous development projects, and only represent a very small percentage of Azerbaijan's national GHG emissions total (approximately 0.2%).

There is a drive to reduce the carbon footprint of bp operations, and current regional projects such as bp's solar Sunrise project (a photovoltaic power facility in Azerbaijan), and the Sangachal Terminal Electrification (STEL) project (which aims to electrify Sangachal Terminal and establish a framework to operate the terminal without direct or indirect carbon dioxide emissions) are all part of this drive. The SDC project is aligned with bp's aims and has been designed to maximise synergies with the STEL project.

Accidental events

Due to the limited hydrocarbon inventory on the SDC platform, an accidental hydrocarbon release scenario from this facility is not considered. In addition there will be no condensate within the SDC infield pipelines.

Feasible accidental event scenarios for the SDC project are therefore limited to:

- release of chemicals / waste from a project vessel or the SDC platform (e.g., transformer chemicals)
- hydrocarbon spills associated with project vessels (e.g. small spills resulting from refuelling, larger spill of diesel resulting from a project vessel collision).

[11] Scope 1 emissions are those that occur directly from sources owned or controlled by a defined entity. Scope 2 emissions are those that occur due to the import of energy (electricity or heat) to that entity. These occur at the place where that energy is generated, e.g., a power station. They are therefore termed indirect emissions.

The transformers on the SDC platform will contain synthetic ester transformer fluid. The product selected will be readily biodegradable in the marine environment and ecotoxicity testing will be carried out prior to its use. The transformers will be located in a kerbed area to provide secondary containment. Modelling of synthetic ester transformer fluid for bp's Shah Deniz Alpha Power (SDAP) project considered a release of 7 m^3. In this instance the discharge plume reached a 'no effect' concentration within 8 m of the discharge point.

To support the assessment of project vessel accidental hydrocarbon spill impacts, diesel spill modelling of 400 m^3 and 123 m^3 releases in the SD Contract Area were reviewed. In both cases the impact of the diesel was restricted to the vicinity of the release point, with no shoreline impacts. The released diesel was lost from the sea surface by evaporation into the air, or by natural dispersion into the water column, within 2 days.

The AGT Offshore Facilities Oil Spill Contingency Plan (OSCP) provides guidance and actions to be taken during a hydrocarbon spill incident and includes drilling rigs, platforms, subsea pipelines and marine vessels. This document will be reviewed and amended to incorporate the new offshore SDC facilities.

N.9 Environmental and Social Management

Each phase of the SDC project will be subject to formal environmental and social management planning.

During construction, installation and HUC phase, bp will develop a Construction Phase Environmental and Social Management System (ESMS) that will include an Environmental and Social Management and Monitoring Plan (ESMMP) supported by additional topic-specific management plans, a Commitments Register listing all the commitments in this ESIA, and a register of environmental and social legislation applicable to the SDC project.

The main construction and installation contractors will be required to develop and implement their own Construction Phase ESMS, specific to the SDC project, that is consistent with the above. The main construction and installation contractors' ESMS will include a set of environmental and social management plans and procedures that will be submitted to bp for approval before construction begins.

At operations phase bp will manage the SDC facilities using an Operations Phase Environmental Management System (EMS) that is aligned with the requirements of ISO 14001, the leading international standard on environmental management. Prior to commencement of SDC operations, a transition plan will be developed to support the movement of SDC from the Construction Phase ESMS to the Operations Phase EMS.

The AGT Environmental Monitoring Programme (EMP) provides a consistent, long-term set of data, with the objective of developing an accurate picture of potential impacts on the surrounding environment, so that they can be managed and mitigated as effectively as possible. As part of this programme, a marine environmental baseline survey was undertaken at the proposed SDC platform location in August 2023. Due to the lack of significant discharge sources associated with the SDC facility (unmanned facility, no drilling conducted, no discharge of produced water, cooling water, etc) project-specific post-installation and operational monitoring is not proposed. Shah Deniz regional environmental surveys will continue to be conducted approximately every 5 years to capture any Contract Area impacts.

N.10 ESIA Consultation and Disclosure

Stakeholder consultation is an important element of the ESIA process, ensuring that the opinions of potentially affected people and interested parties are solicited, collated and documented. The stakeholder engagement and consultation process has:

- made use of the consultation framework and methods established for earlier SD and other bp projects in Azerbaijan
- been developed with reference to applicable national legislation, ratified international conventions, and accepted guidance on expectations of ESIA consultation and disclosure
- considered the extent of consultation and disclosure already undertaken in recent years.

The scope of the SDC project ESIA was agreed with the MENR at a scoping meeting held in Baku in June 2024.

The Draft Final ESIA Report and Non-Technical Summary, in English and Azerbaijani, will be made available (along with feedback forms) for a 60 day consultation period at the following locations and via the Internet:

- bp website
- bp Xazar Centre Office reception
- M.F. Akhundov Public Library
- the Scientific Library of the Azerbaijan Ministry of Science and Education
- the Library of the Azerbaijan State University of Oil and Industry
- Aarhus Public Environmental Information Centre, MENR
- the Library of Baku Higher Oil School, Campus.

As part of the Draft Final ESIA consultation process the following meetings will be held:

- meeting with the MENR, Baku
- public meeting, Baku.

Comments received on the Draft Final ESIA will be collated and analysed, with responses issued where relevant. The ESIA will be subsequently revised and finalised for MENR approval.

CHAPTER 1: Introduction

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1 INTRODUCTION

1.1 Overview

This Environmental and Social Impact Assessment (ESIA) has been prepared for the Shah Deniz Compression (SDC) project. The SDC project follows on from previous phases of development in the Shah Deniz (SD) Contract Area in the Azerbaijani sector of the Caspian Sea (see Figure 1.1). It involves the installation of an offshore compression platform (SDC platform), and associated facilities, to enable further gas to be extracted and processed from the field.

The SDC platform will serve as a host facility for SDA and SDB gas export compression. Export gas from SDA and SDB will be compressed at the unmanned SDC compression platform before exporting it to Sangachal terminal onshore, utilising the existing SDA and SDB export pipelines.

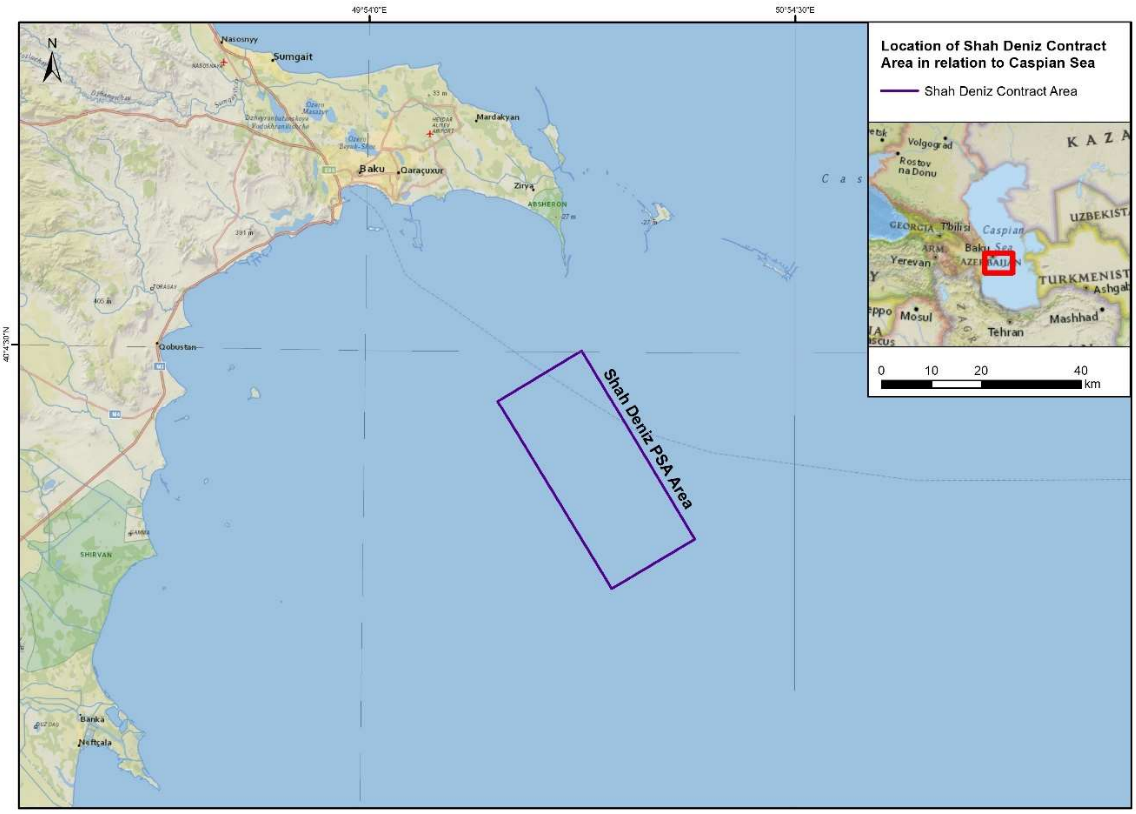

Figure 1.1: Location of Shah Deniz Contract Area

This ESIA has been conducted in accordance with the legal requirements of Azerbaijan, including the SD Production Sharing Agreement (PSA), as described in Chapter 2: Policy, Regulatory and Administrative Framework. The scope and assessment methodologies used in this ESIA have been informed through a consultation process, as described in Chapter 8: Consultation and Disclosure.

1.2 Shah Deniz Development

1.2.1 Shah Deniz Production Sharing Agreement

The Shah Deniz PSA was signed in 1996 between the State Oil Company of the Azerbaijan Republic (SOCAR) and a consortium of foreign oil companies, with BP as operator. The PSA received parliamentary ratification on 4th October 1996, thereby giving exploration, development and production rights to the signatory parties and establishing particular obligations, with respect to these activities, within the defined SD Contract Area.

Development of the Contract Area is being pursued in stages as described below.

1.2.2 Shah Deniz Stage 1 Project

Shah Deniz Stage 1 (SD1) commenced production in 2006 and includes a fixed platform (Shah Deniz Alpha (SDA)) with drilling and processing facilities and two export pipelines to transport gas and condensate to onshore reception facilities at Sangachal Terminal (one 26" diameter gas export line and one 12" condensate line), see Figure 1.2.

This phase of the development has the capacity to produce around 1,040 million standard cubic feet per day (MMSCFD) of gas (BP AGT Region / Projects, 2023) and 50,000 barrels a day of condensate (BP, 2024a).

1.2.3 Shah Deniz Stage 2 Project

Shah Deniz Stage 2 (SD2) commenced production in 2018 and includes a fixed platform complex (Shah Deniz Bravo (SDB)) with two bridge linked platforms, five subsea well clusters (in water depths up to 550 m), gas and condensate export lines to Sangachal Terminal (ST) (two 32" diameter gas export lines and one 16" condensate line[1]) and additional onshore processing facilities within an expansion area at Sangachal Terminal, see Figure 1.2.

At present a total 21 wells have been drilled for SD2 out of the 26 planned. These include five wells on the North flank, four wells on the West flank, four wells on the East South flank, five wells on the West South flank and three wells on the East North flank (BP, 2024b).

This phase of the development has the capacity to produce around 1,777 MMSCFD of gas (BP AGT Region / Projects, 2023) and 100,000 barrels a day of condensate (BP, 2024b).

1.2.4 Gas Export

Gas produced from the SD Contract Area is exported from Sangachal Terminal via the South Caucasus Pipeline (SCP). The SCP commenced operation in 2006 and transports gas from Azerbaijan, through Georgia to Turkey. The pipeline is 691 km in length and runs parallel to the Baku-Tbilisi-Ceyhan (BTC) oil pipeline (see Section 1.3) to the Turkish border where it is linked with the Turkish gas distribution network.

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[1] There is also one 6" monoethylene glycol (MEG) import line from Sangachal Terminal to SDB platform.

The existing 42” diameter SCP system has recently been expanded as part of the SD2 stage development (the SCPX project). SCPX expands the existing 7 billion cubic metres of gas per year (bcma) SCP system to accommodate a further 16 bcma (BP, 2024c).

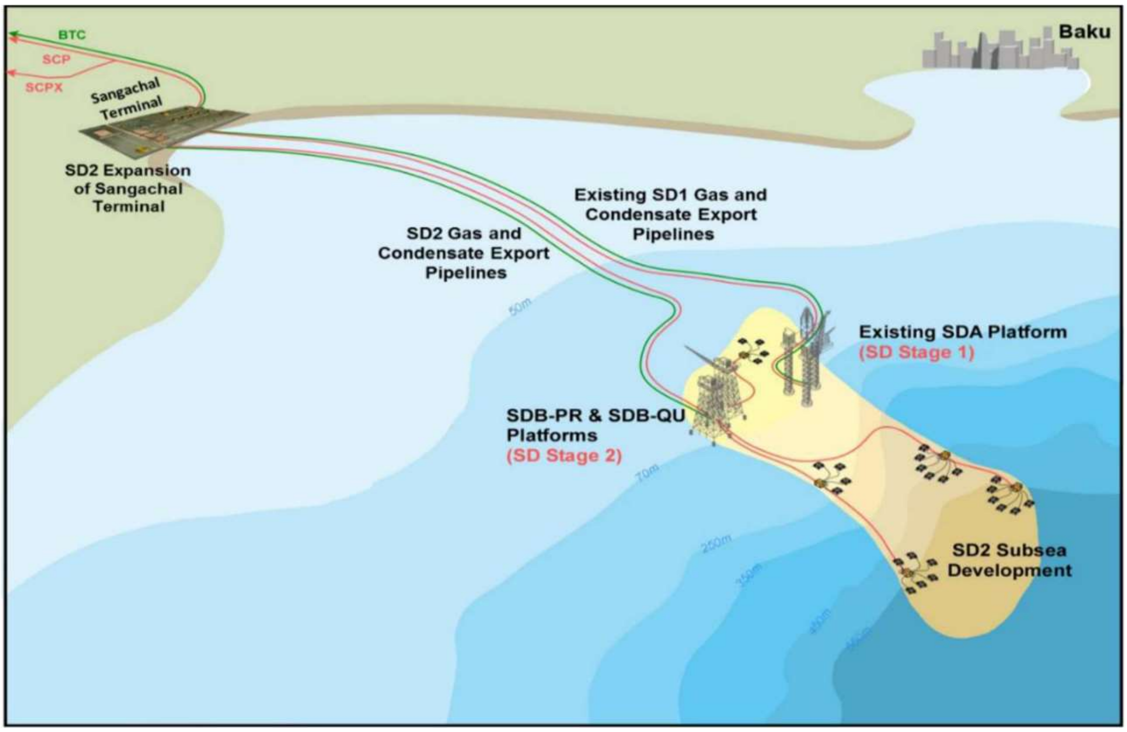

Figure 1.2: Schematic of existing Shah Deniz facilities and infrastructure

Source: BP, 2023a

1.3 ACG Development Overview

Development of the Azeri Chirag Guneshli (ACG) Contract Area has been pursued in phases in parallel with the SD Contract Area under a separate PSA (refer to Figure 1.1 for the location of the ACG Contract Area). To date the development phases have included:

- Early Oil Project (EOP)
- ACG Phase 1
- ACG Phase 2
- ACG Phase 3
- Chirag Oil Project
- Azeri Central East (ACE) Project.

Oil produced from the ACG Contract Area is transported via the BTC pipeline from Sangachal Terminal (through Azerbaijan, Georgia and Turkey) to Ceyhan Terminal located on the Turkish coast of the Mediterranean Sea. In addition, the Western Route Export Pipeline transports ACG oil from Sangachal Terminal to Supsa Terminal on Georgia’s Black Sea coast.

1.4 Proposed Shah Deniz Compression Project

Since the start of production from the Shah Deniz gas field the pressure has naturally been falling in the reservoir. Gas compression has been widely adopted by the petroleum industry and is validated as a reliable method for improving the reserves base.

As gas fields mature, their reservoir pressure declines with an associated reduction in gas production rates. This phenomenon is even more pronounced in fields where aquifer water breaks through and results in rapidly falling well head pressures which naturally result in reduced reserves recovery over the producing life of the field.

The installation of a compression platform in the Shah Deniz field will elongate well life and field life by allowing access to untapped reserves which may be left behind if surface compression facilities are not put in place in a timely manner. Offshore compression allows consolidation of large gas volumes produced via the SDA and SDB wellheads at lower pressures into a high-pressure stream, providing the driving force to keep the gas moving down the export lines.

The SDC project comprises:

- an electrically powered Normally Unattended Installation (eNUI)[2] (Shah Deniz Compression platform)
- infield subsea gas pipelines to/from the existing SDA and SDB gas export lines (along with associated spools / structures for pigging, bypass and isolation, and control umbilicals)
- a combined power and fibre optic cable (PFOC) from Sangachal Terminal to the SDC platform (and an interconnector PFOC from SDB to SDC platform).

The SDC platform will be located approximately 3 km from SDB platform and 10 km from SDA platform in around 85 m water depth.

Brownfield works will be undertaken at SDA, SDB and Sangachal Terminal as part of the project. No new infrastructure will be required at Sangachal Terminal (other than installation of power receiving and transfer kit) and there will be no expansion of the terminal area.

Figure 1.3 presents a schematic of the SDC offshore facilities including platform, infield pipelines and power cable to shore.

The following Environmental Technical Notes (ETNs) have been submitted to the MENR in order to facilitate the collection of subsurface and geological data for the proposed SDC platform location:

- SDC 2D UHR Seismic Survey ETN – approved by the MENR and survey carried out in September 2023
- SDC Geotechnical Survey ETN – submitted to the MENR in June 2024, the survey is currently scheduled for Q4 2024.

The purpose of this ESIA is to assess the environmental and social impacts associated with the SDC project construction, installation, and operational activities.

[2] The concept of an eNUI platform is new to the region.

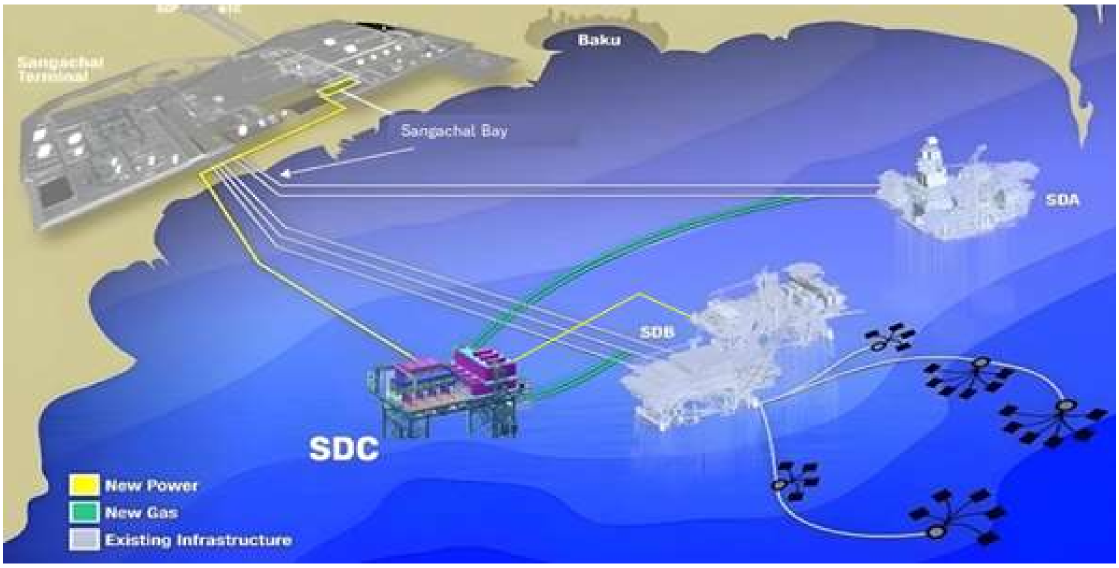

Figure 1.3: Schematic of proposed SDC facilities

Source: BP, 2023b

1.5 SDC Project Environmental and Social Impact Assessment

The overall objective of the SDC project ESIA is to ensure that any adverse environmental and socio-economic impacts arising from the proposed works are identified and, where possible, eliminated or minimised through early recognition of, and response to, the issues.

The purpose of this ESIA is to:

- identify the legal and regulatory requirements and other standards relevant to the project
- identify sensitive environmental and social receptors in the project study area
- determine project aspects and activities that could result in environmental and social impacts
- ensure that environmental and socio-economic considerations are integrated into the SDC project design and implementation
- develop mitigation measures to reduce potential negative environmental and social impacts to acceptable levels and enhance any beneficial impacts arising from the project
- ensure that relevant stakeholders are consulted throughout the ESIA process and their concerns addressed
- ensure mitigation measures are incorporated into environmental and social management system documentation that will be implemented during construction, commissioning and operation.

Within the impact assessment, activities and potential receptor interactions will be evaluated against existing environmental and socio-economic conditions and sensitivities, and the potential impacts ranked. The assessment of potential impacts takes account of existing and planned controls and monitoring, and mitigation measures developed as part of earlier SD and ACG projects.

1.6 ESIA Team

Details of the SDC project ESIA team are provided in Table 1.1.

Table 1.1: SDC project ESIA team

Team member	Role
RSK	ESIA project manager and lead authors Onshore air quality screening and assessment Onshore noise screening and assessment
Dr Tariel Eybatov	Local Caspian seal specialist
Professor Mehman Akhundov	Local fish and fisheries specialist
Grigoriy Palatnikov	Local fish physiology specialist
Nigar Agayeva	Local bird specialist
Xodus Group	Offshore hydrotest discharge modelling
Award Environmental Consultants	Underwater sound modelling
bp	Shah Deniz Contract Area operator on behalf of contractor parties

1.7 ESIA Structure

A summary of the SDC project ESIA structure and content is provided in Table 1.2.

Table 1.2: Structure and content of the ESIA

Chapter title	Description of content
Non-Technical Summary	A concise summary of the ESIA findings.
Units & Abbreviations	A description of the units and abbreviations used in the ESIA.
1. Introduction	An overview of SD field development to date, the proposed SDC project, ESIA objectives, ESIA team members and ESIA report structure.
2. Policy, Regulatory and Administrative Framework	A summary of applicable requirements from national environmental and social legislation, the SD PSA, ratified regional / international conventions and agreements, and international petroleum industry standards.
3. Impact Assessment Methodology	A description of the process and methodology used for the impact assessment.
4. Options Assessed	A description of the alternative concept options assessed for the SDC project that aimed to reduce negative environmental or social impacts.

Chapter title	Description of content
5. Project Description	A detailed description of the SDC project.
6. Environmental Description	A description of the existing offshore, nearshore and onshore environmental conditions potentially affected by the SDC project.
7. Social Description	A description of the existing offshore, nearshore and onshore social conditions potentially affected by the SDC project.
8. Consultation and Disclosure	An overview of the consultation and disclosure activities undertaken during the ESIA programme, and the issues and concerns raised.
9. Construction, Installation and HUC Environmental Impact Assessment, Mitigation and Monitoring	An assessment of potential environmental impacts associated with offshore, nearshore and onshore SDC construction, installation and HUC, including any necessary mitigation and monitoring.
10. Operations Environmental Impact Assessment, Mitigation and Monitoring	An assessment of potential environmental impacts associated with the operations phase of the SDC project, including any necessary mitigation and monitoring.
11. Socio-economic Impact Assessment, Mitigation and Monitoring	An assessment of potential social impacts associated with each phase of the SDC project activities, including any necessary mitigation and monitoring.
12. Cumulative and Transboundary Impacts and Accidental Events	An assessment of potential cumulative and transboundary impacts associated with the SDC project activities, and an assessment of potential accidental event scenarios.
13. Environmental and Social Management	A summary of the environmental and social management system associated with the SDC project activities.
14. Residual Impacts and Conclusion	A summary of the residual impacts and conclusions of the assessment.
Appendices	Supporting studies and information.

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CHAPTER 2: Policy, Regulatory and Administrative Framework

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2 POLICY, REGULATORY AND ADMINISTRATIVE FRAMEWORK

2.1 Introduction

This chapter provides an overview of the regulatory and administrative framework relevant to the assessment and management of environmental and social impacts associated with the proposed SDC project.

The project activities assessed within this ESIA will be undertaken in accordance with applicable national legislation, applicable international conventions ratified by the Azerbaijan Government, the Shah Deniz PSA, and international petroleum industry standards and practices.

The regulatory hierarchy applicable to the project is outlined in Figure 2.1.

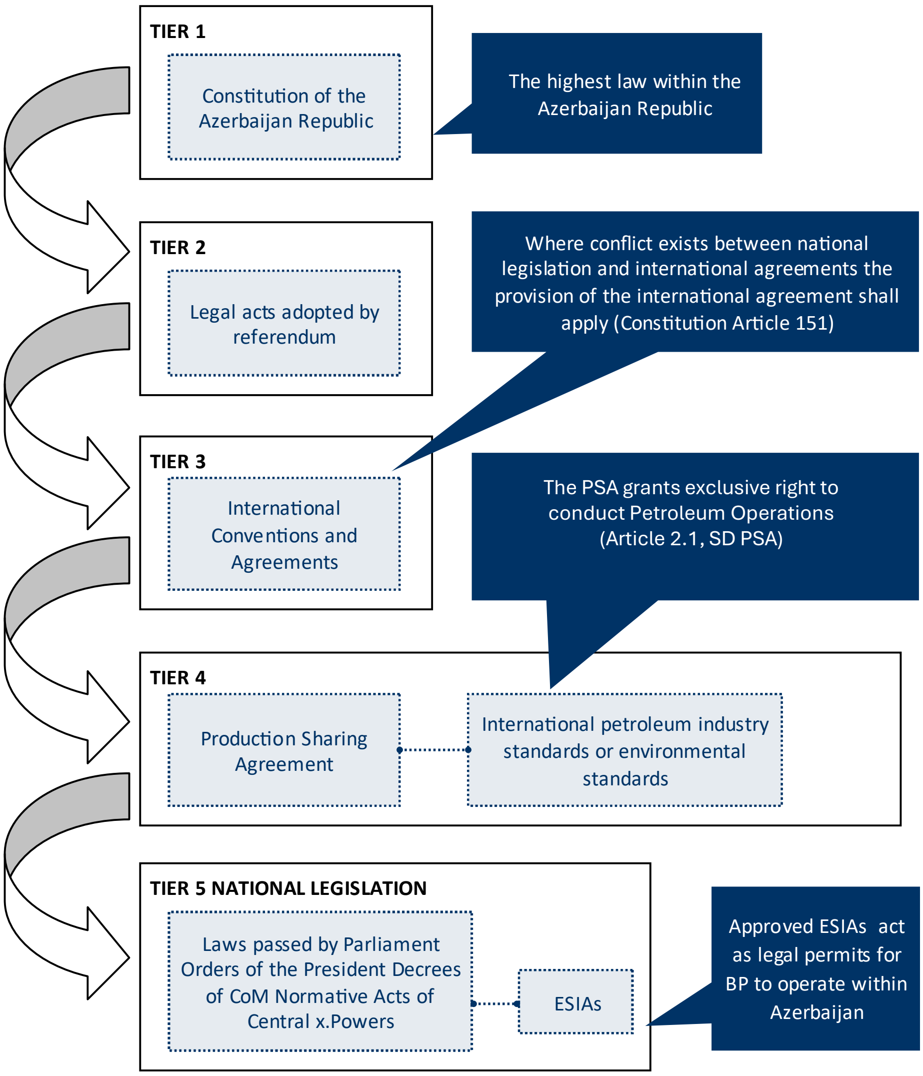

Figure 2.1: Azerbaijan legal hierarchy applicable to the SDC project

2.2 Regulatory Agencies

The Ministry of Ecology and Natural Resources (MENR) is the main government institution set up to regulate environmental issues in the Republic of Azerbaijan. The MENR holds central executive power and is responsible for:

- development of draft environmental legislation for submission to the Azerbaijan Parliament
- implementation of environmental policy
- enforcement of standards and requirements for environmental protection
- suspension or termination of activities not meeting set standards
- advising on environmental issues
- expert review and approval of environmental documentation, including Environmental Impact Assessment (EIA) and ESIA, and
- implementation of the requirements set out in international conventions ratified by the Azerbaijan Republic (within its competence).

Other notable ministries, committees and institutions which work on environment-related matters include:

- Ministry of Emergency Situations (MES) - responsible for the management of natural disasters and industrial accidents and the implementation of safety rules in construction, mining and industry. MES (along with the State Oil Company of the Azerbaijan Republic (SOCAR), MENR and other appropriate Ministries) requires prompt notification in the event of an emergency, or an accident.
- Ministry of Health - state institution controlling the sanitary-epidemiological situation in the country and regulation of health protection in the work place.
- Ministry of Energy - responsible for upstream and downstream oil and gas activities, and efficient utilisation of Azerbaijan's energy resources.

2.3 National Legislation

2.3.1 The Constitution

The Constitution is the highest law in the Republic of Azerbaijan and prevails over national legislation and international agreements. The following Articles help determine the applicability of national and international requirements to the proposed SDC project:

- Article 148.II - *International agreements acceded to by the Republic of Azerbaijan become an integral part of the legislative system of the Republic of Azerbaijan*; and
- Article 151 - *If any conflicts arise between the normative-legal acts which constitute the legislative system of the Republic of Azerbaijan (except for the Constitution and the acts adopted via referendum) and the international agreements acceded to by the Republic of Azerbaijan, the provisions of the international agreements shall apply.*

The Constitution (Article 39) also stipulates the basic rights of people to live in a healthy environment, to have access to information on the state of the environment and to obtain compensation for damage suffered as the result of a violation of environmental legislation.

2.3.2 Production Sharing Agreement

The Shah Deniz PSA[1] establishes the legal regime for the joint development and production sharing of the Shah Deniz field in the Azerbaijan sector of the Caspian Sea. This agreement applies to all phases of the Shah Deniz project and has been enacted into Azerbaijan law. Under the terms of the PSA, BP Exploration (Shah Deniz) Limited, acting on behalf of the Contractor Parties, has the right, for the entire term of the PSA, to explore, develop and produce hydrocarbons from the Shah Deniz offshore field. The PSA states that the conduct of operations should be undertaken with respect to the general environment, other natural resources and property, with the order of priority being the protection of life, environment and property.

Article 26.2 of the PSA states:

"Contractor shall conduct the Petroleum Operations in a diligent, safe and efficient manner in accordance with the Environmental Standards and shall take all reasonable actions in accordance with the Environmental Standards to minimise any potential disturbance to the general environment, including without limitation the surface, subsurface, sea, air, lakes, rivers, animal life, plant life, crops and other natural resources and property".

Article 26.4 of the PSA requires Contractor to:

"…*comply with the present and future Azerbaijani laws or regulations of general applicability with respect to public health, safety and protection and restoration of the environment to the extent that such laws and regulations are no more stringent than the Environmental Standards*".

Environmental standards and practices are specified in Appendix 9 of the Shah Deniz PSA.

2.3.3 Environmental Regulations

The Azerbaijan Government has committed to a process to align national environmental legislation with the principles of internationally recognised legislation, based on EU environmental legislation. As this process is on-going, the SDC Project will comply with the intent of current national legal requirements where those requirements are consistent with the provisions of the PSA, and do not contradict, or are otherwise incompatible with, international petroleum industry standards and practice.

The key pieces of environmental legislation with respect to the SDC ESIA process are described below. Other relevant legislation is summarised in Table 2.1.

Law on the Protection of the Environment No. 678-IQ (08/06/1999 as amended on 17/02/23)

The law defines the legal, economic, and social foundations of environmental protection. The purpose of the law is to ensure environmental safety in the field of protecting the ecological balance of the environment, eliminating the harmful effects of economic and other activities on natural ecological systems, preserving biological diversity and rational organisation of nature management. This law regulates the relationship of society and nature to strengthen the rule of law and legal rules in the field of improving the quality of

[1] The Shah Deniz PSA was signed by SOCAR and a consortium of foreign oil companies (with BP as operator) on 4th June 1996.

the environment, rational use and restoration of natural resources, and environmental protection.

The law also requires all EIAs to be examined and approved by the State Ecological Expertise; MENR is responsible for regulating the review process.

Law on Environmental Impact Assessment No. 1175-VQ (12/06/2018 as amended 17/02/2023)

This law provides the EIA process for projects of economic importance, projects of strategic importance, and planning for the development of regions and individual economic areas, in accordance with Article 39 and Article 94 (Clause 20) of the Constitution of the Republic of Azerbaijan.

The law states that the main purpose of the EIA process is to identify the possible harmful effects of the planned activity on the environment and humans. The law includes a list of the mandatory contents of the EIA document; requires an assessment of the scale and intensity of the impacts as well as the implementation of measures to reduce or eliminate them; and provides a list of activity types requiring mandatory environmental assessment.

It also sets out provisions on the responsibilities of the relevant stakeholders, international cooperation in the fields of protection of environment and ecological safety, and state control.

The approval of an EIA by the MENR establishes the compliance framework, including the environmental and social standards that an organisation should adhere to.

The Cabinet of Ministers has issued a number of rules under the Law on EIA, including:

- Rules and Terms for Conducting EIA, including in a Transboundary Context - Resolution No. 362 (21/09/2022) – defines the EIA application process and review process. A separate article is devoted to the content and methodology of transboundary assessment. In respect of projects with transboundary effects, the Ministry of Foreign Affairs shall facilitate the consultations with the impacted States.
- Inspection in the fields of EIA and Strategic Ecological Assessment (SEA) Resolution No. 425 (02/10/2019). Lays down rules for the state control over EIA and SEA in order to ensure rational use of the environment, sustainable development of the environment, and environmental safety.

Table 2.1: Other key national environmental and social laws

Subject	Title	Date of original enactment	Description / relevance to SDC project ESIA
General	Law of Azerbaijan Republic on Ecological Safety No. 677-IQ.	08/06/1999	Its purpose is to establish a legal basis for the protection of life and health, society, the environment, including atmospheric air, space, water bodies, mineral resources, natural landscapes, plants and animals from natural and anthropogenic dangers. The Law assigns the rights and responsibilities of the State, citizens and public associations in ecological safety, including information and liability. The Law also deals with the regulation of economic activity, territorial zoning and the alleviation of the consequences of environmental disasters.
Ecosystems	Law of the Azerbaijan Republic on Specially Protected Natural Territories and Objects No. 840-IQ.	24/03/2000	Determines the legal basis for protected natural areas and objects in Azerbaijan.
	Law of Azerbaijan Republic on Fauna No. 675-IQ.	04/06/1999	Defines the animal world, property rights over fauna and legal relationships between parties. It also describes issues of State inventory and monitoring, and economic and punitive regulations.
Water	Water Code of Azerbaijan Republic (approved by Law No. 418-IQ).	26/12/1997	Regulates the use of water bodies, sets property rights and covers issues of inventory and monitoring. The Code regulates the use of water bodies for drinking and service water and for medical treatment, spas, recreation and sports, agricultural needs, industrial needs and hydro energy, transport, fishing and hunting, discharge of waste water, fire protection and specially protected water bodies. It provides for zoning, maximum allowable concentrations of harmful substances and basic rules of industry conduct.
	Law of the Azerbaijan Republic on Water Supply and Wastewater No. 723-1Q.	28/10/1999	Applicability limited to onshore operations. Restricts industrial waste releases into the sewage system; requires segregation of stormwater and industrial wastes from sewage and requires legal entities to acquire permissions to operate sewage treatment plant.

Subject	Title	Date of original enactment	Description / relevance to SDC project ESIA
	Rules of Referral of Specially Protected Water Objects to Individual Categories, Cabinet of Ministers Decree No. 77.	01/05/2000	The Caspian Sea is a specially protected water body. This resolution requires special permits for disposal if there are no other options for wastewater discharge. The resolution allows for restrictions to be placed on the use of specially protected water bodies, and for further development of regulations related to these water bodies. It requires consent from MENR for activities that modify the natural conditions of specially protected water bodies and includes provisions for permitting of any discharges to water that cannot be avoided. There are also special requirements for the protection of water bodies designated for recreational or sports use (which includes the Caspian).
	Rules for Protection of Surface Waters from Waste Water Pollution, State Committee of Ecology Decree No. 1.	04/01/1994	Under this legislation the *Permitted Norms of Harmful Impact Upon Water Bodies of Importance to Fisheries* require discharges to meet several specified standards for designated water bodies in terms of suspended solids; floating matter; colour, smell and taste; temperature; dissolved oxygen; pH; Biological Oxygen Demand (BOD) and poisonous substances. Limits are based on Soviet era standards and are to be achieved at the boundary of the facility (specific "sanitary protection zone limits") rather than "end-of-pipe" limits. End of pipe limits are defined in facility-specific "eco-passports" and are established with the intent to ensure compliance with applicable ambient standards.
Air	Law of Azerbaijan Republic on Air Protection No. 109-IIQ.	27/03/2001	Establishes the legal basis for the protection of air, thus implementing the constitutional right of the population to live in a healthy environment. It stipulates the rights and obligations of the authorities, legal and physical persons and non-governmental organisations (NGOs) in this respect, sets general requirements for air protection during economic activities, establishes norms for mitigating physical and chemical impacts to the atmosphere, establishes rules for the State inventory of harmful emissions and their sources and introduces general categories of breaches of the Law that will trigger punitive measures.
	Methodology to Define Facilities' Hazards Categories Subject to Hazardous Substance Emissions Levels and Need to Develop Projects' Maximum Permissible Emissions (MPEs).	04/09/1990	Under this methodology the maximum permissible concentrations of harmful substances and their hazard classes are provided. Limits are based on Soviet era standards.

Subject	Title	Date of original enactment	Description / relevance to SDC project ESIA
Waste	Law of Azerbaijan Republic on Waste No. 514-IQ.	30/06/1998	Describes State policy in environmental protection from industrial and household waste including harmful gases, waste water and radioactive waste. It defines the rights and responsibilities of the State and other entities, sets requirements for the design and construction of waste-treatment installations, licensing of waste generating activities, and for the storage and transport of waste (including transboundary transportation). The Law also encourages the introduction of technologies for the minimisation of waste generation by industrial enterprises. There is a general description of responses to infringements. This law is specified by Resolutions of the Cabinet of Ministers on the rules of certification of hazardous wastes, state strategy on management of hazardous wastes in Azerbaijan and by Instructions on the Inventorisation Rules and Classification System of the Wastes generated by Industrial Processes and In the Field of Services approved by the MENR.
Subsurface	Law of the Azerbaijan Republic on Subsurface Resources No. 439-IQ.	13/02/1998	Regulates the exploitation, rational use, safety and protection of subsurface resources and the Azerbaijani sector ofthe Caspian Sea. The Law lays down the principal property rights and responsibilities of users. It puts certain restrictions on the use of mineral resources, based on environmental protection considerations, public health and economic interests.
Information	Law of the Azerbaijan Republic on Accessto Environmental Information No. 270-IIQ.	12/03/2002	Establishes the classification of environmental information. If information is not explicitly classified “for restricted use” then it is available to the public. Procedures for the application of restrictions are described. Law aims to incorporate the provisions of the Aarhus Convention into Azerbaijani Law.
Heath & Safety	Law on Sanitary-Epidemiological Services(authorised by Presidential Decree No. 371).	10/11/1992	Establishes sanitary and epidemiological requirements for industrial entities to be met at design, construction and operational stages, and for other economic activities. Aims to protect the health of the population. It addresses the rights of citizens to live in a safe environment and to receive full and free information on sanitary-epidemic conditions, the environment and public health.
	Law of the Azerbaijan Republic on Protection of Public Health No. 360-IQ.	26/06/1997	Sets out the basic principles of public health protection and the health care system. The Law assigns liability for harmful impact on public health, stipulating that damage to health that results from a polluted environment shall be compensated by the entity or person that caused the damage.

Subject	Title	Date of original enactment	Description / relevance to SDC project ESIA
	Law of the Azerbaijan Republic on Public Radiation Safety No. 423-IQ	30/12/1997	Includes requirements for ensuring radiation safety in industrial entities. The Law establishes the main principles of government policy on radiation safety, as well as environmental norms protecting the safety of employees and populations in areas potentially affected by the use of radioactive sources. The Law provides for compensation for damage to health, property and life due to accidents.
	Norms of vibration and noise pollution that have a negative impact on the environment and human health, Decree No. 796	08/07/2008	Develops the norms of vibration and noise pollution that adversely affect the environment and human health in accordance with the Law on Ecological Safety, the Law on Sanitary and Epidemiological Services, and other legislative acts.
	Law of Azerbaijan on Technical Safety No. 733-IQ	02/11/1999	Establishes legal, economic and social basis of safe operation of potentially dangerous facilities, regulates activity of legal and physical persons operating the given facilities directed to prevent failures capable of arising at these facilities and eliminating consequences of the occurred failures.
Permitting	A System of Standards for the Environment Protection and Improvement of Natural Resources Utilization. Industrial Enterprise Ecological Passport Fundamental Regulations, GOST 17.0.0.04-90.	01/07/1990	The MENR issues ecological documents on the impact on the environment of potentially polluting enterprises. The documents include maximum allowable emissions, maximum allowable discharges, and an “ecological passport.” The last item is specific to countries of the Former Soviet Union and contains a broad profile of an enterprise’s environmental impacts, including resource consumption, waste management, recycling, and the effectiveness of pollution treatment. Enterprises develop the draft passport themselves and submit it to MENR for approval.
Cultural Heritage	Law on the Protection of Historical and Cultural Monuments No. 470-IQ	10/04/1998	Specifies the responsibilities of state and local authorities, and lays down principles for the use, study, conservation, restoration, reconstruction, renovation and safety of monuments. The Law declares that cultural objects with national status, historical and cultural monuments, cultural goods stored in state museums, archives, libraries, as well as the territories where they are situated, are not subject to privatisation. Requires archaeological studies prior to construction works in areas with archaeological significance.

2.4 International and Regional Environmental Conventions

Azerbaijan is signatory to numerous international and regional conventions that oblige the government to prevent pollution and protect specified habitats, flora and fauna. Those of relevance to the SDC Project are listed in Table 2.2 and Table 2.3.

Table 2.2: Summary of international conventions

Convention	Purpose	Status
UN Convention on Biological Diversity - 1992	Conservation of biological diversity including the sustainable use of its components and the fair and equitable sharing of benefits.	Azerbaijan became party to the Convention in 2000.
Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) - 1979	Principal aims of the Convention are to ensure conservation and protection of wild plant and animal species and their natural habitats (listed in Appendices I and II of the Convention), to increase co-operation between contracting parties, and to regulate the exploitation of migratory species listed in Appendix III.	Entered into force in Azerbaijan in 2002.
UNESCO Convention on Wetlands of International Importance especially as Waterfowl Habitat (RAMSAR Convention) - 1971	Promotes conservation of wetlands and waterfowl. In addition, certain wetlands are designated as Wetlands of International Importance and receive additional protection.	Entered into force in Azerbaijan in 2001.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) -1973	Controls trade in selected species of plant and animals.	Entered into force in Azerbaijan in 1999.
FAO International Plant Protection Convention - 1951	A treaty to prevent the spread and introduction of pests of plants and plant products and to promote measures for their control.	Entered into force in Azerbaijan in 2000.
UN Convention to Combat Desertification - 1994	To combat desertification and mitigate the effects of drought.	Entered into force in Azerbaijan in 1998.
UN Convention on the Protection of the Ozone Layer (Vienna Convention) - 1985	Framework for directing international effort to protect the ozone layer, including legally binding requirements limiting the production and use of ozone depleting substances as defined in the Montreal Protocol to the Convention. Supported by the Montreal Protocol and amendments (see below).	Azerbaijan acceded in 1996.
Montreal Protocol on Substances that Deplete the Ozone Layer - 1987	Specific requirements for reductions in emissions of gases that deplete the ozone layer. Amended four times: London 1990, Copenhagen 1992, Montreal 1997 and Beijing 1999.	Azerbaijan acceded in 1996.

Convention	Purpose	Status
United Nations Framework Convention on Climate Change - 1992	Seeks to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, within a sufficient time frame to allow ecosystem to adapt naturally, protect food production and enable sustainable economic development.	Azerbaijan acceded in 1992 and not formally required to meet specific reduction targets.
Kyoto Protocol of the United Nations Framework Convention on Climate Change (UNFCCC) - 1997	Follow on from the Framework Convention on Climate Change.	Azerbaijan acceded in 2000.
Stockholm Convention on Persistent Organic Pollutants - 2001	Reduction in releases of dioxins, furans, hexachlorobenzene and PCBs with the aim of minimisation or elimination.	Azerbaijan acceded in 2004.
UN Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposals (Basel Convention) – 1989	Regulates the transboundary movements of hazardous wastes and provides obligations to its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner.	Azerbaijan ratified in 2001.
International Convention for the Prevention of Pollution from Ships/ Vessels (MARPOL 73/78)	Main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. Includes the following Annexes: • Annex I Regulations for the Prevention of Pollution by Oil • Annex II Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk • Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form • Annex IV Prevention of Pollution by Sewage from Ships • Annex V Prevention of Pollution by Garbage from Ships • Annex VI Prevention of Air Pollution from Ships.	Azerbaijan acceded in 2004 (including all six annexes).

Convention	Purpose	Status
International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) - 1990	Seeks to develop further measures to prevent pollution from ships.	Azerbaijan acceded in 2004.
Convention on the International Regulations for Preventing Collisions at Sea (COLREGS) – 1972	Set out, among other things, the "rules of the road" or navigation rules to be followed by ships and other vessels at sea to prevent collisions between two or more vessels.	Azerbaijan acceded in 1997.
UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions - 2005	Promotes participants’ right to formulate and implement their cultural policies and to adopt measures to protect and promote the diversity of cultural expressions and to strengthen international cooperation.	Azerbaijan acceded in 2010.

Table 2.3: Summary of regional conventions

Convention	Purpose	Status
Convention on Access to Environmental Information, Public Participation in Decision Making Process and Access to Justice in Environmental Matters (Convention) – 1998*	To guarantee the rights of access to information, public participation in decision-making and access to justice in environmental matters.	Azerbaijan acceded in 2000.
Espoo Convention on Environmental Impact Assessment in a Transboundary Context – 1991*	To promote environmentally sound and sustainable development through the application of ESIA, especially as a preventive measure against transboundary environmental degradation.	Azerbaijan acceded in 1999 and at the time of writing Azerbaijan has not signed a related protocol on Strategic Environmental Assessment.
Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention) - 1992*	To prevent, control or reduce transboundary impact resulting from the pollution of transboundary waters by human activity.	Azerbaijan acceded in 2002.
	Includes the Protocol on Water and Health whose objective is to protect human health and well-being by better water management and by preventing, controlling and reducing water-related diseases.	Azerbaijan acceded in 2003.
Convention on Long-range Transboundary Air Pollution (LRTAP Convention) - 1979*	Provides a framework for controlling and reducing transboundary air pollution.	Entered into force in Azerbaijan in 2002. Has been extended by 8 protocols, none of which at the time of writing have been ratified by Azerbaijan.
Convention on the Transboundary Effects of Industrial Accidents - 1992*	To prevent industrial accidents that may have transboundary effects and to prepare for and respond to such events.	Azerbaijan acceded in 2004.
Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) - 1957*	Provides requirements for the packaging and labelling of dangerous goods and the construction, equipment and operations of transportation vehicles. Annexes provide detailed technical requirements.	Entered into force in Azerbaijan in 2000.

Convention	Purpose	Status
Framework Convention for the Protection of the Marine Environment of the Caspian Sea (Tehran Convention)	The Tehran Convention serves as an overarching governance framework which lays down the general requirements and the institutional mechanism for environmental protection and sustainable development in the Caspian Sea region. The Contracting Parties to the Tehran Convention assigned priority to the development of five Protocols to the Convention in thematic areas of concern as below:	Ratified by all Caspian countries entered into force in August 2006.
	• Protocol concerning Regional Preparedness, Response and Cooperation in Combating Oil Pollution Incidents (Aktau Protocol)	Ratified by all Caspian countries, entered into force in July 2016.
	• Protocol for the Protection of the Caspian Sea Against Land-Based Sources of Pollution (Moscow Protocol)	Ratified by all Caspian countries, entered into force in November 2023.
	• The Protocol for the Conservation of Biological Diversity (Ashgabat Protocol)	Not ratified by Azerbaijan and Kazakhstan.
	• Protocol on Environmental Impact Assessments in a Transboundary Context	Not ratified by Iran.
	• Protocol on Monitoring, Assessment and Information Exchange	Currently being negotiated by the Contracting Parties to the Tehran Convention.
Convention for the Protection of the Archaeological Heritage of Europe (Valletta Convention) - 1992	Requires each state party to support archaeological research financially and promote archaeology, using public or private funding.	Azerbaijan ratified in 2000.

* UNECE agreements - Azerbaijan became a member of the UNECE in 1993. The major aim of the UNECE is to promote pan-European integration through the establishment of norms, standards and conventions.

2.5 Regional Processes

2.5.1 European Union

European Union relations with Azerbaijan are governed primarily by the framework of the European Neighbourhood Policy and its eastern regional dimension, the Eastern Partnership. The EU's bilateral relations with Azerbaijan are based on the EU-Azerbaijan Partnership and Cooperation Agreement (PCA) in force since 1999.

Under Article 43 of the PCA:

"The Parties recognise that an important condition for strengthening the economic links between the Republic of Azerbaijan and the Community is the approximation of the Republic of Azerbaijan's existing and future legislation to that of the Community. The Republic of Azerbaijan should endeavour to ensure that its legislation will be gradually made compatible with that of the Community".

As part of the PCA an EU assessment of Azerbaijan's environmental legislation against EU Directives identified a number of recommendations for the approximation of national legislation with EU Directives (Mammadov & Apruzzi, 2004). Based on this, a draft national programme was developed that emphasises a flexible approach to amending national legislation to take account of institutional capacity and cost (SOFRECO, undated).

The 2007 National Indicative Programme for implementing the European Neighbourhood Policy (EU, 2007) included a commitment to support legislative reform in the environmental sector, including:

- approximation of Azerbaijan's environmental legislation and standards with the EU's
- strengthening management capacity through integrated environmental authorisation
- improved procedures and structures for environmental impact assessment
- development of sectoral environmental plans (waste and water management, air pollution, etc.).

The Multiannual Indicative Programme for Azerbaijan 2021-2027 (EU, 2021) includes specific objectives related to a transition to a climate neutral economy (through energy efficiency and renewable energy), preservation of the economy's natural assets (by greening regional and rural development), and enhancement of sustainable and inclusive regional development (including in the less developed regions).

2.5.2 EU4Environment Programme

EU4Environment aims to help the six partner countries (including Azerbaijan) preserve their natural capital and increase people's environmental well-being, by supporting environment-related action, demonstrating and unlocking opportunities for greener growth, and setting mechanisms to better manage environmental risks and impacts. Under the auspices of the EU4Environment a series of ministerial conferences on the environment have been held that have resulted in the establishment of the UNECE conventions described in Section 2.4.

2.6 International Petroleum Industry Standards and Practices

The Shah Deniz PSA refers to a number of international industry standards that should be taken into account when conducting petroleum operations, including those of the Oil Industry International Exploration and Production Forum (E&P Forum), the International Association of Drilling Contractors (IADC), and the International Association of Geophysical Contractors (IAGC).

With respect to the SDC project, the Convention for the Protection of the Marine Environment of the North-East Atlantic[2] (the "OSPAR Convention) is of relevance to the offshore activities, particularly the regulation of chemicals. bp has adopted the OSPAR principles as the basis for chemical selection and discharge evaluation in its Caspian operations.

[2] Formed by five regions – Arctic Waters, Greater North Sea, Celtic Seas, Bay of Biscay and Iberian Coast, and the Wider Atlantic.

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CHAPTER 3: Impact Assessment Methodology

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3 IMPACT ASSESSMENT METHODOLOGY

This chapter presents a description of the ESIA process adopted for the SDC project and the methodology used to assess impact significance.

3.1 ESIA Approach

The ESIA process constitutes a systematic approach to the evaluation of a project and its associated activities throughout the project lifecycle. The process (see Figure 3.1) includes:

- screening and scoping
- determination of project alternatives and base case design
- review of existing environmental and social conditions
- impact assessment and residual impact identification
- disclosure and stakeholder consultation
- mitigation and monitoring.

These are discussed in more detail below.

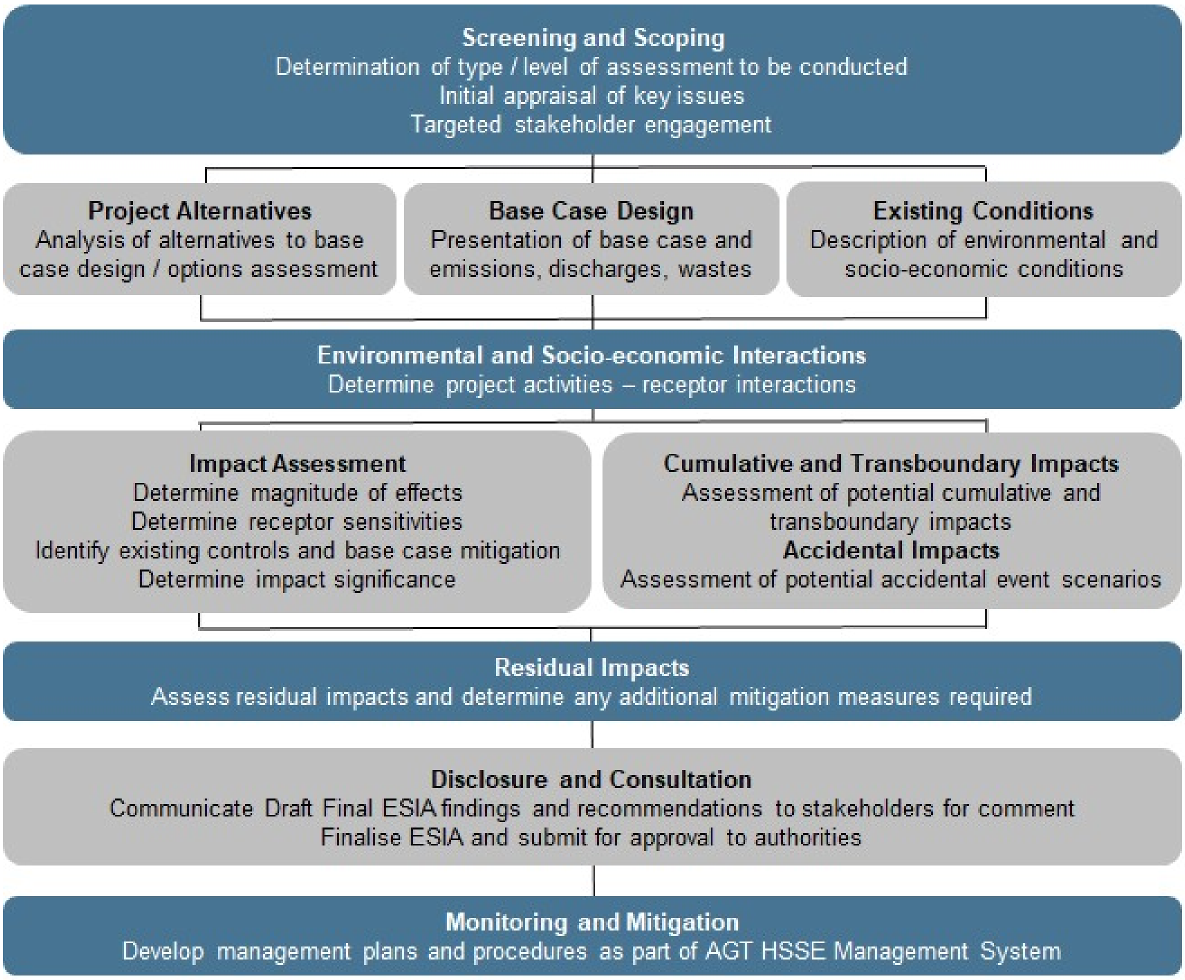

Figure 3.1: ESIA process

3.2 Screening and Scoping

3.2.1 Screening

Screening is the first step in the assessment process. It confirms the need (or otherwise) for an ESIA by appraising the type of project and its associated activities throughout the project lifecycle in the context of its biophysical, social, policy and regulatory environments.

Based on the SDC project location, scope and planned activities it is deemed necessary that the project should be subject to an ESIA, and the ESIA should take account of applicable national and international legislation as detailed in 'Chapter 2: Policy, Regulatory and Administrative Framework'.

3.2.2 Scoping

Scoping is a high-level assessment of anticipated interactions between project activities and environmental and social receptors. Its purpose is to focus the assessment on key issues and eliminate certain activities from the full impact assessment process based on their limited potential to result in discernible impacts. To arrive at a conclusion to 'scope out' an activity / effect, a mixture of expert scientific judgement based on prior experience of similar activities / effects and, in some instances, scoping level quantification / numerical analysis is used.

The SDC scoping process included:

- review of available environmental and social data and reports relevant to the area potentially affected by the SDC project activities; and
- liaison with the SDC Project Team to gather data and formulate an understanding of project activities.

Based on the findings and results of these reviews, investigations and consultations, the following were identified:

- potential project related environmental and social impacts based on likely interactions between SDC project activities and environmental / social receptors; and
- gaps where the extent, depth and/or quality of environmental, social and/or technical data were insufficient for the SDC project ESIA process, thus identifying any additional work required to complete the ESIA.

The approach and the scope of the ESIA was agreed with the MENR at a scoping meeting held in June 2024.

3.3 Impact Assessment Process

3.3.1 Project alternatives and base case design

3.3.1.1 Project alternatives

The initial step in defining a project is to identify, at a conceptual level, viable alternatives so that a base case design may be realised. Consideration of project alternatives occurs at two levels:

- to the development as a whole, including the 'no development' option; and
- engineering alternatives within the selected project's concept design definition.

Project alternatives were defined during the early conceptual design of the SDC project and were compared on financial, technical design, safety, environmental and social criteria. The alternative that represented the best balance with regards to these criteria was taken forward to the subsequent detailed design stage.

'Chapter 4: Options Assessed' presents a summary of the alternative designs considered and options evaluated for the SDC project.

3.3.1.2 Project design

The SDC ESIA Team worked with the SDC Design Team to gather and interpret relevant information for the ESIA. This dialogue between the teams identified where additional project design definition, in terms of existing controls and additional mitigation measures, was required in the SDC base case design to minimise impacts. Opportunities identified for environmental and social enhancements were considered by the teams and incorporated into the SDC base case design where appropriate and practicable.

The SDC base case design, on which the SDC project ESIA is based, is presented in 'Chapter 5: Project Description'.

3.3.2 Existing conditions

In order to identify potential impacts to receptors, an understanding of the existing conditions needs to be established prior to execution of project activities. The SDC project ESIA scoping exercise determined that the project will likely result in impacts on the following receptor groups:

- biological / ecological
- social / human.

A number of environmental surveys have been undertaken within the Shah Deniz (SD) Contract Area and along the existing SD export pipeline corridors to support the preparation of the previous SD ESIAs and, since 2004, as part of the Environmental Monitoring Programme (EMP). In addition, an environmental baseline survey was completed for the proposed offshore SDC platform location in August 2023.

The following reviews were completed in liaison with Azerbaijani academics to provide additional data:

- migratory, overwintering and nesting birds in the SDC project area
- fish, fish physiology and fishing activities in the SDC project area
- activity and distribution of Caspian seals in the SDC project area.

Data on national and regional socio-economic conditions was obtained from a review of secondary data, including data from the Azerbaijan State Statistical Committee.

The results of the environmental and social surveys and reviews were used to prepare 'Chapter 6: Environmental Description' and 'Chapter 7: Socio-economic Description'.

3.3.3 Stakeholder consultation and ESIA disclosure

During the ESIA development process bp consulted with state agencies and academics to gather input data for and agree the scope of the ESIA. Stakeholder feedback is used to focus the impact assessment and, where appropriate, influence project design and execution. Stakeholder consultation has been carried out in accordance with the Public Consultation and Disclosure Plan developed for the SDC project.

The ESIA process includes public consultation and disclosure, the main goal of which is to identify the views and opinions of potentially affected people and other interested parties. Therefore, the Draft Final ESIA Report will be disclosed in compliance with Azerbaijani law enabling project stakeholders to review and comment on identified impacts and the assessment of those impacts, ensuring that appropriate weighting has been given to local priorities and concerns where appropriate. MENR, stakeholders and communities will have the opportunity to assess whether proposed impact mitigation and management strategies adequately achieve these objectives, respond to local needs, are culturally appropriate and technically viable.

Feedback received during this disclosure phase will inform the development of the Final ESIA Report, which will then be submitted for final approval. In the event that no comments are received, the disclosed ESIA Report will be considered the final version.

Further detail is provided in 'Chapter 8: Consultation and Disclosure'.

3.3.4 Impact significance assessment

An **impact**, as defined by the international standard ISO14001:2015 is:

"Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's environmental aspects (activities, products and services)".

Where project activity and receptor interactions occur, an impact is defined (see Table 3.1) and ranked according to its **significance** determined by:

- the **magnitude** of the effect occurring (the change to the existing baseline conditions as a result of the project activities)
- the **sensitivity** of the receiving environmental or social receptor.

The overall approach to determining the significance of impacts is outlined below.

Table 3.1: Impact definitions

Nature of impact	**Negative**	Considered to represent an adverse change from the baseline, or to introduce a new undesirable factor.
	Positive	Considered to represent an improvement to the baseline or to introduce a new desirable factor.
Types of impact	**Direct**	Resulting from a direct interaction between a planned or unplanned project activity and the receiving environment.
	Indirect	Resulting from the project but at a later time, or at a removed distance, or which may occur as a secondary effect of a direct impact.
	Cumulative	Cumulative impacts are those that act together with other impacts, from the same or other projects, to affect the same environmental or social resource or receptor.
	Trans-boundary	Impacts that occur outside the jurisdictional borders of a project's host country.

3.3.4.1 Magnitude of effect

For each project aspect, the magnitude of effect is evaluated according to the following criteria:

- the nature and size of the change
- the geographical extent of the change
- the duration, frequency and reversibility (where applicable) of the change
- relevant legislative or policy standards or guidelines.

The magnitude is scored from 1 (very low) to 4 (high) based on the definitions in Table 3.2. A rating of 0 is provided for beneficial (positive) effects.

3.3.4.2 Sensitivity of receptor

The evaluation of receptor sensitivity considers its local, regional, national and international designations, its importance to the local or wider community and its economic value. The assessment of the sensitivity of human receptors, for example a household, community or wider social group, also considered their likely response to change and their ability to adapt to and manage the effects of the impact. Stakeholder concerns are also taken into consideration.

Sensitivity of the receptor is scored from 1 (very low) to 4 (high) based on the definitions in Table 3.3.

Table 3.2: Definitions to assist with scoring magnitude of effect

Score	General	Examples of environmental effects	Examples of socio-economic effects
0		Beneficial effect on ecosystem / population of species.	Beneficial social, economic or cultural dynamics.
1 Very low	Extent: Site-specific, project footprint and immediate surrounding area. Duration: Transient, limited to the duration of the activity in question.	Changes in an ecosystem / population of species that are unlikely to be noticeable (i.e. well within the scope of natural variation).	The social, economic or cultural impact is 'imperceptible' or unlikely to be noticed.
2 Low	Extent: Localised, within the project footprint and up to 3 km away. Duration: Short-term, recovery / impact likely to be mitigated through natural processes (or mitigation measures) within a year of cessation of activities.	May affect a group of individuals of a population within a localised area and / or over a short period (one generation or less). Does not affect other trophic levels or the integrity of the population itself. Emissions / discharges to environment within legal compliance.	Changes in social, economic or cultural dynamics with slight and temporary effect on any given sector performance and/ or population wellbeing. Limited impact to natural resources. Unlikely to result in concerns being raised by governmental bodies or stakeholders
3 Medium	Extent: Regional, effects of impact experienced 3 – 50 km from site. Duration: Medium-term. Impact likely to be mitigated through natural processes (or mitigation measures) within a number of years of cessation of activities (1-5 years).	May affect a portion of the population or species over one of more generations but does not change the integrity of the population as a whole. Occasional exceedances of emission and effluent discharge licence limits, or national / international standards. May result in concerns being raised by governmental bodies or stakeholders.	Changes in social, economic or cultural dynamics with moderate and noticeable adverse effect on any given sector performance and / or population wellbeing. Involves damage to natural resources of local importance. May result in concerns being raised by governmental bodies or stakeholders
4 High	Extent: Widespread. National or transboundary impact experienced > 50 km from site. Duration: Long term (> 5 years). Impact and its effects will continue more than five years following cessation of activities, potentially irreversible.	May affect the whole population or species causing a change in abundance and / or distribution, or the size of genetic pool such that natural recruitment would not return to that population, or any population of species dependent upon it. Numerous or consistent non-compliances with or exceedances of emission and effluent discharge licence limits, or national / international standards. May result in immediate intervention by governmental bodies and stakeholders.	Changes in social, economic or cultural dynamics with major adverse effect on any given sector performance and/or population wellbeing. Involves damage or permanent loss to natural resources of international/national importance. May result in immediate intervention by governmental bodies and stakeholders.

Table 3.3: Definitions to assist with scoring receptor sensitivity

Score	Environmental receptor sensitivity	Socio-economic receptor sensitivity
1 Very low	Commonly occurring habitats and species, not subject to significant decline. Habitats / receptors that are already disturbed / modified with little biodiversity value. No cultural heritage assets or activities, or artefacts of low archaeological importance.	Study area and potential zone impacted includes very few inhabitants and / or resources that are not used. No human receptors for air emissions and noise apart from work force.
2 Low	Low sensitivity or local ecosystem value. Sites of local biodiversity value but not intact, fragile or unique. Habitats / receptors that recover quickly following disturbance. Designated and undesignated cultural heritage assets and activities of local importance.	Study area and potential zone impacted include a low number of inhabitants and / or resources of limited local importance. Individuals / households are not dependent on the resource and have access to nearby alternatives. Human receptors for air quality and noise limited to individuals from local community that may pass through the area, but exposure for extended periods unlikely.
3 Medium	Medium sensitivity or regional ecosystem value. Receptors that are sensitive to change in the surrounding environment and have moderate capacity to absorb change without significantly altering present character; natural recovery possible over medium-term duration. Cultural heritage assets and activities of regional or national importance.	Study area and potential zone impacted include a moderate number of inhabitants and / or resources of regional importance. Some individuals / households depend on the affected resource with no nearby alternatives. Human receptors for air quality and noise include residential buildings where longer periods of exposure may occur.
4 High	High sensitivity or national / international ecosystem value. Legally protected species or area. Receptors that are highly sensitive to changes in the surrounding environment and have no / low capacity to absorb change without significantly altering present character; natural recovery possible over years. Cultural heritage assets and activities of international importance, e.g. UNESCO World Heritage Site.	Study area and potential zone impacted include a significant number of inhabitants and / or resources of national or global importance. Communities depend on the affected resource(s) with no nearby alternatives. Human receptors for air quality and noise include residential buildings, schools, hospitals where near-constant presence of people is possible and long-term exposure likely.

3.3.4.3 *Impact significance*

Impact significance, as a function of the magnitude of effect and receptor sensitivity, is subsequently ranked as negligible, minor, moderate or major for adverse impacts as presented in Figure 3.2.

Significance rankings will not be determined for beneficial impacts. Instead, these will be described in qualitative terms and, where applicable, measures to maximise benefits will be described.

Significance			Sensitivity rating			
			Very low	Low	Medium	High
		0 Positive	1	2	3	4
Magnitude rating	Very low	1	1 Negligible	2 Negligible	3 Minor	4 Minor
	Low	2	2 Negligible	4 Minor	6 Moderate	8 Moderate
	Medium	3	3 Minor	6 Moderate	9 Moderate	12 Major
	High	4	4 Minor	8 Moderate	12 Major	16 Major

Figure 3.2: Impact significance matrix

Environmental impacts are presented in 'Chapter 9: Construction, Installation and HUC Impact Assessment Mitigation and Monitoring' and 'Chapter 10: Operations Impact Assessment Mitigation and Monitoring'.

Socio-economic impacts are presented in 'Chapter 11: Socio-economic Impact Assessment, Mitigation and Monitoring'.

3.3.5 Cumulative and transboundary impacts and accidental events

3.3.5.1 *Cumulative impacts*

Cumulative impacts are those that act together with other impacts, from the same or other projects, to affect the same environmental or social resource or receptor. They can be either:

- Intra-project impacts, where different types of impact from the project being considered are likely to affect the same environmental or social features. For example, a sensitive receptor being affected by both noise and discharges to water during construction could potentially experience a combined effect greater than the individual impacts in isolation.

- Inter-project impacts, which result from the combined or incremental effects of the project when considered in combination with those associated with other known future projects. While a single activity, in itself, may result in an insignificant impact, it may, when combined with other impacts in the same geographical area and occurring at a similar time, result in a cumulative impact that could have a detrimental effect on important resources.

The approach taken to assessing the cumulative impact between individual SDC project impacts focuses on assessing the potential temporal and geographical overlap between environmental and socio-economic impacts, based on the current schedule, and the results of modelling assessments demonstrating the expected geographic extent of the impacts.

The potential for cumulative impacts with other planned project and activities is based on a review of available information talking into account the geographical and temporal scope of the individual project impacts and hence the potential to result in cumulative impacts with the SDC project.

Where there is potential for impact interaction, and the project is sufficiently defined and sufficient data is available, a quantitative assessment of cumulative impacts will be undertaken. Where insufficient data is available, a qualitative assessment is presented.

3.3.5.2 Transboundary impacts

Transboundary impacts are those that extend or occur across a national boundary - impacts that affect countries other than the country in which the project will be constructed or operated.

The potential transboundary impacts associated with the SDC project activities are considered to be limited to:

- social issues surrounding the sourcing of labour, goods and services from the international market; and
- greenhouse gas (GHG) emissions to air.

3.3.5.3 Unplanned / accidental impacts

Accidental events are incidents and malfunctions that are not expected to occur during the project's normal activities. Accidental events have the potential to result in a number of adverse impacts, varying in nature and magnitude depending on the type of event.

Due to the limited hydrocarbon inventory on the SDC platform, credible accidental event scenarios are limited to an installation / support vessel diesel spills. The significance of accidental impacts is assessed using a semi-quantitative analysis taking into account existing controls. The probability of the accidental event scenario occurring is also considered.

Potential cumulative, transboundary and accidental impacts associated with the SDC project are presented in 'Chapter 12: Cumulative, and Transboundary Impacts and Accidental Events'.

3.3.6 Monitoring and mitigation

Processes are required to ensure that both the operator and relevant contractors implement commitments derived from the ESIA during the construction and operation phases.

A project-specific Construction Phase Environmental & Social Management System (ESMS) will be developed and implemented that will demonstrate how the SDC project will deliver the ESIA commitments and review the environmental and social performance of the SDC project.

bp will operate the SDC project facilities using an Operations Phase EMS that is aligned with the requirements of the ISO 14001 Standard for Environmental Management Systems and will be based on the 'plan-do-check-act' cycle. Prior to commencement of SDC operations, a transition plan will be developed to support the movement of SDC from the construction to operations phase EMS.

More information is provided in 'Chapter 13: Environmental and Social Management'.

CHAPTER 4: Options Assessed

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TABLES

FIGURES

RSK

4 OPTIONS ASSESSED

4.1 Introduction

This chapter of the ESIA presents the options assessed for the SDC project. The design options assessment process followed is summarised within Figure 4.1, which illustrates the stages for the project and the various aspects associated with each stage.

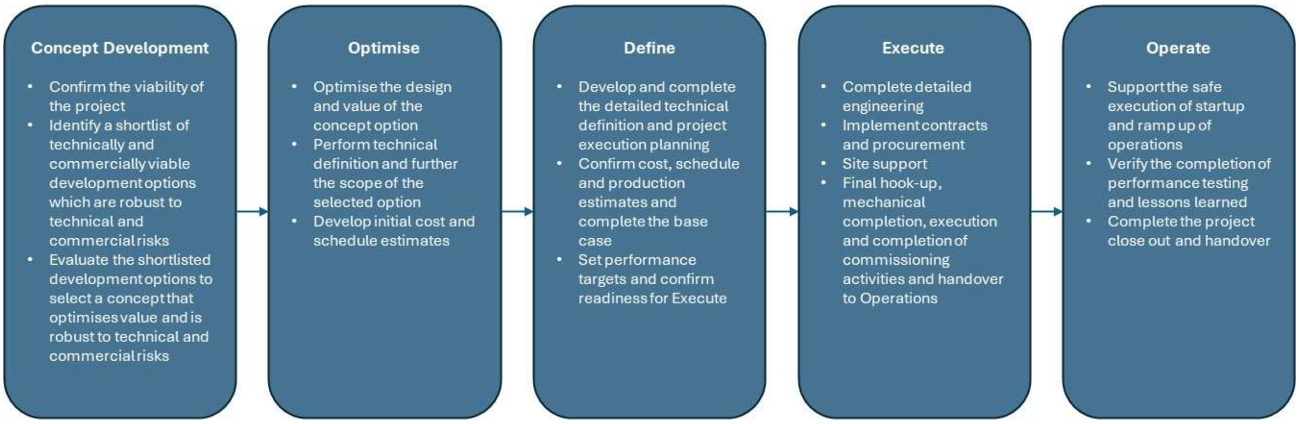

Figure 4.1: Project development process

As Figure 4.1 demonstrates, conceptual options are shortlisted and analysed in terms of their technical and commercial feasibility during the Concept Development stage. The recommended design concept then passes into the Optimise stage during which the design is further defined and matured. During the Define stage, the detailed technical definition of the project is completed, and final design decisions are made.

The earlier Azeri Chirag Gunashli (ACG) Phase 1-3 projects were developed based on a standardised design principle, utilising in-country construction facilities wherever possible. Lessons learned during the design and development of ACG Phases 1-3 were subsequently incorporated into the design of the Chirag Oil Project (COP), Shah Deniz Stage 2 (SD2) and Azeri Central East (ACE) facilities to minimise environmental impacts and improve environmental performance.

The SDC project adopts existing good practice from the existing ACG and SD facilities while incorporating key learnings to improve the design, where appropriate.

The key options assessed during the SDC Project design development have focused on:

- concept selection and definition
- the selection of a suitable location within the SD Contract Area to site the offshore platform
- platform design and simplification
- platform power source selection
- infield pipeline routing.

Throughout the design development, environmental evaluation of the project options has been undertaken alongside technical and economic evaluation and consultation with stakeholders including the State Oil Company of the Azerbaijan Republic (SOCAR) and the Production Sharing Agreement (PSA) Contractor Parties[1].

This chapter presents a summary of the options that have been assessed to support the current design base case (presented in Chapter 5 of this ESIA) comprising:

- an electrically powered Normally Unattended Installation (eNUI) (Shah Deniz Compression platform)
- four infield subsea gas pipelines to/from the existing SDA and SDB gas export lines (along with associated spools, subsea pigging loops, and control umbilicals)
- a combined power and fibre optic cable (PFOC) from the SDC platform to Sangachal Terminal, and an interconnector power cable from SDC to SDB platform
- brownfield modifications at SDA, SDB and Sangachal Terminal.

The option of not developing the SDC project has also been considered. The decision to not proceed would result in a reduction of potential revenues to the Azerbaijan government (the SDC project enables bp to access and produce low pressure gas reserves in the SD Contract Area and maximise recovery of resources) with a resultant inability to deliver the associated benefits to the Azerbaijan economy. Pursuing the SDC project will result in employment creation for national citizens during the design, construction, and to a lesser extent operational phases of the development, as well as increased use of local facilities, infrastructure and suppliers. The option of not proceeding was therefore disregarded when considered against these socio-economic benefits.

4.2 Preliminary Concept Development and Selection

As part of the SD2 project, a study was carried out early in the select stage to consider offshore compression, with an offshore platform providing compression for both SD Stage 1 and SD Stage 2. At this time a comparison of the ‘offshore compression’ and ‘no offshore compression’ concepts delivered a similar gas sales profile and, on this basis, the SD2 project adopted the “no offshore compression” concept into the SD2 base case design (URS, 2013).

However, in 2021 the bp Azerbaijan Georgia Turkey (AGT) gas strategy was updated as part of the Regional Energy Plan. The SDC project was identified as a credible solution to fulfil AGT gas commitments from 2030 to the end of the SD PSA. Based on the above, the project was reframed, and concept development re-started in August 2021. The updated mission of the SDC project is to deliver Shah Deniz contracted gas volumes by developing the most economically efficient and lowest risk compression solution (bp, 2023b).

[1] Chapter 8: Consultation and Disclosure provides details of the consultation undertaken specifically with regards to the SDC Project ESIA.

4.3 SDC Platform Location Options

Selection of the SDC platform location has a direct impact on the remainder of the project facilities. It is one of the key contributors to pipeline routing, subsea design, and project cost estimates. During Concept Development a decision was made to site the platform close to the exiting SDA and SDB platforms (bp Exploration (Caspian Sea) Ltd, 2023a).

During the Optimise phase four potential SDC platform locations (NUI-1, NUI-2, NUI-3 and NUI-4) were identified, see Figure 4.2.

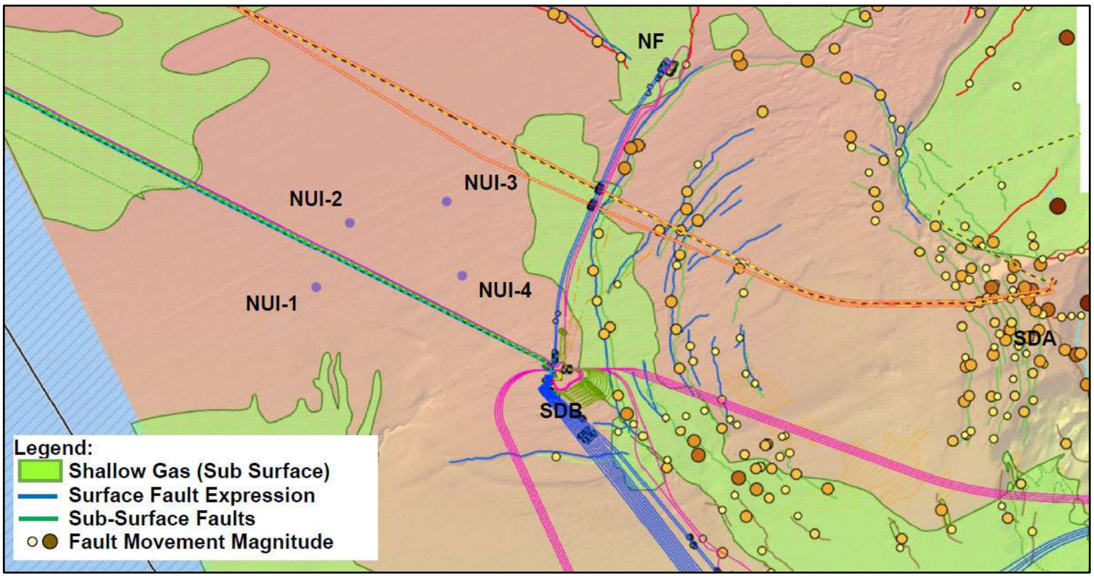

Figure 4.2: Proposed SDC platform locations and subsurface features

Source: bp / Wood, 2023a

Engineering constraints used to select these locations included:

- close proximity to the existing SDA and SDB platforms (but at a sufficient distance to limit construction activity interaction with existing platforms, and outside any accidental release gas cloud extent)
- more than 300 m from existing subsea pipelines to minimise risk of damaging pipelines during construction
- outside Restricted Area No. 23 that overlaps the northwest part of the Contract Area and is a military training area.

The area of interest for these four proposed platform locations also avoided areas of shallow sub-surface gas and subsurface faults (see Figure 4.2), and a disturbed soil zone to the west of the SDB platform and a channel feature running northwest of SDB (see Figure 4.3).

The four potential locations were evaluated against multiple criteria, a summary is provided in Table 4.1 (a higher score indicates a more favourable location). Due to the closeness in scoring of platform locations NUI-1 and NUI-4 the relative merits of both options were investigated further, see Table 4.2. Ultimately due to the additional construction complexity at NUI-4 location, NUI-1 was selected as the favoured location.

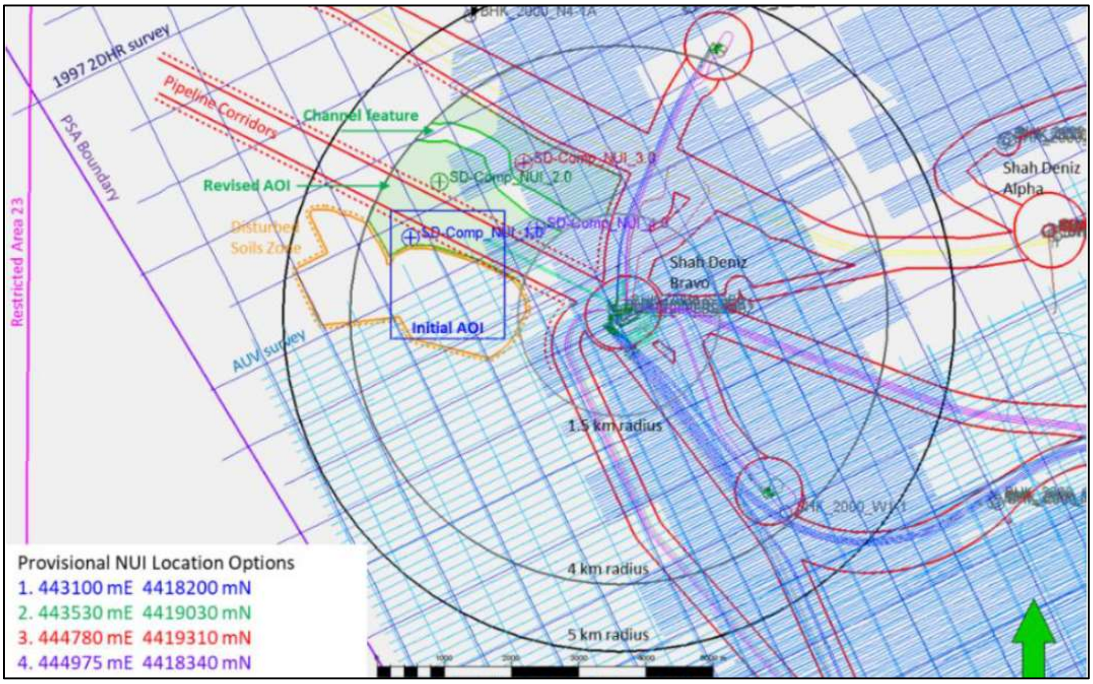

Figure 4.3 Geophysical data in proximity of proposed platform locations

Source: bp Exploration (Caspian Sea) Ltd, 2023a

Table 4.1: Platform location assessment (summarised)

	NUI-1	NUI-2	NUI-3	NUI-4
Location information				
Distance from SDA (km)	10.5	10.0	9.0	8.5
Distance from SDB (km)	3.0	3.0	2.5	1.5
Water depth (m)	85.7	79.2	80.2	86.3
Depth to potentially liquefiable sand (mbsf)	13.0	15.0	12.0	6.0
Thickness of liquefiable layer (m)	1.5	3.0	1.5	1.5
Assessment				
Subsea assessment criteria (total subsea score) – includes pipelines total route length, number of pipeline crossings, spool crossings, spool design complexity, SDC power cable crossings of existing facilities, capital expenditure (CAPEX)	9.85	7.58	8.36	8.36
Platform assessment criteria (total platform score) – includes jacket fab and load out/launch, platform transport from launch site, piling, offloading of supply vessels and transfer of personnel	8.53	4.65	5.53	9.85
Combined score	**18.38**	**12.23**	**13.89**	**18.21**

Table 4.2: Relative merits of platform NUI-1 and NUI-4 locations

	NUI-1	NUI-4
Construction damage	No need to tow launched jacket and piles over existing infrastructure	Longer tow of jacket and piles, possibly over existing infrastructure
Construction complexity	More space for subsea tie-ins upstream of existing SSIVs	Less space for subsea tie-ins upstream of existing SSIVs
Construction complexity	22 total pipeline crossings required	16 total pipeline crossings required
Project competitiveness	Further from SDB (3 km)	Closer to SDB (1.5 km)

Source: bp Exploration (Caspian Sea) Ltd, 2023a

Micro-siting of NUI-1 platform location

2D Ultra High Resolution (2D UHR) seismic and sub-bottom profiler data acquired in September 2023 allowed further refinement of the NUI-1 platform location. The survey was able to analyse near seabed conditions, define the top and bottom of the sand layer, and more precisely interpret the zone of disturbed soils associated with a slope failure in the area of interest. As a result, the final platform location was moved a small distance north-northwest to avoid the zone where the top of the sand layer was identified as being irregular, and to be more remote from the disturbed soils zone.

The selected SDC platform location (NUI-1.4) is therefore as follows:

Location	Easting (m)	Northing (m)	Water depth (m)
NUI – 1.4	443,037.3	4,418,337.5	84.6
Notes: CRS Pulkovo 1942 (AIOC97) (EPSG 4284) Vertical CS AIOC95 depth (EPSG 5734) Bathymetry is from 2011 Pipeline Route Reconnaissance Survey (+/- 0.5 m accuracy)			

Source: bp Exploration (Caspian Sea) Ltd, 2023a

4.4 SDC Platform Design Options

In Concept Development phase the decision was made to design the SDC platform with minimum process equipment onboard - limited as far as possible to compressors and their auxiliaries and sub-systems.

In Optimise phase a further study was carried out to define which systems are necessary on the SDC platform, and which systems are not required whilst still ensuring safe and reliable operations. Justification was provided for exclusion of certain systems, with the aim of minimising the offshore maintenance burden (bp Exploration (Caspian Sea) Ltd, 2023b). A summary of the system decisions is provided in Table 4.3.

Table 4.3: Summary of SDC platform system decisions

Options assessed	Decision
Overpressure protection. Refers to overpressure as a result of a blocked compressor discharge on the platform, in the new subsea infrastructure, or at Sangachal Terminal.	
Option 1 - Overpressure protection provided by pressure safety valves (PSVs) relieving to a flare system in combination with instrumented protection systems. Option 2 - Use of a safety instrumented function (SIF). This is achieved by a differential pressure device (e.g. bursting disc) which opens when there is a high differential pressure across the compressor and recycles the discharge gas back to the suction, limiting the discharge pressure.	Option 2 selected. It is recommended to rate the process systems on the platform to a design pressure aligned with 1500# piping. Protection for the topsides and subsea pipeline against blocked outlet will be provided via a combination of an instrumented protection system and relief device routing flow to the suction of the compressor. This avoids having a flare with all the supporting systems (inert gas, fuel gas, air).
Liquids handling. Liquids accumulate in the subsea lines, particularly at low production rates and during shutdowns. When compression is restarted these liquids can become slugs which put the compressors at risk of damage.	
Option 1 – Slug catchers to intercept liquids at platform inlet. Option 2 – Simple bypass around the compressors using the gas pressure to drive the liquid past the platform before compressor start-up.	Option 2 selected. It is recommended that slugs of liquid accumulated between SDA/SDB and the SDC platform are dealt with via a topsides bypass. The natural energy in the wells will be used to push the slugs over the topsides and then the compressors started up afterwards. This will avoid the installation of a slug catcher per pipeline with associated high-pressure pumps.
Compressor suction scrubbers. Gas delivered to the compressors from SDA and SDB has been through simple gravity separation but not a dew pointing process and is still classified as 'wet gas'.	
Option 1 – Use of suction scrubbers to intercept liquids and high-pressure pumps to reinject liquid into compressor discharge. Option 2 – Selection of compressors that can tolerate 8-12% liquid mass fraction.	Option 2 selected. The selection of hermetically sealed compressor technology which will tolerate a higher liquid mass fraction in the gas than a conventional compressor leads to the recommendation that suction scrubber vessels and associated high pressure pumps are not required.

Options assessed	Decision
Drains (open and closed). Linked to the liquids handling and suction scrubbers – with no significant inventories of liquid on the platform, the requirement for large drain vessels is removed. There is an opportunity to simplify the platform drainage solutions.	
Option 1 - Separate closed drains system including drum with high pressure pumps to reinject the liquids into the process or export to Sangachal Terminal. Open drains system with collection vessel for separation before water is discharged to caisson. Option 2 - Temporary local connections to be made to perform draining into vessels to be removed once maintenance campaign is complete. Open drains discharged directly to caisson.	Option 2 selected. No permanent closed drains will be installed on platform. Instead, it is recommended that local draining be undertaken with temporary equipment during maintenance campaigns. Open drains will discharge directly to a caisson and any separated oil will be pumped out into a temporary vessel during maintenance campaigns. Justification behind this decision is that all liquid inventories (except the vent/closed drain drum) have been removed from the topsides.
High pressure flare	
See options discussion above.	There are no large hydrocarbon inventories on the platform and overpressure protection is provided by a combination of a relief device relieving into the compressor suction and a SIF to protect the subsea. Depressurisation for maintenance will be via an atmospheric vent, and no blowdown is required in an emergency due to the small onboard inventories. The SDC process facility is designed to minimise cold venting requirements. A flare system would need to be nitrogen purged, resulting in higher energy consumption, and a continuous flare pilot would be required to operate.
Low pressure flare	
See options discussion above.	The selection of hermetically sealed compressor technology, which does not have continuously purged dry gas seals, and the fact that there are no low-pressure vessels on the platform means there is no requirement for a LP flare.

Options assessed	Decision
Inert gas. Nitrogen is used to purge flares, purge compressor seals, and purge equipment for maintenance / leak testing.	
Option 1 – Provision of nitrogen generation systems onboard the SDC platform. Option 2 – Nitrogen only brought to the platform when required.	Option 2 selected. As there are no compressor dry gas seals, or flares to continuously purge, there is no continuous demand for nitrogen on the platform. It is recommended that any inert gas required for leak testing and purging during maintenance is brought as temporary equipment at the start of the campaign.
Instrument air. Air is typically used to actuate valves, in flare ignition systems and as a utility e.g. to provide motive force for temporary pumps.	
Option 1 – Provide an instrument air system including air compressors to actuate valves. Option 2 – Use an alternative means of actuating valves.	Option 2 selected. To avoid the installation of an instrument air system (compressors and driers), it is recommended to use an alternative actuation technology for the valves on the platform (e.g. electro-hydraulic).
MEG injection. Hermetically sealed compressors may require periodic MEG flushing to prevent fouling.	
Option 1 – Install a permanent MEG injection system to facilitate periodic flushing. Option 2 – Install tie-ins for a temporary MEG injection skid when flushing required.	Option 2 selected. As MEG flushing anticipated to be an infrequent and short duration activity, which can be forecast by remote monitoring, it is not recommended to install a permanent MEG injection system. Tie-ins will be installed for a temporary skid to be brought as required.
Fire water	
See options discussion above.	Eradication of any significant liquid hydrocarbon inventories means no fire water is required.

Further studies will be conducted regarding compressor compatibility with Shah Deniz fluids, overpressure protection design, nitrogen demand, alternatives to air actuation valves, and the design of hoses for temporary MEG injection.

4.5 SDC Platform Power Source Selection

Since the SDC platform is planned to be a normally unattended and remotely operated installation, with no local electrical power generation, the electrical power to the facility needs to be supplied from elsewhere.

At the Concept Development stage of the SDC project, it was suggested that the power supply to the SDC platform would be provided from Sangachal Terminal with the addition of 1 or 2 Gas Turbine Generators (GTGs) to the existing 7 GTGs at the terminal. With the additional GTGs the local power generation at the Sangachal Terminal would be sufficient to supply the extra demand of approximately 60 MW at SDC on top of the existing Sangachal Terminal electrical power demand.

During Optimise a further study was conducted on the power from shore configuration, and it was acknowledged that the goal of providing electrical power to the platform should be achieved in synergy with other project goals such as bp's Net Zero Aim 1, which envisages bp becoming net zero across its operations on an absolute basis by 2050 or sooner[2]. As a result, there is a drive to reduce the carbon footprint of bp operations. Current regional projects such as bp's project Sunrise (a photovoltaic power facility in Azerbaijan) and the Sangachal Terminal Electrification (STEL) project (which aims to partly or wholly electrify Sangachal Terminal and establish a framework to operate the terminal without direct or indirect CO_2 emissions) are all part of this drive (bp Exploration (Caspian Sea) Ltd, 2023c).

As a result, five main options for SDC power generation from shore were considered, as summarised below:

- Option 1 - SDC platform fed directly from existing Azerenergy substation onshore. Subject to negotiations with the Azerbaijan grid operator a suitable existing substation close to the SDC cable route could be upgraded to accommodate the SDC electrical power demand.
- Option 2 - SDC platform fed directly from a new Azerenergy substation onshore, which would be built as per SDC project request. Subject to negotiations with the Azerbaijan grid operator a new substation could be built close to the SDC cable route to provide a feeder for SDC electrical power demand.
- Option 3 - SDC platform fed from the existing Sangachal Terminal infrastructure with additional GTGs to generate the extra power demand of SDC. Existing ST SD2 110 kV switchgear would need to be extended and 1 or 2 additional GTGs installed for load demand.
- Option 4 – SDC platform fed from Sangachal Terminal with no connection to ST electrical power system. This would be achieved by installing new dedicated 110 kV gas insulated switchgear (GIS) at the terminal for SDC platform and feeding SDC platform exclusively off the 2 x 110 kV Azerenergy grid lines whilst having no interconnection to Sangachal Terminal electrical system.
- Option 5 - SDC platform fed from Sangachal Terminal with no new GTGs installed at the terminal. Normal operating mode is to supply most of the SDC loads from the existing 2 x 110 kV grid incomers and a small amount of it from the local power generation at the terminal. SDC project anticipates that STEL project execution will enable supplying Sangachal Terminal existing loads (about 65 MW) and SDC load (85 MW at 0.9 power factor) solely from Azerenergy grid.

[2] bp has set an ambition to become a net zero company by 2050 or sooner. This means reducing GHG emissions from its operations and production, while at the same time growing new lower and zero carbon businesses, products and services.

The above options were assessed taking into consideration synergy with the STEL project, sustainability (Aim 1 GHG emissions), execution complexity, power quality, partner alignment and cost.

Option 3, which envisaged installation of additional GTGs at Sangachal Terminal, was ruled out based on the emission concerns (GHG emissions 511 kte / year, as opposed to 353 kte / year for the other options), misalignment with the STEL project, execution complexity, and cost.

Option 4 (using the existing 2 x 110kV grid incomers to ST exclusively for SDC) and Options 1 and 2 (provision of new feeders from existing/new Azerenergy substation bypassing Sangachal Terminal), were ruled out based on limited synergy with the STEL project, partner alignment, execution complexity, power quality / flexibility and cost.

Option 5 (feeding the SDC platform by extending the existing 110 kV switchgear without installation of additional GTGs at Sangachal Terminal) has been taken forward into the Define stage. Feeding the SDC platform from Sangachal Terminal electrical power system is in line with bp Net Zero Aim 1. Potential for integration and synergy with the STEL project will be fully realised through this solution, enabling a power supply to the SDC platform that is less carbon intense, with a highly available power supply under full Sangachal Terminal control. It will also help to utilise existing space and infrastructure available onshore for simplifying the onshore scope of the SDC project design and execution (bp Exploration (Caspian Sea) Ltd, 2023c). The electrical diagram for the selected option is provided in Figure 4.4.

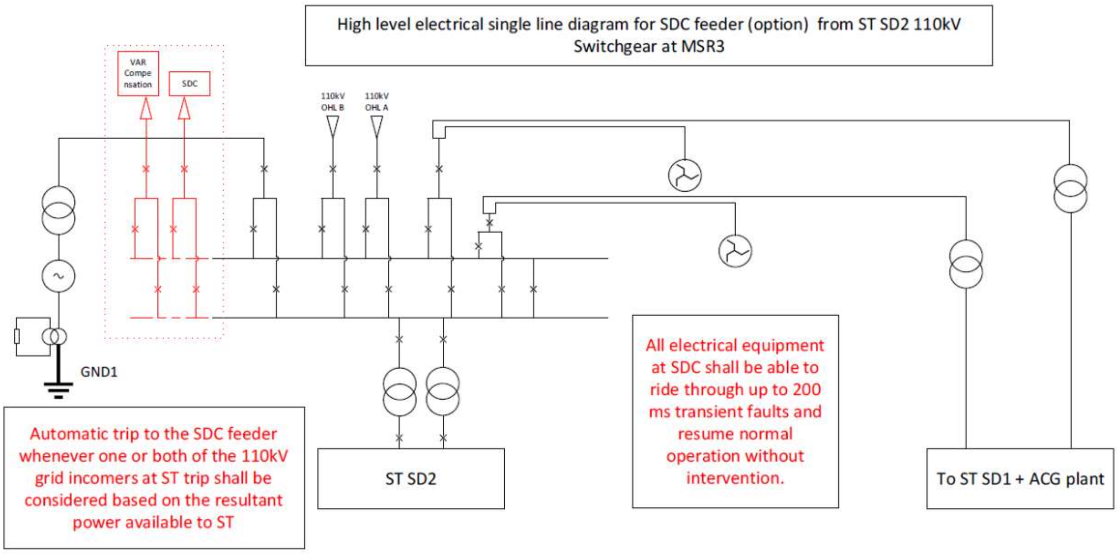

Figure 4.4: Electrical diagram for proposed feeder to SDC platform

Source: bp Exploration (Caspian Sea) Ltd, 2023c

It should be noted that the route of the PFOC between Sangachal Terminal and the SDC platform has been selected to minimise environmental impact by running parallel and alongside the existing bp pipeline corridors (in particular the SD2 gas export pipelines).

4.6 Infield Pipeline Routing Options

In optimise phase the SDC project design included 2 x 26” infield pipelines between the SDA and SDC platforms, and 4 x 32” infield pipelines between the SDB and SDC platforms (with infield pipelines tied in to the existing 32” and 26” export pipelines near the existing platforms).

An initial routing study compared several route options for the infield pipelines depending on the location of the SDC platform (NUI 1, 2, 3 and 4 - see Section 4.3). This study concluded that the final NUI location selected does not significantly influence infield pipeline routing, except crossings configuration and a marginal variation in the overall pipeline length required (bp / Wood, 2023a).

Following selection of the NUI 1 location for the SDC platform, a further infield pipeline routing study was carried out focusing on minimising the overall length of the subsea pipelines, and the length of pipe within exclusion zones around the platforms. In addition, a number of constraints to the pipeline routes were considered including third party constraints (e.g. avoidance of wrecks, avoidance of 3rd party facilities); physical constraints (e.g. avoidance of geohazards, restriction of pipeline routes to areas of relatively smooth seabed) and engineering constraints (e.g. minimisation of unnecessary pipeline or cable crossings, targeting crossing angles as close as possible to 90°) (bp / Wood 2023b).

In early 2024, further simplification was carried out in order to minimise project CAPEX. This resulted in a reduction in the number of infield pipelines to 2 x 26” infield pipelines between the SDA and SDC platforms, and 2 x 32” infield pipelines between the SDB and SDC platforms (with an associated reduction in environmental impact). The infield pipeline arrangement taken forward in this ESIA is presented in Figure 5.10 (Project Description chapter).

4.7 Base Case Optimisation

The design of the SDC facilities will be further optimised during the Define stage of the project. It is not anticipated, however, that there will be any significant changes to the current design Base Case presented in Chapter 5.

Should the optimisation result in a change to the SDC Project Base Case design as assessed within this ESIA, the SDC Management of Change Process will be followed as detailed within Chapter 5: Section 5.12.

REFERENCES

bp Exploration (Caspian Sea) Ltd (2023a), SD Compression Project – Tier 2 Decision Note eNUI Platform Location (BP-CP-ZZZZ-SS-DEP-0001_P01).

bp Exploration (Caspian Sea) Ltd (2023b), Decision Note Tier 2: eNUI Simplification (BP-CPZZZZ -EN-DEP-000-0003).

bp Exploration (Caspian Sea) Ltd (2023c), Decision Note Shah Deniz Compression Project Tier 2: SDC Power from Shore Configuration (BP-CPZZZZ-EL-DEP-0001.

bp / Wood (2023a), GPO AGT Projects SDC Pipelines Routing and Installation / Pre-Commissioning Study (JK-S4SSSS-PL-STU-0001-000_P01).

bp / Wood (2023b), GPO AGT Projects 26” and 32” Shah Deniz Compression Pipelines Routing Report (JK-S4SSSS-PL-REP-0003-000_P01).

URS (2013), Shah Deniz 2 Project Environmental and Social Impact Assessment.

CHAPTER 5: Project Description

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TABLES

FIGURES

5 PROJECT DESCRIPTION

5.1 Introduction

This chapter of the ESIA describes the construction and operational activities associated with the SDC project. It describes the design basis for the project facilities, as well as planned activities for the following project phases:

- **Construction, installation, hook-up and commissioning (HUC):**
    - onshore construction and commissioning of facilities at the construction yards
    - offshore platform installation and HUC
    - offshore infield pipeline and subsea infrastructure installation and commissioning
    - PFOC installation (offshore, nearshore and onshore)
- **Operations:**
    - offshore operations
    - onshore operations (at Sangachal Terminal)
    - electricity import.

Estimated emissions, discharges and wastes from the SDC project are presented for each project phase; emission estimate assumptions are provided in full within Appendix 5A.

This chapter provides the basis for the assessment of environmental and social impacts, as presented in Chapters 9 to 12, and was prepared during the 'Define' stage of the project. During subsequent stages of the SDC project, there may be a need to change a design element. The SDC project ESIA Management of Change Process that will be followed should this be necessary, is presented in Section 5.13.

The base case SDC project design includes:

- an electrically powered Normally Unattended Installation (eNUI) (Shah Deniz Compression platform)
- four infield subsea gas pipelines to / from the existing SDA and SDB gas export lines (along with associated spools, subsea pigging loops[1], and control umbilicals)
- a combined power and fibre optic cable (PFOC) from Sangachal Terminal to the SDC platform (and an interconnector PFOC from SDB to SDC platform).

Brownfield works will be undertaken at SDA, SDB and Sangachal Terminal as part of the project. No new infrastructure will be required at Sangachal Terminal (other than installation of power receiving and transfer kit) and there will be no expansion of the terminal area.

Figure 5.1 provides an overview of the SDC platform and associated infrastructure.

[1] Pipeline pigging refers to the practice of using devices or implements known as 'pigs' to perform various cleaning, clearing, maintenance, inspection, dimensioning, process and pipeline testing operations on new and existing pipelines.

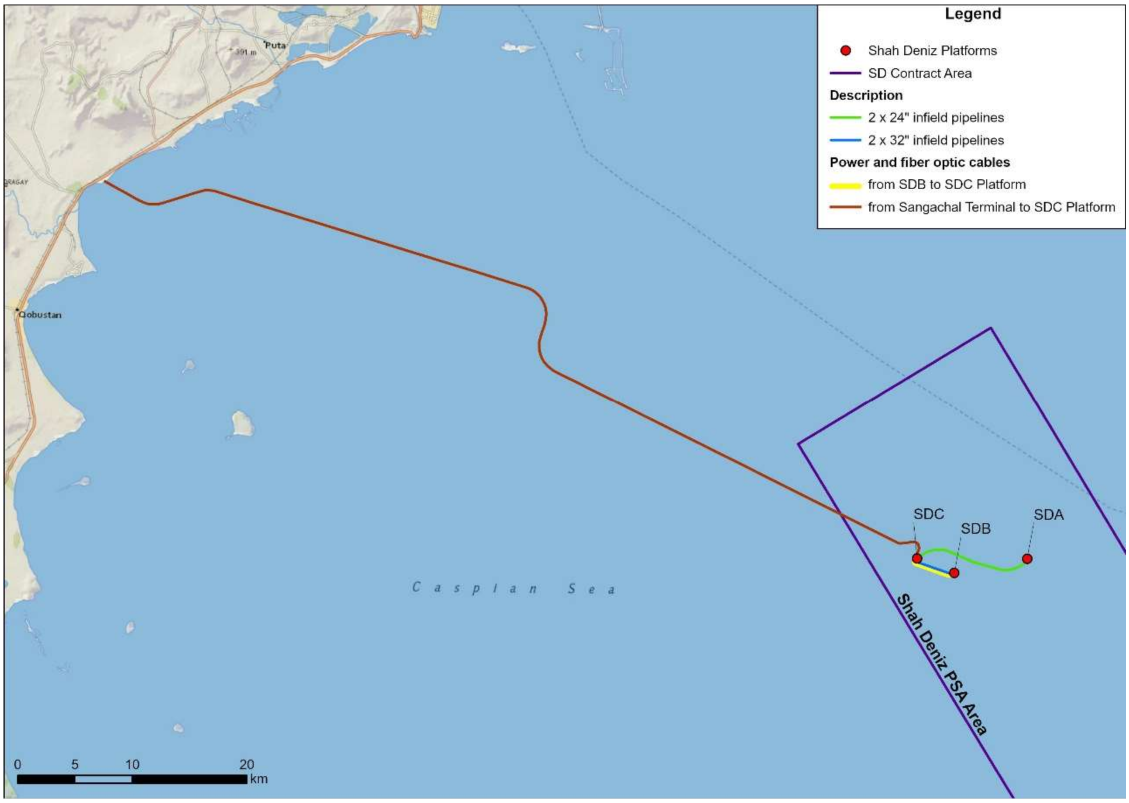


Figure 5.1: Overview of proposed SDC platform location and associated infrastructure

Note: SDA platform, SDB platform and Sangachal Terminal already in existence

A schedule for the SDC project activities is provided in Section 5.2 and supports a first gas date of Q2 2029 from SDA platform and Q2 2030 from SDB platform.

The compression systems on the SDC platform will be sized to match the design capacity of SDA and SDB (approx. 1 billion cubic feet (Bcf) and 1.8 Bcf, respectively) and to deliver arrival pressures at the terminal of 103 barg[2] to the SD1 processing plant and 74 barg to the SD2 processing plant.

5.2 SDC Project Schedule

A provisional SDC project overview schedule is provided in Figure 5.2, based on the best available knowledge at the time of writing.

[2] barg is a unit of gauge pressure, i.e. pressure in bars above ambient or atmospheric pressure.

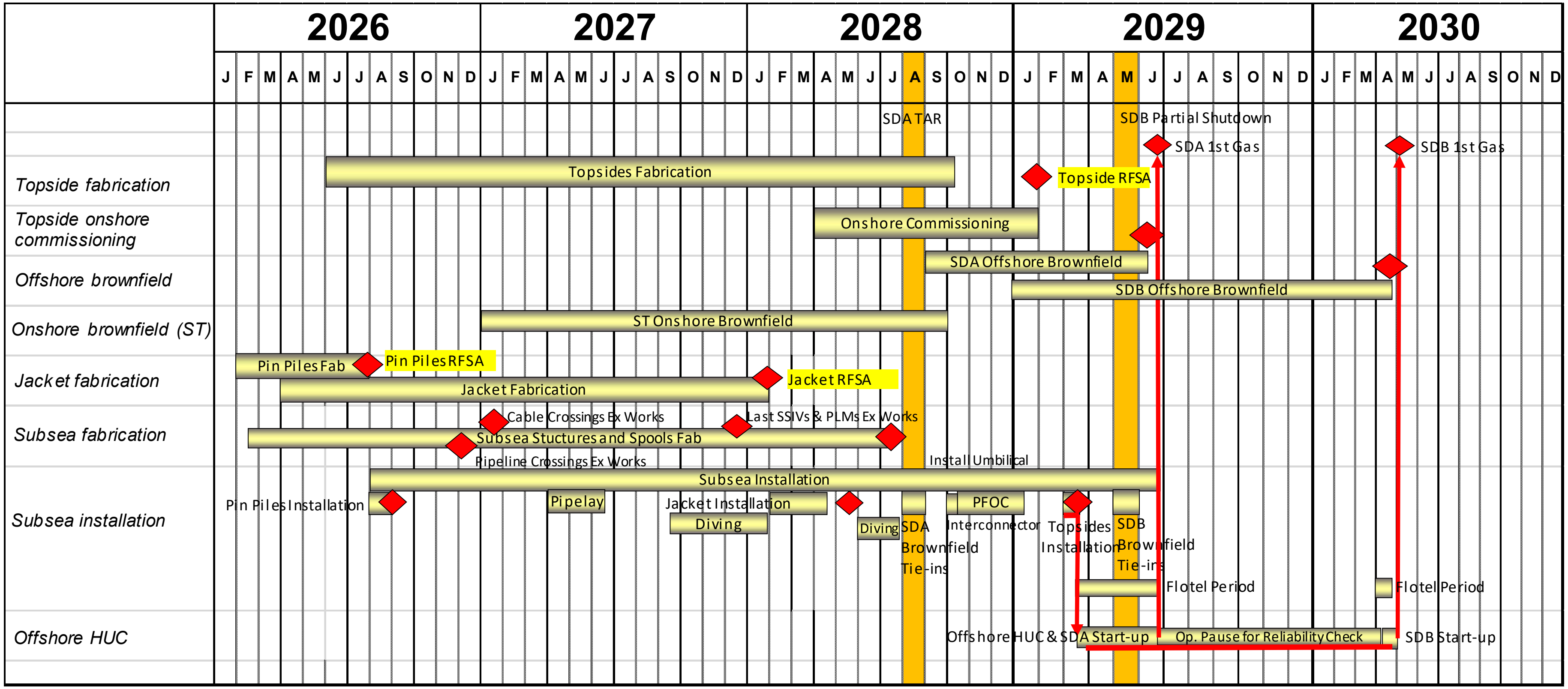


Figure 5.2: Provisional SDC project schedule

Notes: RFSA – ready for sail away; TAR – turnaround (scheduled event where facility is taken offline for extended work); PFOC – power and fibre optic cable

5.3 Onshore Construction and Commissioning of Offshore Facilities

5.3.1 Introduction

It is currently planned to undertake fabrication of the SDC jacket and topside, as well as elements of the subsea infrastructure, in Azerbaijan. The tender process for the selection of the construction contractors is planned for completion by the end of Q2 2025. It has been assumed for the purposes of this ESIA, that a combination of the following construction yards may be used:

- Baku Deep Water Jacket Factory (BDJF) yard[3] - used extensively on previous SD and ACG projects. It is planned that the platform jacket and elements of the subsea spools and structures will be constructed at this yard.
- AzFen Bayil yard[4] - used extensively on previous SD and ACG projects. It is planned that the topsides will be constructed at this yard.

The location of these facilities is presented in Figure 5.3.

No major upgrades or modifications at the potential construction yards to be used for the SDC project have been identified to date[5].

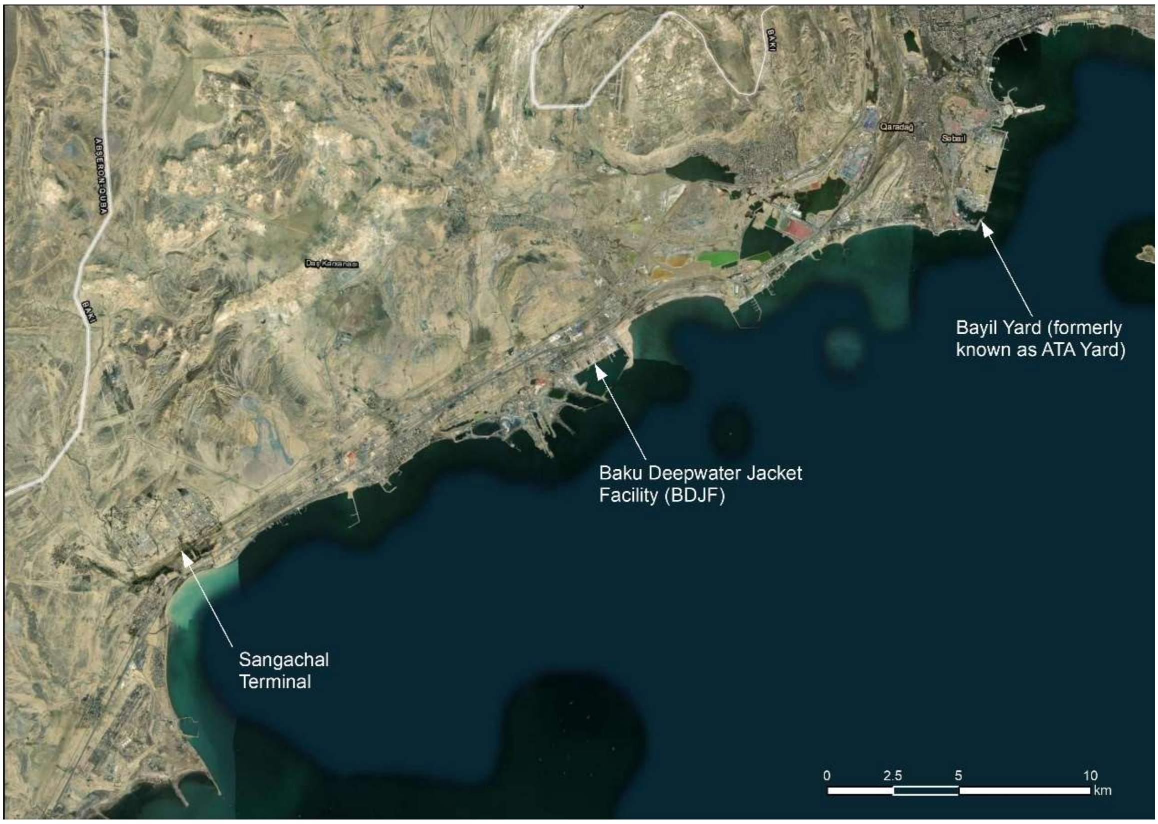


Figure 5.3: Location of potential construction yards for the SDC project

[3] Formerly known as Shelfprojectsroi (SPS) yard.

[4] Formerly known as Amec-Tekfen-Azfen (ATA) yard.

[5] Upgrade of the existing power system at Bayil yard may be required, however, this is outside the scope of this ESIA.

There is also the option of using a pipeline bundle fabrication site on the Absheron Peninsula for onshore welding of the SDC infield pipelines and tow out of the pipeline bundles to site. If this option is selected an Addendum to this ESIA will be submitted to cover these activities.

5.3.2 Materials transportation

Preference will be given to sourcing equipment and materials that meet the required project specifications from Azerbaijan wherever possible, including using suitable in-country surplus material. Where international procurement is required, materials and equipment will arrive by road, rail, sea and air using the transportation routes established for the previous SD and ACG construction programmes.

Goods arriving via sea can travel by two main routes. From the Mediterranean and Black Sea, vessels must pass through the Don-Volga canal system. Cargoes following the Baltic Sea route, would be transhipped at St. Petersburg and travel along the Baltic-Volga system. These routes are not available during the ice season (November - April).

Rail links are available from Poti in Georgia and Riga in Latvia. Deliveries by road from Europe would be through Turkey and Georgia and via Iran. Figure 5.4 illustrates potential transport routes.

While available transport routes can be identified, the likely use of each and what will be transported cannot be determined with any certainty until the procurement strategy and award of construction contracts has been made.

Figure 5.4: Import routes to Azerbaijan

5.3.3 Jackets and piles

The SDC platform jacket, an eight legged, braced, steel structure will support the topside and will be designed for installation over four pre-installed jacket pin piles. The jacket structure will be approximately 100 m tall, extending approximately 15 m above the sea surface. The top of the jacket will be a "twin tower" configuration to enable "float over" installation of the topside deck. The design of the base will incorporate two pile sleeves at each of the four corners into which eight skirt piles will be driven.

To construct the jacket, steel plate received at the fabrication yard will be cut and shaped as required and then welded together with any prefabricated elements that are not constructed in country, to form the various sectional pieces. Section and weld joints will be integrity tested using non-destructive testing (NDT) prior to grit blasting in preparation for painting.

The majority of grit blasting and anti-corrosion painting of jacket and pile components will be undertaken in a paint shop with a fume extraction and grit recovery system in place. Grit blasting and anti-corrosion painting of sections which are too large to be accommodated within a paint shop, or are on the installation itself, will be undertaken within a temporary enclosure. Estimated paint use quantities are provided in Table 5.1. Waste grit and paint will be collected and disposed of in accordance with SDC waste management plans and procedures (see Chapter 13). Cathodic protection of the jacket components will be installed, with the active anode material comprising an aluminium-zinc-indium type alloy.

Onshore hydrotesting of the risers will be undertaken using freshwater supplied from a tank, with the water returned to the tank following use, and removed from site by a licensed AGT Region approved contractor. The jacket sections will then be transferred to the assembly skidway, where they will be crane lifted into position and welded to other jacket sections to form the complete structure. Figure 5.5 shows the various stages of jacket fabrication.

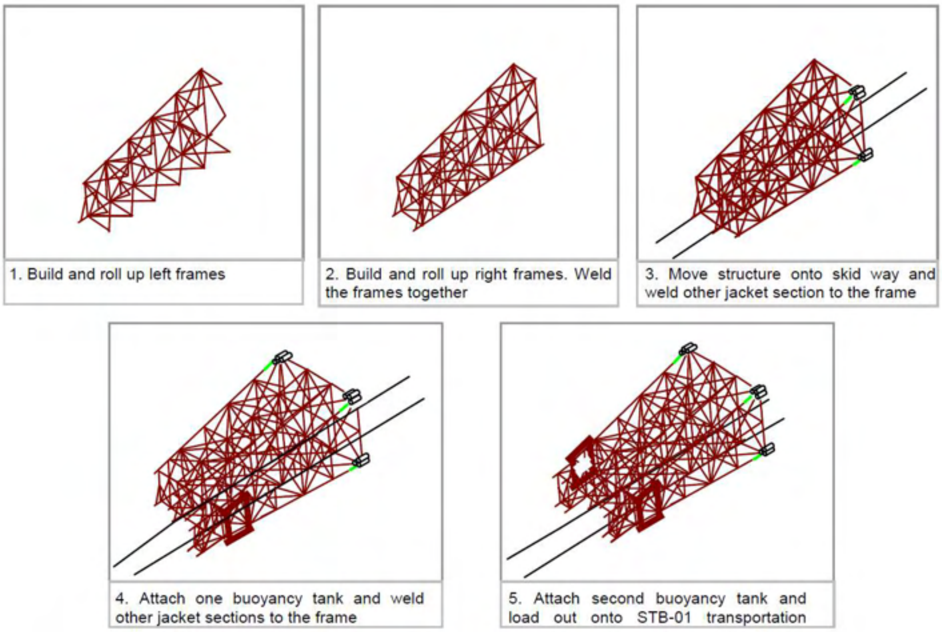


Figure 5.5: Jacket fabrication process

Source: AECOM, 2019

Two buoyancy tanks will be placed on either side of the jacket. The current plan is to re-use the tanks from the Azeri Central East (ACE) project, which will be cleaned and integrity checked using ultrasonic inspection. During jacket installation, a number of the buoyancy tank compartments will be flooded to ensure stability of the jacket, using approximately 2,500 m^3 of seawater for each tank. Following installation of the jacket the buoyancy tanks will be emptied and then towed back to the shore.

The four jacket pin piles (each 108” diameter and approximately 120 m in length) and eight jacket skirt piles (each 108” diameter and approximately 110 m in length) will be assembled, inspected and tested at the construction yard in a similar manner to the jacket.

Table 5.1: Anticipated paint use quantities (jacket and topside)

Item	Area	Undercoat (litres)	Topcoat (litres)	
Jacket				
Jacket	Below splash zone	15,000	15,000	
	Within splash zone	1,500	1,500	
Risers	External	400	400	
Caisson and J-tube	External	600	600	
Caisson	Internal	150	150	
Skirt piles		180	700	
Item	**Area**	**Primer (litres)**	**Midcoat (litres)**	**Topcoat (litres)**
Topside				
Structural	Sub under deck	1,970	1,100	1,100
	Under deck	14,960	8,200	8,200
	Main deck	25,253	13,900	13,900
	Electrical room	3,565	1,960	1,960
	Cooler structure	2,695	1,480	1,480
Passive fire protection	Vent stack	392	170	170
	Under deck	2,630	470	470
Piping spools	Topsides	6,542	3,500	3,500
Pipe supports	Topsides	8,800	4,800	4,800

5.3.4 Topside

The SDC topside will be a steel structure erected from steel girders, steel stanchions, trusses and cross beams, which form and enclose the deck and modules. Equipment, both electrical and mechanical, will be installed into the topside modules.

The SDC topside will comprise a topsides process and utilities deck (see Figure 5.6) that will support the compression system (compressor package, compressor coolers and scrubbers) and associated utilities and safety / telecom systems (see Section 5.7 for more information).

The main topside structure will be fabricated at the selected topside construction yard. Prefabricated and imported components and modules will either be transported from international fabrication yards, or fabricated at one of the Azerbaijani construction yards.

Steel plate will be cut, shaped and welded to form the topside structural elements. The sections will then be grit blasted and painted with anti-corrosion paint (see Table 5.1). Prefabricated utility and process equipment will be lifted into place using cranes, installed into the structural frame, secured and then fitted with power and piping connections as required. All deck frame and component weld joints will be tested using NDT methods.

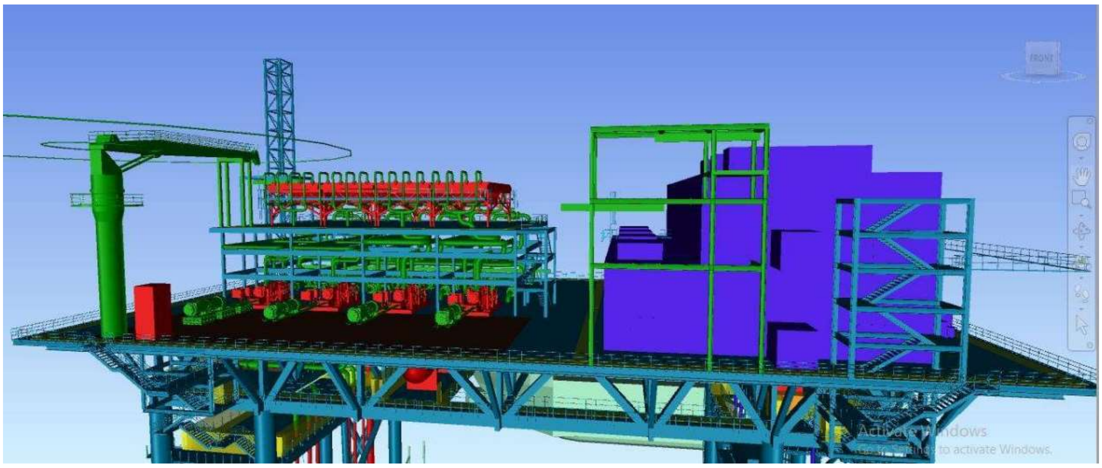


Figure 5.6: SDC topsides process and utilities deck

Source: bp, 2023b

Testing and commissioning activities in the topsides yard are planned to take place over a 10-month period.

It is proposed that testing of the vent system, compression trains and process systems will be carried out using a nitrogen / helium simulated process gas. Full dynamic running of the compression trains (including surge verification testing and parallel running tests) will be carried out using electrical power from the yard.

Safety and environment critical systems will be tested for standards of performance and integrity.

Hydrotesting of the SDC topsides piping system will be carried out using demineralised water (produced onsite at the construction yard using reverse osmosis). There are presently two options with regards to the onshore hydrotesting:

- Option 1 - The hydrotest water will be single use and will be drained after each test into portable tanks and disposed of via the construction yard drainage system (if relevant discharge standards are met). Preservation chemicals will not be added to the topsides piping system hydrotest water. Instead after draining of each hydrotest the piping system will be subjected to an enhanced drying process.
- Option 2 – The hydrotest water will be batch treated with a suitable additive to control bacterial growth in the piping system. The hydrotest water will be single use and drained after each test into portable tanks and removed from site by a licensed AGT Region approved contractor.

5.3.5 Subsea infrastructure and pipelines

The current base case is to import line pipe, spool pipe and bends to Azerbaijan and undertaking coating and NDT at the applicable selected construction yard.

Materials to fabricate the elements of the subsea infrastructure to be constructed in country (which are planned to include a number of subsea spools, subsea isolation valves (SSIVs), and pigging loop modules (PLMs)) will be received at the selected onshore subsea component fabrication facility. Fabrication activities will include cutting, welding, applying a corrosion coating, hydrotesting and NDT.

Hydrotesting of SDC subsea spools and structures within the yard will be undertaken using freshwater supplied from a tank, with the water returned to the tank following use, and removed from site by a licensed AGT Region approved contractor. Following hydrotesting, it is planned to prefill all subsea structures and spools with seawater dosed with preservation chemicals (i.e. biocide, oxygen scavenger, corrosion inhibitor - see Section 5.5.4) in the yard prior to installation offshore.

5.3.6 Load out and sail away

Once completed, the jacket and topside will each be loaded onto the STB-1 barge at the respective fabrication yards for transportation to the SDC platform location.

The jacket will be manoeuvred onto the STB-1 barge and fixed by welding members (sea fastening) from the jacket to the barge deck. The barge will be ballasted and trimmed to sea-tow condition. Figure 5.7 shows the Deep Water Gunashli drilling, utilities, and quarters (DWG-DUQ) jacket on the transportation barge ready for sail-away as an example of this activity. The jacket pin piles and skirt piles will be transported to site by “wet float”, that is, towed in the water behind a tow vessel.

The topside will be positioned on a 13 m high loadout frame, which will then be moved onto the STB-1 barge. During both jacket and topside sail-away, the barge will be assisted by a number of support vessels. Figure 5.8 shows the EA platform topside on the transportation barge as an example of this activity.

Figure 5.7: DWG-DUQ jacket during loadout

Figure 5.8: EA platform onboard STB-1 barge

5.3.7 Onshore construction and commissioning – emissions, discharges and waste

5.3.7.1 Summary of emissions to atmosphere

Table 5.2 summarises the emissions predicted to be generated during onshore construction and commissioning from key sources which include:

- construction yard engines and generators (including plant (e.g. generators, compressors), cranes and onsite vehicles)
- volatile materials used during construction (e.g. paint).

Table 5.2: Estimated emissions associated with routine and non-routine SDC onshore construction and commissioning activities

	Jacket and subsea construction	Topsides construction and commissioning	Total
CO_2 (k tonnes)	9.24	6.99	16.23
CO (tonnes)	53.17	40.22	93.39
NO_x (tonnes)	247.04	186.87	433.91
SO_2 (tonnes)	16.22	12.3	28.52
CH_4 (tonnes)	0	0	0
NMVOC (tonnes)	10.96	23.10	34.06
GHG (k tonnes CO_2 equivalent)	9.24	6.99	16.23
See Appendix 5A for detailed emission estimate assumptions. GHG – greenhouse gas			

5.3.7.2 Summary of discharges to sea

At the construction yards there will be three categories of drainage water:

- Black and grey water – black and grey water generated at the construction yard(s) will be collected in onsite sewer pipes and sumps and then either transferred by road tanker or by sewer pipes to a MENR approved sewage treatment plant for treatment and disposal. If the construction yard has an operational sewage treatment plant that discharges treated effluent to the environment, the yard operator will be responsible for agreeing the discharge standards with the MENR and maintaining the discharge permit conditions stipulated by the MENR.
- Hazardous area drainage – drainage water from areas in the construction yard(s) in which hazardous materials are stored and routinely used will be contained and will be collected by road tanker, handled as liquid waste and removed from site. If the yard operator has an agreement with the MENR for discharge of drainage from areas where hazardous materials are stored or used, they will be responsible for maintaining the discharge permit conditions stipulated by the MENR.
- Storm / rain water drainage - uncontaminated rainwater will be discharged directly to the onshore or marine environment to prevent flooding and ponding of water onsite. If untreated demineralised water is used for the hydrotesting of topsides piping this will be disposed of via the storm / rain water drainage (providing relevant discharge standards are met). In summer this water may be used for dust suppression on site.

5.3.7.3 Summary of non-hazardous and hazardous waste

Estimated quantities of non-hazardous and hazardous waste that will be generated during onshore construction and commissioning are provided in Table 5.3. These have been estimated based on the waste records for construction of bp's ACE platform.

All waste generated during onshore platform and subsea infrastructure construction and commissioning activities will be managed in accordance with existing AGT Region waste management plans and procedures.

Table 5.3: Estimated non-hazardous and hazardous waste quantities associated with onshore construction and commissioning activities

Classification	Physical form	Waste stream name	Disposal / treatment route	Estimated quantity (tonnes)	
				Jacket yard	Topsides yard
Non-hazardous	Solid wastes	Domestic / food	Landfill	0	3
		Domestic/office wastes	Landfill	1,384	4,059
		Metals - scrap	Re-use	1,386	1,320
		Paper and cardboard	Re-use	36	25
		Wood	Re-use	138	359
		Toner / printer cartridges	Re-use	0	0.7
		Plastic- recyclable (high density poly ethylene (HDPE))	Re-use	2	8
		Waste electrical and electronic cables	Re-use	0	72
		Construction debris	Re-use	5	27
		Tyres	Storage	0	3
		Metal containers	Re-use	0.6	1
		Plastic containers	Re-use	0	2
		Grit blast	Re-use	48	0
	Liquid wastes	Oils – cooking oils	Treatment / disposal	0	34
	Total (non-hazardous)			**3,000**	**5,914**

Classifi-cation	Physical form	Waste stream name	Disposal / treatment route	Estimated quantity (tonnes)	
				Jacket yard	Topsides yard
Hazardous	Solid wastes	Adhesives, resins and sealants	Re-use	0	1
		Batteries - dry cell	Storage	0	0.5
		Clinical waste	Incineration	0.1	2
		Contaminated materials	Incineration	30	18
		Filter bodies	Incineration	0	1
		Pressurised containers	Re-use	0	2
		Lamps/tubes - mercury vapour	Storage	1	3
		Greases	Re-use	0	0.5
	Liquid wastes	Antifreezes	Re-use	0	24
		Oils – fuel	Re-use	0	66
		Oils – lubricating oil	Re-use	12	31
		Paints and coatings	Treatment and disposal / recovery	55	171
		Chemically treated water	Treatment / disposal	0	2,676
		Oily water	Treatment / disposal	181	283
		Hydrotest water	Re-use	793	7
		Sewage sludge	Treatment / disposal	0	1,926
	Total (hazardous)			**1,072**	**5,212**

Note: Quantities based on waste data generated from jacket yard and topsides yard during construction of bp's Azeri Central East platform 2019-2023.

5.4 Offshore Platform Installation, Hook Up and Commissioning

5.4.1 Jacket

The SDC jacket will have an estimated weight of 9,800 tonnes and will incorporate two J-tubes, four risers and one open drains caisson.

Launch and installation of the SDC jacket, scheduled to take approximately 75 days, will follow similar methods as employed for the previous SD and ACG projects with the jacket launched from the STB-1 barge, and the Khankendi Subsea Construction Vessel (SCV) or Derrick Barge Azerbaijan (DBA)[6] used to position and lower the jacket and install the skirt piles. The process followed to unload and position the jacket is shown in Figure 5.9. This involves lifting, positioning, ballasting (using the jacket leg and buoyancy tanks) and setting down the jacket over the four pre-installed jacket pin piles.

The function of the pin piles is to provide temporary foundations for the jacket, until the jacket skirt piles are installed and grouted. Each pin pile will be approximately 120 m in length and will be transported to site by "wet float" and installed using the SCV or the DBA. To position the piles for installation, a support vessel will be used to assist the SCV / DBA. The pin piles will be driven into the sediment until they are 4 m above the seabed using an underwater hydraulic hammer and a vibro hammer. It is anticipated that, including preparation works, it will take approximately 2.5 days to install each jacket pin pile. Markers on the seabed and a subsea acoustic system will ensure that the pin piles are accurately positioned.

Following set-down of the jacket onto the pin piles, the buoyancy tanks will be removed, and hydraulic grippers activated to provide additional stability. The buoyancy tanks will be removed by a combination of seawater ballasting and lifting with the SCV / DBA crane, then drained and towed back to shore.

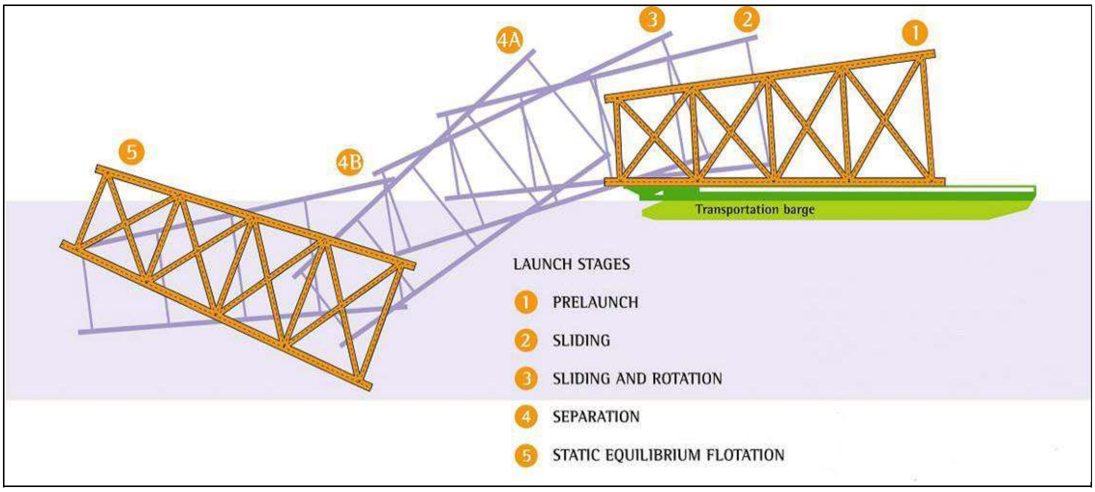


Figure 5.9: Jacket installation

The jacket will be secured into position using the eight skirt piles. Each jacket skirt pile will be lifted vertically by the SCV / DBA crane and positioned, penetrating into the seabed through its own weight. Once sufficient penetration is achieved, the SCV / DBA crane will detach itself from the pile and a hydraulic hammer will then be used to drive it to its target penetration. The skirt piles will be grouted. Grout will be supplied via flexible hoses to the grout manifold panel located on the side of the jacket; and pumped down into the annulus between the pile and pile sleeve. A grout seal / packer will ensure that the grout material is retained inside the pile sleeve annulus. A high strength cement will be used for the grout operation.

[6] The DBA anchoring system comprises 8 anchors each attached to electrically driven hydraulic mooring winches.

5.4.2 Topsides installation

The topside has been designed for a "float-over" method of installation, as employed for the previous SD and ACG Phases. The STB-1 transportation barge will be positioned between the two jacket towers and then ballasting will be undertaken until the weight of the topside is transferred to the jacket, as illustrated in Figure 5.10. The mating operation (i.e. the process of connecting the topside to the jacket) will be executed by ballasting the barge such that the topside engages with shock absorbers in the jacket legs and the load is transferred. Sand jacks will then be used to lower the topside until steel faces mate and are ready for welding. It is estimated that approximately 35 m^3 of sand will be released from the eight sand jacks during this process and discharged to the sea.

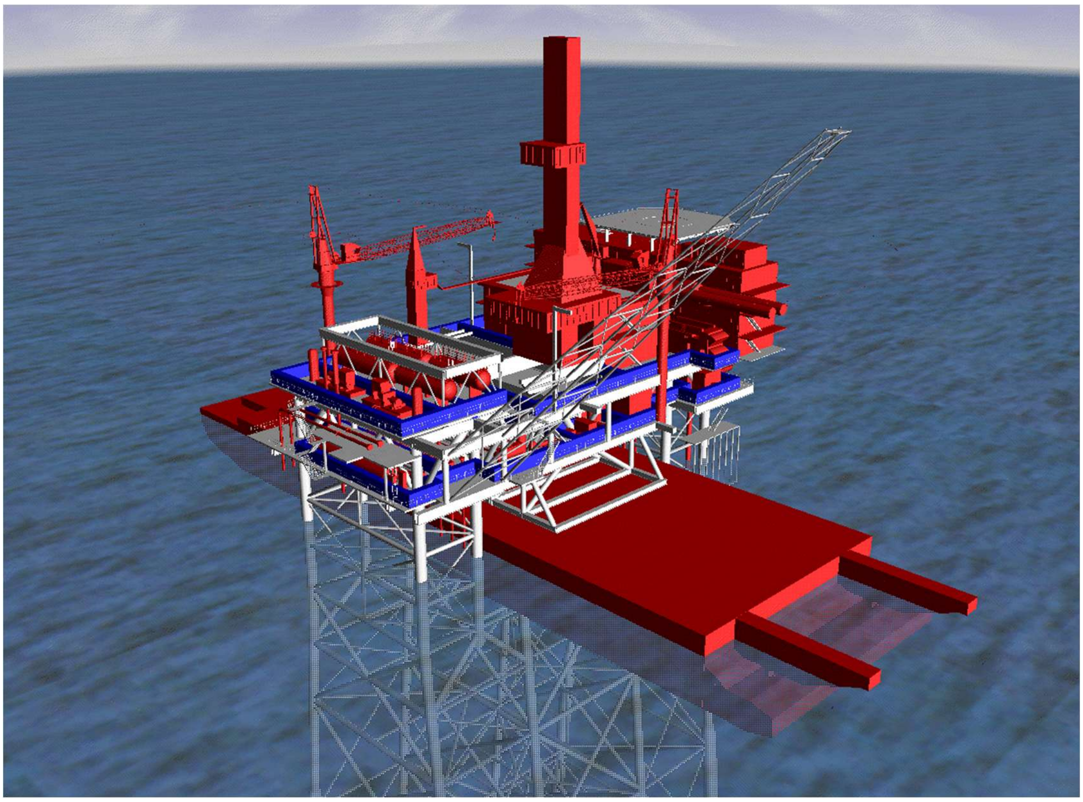


Figure 5.10: Topsides 'float-over' installation method

5.4.3 Topsides hook up and commissioning

An onshore maximum commissioning strategy will be used for the SDC topsides with the vent system, drains system, etc all commissioned onshore[7].

The offshore scope will include:

- connection of the PFOC from Sangachal, connection of the interconnector PFOC from SDB (installation of both PFOCs described in Section 5.6), connection of pigging loop module (PLM) umbilical, and electric / hydraulic flying leads[8]

[7] Current assumption is that start up involves introduction of hydrocarbons from SDA pipeline tie-in and compression train start up (units already commissioned onshore using simulated process inventory, see Section 5.3.4).

[8] Flying leads refer to an electrical cable or wire not permanently attached to a device or equipment. Instead, it has one or both ends left unconnected, allowing it to be easily connected or disconnected as needed.

- final telecom and Integrated Control and Safety System (ICSS) commissioning enabling control from shore.

If the PFOC from Sangachal Terminal and the PFOC from SDB platform are not ready for connection at SDC offshore commissioning stage, a temporary diesel generator will be used. This has been included in the emission calculations in Section 5.4.6.

Tie-in of the PFOCs to the SDC platform will require use of sealed pipes (termed J-tubes) that extend from the topside into the sea. The J-tubes will contain treated seawater[9] (approximately 17 m^3 in volume per J-tube) introduced when the platform was constructed to provide corrosion protection. Prior to unsealing both ends of the J-tubes, samples will be taken and analysed to confirm ecotoxicity, and a risk assessment completed to confirm potential impacts to the marine environment associated with discharge to sea. Depending on the outcome of the risk assessment the contents of the J-tubes will either be discharged to sea or recovered to the topside, contained and shipped to shore for disposal. Once emptied it is then planned to flush the pipe casing twice using seawater treated with Hydrosure HD-5000 at a dose of 1000 ppm (i.e. the same product and dosage planned to be used during cleaning and hydrotesting of the new infield pipelines - refer to Section 5.5.4).

5.4.4 Brownfield works

Brownfield works will be undertaken on the SDA and SDB platforms for the purpose of the SDC project. Works will comprise:

- modifications to remove bottlenecks including replacement of export and booster pumps and modification of monoethylene glycol (MEG) injection pipework at SDA platform
- replacement of nucleonic transmitters on SDB separators
- modification of export systems, and replacement of valves and injection equipment at both platforms
- connection of the SDB to SDC PFOC interconnector at SDB platform (see Section 5.6.4).

It is currently planned to undertake the SDA brownfield works in Q2 2028 to align with a SDA regional shutdown and turnaround (TAR), and the SDB brownfield works in Q2 2029. Faring is not anticipated during shut-down or start-up.

5.4.5 Installation, hook up and commissioning vessels

A number of vessels will be used to support the SDC platform installation, hook up and commissioning (HUC) activities.

For jacket and topsides tow out, the STB-1 barge will be used, supported by three anchor handling tugs.

For jacket and topsides installation, hook up and commissioning, and brownfield modifications, either the Khankendi SCV or the DBA will be used. If the SCV is used it will be supported by one support vessel. If the DBA is used it will be supported by two

[9] Dosing of 500 ppm biocide and 100 ppm oxygen scavenger.

anchor handling tugs and one support vessel. In addition, a flotel will be used to house additional personnel during the SDA and SDB tie-in periods.

The above information is summarised in Table 5.4. The operational discharges associated with these vessels are provided in Table 5.5.

Personnel transfer will be carried out when the fleet returns to shore for the majority of the vessels (approximately every 28 days). For the Khankendi SCV helicopter transfers of personnel will be carried out.

Table 5.4: Estimated number and function of SDC platform installation, hook up and commissioning vessels

Vessel	Number	Function	POB
STB-1	1	Transportation and installation of the jacket and topside	8
Tugs / anchor handling / barge support vessel	3-4	Tow out SDC jacket pin and skirt piles to SDC platform location, positioning of piles, tow STB-1 during jacket / topside transportation, assist with DBA anchor handling	23
SCV / DBA	1	Installation of pin piles, jacket and skirt piles, support to STB-1 during topside installation and to provide accommodation during HUC period	200 / 175
Flotel	1	To house additional personnel offshore	Dependent on flotel selected

Table 5.5: Platform, infield pipeline and subsea installation, hook up and commissioning vessel discharges

Utility	Description
Sanitary waste	Grey water and black water generated on the vessels will be sent to the onboard approved sewage treatment plant[10]. Treated sewage water will only be discharged >12 nautical miles from the nearest land when the ship is enroute and proceeding at not less than 4 knots (MENR requirement). Under non routine conditions when the sewage treatment system is not available black water will be managed in accordance with the existing AGT Region plans and procedures. Sewage sludge will be shipped to shore for disposal in accordance with the existing AGT Region waste management plans and procedures.
Galley waste	Depending on the availability of the food waste treatment capabilities onboard of the vessel, galley food waste will either be: • sent to vessel maceration units designed to treat food wastes to applicable MARPOL 73/78 Annex V requirements; or • contained and shipped to shore for disposal.

[10] Under MARPOL 73/78 an "approved" treatment plant is one that meets Resolution MEPC.2(VI) 1976, if the sewage treatment plant (STP) is installed prior to January 1, 2010: Faecal coliforms < 250 /100ml; TSS < 50 mg/l (shoreside testing); TSS < 100 mg/l (shipboard testing); BOD5 <50mg/l. After 1 Jan 2010, an "approved" STP is one that meets Resolution MEPC.159(55) 2006: Thermotolerant coliforms < 100 / 100ml; TSS <35 mg/l; BOD5 <25 mg/l COD <125 mg/l; pH 6 < 8.5.

Utility	Description
Drainage / wash water	Bilge[11] will be stored onboard the vessels and transferred onshore for treatment and disposal at licensed waste facilities. Deck wash water (water and cleaning agents / additives) will be discharged to sea in accordance with MARPOL 73/78.

5.4.6 Offshore platform installation, hook up and commissioning – emissions, discharges and waste

5.4.6.1 Summary of emissions to atmosphere

Table 5.6 summarises the routine emissions predicted to be generated during platform installation and HUC from key sources, which include:

- jacket and topside transit vessels
- jacket and pin pile/skirt pile installation vessels
- topsides installation vessels
- helicopter transfers
- use of a temporary diesel generator on SDC platform during the commissioning period, prior to hook up of the PFOC from Sangachal Terminal or SDB platform (1MW generator at 50% load for 2 months).

Table 5.6: Estimated emissions associated with SDC platform installation, hook up and commissioning

	Jacket and pin pile installation	Topsides installation and commissioning	Total
CO2 (k tonnes)	16.33	14.29	30.62
CO (tonnes)	26.62	24.78	51.41
NOx (tonnes)	65.20	63.40	128.60
SO2 (tonnes)	0.51	0.45	0.96
CH4 (tonnes)	0.44	0.40	0.84
NMVOC (tonnes)	4.13	3.71	7.85
GHG (k tonnes CO_2 equivalent)	16.35	14.30	30.64
See Appendix 5A for detailed emission estimates assumptions.			

5.4.6.2 Summary of discharges to sea

Routine discharges to sea during platform installation, hook up and commissioning comprise:

- ballast water during jacket installation (refer to Section 5.4.1)
- sand from topside jacking activities (refer to Section 5.4.2)
- installation and support vessel operational discharges (refer to Table 5.5)
- discharges associated with opening the SDC platform J-tubes (refer to Section 5.4.3).

[11] Bilge water is defined in MARPOL 73/78 Annex I as water which may be contaminated by oil resulting from issues such as leakage or maintenance work in machinery spaces. Any liquid entering the bilge system including bilge wells, bilge piping, tank top or bilge holding tanks is considered oily bilge water.

5.4.6.3 *Summary of non-hazardous and hazardous waste*

Predicted quantities of non-hazardous and hazardous waste that will be generated during SDC offshore platform and subsea installation are provided in Table 5.7. These have been estimated based on waste records from vessel activities associated with bp's ACE project. All waste generated will be managed in accordance with existing AGT Region waste management plans and procedures.

Table 5.7: Estimated non-hazardous and hazardous waste quantities associated with vessel activities during offshore platform and subsea installation

Classification	Physical form	Waste stream name	Disposal / treatment route	Estimated quantity (tonnes)
Non-hazardous	Solid wastes	Domestic / office waste	Landfill	595
		Scrap metal	Re-use	499
		Plastics – recyclable (HDPE)	Re-use	3
		Wood	Re-use	45
		Paper and cardboard	Re-use	2
		Toner and printer cartridges	Re-use	0.4
	Liquid wastes	Oils – cooking oils	Treatment / disposal	0.7
	Total (non-hazardous)			**1,145**
Hazardous	Solid waste	Batteries - wet cell	Storage	1.6
		Batteries - dry cell	Storage	0.2
		Contaminated materials	Incineration	1.5
		Lamps/tubes - mercury vapour	Storage	0.4
		Oily rags	Incineration	12
		Tank bottom sludge	Treatment / disposal	82
		Clinical waste	Incineration	0.1
		Filter bodies	Incineration	1.5
		Pressurised containers	Re-use	0.45
	Liquid wastes	Acids	Re-use	0.4
		Alkalis and bases	Re-use	4
		Oils - fuel	Re-use	7

Classification	Physical form	Waste stream name	Disposal / treatment route	Estimated quantity (tonnes)
		Oils – lubricating oils	Re-use	60
		Paints and coatings	Treatment and disposal / recovery	0.2
		Sewage – untreated	Treatment / disposal	15,936
		Sewage sludge	Treatment / disposal	224
		Water – oily	Treatment / disposal	923
		Solvents, degreases, thinners	Re-use	0.1
		Water treatment chemicals	Treatment / disposal	2
	Total (hazardous)			**17,174**

Note: Quantities based on waste data generated from offshore vessel activities during bp's Azeri Central East project 2022-2023 and ACE ESIA estimation.

5.5 Infield Pipeline & Subsea Infrastructure Installation, Tie-in and Commissioning

To enable gas to be transferred to / from the SDC platform for compression the following infield pipelines and subsea infrastructure will be installed (see Figure 5.11):

- 2 x 26” 10 km pipelines to / from the SDA gas export line
- 2 x 32” 3.5 km pipelines to / from the SDB gas export line
- 2 pigging loop modules (PLMs) (1 for the SDA loop and 1 for the SDB loop) at SDC platform location
- new subsea isolation valves at the SDA and SDB complexes
- PFOC from Sangachal Terminal to SDC (see Sections 5.6.1-5.6.3)
- PFOC from SDB to SDC (see Section 5.6.4)
- controls umbilical from SDB to SDC PLMs
- spools to enable the following tie-ins:
  from the SDA / SDB risers to the new SSIVs
  from the new SSIVs to the new SDC infield pipelines
  from the SDC to the existing SSIVs
  from the SDC pipelines to the pigging loop modules
  from the SDC risers to the pigging loop modules.

All tie-ins shall occur upstream of the existing SSIV structures relying on existing SSIVs for the tie-in isolation. This approach necessitates new SSIVs at SDA & SDB on the new out-going pipelines for platform protection from the inventory of the newly installed pipeline sections.

5.5.1 Infield pipeline integrity and design

The SDC infield pipeline design and materials will be consistent with that used for the previous SD and ACG projects. The pipelines will be constructed of carbon steel and will be designed to ensure they are suitable for the environmental conditions, seawater properties and geo-hazards. The pipelines will be designed for a 25-year operational design life.

The design of subsea structures and infrastructure is largely based on existing similar structures (where applicable) within the SD Contract Area and comprises steel tubular sections with perforated mudmat foundations, piles and skirts, fitted with removable roof panels for dropped object protection and valve access.

The pipelines will be protected by a high integrity polyethylene coating together with a sacrificial anode cathodic protection system. In addition, corrosion-inhibiting chemicals will be added to the gas stream (on SDA and SDB platforms) before it passes through the pipelines to minimise internal corrosion. Use of concrete mattresses in the vicinity of the platforms to protect the pipelines from potential dropped objects has also been included in the base case design.

In addition to the passive protection measures described above, pipeline integrity systems will include the following:

- monitoring (pressure, flow and fluid contaminant concentrations)
- corrosion protection
- inspection
- emergency response
- management of change (e.g. pipeline system modifications)
- assurance.

These measures form part of the existing Offshore Operations Pipeline Integrity Management System (PIMS).

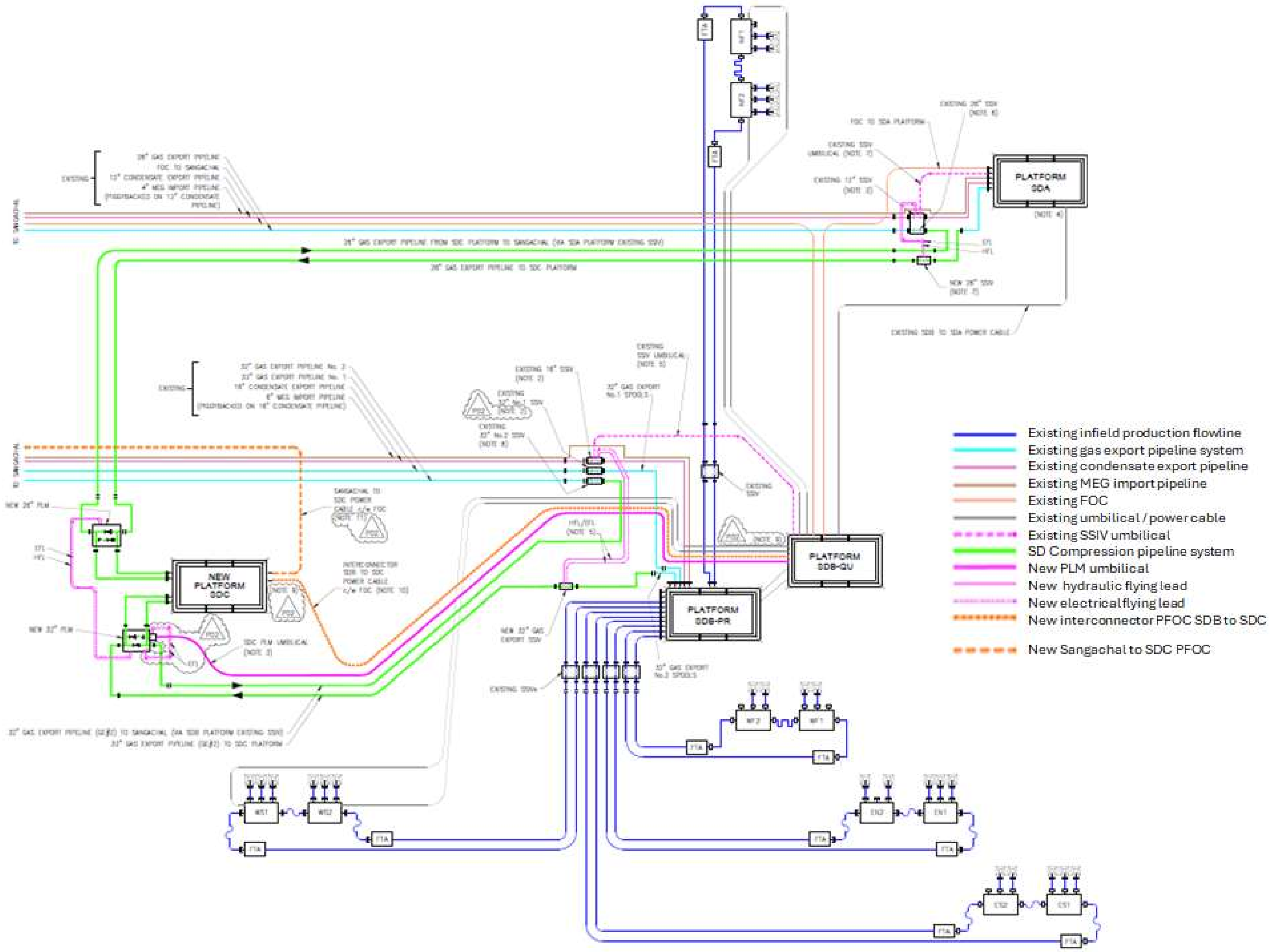


Figure 5.11: Offshore SDC layout schematic

Source: bp / Wood, 2024

5.5.2 Infield pipeline pre-installation survey

Prior to any installation works, a survey vessel will be used to carry out a pre-installation survey of SDC infield pipeline routes to identify any potential obstructions which may cause a hazard to the operations. Where obstacles are identified that may result in a hazard to SDC subsea installation activities, it is planned to move or remove them. In the event that the obstacles identified cannot be cleared from the pipeline routes, the pipelines may be slightly re-routed to ensure safe pipeline installation.

The survey vessel will also be used during pipe-lay to provide pipeline monitoring during installation, and to carry out the as-built survey once the pipelines are installed.

5.5.3 Infield pipeline installation

To install the four new infield pipelines, it is planned to use the pipelay barge “Israfil Huseynov”. The installation methodology will be consistent with previous SD and ACG projects.

On the pipelay barge, each pipe section will be welded to the preceding one and the welded joints will be visually inspected, and integrity tested using NDT techniques. The weld area will then be coated for protection with anti-corrosion material. The pipeline will be progressively deployed from the stern of the pipelay barge via the “stinger” (a support boom that extends outwards from the stern of the barge).

The tensioning system on the pipelay barge maintains a controlled and constant deployment rate, while reducing bending stresses that could threaten the pipeline structure.

The pipe-lay operation will be continuous with the barge moving progressively forward as sections of the pipe are welded, inspected, coated on board and then deployed to the seabed. The barge will be held in position by anchors. As pipe-laying proceeds, the anchors will be periodically moved by three anchor handling support vessels to pull the barge forward. The distance of this will vary but will typically be every 500 m to 600 m of pipeline length. During installation activities, an exclusion zone will be enforced around the pipelay barge. The pipelines will be laid directly on the seabed and will not be trenched.

Transportation of the pipeline sections, and the pipe-lay activities, will involve the use of several vessels from the Azerbaijani fleet that have been used for similar activities previously (see Table 5.11).

Infield pipeline crossings over existing pipelines will typically consist of a series of steel tubular sleepers of graduated heights to ramp the pipe up and over existing pipelines and back to the seabed. Pipelines crossing over the PFOCs will require protection / separation concrete mattresses to be pre-installed.

5.5.4 Infield pipeline and subsea pre-commissioning and commissioning

Pre-commissioning and commissioning of the infield pipelines and subsea structures comprises a number of steps outlined in the sections below. To prevent corrosion and inhibit bacterial growth, seawater used for these activities will be chemically treated.

The chemical dosing for the pipeline pre-commissioning and commissioning is provided in Table 5.8 and the chemical dosing for the spools is provided in Table 5.9. If there is a requirement to select different water treatment chemicals, for commercial or technical reasons, the ESIA Management of Change Process (see Section 5.13) will be followed. The intent is to use chemicals no more toxic or persistent than the base case chemicals.

Infield pipeline flood, clean and gauge (FCG)

The flooding operation will introduce chemically treated filtered dyed seawater into the pipelines in a controlled manner, the cleaning operation will remove construction debris from the internal pipeline surface, and the gauging operation will confirm that there are no pipeline internal deformations or intrusions.

This activity will be performed using a combined pig train. The slugs separating the pigs (including any entrained construction debris) along with the lubrication slug (treated unfiltered seawater) and 20% overfill contingency will be discharged to the environment, see Table 5.10.

Infield pipeline hydrostatic strength testing

Hydrotesting will then be carried out which involves increasing the pressure of the water in the pipeline systems above design pressure to test for leaks (pressurised to 1.25 times design pressure). Upon completion of the hydrotest the volume to pressurise is discharged to the environment, see Table 5.10.

Intervention pig train launch operation

Prior to any diver subsea intervention at SSIV locations, each gas pipeline will be prepared with the launch of an intervention pig train. This pig train will include bi-directional pigs separated with slugs of nitrogen, dyed MEG, potable water for desalination and treated filtered seawater.

The purpose of the intervention pig train is to:

- displace hydrocarbon gas from the existing riser and tie-in spools to the SSIV and replace with chemically treated seawater to support diver disconnection and tie-in activities
- act as a dewatering / MEG swabbing pig train – upon completion of subsea tie-ins and leak test the intervention pig train will be propelled using hydrocarbon gas towards the platform to dewater and condition the pipeline ready for start-up (dewatering discharges described below).

Subsea spool tie-ins

Each subsea spool will be pre-loaded onshore with the required quantities of chemical sticks (i.e. biocide, oxygen scavenger, corrosion inhibitor). These spools will be free-flooded during the subsea deployment. Subsequently, during diver tie-ins of these subsea spools, additional sticks will be inserted to maintain preservation and aid leak detection. The chemical dosage is presented in Table 5.9. It is expected that there will be minimal chemical dispersion subsea during tie-ins. The dissolved contents of the sticks will be discharged during dewatering (see below).

System integrity pressure testing

The tied-in, complete pipeline piggable systems (excluding unpiggable SDC risers) will be topped up and hydrostatically pressure tested (pressurised to 1.1 times design pressure). Upon completion of the pressure test, the volume to pressurise will be discharged to the environment via SDA and SDB platform pipework, see Table 5.10.

Dewatering and MEG swabbing

The entire pipeline system (including existing SSIVs, new SSIVs and PLMs) will be dewatered, desalinated and MEG swabbed[12] by reversing previously launched intervention pig train towards the platform. This dewatering pig train will be propelled by hydrocarbon gas reservoir present inside the pipeline system and all contents i.e. treated dyed seawater, desalination slug, MEG slug and nitrogen slug will be discharged subsea using pipework on SDA and SDB platforms, see Table 5.10. The hydrocarbon gas will be routed to platform process pipework for further processing.

SDC riser MEG displacement

The treated dyed seawater present in the SDC risers, subsea spools and sections of PLM pipework will be drained / discharged subsea at SDC location using MEG gel interface followed with liquid MEG. Upon completion of MEG displacement, SDC risers will be left with final concentration sufficient to provide hydrate inhibition. Therefore, some MEG discharge subsea is expected at this stage, see Table 5.10. The SDC risers will be left pressurised with MEG to equalise pressure across pigging module branch valves.

As a contingency, if post displacement MEG content inside SDC risers is not deemed acceptable from a hydrate inhibition perspective, then additional flushing will be required leading to discharge of diluted MEG with fresh MEG, see Table 5.10.

Table 5.8: Chemical dosing for infield pipeline and subsea pre-commissioning and commissioning

Operation	Chemical dosage				
	Hydrosure HD-5000 (ppm)	Preservan 2140 dye (ppm)	MEG conc.	Roemex RX-9022 dye (ppm)	Remarks
FCG of infield pipelines	1,000	100	NA	NA	
Hydrostatic test of infield pipelines	1,000	100	NA	NA	
Intervention pig train launch	500	100	MEG purity >99%	100	No discharge to environment

[12] MEG swabbing – chemical pipeline drying, removes moisture from the pipeline due to the hydroscopic qualities of MEG.

Operation	Chemical dosage				
	Hydrosure HD-5000 (ppm)	Preservan 2140 dye (ppm)	MEG conc.	Roemex RX-9022 dye (ppm)	Remarks
Subsea spools tie-in	NA	NA	NA	NA	Chemical sticks used, see Table 5.9
System integrity pressure testing	500	100	NA	NA	
Dewatering and MEG swabbing	NA	NA	NA	NA	Chemicals accounted for during intervention pig train launch
SDC risers MEG displacement	NA	NA	MEG purity >99%	NA	Gelling components (8 to 12%) discharged

Source: bp Exploration (Caspian Sea) Ltd, 2024

Table 5.9: Proposed chemical package for SDC subsea spools

Chemical	Function	Dosage per stick (ppm/m^3)	Maximum dosage (ppm/m^3)
Hydrosure biocide stick	Biocide	50	200
Hydrosure corrosion inhibitor stick	Corrosion inhibitor	30	120
Hydrosure oxygen scavenger stick	Oxygen scavenger	40	80
Hydrosure fluorodye UC stick	Dye	12.5	37.5

Source: bp Exploration (Caspian Sea) Ltd, 2024 and e-mail communication

Table 5.10: Summary of discharges for infield pipeline and subsea pre-commissioning and commissioning

Activity	Line	Discharged fluid	Discharge location / depth	Discharge volume (m^3)	Discharge duration
FCG of infield pipelines	32" gas export pipelines x 2	Chemically treated filtered seawater	SDB 2-4 m above seabed	782 x 2	Up to 2 hours per discharge
	26" gas export pipelines x 2		SDA 2-4 m above seabed	1,631 x 2	Up to 5 hours per discharge
Hydrostatic test of infield pipelines	32" gas export pipelines x 2	Chemically treated filtered seawater	SDC sea surface < 1 m water depth	38 x 2	Up to 4 hours per discharge
	26" gas export pipelines x 2		SDC sea surface < 1 m water depth	86 x 2	Up to 4 hours per discharge
System integrity pressure testing	32" gas export pipelines x 2	Chemically treated filtered seawater	SDB subsea riser -92 m water depth	55 x 2	Up to 3 hours per discharge
	26" gas export pipeline		SDA subsea riser -92 m water depth	126	Up to 3 hours per discharge
Dewatering and MEG displacement	32" gas export pipeline	Chemically treated filtered seawater, potable water, dyed MEG, and chemical sticks	SDB subsea riser -92 m water depth	2,828 (2,760 chemically treated filtered seawater; 28 potable water; 40 MEG)	Up to 6 hours per discharge
	26" gas export pipeline		SDA subsea riser -92 m water depth	6,416 (6,283 chemically treated	Up to 20 hours

Activity	Line	Discharged fluid	Discharge location / depth	Discharge volume (m^3)	Discharge duration
				filtered seawater; 63 potable water; 70 MEG)	
SDC risers leak test	16” SDA to SDC riser	Chemically treated filtered seawater	SDC sea surface < 1 m water depth	0.4	Less than 30 mins
	20” SDC to ST riser			0.6	
	20” SDB to SDC riser			0.6	
	22” SDC to ST riser			0.8	
SDC risers MEG displacement	16” SDA to SDC riser	Chemically treated filtered seawater, MEG	SDC sea surface < 1 m water depth	40 (20 chemically treated filtered seawater; 20 MEG)	Less than 30 mins
	20” SDC to ST riser			61 (31 chemically treated filtered seawater; 30 MEG)	
	20” SDB to SDC riser			61 (31 chemically treated filtered seawater; 30 MEG)	
	22” SDC to ST riser			75 (38 chemically treated filtered seawater; 37 MEG)	

Activity	Line	Discharged fluid	Discharge location / depth	Discharge volume (m^3)	Discharge duration
Contingency – SDC risers MEG flushing	16” SDA to SDC riser	Diluted MEG with fresh MEG	SDC sea surface < 1 m water depth	20 (MEG)	Less than 30 mins
	20” SDC to ST riser			31 (MEG)	
	20” SDB to SDC riser			31 (MEG)	
	22” SDC to ST riser			38 (MEG)	
PLM controls commissioning	Discharge from SDB and SDA PLM valve actuation during commissioning of the 32” valves	Transaqua HT2	SDB PLM subsea control module (6.5 m above seabed)	0.6	Time for valve closing movement (82 seconds for each valve)
	Discharge from SDB and SDA PLM valve actuation during commissioning of the 26” valves			0.4	Time for valve closing movement (23 seconds for each valve)

Source: bp Exploration (Caspian Sea) Ltd, 2024

Note discharge volumes may slightly differ from those indicated above.

5.5.5 Infield pipeline and subsea infrastructure installation vessels

The infield pipeline and subsea infrastructure installation activities will involve the use of a number of vessels from the Azerbaijani fleet that have been used for similar activities previously.

For infield pipeline installation it is anticipated that the Pipelay Barge Israfil Huseynov (PLBH) will be used supported by three anchor handling tugs, three pipe carrier vessels, and one support vessel.

For subsea installation and brownfield tie-ins it is anticipated that the Khankendi SCV will be used. This vessel will also provide diving support.

A survey vessel will also be in the field to carry out pre-installation and as-built surveys and provide support during pipelay.

Personnel transfer will be carried out when the fleet returns to shore for the majority of the vessels (approximately every 28 days). For the Khankendi SCV and the PLBH helicopter transfers will be carried out.

The above information is summarised in Table 5.11. The operational discharges associated with these vessels are provided in Table 5.5.

Table 5.11: Estimated number and function of SDC infield pipeline and subsea infrastructure installation support vessels

Vessel	Number	Function	POB
Pipelay barge (Israfil Huseynov)	1	Pipelay	285
SCV	1	Installation of subsea structures and spools	200 / 175
Pipe supply vessels	4	Supply pipe to the pipelay barge from the onshore pipe storage yard	7
Tugs / barge support vessels	4-6	Tow pipeline barge and provide support through subsea installation Connection of PFOC and SSIV umbilical and other support activities including pipeline hydrotesting	16
Survey vessel	1	Inspection during subsea structures and pipelay activities	51

5.5.6 Infield pipeline and subsea infrastructure installation, tie-in and commissioning – emissions, discharges and waste

5.5.6.1 Summary of emissions to atmosphere

Table 5.12 summarises the emissions predicted to be generated during pipeline and subsea installation, tie-in and commissioning from key sources which include the pipelay barge, SCV and support vessels (supply vessels, tugs and survey vessel) and helicopter transfers.

Table 5.12: Estimated emissions associated with SDC infield pipeline and subsea infrastructure installation, tie-in and commissioning activities

	Pipeline and subsea installation
CO2 (k tonnes)	56.47
CO (tonnes)	91.95
NOx (tonnes)	223.66
SO2 (tonnes)	1.76
CH4 (tonnes)	1.53
NMVOC (tonnes)	14.22
GHG (k tonnes CO_2 equivalent)	56.52
See Appendix 5A for detailed emission estimate assumptions.	

5.5.6.2 Summary of discharges to sea

Routine discharges to sea during pipeline and subsea installation, tie-in and commissioning comprise:

- pipeline and subsea infrastructure pre-commissioning and commissioning discharges (refer to Section 5.5.4)
- pipelay and subsea support vessel operational discharges as described within Table 5.5.

5.5.6.3 Summary of non-hazardous and hazardous waste

The estimated quantities of non-hazardous and hazardous waste that will be generated during the pipeline and subsea installation, tie-in and commissioning programme are included in Table 5.7.

5.6 Installation of SDC Power & Fibre Optic Cables

The SDC platform will be powered and controlled remotely from Sangachal Terminal via a subsea PFOC (see Table 5.13).

The electrical power demand of the SDC platform, on top of Sangachal Terminal electrical power demand, will be met by utilising existing 2 x 110 kV overhead lines feeding Sangachal Terminal from the national grid operated by Azerenergy.

Table 5.13: PFOC properties

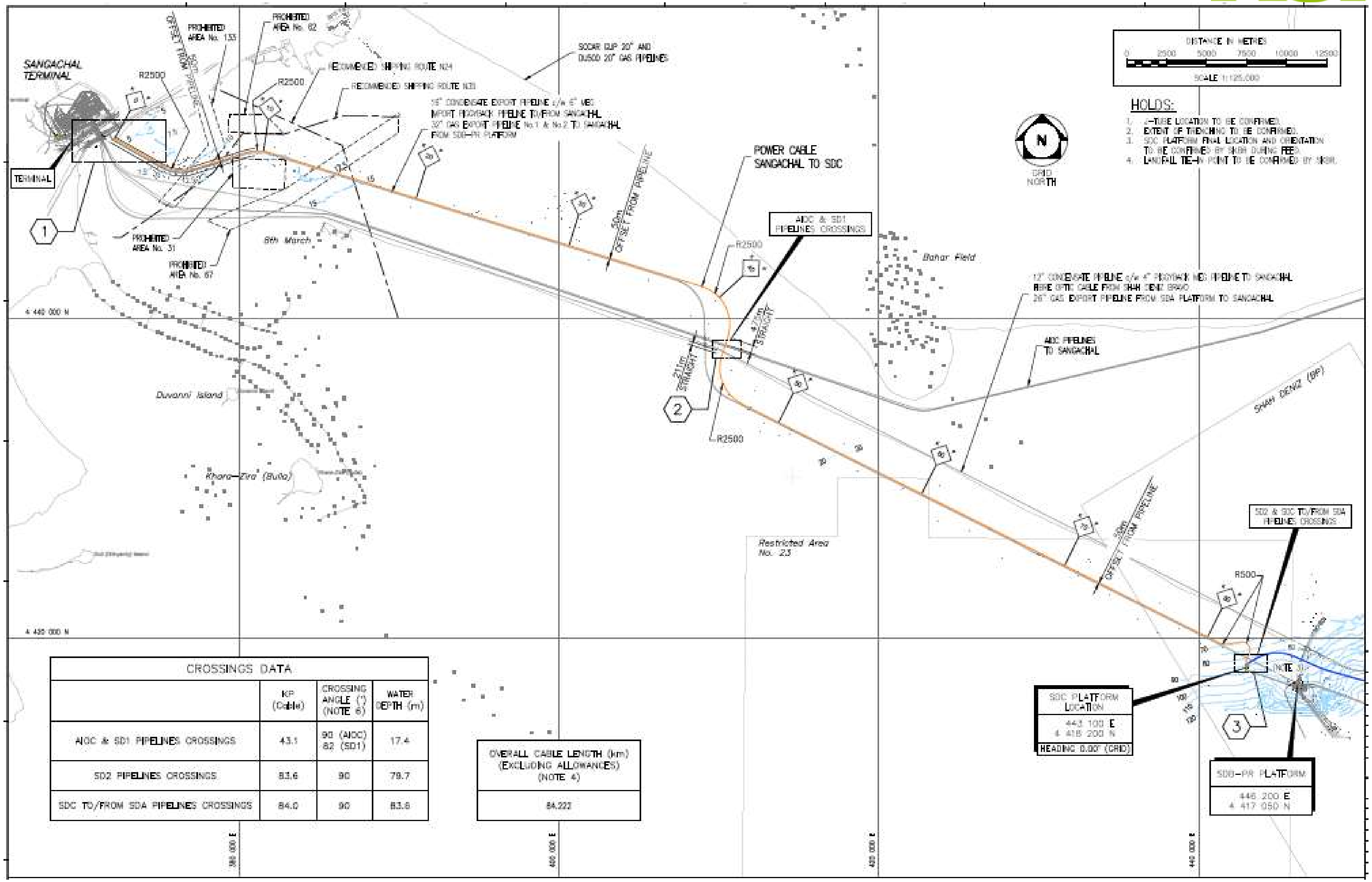
Parameter	Properties
Type	High voltage alternating current (HV-AC)
Voltage	110 kV
Power rating	85 MW
Cable configuration	3-core
Cable diameter	200 mm
Cable protection	Near landfall – trenched and buried Near platforms – concrete mattress protection

Source: bp, 2023c

The route of the proposed PFOC from Sangachal Terminal to the SDC platform is provided in Figure 5.12, the majority of the cable route will follow that of the SD2 gas export pipelines.

Cable installation methodologies in the onshore, nearshore, and offshore zones are described in Sections 5.6.1 to 5.6.3.

In addition to the above, an interconnector PFOC cable will be installed between the SDB platform and the SDC platform. More information is provided in Section 5.6.4.



CROSSINGS DATA

	KP (Cable)	CROSSING ANGLE (°) (NOTE 6)	WATER DEPTH (m)
AIOC & SD1 PIPELINES CROSSINGS	43.1	90 (AIOC) 82 (SD1)	17.4
SD2 PIPELINES CROSSINGS	83.6	90	79.7
SDC TO/FROM SDA PIPELINES CROSSINGS	84.0	90	83.6

Figure 5.12: Proposed Sangachal to SDC PFOC route

5.6.1 Sangachal to SDC PFOC – onshore section

The onshore section of the Sangachal to SDC PFOC, between the onshore landfall and the tie-in point within Sangachal Terminal, will be approximately 4.2 km (see Figure 5.13). It will follow the existing route of the SD2 gas export pipelines.

The section of cable route from the landfall to the first road crossing (approx. 360 m) will be within a fenced security area. The last 2 km of the cable route will be laid within the boundary of Sangachal Terminal and the PFOC will terminate in the SD2 part of the terminal. It should be noted that the section of cable within the Terminal boundary (within the new security fence shown on Figure 5.13) and brownfield activities at Sangachal Terminal[13], are outside the scope of this ESIA.

The PFOC will be installed using open cut methods and trenched to ensure a minimum cover of 1 m. A mixture of excavators and hand digging will be used for the works. Construction trucks, testing trucks and cranes will also be required. All soil removed from the trench being excavated will be placed aside and stored so that it may be used for later reinstatement of the route in order to maintain the environmental characteristics of the area.

As shown in Figure 5.13 the PFOC will need to cross the Baku-Alat Highway (M2), the railway, and various third-party pipeline / service lines. Horizontal drilling is proposed under these features to minimise disruption. At each trenchless crossing it will be necessary to excavate launch and reception pits to enable crossing installation. All soil excavated from the pits will be placed aside and stored so that it may be used for later reinstatement.

A cable transition joint pit will be constructed in the beach area approximately 20-25 m above the shoreline. The transition joint pit will be concrete lined and will allow the pulling in of the submarine power cable and the onshore power cable. The pit will then house the splices between the onshore and offshore sections. The pit will be approximately 10 m long, 8 m wide and 2 m deep, and will be constructed using conventional excavation and concrete / rebar techniques. Following cable connection and testing the pit will be backfilled with an engineered backfill material and topped off with local soil.

Vehicle access, parking, and temporary construction site facilities will be required at the pit location during these works. A temporary gravel road and gravel parking area may be established and then removed after cable pull-in is complete.

[13] Brownfield activities at Sangachal Terminal include power cable tie-in, installation of power receiving and transfer kit, and potential isolation of SD1 and SD2 production crossover.

Figure 5.13: Proposed onshore section of Sangachal to SDC PFOC route (only section from the landfall in Sangachal Bay to the new security fence within scope)

5.6.2 Sangachal to SDC PFOC – nearshore section

Within the nearshore zone the Sangachal to SDC PFOC will cross Sangachal Bay following the existing route of the SD2 gas export pipelines, with an offset of 100 m in water depths less than 7 m and an offset of 50 m in waters greater than this, see Figure 5.14.

The PFOC will be trenched to a minimum cover height of 1 m out to the 12.5 m water depth contour (just beyond the shipping lane) to protect from vessel associated activities / incidents such as anchoring / grounding. This corresponds to cable burial for a distance of approximately 7.5 km from the splice at the beach.

It is proposed to follow a similar nearshore installation methodology as that for previous SD and ACG projects. The trenching proposed within the nearshore area is summarised within Figure 5.15.

The cable will be installed in horizontal lay from a reel or carousel on the Khankendi SCV (or a shallow water dynamically positioned vessel / anchored barge in shallow water depths) into a pre-cut trench constructed as described below:

- For the very nearshore area (i.e. first 300 m out to the 3 m water depth contour) the trench will be constructed using elevated excavators. A finger pier will be constructed by dumping aggregate and trench spoil in the shallow marine zone to achieve the required clearance above sea level. The pier will be designed to support vehicle access with an average planned width of approximately 4-5 m (approximately 10 m at the base). Once the cable is installed in the trench and tested this section will be backfilled with the side cast material to ensure cable stability and protection in the wave breaking zone. This will be done using land-based excavators working from the finger pier.
- For the rest of the trenched section (i.e. out to 7.5 km to the 12.5 m water depth contour) an excavator on a flat-bottom cargo barge will be used to dig the cable trench. The cargo barge will be equipped with spuds that will allow the barge to jack-up and move independently without the need for anchor handling tugs. Marine installation operations will occur within an exclusion zone that will extend for 500 m each side of the cable route corridor and will be marked by buoys. Once the cable is installed in the trench and tested this section will be allowed to backfill naturally.

Prior to commencement of works within the nearshore zone it may be necessary to complete a marine geotechnical survey to confirm the seabed conditions along the proposed route. This would involve the collection of seabed samples using a corer, or a vessel mounted rig to drill boreholes. In the case of boreholes, use and discharge of bentonite mud may be required to facilitate sample retrieval.

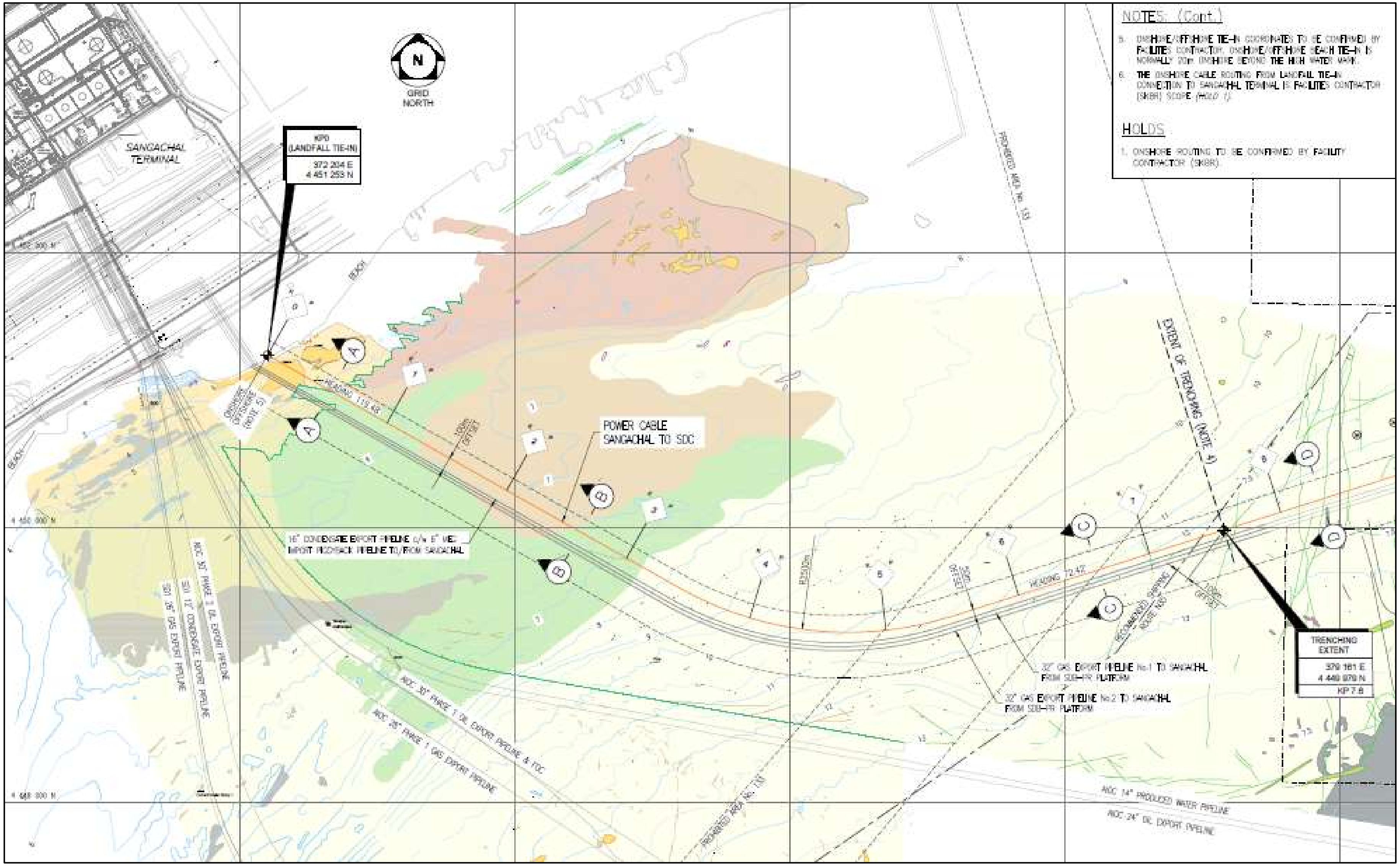


Figure 5.14: Proposed nearshore route of Sangachal to SDC PFOC

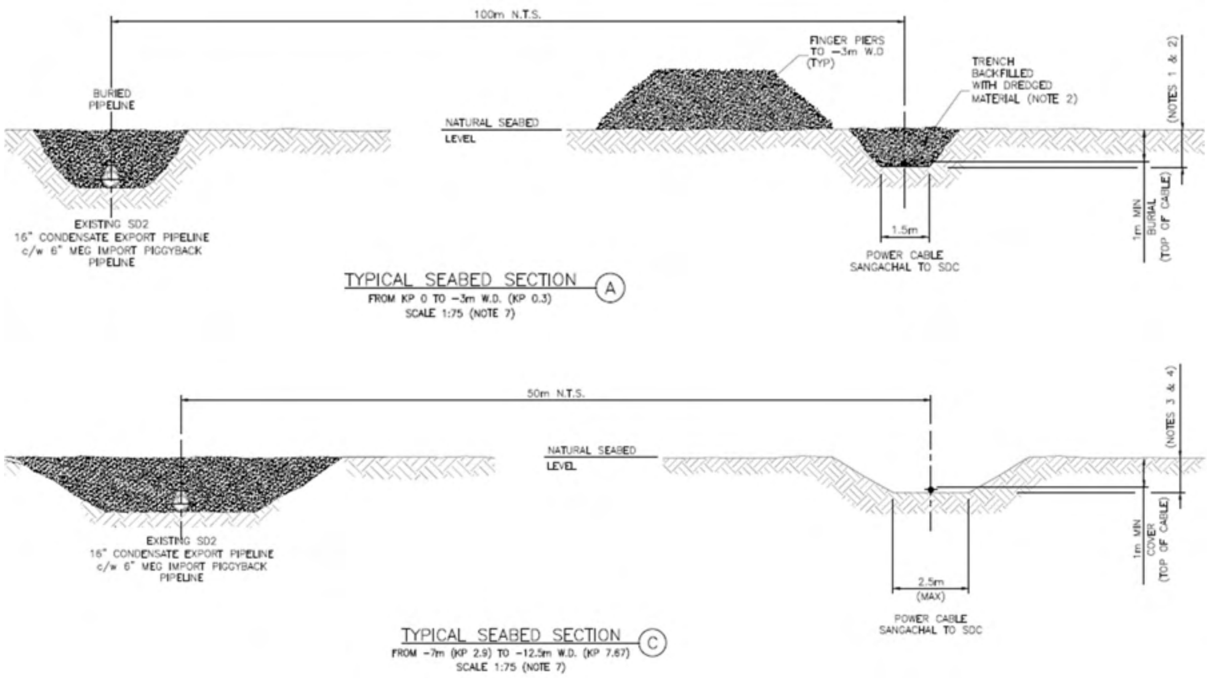


Figure 5.15: PFOC nearshore trenching details

5.6.3 Sangachal to SDC PFOC – offshore section

Beyond the 12.5 m water depth contour, the cable will be laid directly on the seabed from the reel or carousel on the Khankendi SCV. The cable will cross the offshore sector, following the route of the existing SD2 gas export pipelines and will terminate at the SDC platform at the top of the J-tube (see Section 5.4.3).

Marine installation operations will occur within an exclusion zone that will extend for 500 m each side of the cable route corridor.

As Figure 5.12 shows, at approximately 38 km from Sangachal Terminal the SDC PFOC will cross the existing ACG and SD export pipelines and associated services. These include:

- SD1 12” Condensate Export Pipeline (SDA to Sangachal) including 4” MEG pipeline
- SD-1 26” Gas Export Pipeline (SDA to Sangachal)
- SD1 Fibre Optic Cable (Sangachal to SDA)
- AIOC 14” Produced Water Pipeline (ACG to Sangachal)
- AIOC 24” Oil Export Pipeline (ACG to Sangachal)
- AIOC Fibre Optic Cable (Sangachal to ACG)
- AIOC 28” Phase 1 Gas Export Pipeline (ACG to Sangachal)
- AIOC 30” Phase 1 Oil Export Pipeline (ACG to Sangachal)
- AIOC 30” Phase 2 Oil Export Pipeline (ACG to Sangachal).

At these locations the existing pipelines and services will be flanked on either side by concrete supports to ensure minimum separation distances are maintained between the SDC cable and existing pipelines and cables. Crossing angles will be optimised to achieve as close to 90° (where practical) in order to minimise the crossing distance and support dimensions. It is intended that the existing service is protected from impact by mattresses or similar unless there is potential for damage to the existing service through doing this.

5.6.4 SDB to SDC PFOC interconnector

In addition to the above, a bi-directional power link (submarine PFOC interconnector) will be installed between the SDB and SDC platforms. The purpose of this interconnector is as follows:

- provision of early pre-commissioning power to the SDC topsides, up to but not including compressors start-up
- essential services 'back-power' link if power from shore is lost or interrupted.

The same cable will be used as presented in Table 5.13, however, it will be operated at 11 kV with an estimated load of 1.37 MW.

The interconnector cable will be installed using the same methodology as described in Section 5.6.3, from the Khankendi SCV.

5.6.5 PFOC installation – emissions, discharges and waste

5.6.5.1 Summary of emissions to atmosphere

Table 5.14 summarises the routine emissions predicted to be generated during SDC PFOC installation from key sources which include:

- onshore equipment and plant – excavators, trucks, cranes, and horizontal drilling equipment
- nearshore vessels and plant – cable lay vessel (Khankendi SCV), excavator on barge, anchor handling vessels and survey vessel
- offshore vessel – Khankendi SCV.

Table 5.14: Estimated emissions associated with SDC power cable installation

	Onshore	Nearshore	Offshore	Total
CO2 (k tonnes)	0.78	5.03	4.32	10.13
CO (tonnes)	4.50	8.19	7.02	19.71
NOx (tonnes)	20.90	19.75	16.88	57.52
SO2 (tonnes)	1.37	0.16	0.14	1.67
CH4 (tonnes)	0	1.19	0.12	1.31
NMVOC (tonnes)	0	1.26	1.08	2.34
GHG tonnes (k tonnes CO_2 equivalent)	0.78	5.04	4.32	10.14
See Appendix 5A for detailed emission estimate assumptions.				

5.6.5.2 *Summary of discharges to sea*

Routine discharges to the sea during SDC power cable installation comprise:

- Cable lay and trenching vessel operational discharges as described within Table 5.5.
- possible discharge of bentonite mud during nearshore geotechnical survey (refer to Section 5.6.2).

5.6.5.3 *Summary of non-hazardous and hazardous waste*

Estimated quantities of non-hazardous and hazardous waste that will be generated during offshore PFOC installation are included in Table 5.7.

In addition small quantities of waste will be generated during the onshore / nearshore PFOC installation, see Table 5.15. Skips for temporary storage of these waste materials will be in place at the landfall site and they will be managed in accordance with existing AGT Region management plans and procedures.

Table 5.15: Estimated non-hazardous and hazardous waste quantities associated with onshore / nearshore PFOC installation

Classification	Physical form	Waste stream name	Disposal / treatment route	Estimated quantity (tonnes)
Non-hazardous	Solid wastes	General / domestic waste	Landfill	120
		Scrap metal	Re-use	12
		Plastics – recyclable (HDPE)	Re-use	120
		Wood	Re-use	60
		Paper and cardboard	Re-use	60
		Crushed rock	Re-use / disposal	272
		Concrete waste	Re-use / disposal	13
	Total (non-hazardous)			**657**
Hazardous	Liquid wastes	Oily wastes	Treatment / disposal	2
	Total (hazardous)			**2**

5.7 Offshore Operations

The SDC platform will be controlled from Sangachal Terminal from a dedicated operator workplace. Key operational activities that will be undertaken include:

- receipt of gas from the SDA and SDB platforms

- compression of gas (using four electrically driven 11 MW compressors)[14]
- routing of compressed gas back to Sangachal Terminal through infield pipeline connections to existing export pipelines.

Other systems on the SDC platform include:

- combined vent and closed drain system – vent is for depressurisation during maintenance
- open drains system - for rain water collection
- heating, ventilation and air conditioning (HVAC) system
- material and mechanical handling devices (electrically driven crane)
- electrical systems (transformers will contain synthetic ester transformer fluid)
- safety and telecom systems (SDC will have a dedicated Integrated Control and Safety System (ICSS) with all required interfaces to other unit control panels and systems to facilitate process control and shutdown (including fire and gas detection)).

The design life of the facility is 25 years. The SDC platform has been simplified to minimise the offshore maintenance burden. As a result, there will be:

- no discharge of cooling water - air coolers on the topsides have been selected
- no discharge of black and grey water - the platform is unattended
- no discharge of produced water - produced water will remain comingled with the existing condensate export fluids which are treated onshore at Sangachal Terminal
- no discharge of fire water or firefighting foam – no active fire protection on platform
- no flaring - overpressure protection on the platform, and the lack of large hydrocarbon inventories and low-pressure vessels, negates the requirement for high pressure (HP) and low pressure (LP) flares on the platform (no blowdown is required in an emergency due to the small hydrocarbon inventories)
- no permanent closed drains - instead, local draining will be undertaken with temporary equipment during maintenance campaigns and the resulting waste returned to shore
- no topsides pigging facilities - subsea pigging loops will be in place to bypass SDC[15].

Maintenance visits will be carried out to the SDC platform using a walk-to-work vessel (see Figure 5.16). At present a 10 to 14 days maintenance campaign is planned each quarter with no overnight stay option.

There will be no provision for helicopter access at the SDC platform (no helideck). The nature of the eNUI facility is such that it envisages only planned maintenance campaigns at pre-defined periods and will be limited to a series of daily trips to the offshore installation. The platform will be fully controlled and monitored remotely from Sangachal Terminal. To enable flexibility in access there will be at least two boat landing platforms

[14] Compression configuration of 2 x 50% 11 MW compressors for SDA and 2 x 50% 11 MW compressors for SDB service. Compressors will be hermetically sealed and oil free.

[15] Pigs will not be launched from SDC. SDA and SDB will retain the ability to pig the gas export pipelines in their new configuration from the offshore facilities, through the new SDC subsea pig loop manifold, and onwards to Sangachal terminal. Pigging will be performed with the compressor bypassed and the flow directed through the subsea pig loop manifold. The pig loop manifold branch lines will not be piggable.

and two gangway docks. The AGT Regional Emergency Response Plan will be updated to consider the specifics of eNUI operation.

A 500 m exclusion zone[16] will be in place around the SDC platform. The purpose of this zone is to protect the safety of people working on or in the immediate vicinity of the platform (during maintenance activities) and the facility itself against damage.

Figure 5.16: Example of a walk-to-work maintenance vessel

Source: Conoship International, 2024

5.7.1 Offshore operations – emissions, discharges and waste

5.7.1.1 Summary of emissions to atmosphere

Emissions predicted to be generated during offshore operation of the SDC platform, are limited to:

- exhaust emissions from the walk-to-work maintenance vessel (see Table 5.16)
- intermittent venting during maintenance campaigns - it is anticipated that every two years compressor inspection will be required resulting in a maintenance depressurisation of the compressor trains inventories (see Table 5.17)[17]
- fugitive emissions from valves, vents, seals, etc (see Table 5.18).

[16] The United Nations Convention on the Law of the Sea (UNCLOS) 1982 requires all ships to respect safety zones around offshore installations.

[17] It is noted that other venting may occur, linked for example to unplanned system trips leading to emergency shutdowns of components, as well as releases during compressor re-wheeling, however over the project lifecycle these sporadic releases are unlikely to change the forecast GHG emissions contribution from venting materially (bp SOCAR-KBR, 2024).

Table 5.16: Estimated emissions associated with maintenance vessel activities during SDC offshore operations (for 19 years operational life)

	Operations and maintenance
CO2 (k tonnes)	27.24
CO (tonnes)	44.26
NOx (tonnes)	106.40
SO2 (tonnes)	0.85
CH4 (tonnes)	0.74
NMVOC (tonnes)	6.81
GHG (k tonnes CO_2 equivalent)	27.26
See Appendix 5A for detailed emission estimate assumptions.	

Table 5.17: Estimated SDC maintenance venting

	SDC Alpha trains	SDC Bravo trains
Mass of gas vented per depressurisation (tonnes)	9.2	7.9
Methane per depressurisation (tonnes) *	7.8	6.7
CO_2 per depressurisation (tonnes) **	0.03	0.03
GHG emissions per depressurisation (tonnes CO_2 equivalent)	231	199
GHG emissions / year (tonnes CO_2 equivalent)	115.5	99.5
Total GHG emissions / year (k tonnes CO_2 equivalent)	**0.22**	

Source: bp SOCAR-KBR, 2024

Notes:
* Vapour weight fraction %: SDC Alpha methane 0.8435, SDC Bravo methane 0.8438.

** Vapour weight fraction %: SDC Alpha CO_2 0.0036, SDC Bravo CO_2 0.0043.

Globa warming potential equivalents: CO2 = 1, CH_4 = 29.8 (IPCC AR6 GWP values, 2024).

Table 5.18: Estimated SDC fugitive emissions and GHGs

	Component Count	Emissions rates (kg/component/ year)	Fugitive emissions (tonnes/yr)
SDC Alpha trains			
Valves	107	4.52	0.40
Connections	262	0.946	0.20
Others	8	60.9	0.40
Subtotal			**1.0**
SDC Bravo trains			
Valves	107	4.52	0.40
Connections	262	0.926	0.20
Others	8	60.9	0.40
Subtotal			**1.0**
Total fugitives released SDC (tonnes)			2.0
Total methane (tonnes with 20% contingency added) *			2.4
Total fugitive GHG emissions / year (k tonnes CO_2 equivalent with 20% contingency added)			**0.07**

Source: bp SOCAR-KBR, 2024

Notes:

Component weight percentage of methane 0.81936

Emissions factors from bp 'Life of Field GHG Forecasting and Methodology Guide (bp Global Projects Organisation, 2021)

5.7.1.2 *Summary of discharges to sea*

Discharges to sea from the SDC platform and subsea operation will be limited.

Platform rainwater and wash down water will be routed through the open drains header to the open drains caisson for discharge to sea. The open drains caisson will be equipped with an oil recovery system to recover any hydrocarbons to temporary storage which will be shipped to shore for treatment. For the closed drain system, equipment drainage containing hydrocarbons will be routed through the closed drains header to a collection drum. There shall be no discharge to sea from the closed drains system. Collected oil will be removed to a temporary storage container and removed from the facility during maintenance campaigns.

With respect to the SDC infield pipelines, small volumes of hydraulic fluid (Transaqua HT2) will be discharged during PLM valve actuation as a result of pigging operations, or potential infield pipeline shutdown. The volumes under consideration are provided in Table 5.19.

Maintenance discharges will be limited to operational discharges from the walk-to-work vessel.

Table 5.19: Estimated PLM hydraulic fluid discharges during operational pigging / potential shutdown of SDC infield pipelines

	Pigging valve swept volume per operation including 25% safety margin (litres)	Pigging bypass valve swept volume per operation including 25% safety margin (litres)	Pigging operations during facility lifetime till 2041	Potential shutdowns in facility lifetime (pigging bypass volume only)	Total discharged volume during facility lifetime till 2041 (litres)
SDA	37.5	25	3	2	237.5
SDB	37.5	25	3	2	237.5
Total discharged volume during operate phase					475

5.7.1.3 Summary of non-hazardous and hazardous waste

As the SDC platform will be normally unattended, and no drilling activities will be carried out from the platform, wastes generated during operations phase will be limited to small volumes of maintenance wastes, see Table 5.20.

Adequate space will be provided on the SDC platform for waste segregation and handling and bunding of oil and chemical wastes. All wastes generated will be returned to shore at the end of each maintenance campaign and managed in accordance with existing AGT Region management plans and procedures.

Table 5.20: Annual estimated non-hazardous and hazardous waste quantities associated with SDC platform operation (maintenance wastes)

Classification	Physical form	Waste stream name	Disposal / treatment route	Estimated quantity (tonnes\year)
Non-hazardous	Solid wastes	General / domestic waste	Landfill	0.8
		Scrap metal	Re-use	0.4
		Containers - plastic	Re-use	0.06
		Plastics – recyclable (HDPE)	Re-use	0.01
		Plastics – recyclable (low density polyethylene (LDPE)	Re-use	0.1
		Waste electrical and electronic cables	Re-use	0.05
		Wood	Re-use	0.1
		Paper and cardboard	Re-use	0.04
		Wildlife	Disposal	0.01
	Total (non-hazardous)			**1.6**

Classification	Physical form	Waste stream name	Disposal / treatment route	Estimated quantity (tonnes\year)
Hazardous	Solid wastes	Batteries – dry cell and wet cell	Storage	0.05
		Clinical waste	Incineration	0.001
		Contaminated materials	Incineration	0.11
		Oily rags	Incineration	0.4
		Lamps / tubes (mercury vapour)	Storage	0.18
		Pressurised containers	Re-use	0.02
	Liquid wastes	Oils - fuel and MEG	Re-use	5
		Paints and coatings	Treatment and disposal / recovery	0.04
		Sewage - untreated	Treatment / disposal	3.84
	Total (hazardous)			**9.6**

5.8 Onshore Operations (Terminal)

The compressed gas stream from the SDC platform will be transported via the existing 1 x 26" gas export pipeline from SDA, and the 1 x 32" gas export pipeline from SDB, to Sangachal Terminal for processing.

Final processing to export specifications will be carried out in the existing SD facilities. There is sufficient capacity at Sangachal Terminal therefore no additional facilities, upgrades or improvements are required for onshore processing of the gas.

5.8.1 Onshore operations (terminal) – emissions, discharges and waste

Analysis of Shah Deniz gas field production profiles indicate peak gas volumes in the period 2024 to 2026, with production declining after this as the reservoir matures. When the SDC facility comes online in 2029 for SDA gas and in 2030 for SDB gas, although the compression facilities will increase gas production in line with export commitments[18], production rates will not be higher than present day therefore Sangachal Terminal emissions will not increase from present day as a result of the SDC project.

[18] It is assumed that emissions associated with meeting contracted gas volumes have already been assessed in earlier Shah Deniz ESIAs.

Incremental changes in waste generation are expected to be limited to a very small increase in waste generated from routine activities such as gas pipeline pigging and will be managed in accordance with existing AGT Region waste management plans and procedures.

5.9 Electricity Import

SDC platform being a 'directly electrified' eNUI will receive its electrical power via a PFOC from onshore. A peak total power demand of 60 MW has been assumed for SDC, reducing slightly after 2039 based on the projected power demand over the production lifecycle.

5.9.1 Scope 2 emissions

Scope 2 emissions are indirect GHG emissions from the generation of purchased energy (as opposed to Scope 1 emissions which are direct GHG emissions from owned or controlled sources and have been presented in the previous sections). In this case they are a function of the electricity imported (MWh/yr) and its carbon intensity, using an agreed emission factor expressed in terms of tonnes CO2equivalent/MWh.

The electricity for the SDC platform will be supplied from the Azerbaijan national grid. The carbon intensity for grid electricity over the production lifecycle has been calculated based on an agreement with a representative from the Ministry of Energy for Azerbaijan and bp and is presented in Table 5.21.

Table 5.21: Carbon intensity electrical import from Azerbaijan national grid

Year	2028	2029	2030	2031	2032	2033	2034
Carbon intensity (tonnes CO_2e/MWh)	0. 403	0.395	0.386	0.378	0.371	0.363	0.355
Year	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Carbon intensity (tonnes CO_2e/MWh)	0.348	0.341	0.334	0.327	0.320	0.313	0.307

Source: bp SOCAR-KBR, 2024

Total Scope 2 GHG emissions, based on electricity import from the Azerbaijan national grid, are estimated to be 2,387 ktonnes CO2 equivalent for the SDC P50 production lifecycle[19] between 2028-2041. The annual components of these emissions are presented in Table 5.22.

[19] P50 is a probability figure and in this case is the annual average level of production (where the production is forecast to be exceeded 50% over a year).

Table 5.22: P50 Scope 2 GHG emissions from provision of SDC grid electricity

Year	2028	2029	2030	2031	2032	2033	2034
Annual GHG emissions (ktonne CO_2e/yr)	35	207	203	199	195	191	187
Year	**2035**	**2036**	**2037**	**2038**	**2039**	**2040**	**2041**
Annual GHG emissions (ktonne CO_2e/yr)	183	179	175	172	163	156	142
Total P50 production lifecycle Scope 2 GHG Emissions (ktonne CO_2 equivalent)							**2,387**

Source: bp SOCAR-KBR, 2024

5.10 Decommissioning

In view of the operational lifetime of the SDC platform, and associated infrastructure, it is not currently possible to provide a detailed methodology for the potential decommissioning of the facilities.

In accordance with the SD PSA, an abandonment plan will be prepared no later than one year prior to the calendar year in which 70% of the identified reserves have been produced.

5.11 Summary of Emissions and Waste

5.11.1 SDC project emissions

Table 5.23 presents an estimate of the total emissions associated with the SDC project.

In addition, Scope 2 GHG emissions, based on electricity import from the Azerbaijan national grid, are estimated to be 2,387 ktonnes CO_2 equivalent for SDC between 2028-2041.

Table 5.23: Estimated emissions associated with the SDC project

	Onshore construction and comm-issioning (yards and onshore section of PFOC)	Offshore platform installation and HUC (jacket and topsides)	Infield pipeline and subsea installation (infield pipelines, and marine section of PFOC)	Offshore operations for operational life (maintenance vessel, venting, and fugitives)	Total
CO_2 (k tonnes)	17.0	30.6	65.8	27.2	**141**
CO (tonnes)	97.9	51.4	107.2	44.3	**301**
NO_x (tonnes)	454.8	128.6	260.3	106.4	**950**
SO_x (tonnes)	29.9	0.96	2.1	0.9	**34**

	Onshore construction and comm-issioning (yards and onshore section of PFOC)	Offshore platform installation and HUC (jacket and topsides)	Infield pipeline and subsea installation (infield pipelines, and marine section of PFOC)	Offshore operations for operational life (maintenance vessel, venting, and fugitives)	Total
CH_4 (tonnes)	0	0.8	2.8	184.1	**188**
NMVOC (tonnes)	34.1	7.84	16.6	6.8	**65**
GHG (k tonnes CO_2 equivalent)	17.0	30.7	65.9	32.7	**146**
See Appendix 5A for detailed emission estimate assumptions.					

5.11.2 SDC project non-hazardous and hazardous waste

Table 5.24 presents a summary of the expected non-hazardous and hazardous waste generated by the SDC project. The planned destination of each SDC waste stream is provided within

Table 5.25.

Waste management plans and procedures are detailed in Chapter 13.

Table 5.24: Estimated non-hazardous and hazardous waste associated with SDC project

Classifi-cation	Form	Waste stream	Estimated quantity (tonnes)			
			Onshore construction yards	Offshore installation and HUC*	Onshore / nearshore PFOC installation	Offshore operation – SDC platform (operational life)
Non-hazardous	Solid wastes	General / domestic waste	5446	595	120	15
		Metals - scrap	2706	499	12	8
		Paper and cardboard	61	2	60	1
		Wood	497	45	60	2
		Toner / printer cartridges	0.7	0.4		

Classifi-cation	Form	Waste stream	Estimated quantity (tonnes)			
			Onshore construction yards	Offshore installation and HUC*	Onshore / nearshore PFOC installation	Offshore operation – SDC platform (operational life)
		Plastic-recyclable (HDPE & LDPE)	10	3	120	2
		Waste electrical and electronic cables	72			1
		Construction debris	32			
		Tyres	3			
		Metal containers	1.6			
		Plastic containers	2			1
		Grit blast	48			
		Crushed rock			272	
		Concrete waste			13	
		Wildlife				0.2
	Liquid wastes	Oils – cooking oils	34	0.7		
	Total (non-hazardous)		**8,914**	**1,145**	**657**	**30**
Hazardous	Solid wastes	Adhesives, resins and sealants	1			
		Batteries - dry cell	0.5	0.2		
		Batteries – wet cell		1.6		1

Classifi-cation	Form	Waste stream	Estimated quantity (tonnes)			
			Onshore construction yards	Offshore installation and HUC*	Onshore / nearshore PFOC installation	Offshore operation – SDC platform (operational life)
		Clinical waste	2.1	0.1		0.02
		Contaminated materials	48	1.5		2
		Oily rags		12		8
		Filter bodies	1	1.5		
		Pressurised containers	2	0.45		0.5
		Lamps/tubes - mercury vapour	4	0.4		3
		Greases	0.5			
		Tank bottom sludge		82		
	Liquid wastes	Antifreezes	24			
		Acids		0.4		
		Alkalis and bases		4		
		Paints and coatings	226	0.2		1
		Oils – fuel	66	7		
		Oils – lubricating oil	43	60	2	
		Oils – fuel and MEG				95
		Chemically treated water	2676			
		Oily water	464	923		
		Hydrotest water	800			
		Sewage sludge	1926	224		

Classification	Form	Waste stream	Estimated quantity (tonnes)			
			Onshore construction yards	Offshore installation and HUC*	Onshore / nearshore PFOC installation	Offshore operation – SDC platform (operational life)
		Sewage untreated		15,936		73
		Solvents, degreases, thinners		0.1		
		Water treatment chemicals		2		
	Total (hazardous)		**6,284**	**17,174**	**2**	**184**

* Includes offshore installation and HUC of platform, infield pipelines and subsea including offshore sections of PFOCs

Table 5.25: Planned destination of SDC project waste streams

Category	Sub category	Destination
Non-hazardous non-recyclable waste	Domestic / office wastes	Non-hazardous landfill – current facility has been designed and constructed to EU standards.
Recyclable waste	Waste electrical and electronic cables	Treatment and disposal / recovery by licensed AGT Region approved contractor or storage pending availability of appropriate techniques / contractor.
	Paper and cardboard	
	Plastics – recyclable (HDPE)	
	Wood	
	Containers – plastic	
	Construction debris	
	Tyres	
	Grit blast	
	Metals - scrap	Sent to SOCAR

Category	Sub category	Destination
Solid hazardous waste	Batteries - dry cell	Treatment and disposal / recovery by licensed AGT Region approved contractor or storage pending availability of appropriate techniques / contractor.
	Batteries - wet cell	
	Cement	
	Clinical waste	
	Contaminated materials	
	Contaminated soil and sand	
	Filter bodies	
	Lamps/tubes – mercury vapour	
	Oily rags	
	Tank bottom sludge	
	Toner or printer cartridges	
Liquid hazardous waste	Oils - fuel	Treatment and disposal / recovery by licensed AGT Region approved contractor or storage pending availability of appropriate techniques / contractor.
	Oils - lubricating oil	
	Paints and coatings	
	Sewage - sludge	
	Sewage - untreated	
	Solvents, degreasers and thinners	
	Tank bottom sludge	
	Water - hydrotest water	
	Water - oily	
	Water treatment chemicals	

5.12 SDC Employment

The estimated employment associated with the SDC project during onshore construction phase and offshore installation, hook up and commissioning is presented in Figure 5.17. Employment during topsides construction, jacket construction, subsea works, and Sangachal onshore works is estimated to peak at approximately 2,600 persons in 2027.

During the operational phase only a limited number of maintenance personnel will be employed by the project as the SDC platform is unattended.

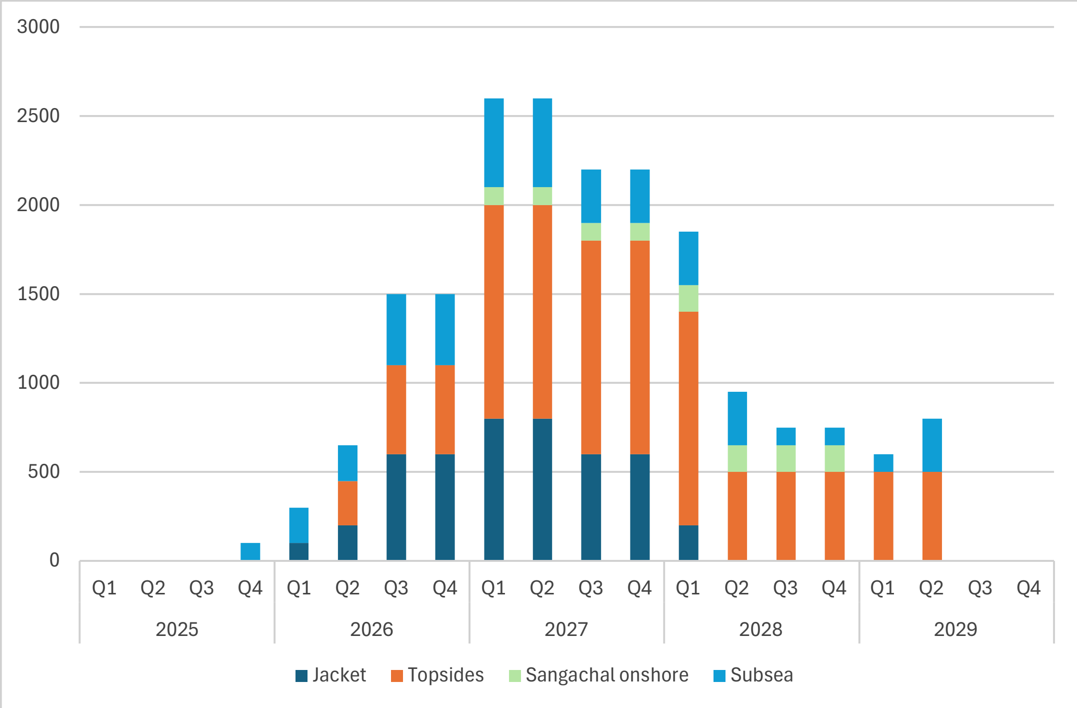


Figure 5.17: Estimated manpower associated with SDC construction phases

5.13 Management of Change Process

During the 'Define', 'Execute' and 'Operate' stages of the SDC project, there may occasionally be a need to change a design element or a process. The SDC project intends to implement a formal process to manage and track any such changes, and to:

- assess their potential consequences with respect to environmental and social impact; and
- in cases where a new or significantly increased impact is anticipated, to inform and consult with the MENR to ensure that any essential changes are implemented with the minimum practicable impact.

All proposed changes where there is potential for new or altered environmental and social interactions, whether to design or process, will be notified to the Project HSE team, who will review the proposals and assess their potential for creating potentially significant environmental or social interactions.

Changes which do not alter existing interactions or impacts, or which give rise to no interactions or impacts, will be summarised and periodically notified to the MENR, but will not be considered to require additional approval. This category will include items such as minor modification of chemicals, where the modification involves substitution of a chemical with equal or less environmental impact than the original.

If internal review and assessment indicates that a new or significantly increased impact may occur, the following process will be applied:

- categorisation of the impact using ESIA methodology
- assessment of the practicable mitigation measures
- selection and incorporation of mitigation measures; and
- re-assessment of the impact with mitigation measures in place.

In practical terms, the changes that will require prior engagement and approval by the MENR are those that:

- result in a discharge to the Caspian that is not described in the SDC project ESIA
- Increase the quantity discharged as detailed in the SDC project ESIA by more than 20%[20] [21]
- result in the discharge of a chemical not referenced in the ESIA and not currently approved by the MENR for use in the same application by existing AGT Region operations; or
- create or increase noise, light or other disturbance above applicable thresholds to human populations living in the vicinity of the SDC project activities.

Once the changes (and any appropriate mitigation) have been assessed as described above, a technical note will be submitted to the MENR describing the proposal and reporting the results of the revised impact evaluation. Where appropriate, this may include the results of environmental testing and modelling (e.g. chemical toxicity testing and dispersion modelling). Following submission of the technical note, the Project team will engage in meetings and communication with the MENR in order to secure formal approval. Once approved, each item will be added to a register of change. The register will include all changes, including those non-significant changes notified in periodic summaries, and will note any specific commitments or regulatory requirements associated with those changes.

[20] For the discharges detailed in the ESIA, an increase of 20% in volume would result in a 3-4% increase in the linear dimension of the mixing zone. For instance, a mixing plume 100 m by 20 m by 20 m would increase by less than 2 m in each dimension. Taking into account the actual size of the predicted mixing zones, this magnitude of increase is considered to make no material difference to the physical extent of the impacts. In practical terms, this would apply to increases of more than 20% (the value was selected to be conservative).

[21] Unless increase is deemed to have no material effect on the associated impact(s).

REFERENCES

AECOM (2019), Azeri Central East Project ESIA.

bp (2023a), Shah Deniz Compression Project – Basis of Design (BP-CPZZZZ-EN-BOD-0001-000_D01).

bp (2023b), Shah Deniz Compression Project – Construction Execution Plan (BP-CPCDZZ-CM-PLN-0007-000_P01).

bp (2023c), Shah Deniz Compression Project – Subsea Basis of Design (JK-S4SSSS-PE-BOD-0001-000_P01).

bp Exploration (Caspian Sea) Ltd (2024), GPO AGT Projects Subsea Pipelines Commissioning Discharge Plan (BP-C4ZZZZ-CG-PLN-0001_000).

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bp SOCAR-KBR (2024), Shah Deniz Compression Project – Energy Usage and Air Emissions Forecast Report (including atmospheric emissions modelling and GHG emissions forecast) (SJ-CPZZZZ-EV-REP-0006-000-D01).

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CHAPTER 6: Environmental Description

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FIGURES

6 ENVIRONMENTAL DESCRIPTION

6.1 Introduction

This chapter defines and describes the environment within which the Shah Deniz Compression project will take place. The purpose of the environmental description is to provide sufficient information to allow for assessment of potential impacts of the project activities in accordance with the methodology laid out in Chapter 3. The scope and content of this chapter have been informed by the anticipated environmental interactions identified during the SDC scoping phase, with the geographical scope focused on:

- onshore - the potential construction yards to be used for the SDC platform construction activities, and the route of the onshore section of the Sangachal Terminal to SDC power and fibre optic cable (PFOC)
- coastal – the route of the Sangachal Terminal to SDC PFOC as it approaches landfall within Sangachal Bay
- offshore - the Shah Deniz Contract Area, the proposed SDC platform location, the SDC infield pipeline routes, and the route of the offshore section of the Sangachal to SDC PFOC.

This chapter provides relevant baseline information on the following conditions:

- physical and geophysical environment - a summary of geology, meteorology, and climactic conditions relevant to the Caspian region as a whole (i.e., the entire geographic area in which the Caspian Sea is located) and to the SD Contract Area
- terrestrial and coastal - the setting and relevant environmental conditions in the vicinity of the potential construction yards to be used for the SDC platform construction activities, in the vicinity of the onshore Sangachal Terminal to SDC PFOC route, and high-level information on the Azerbaijan coastline (Absheron Peninsula to Neftchala)
- nearshore marine environment - the setting and relevant environmental conditions in Sangachal Bay
- regional offshore marine environment – physical, chemical and biological characteristics of the Caspian Sea and the Shah Deniz Contract Area
- offshore environment specific to the SDC project – physical, chemical and biological characteristics particular to the proposed offshore SDC platform location and offshore Sangachal Terminal to SDC PFOC route.

The terrestrial, nearshore, and offshore locations associated with the SDC project are shown in Figure 6.1.

The social baseline conditions relevant to the SDC project are presented in Chapter 7.

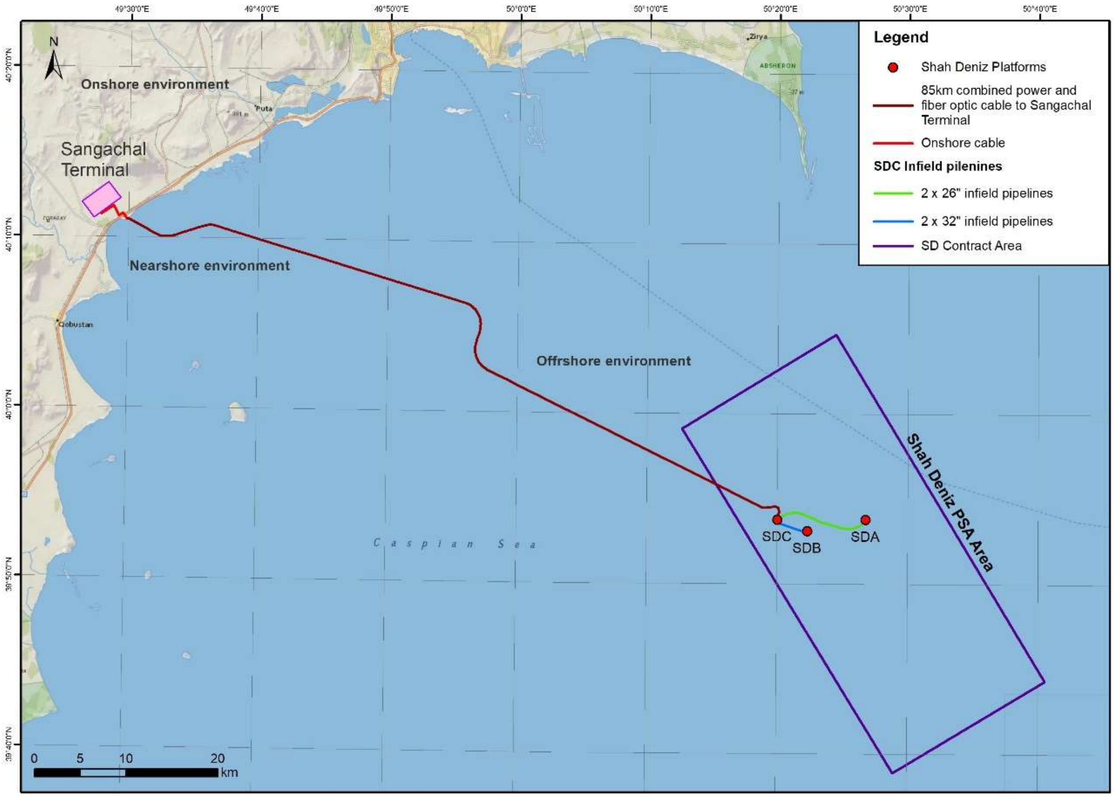

Figure 6.1: Overview of SDC project and offshore, nearshore and onshore (terrestrial and coastal) environments

6.2 Data Sources

Environmental monitoring data has been collected by bp across the Shah Deniz Contract Area for over 25 years. Since 2004 this data has been collected under the Environmental Monitoring Programme (EMP). The primary aim of the EMP is to develop reliable and consistent time series data for each monitoring location within a clearly defined survey area to enable long-term trends to be identified. Table 6.1 lists the baseline and EMP surveys carried out to date that are relevant to the SDC project.

In addition to the above, a number of SDC project specific environmental studies have been conducted / commissioned as follows:

- Offshore environmental baseline survey of the SDC platform location (August 2023)
- Bird literature review specific to SDC project – Nigar Agayeva, Expert Ornithologist, Azerbaijan Ornithological Society (June 2024), see Appendix 6A.
- Fish literature review specific to SDC project - Professor Mehman Akhundov, Fisheries and Aquaculture Research Centre Director, Ministry of Science and Education - Republic of Azerbaijan (June 2024), see Appendix 6B.
- Fish physiology literature review specific to SDC project - Grigoriy Palatnikov, Head of Department of Ecotoxicology - Institute of Physiology, Ministry of Science and Education - Republic of Azerbaijan (June 2024), see Appendix 6C.
- Caspian seal literature review specific to SDC project – Dr Tariel Eybatov, Director of Natural History Museum, Ministry of Science and Education - Republic of Azerbaijan (June 2024), see Appendix 6D.

Table 6.1: Relevant offshore, nearshore and terrestrial / coastal surveys (1996 to date)

Date	Title of survey
Offshore surveys – Shah Deniz Contract Area	
2023	Shah Deniz Compression Environmental Baseline Survey
2021	Environmental Survey of the Shah Deniz Alpha Field
2020	Regional Environmental Survey of the Shah Deniz Contract Area
2019	Environmental Survey of the Shah Deniz Alpha Field
2018	Shah Deniz Stage 2 Bravo PR and QU Platforms Post-Installation Environmental Survey
2017	SDX-8 Environmental Baseline Survey
2016	Environmental Post Drilling Survey SD11-WF Well Cluster 2016
2015	Regional Environmental Survey of the Shah Deniz Contract Area
2011	Environmental Survey around Shah Deniz Stage 2 East South Manifold Location
2011	Environmental Survey around the SD2 Bravo Platform Complex
2011	Environmental Survey around the SD2 East North Manifold Location
2011	Environmental Survey around the SD2 West South Manifold Location
2009	WF1 Baseline Survey
2009	Shah Deniz Regional Environmental Survey Report 2009
2008	SDX-6 (NF1) Baseline Benthic Survey
2008	Shah Deniz Regional Environmental Survey
2006	SDX-5 Baseline Benthic Survey
2005, 2007	SD Alpha Platform Benthic Survey
2005, 2007	SD Contract Area Regional Water Quality/Plankton Survey
2005	SDX-4 Baseline Benthic Survey
2002	SDX-3 Post Well Monitoring Survey
2001	Shah Deniz Stage 1 Platform and Baseline Survey
2001	SD Contract Area Pipeline Benthic Survey
2001	SD Alpha Platform Location Baseline Benthic Survey
2000	SDX-1 Well Post-drilling Benthic Survey
1998	SD Contract Area Baseline Benthic Survey
Nearshore surveys – Sangachal Bay	
2019	Environmental Survey of Sangachal Bay
2018	Sangachal Bay 3 Years Post SD2 Pipeline Trenching Environmental Survey
2018	Shah Deniz 2 Drop Down Video Survey – Sangachal Bay
2016	Fish Monitoring – Sangachal Bay

Date	Title of survey
2015	Shah Deniz 2 Fish Monitoring – Sangachal Bay
2015	Sangachal Bay Environmental Survey
2014	Shah Deniz 2 Drop Down Video Survey – Sangachal Bay
2013	Sangachal Bay Environmental Survey
2010	ACG Pipeline Survey
2009	Fish Monitoring Sangachal Bay
2008	Fish Monitoring Sangachal Bay
2008	Mapping Sea Grass in Sangachal Bay, Azerbaijan
2008	Sea Grass Taxonomy and Weight Analysis Report: Based on Ninel Karavera (Botany Institute Specialist) Reports
2008	Sangachal Bay Sediment and Plankton Survey
2008	Mapping Sea Grass in Sangachal Bay, Azerbaijan
2008	ACG Pipeline Survey
2006	ACG Pipeline Post Installation Survey
2006	Sangachal Bay Benthic Survey
2006	Mapping of Sea Grass in Sangachal Bay, Azerbaijan Using Drop-down Video and Acoustic Remote Sensing
2005	Fish Monitoring Sangachal Bay 2005
2004	Sangachal Offshore Survey
2004	Sangachal Metocean Study
2004	Biomonitoring at Sangachal (May-Sept-Dec 2004)
2004	Monitoring the Impact of Pipeline Trenching Operations in Sangachal Bay
2004	Trenching Monitoring
2003	Biomonitoring at Sangachal (Sept-Dec 2003)
2003	2003 Sea Grass Studies in Sangachal Bay
2003	Sangachal Seabed Survey
2002	Repeat Sea Grass and Red Algae Studies in Sangachal Bay
2001	Sangachal Seabed Mapping Survey
2000-2005	Sangachal Fisheries Monitoring Programme
2000	Sangachal Repeat Survey (Baseline)
2000	In situ Biomonitoring: Baseline Studies in the Laboratory and at Sangachal Using the Bivalve Mollusc *Mytilaster lineatus* (Gmelin)
1996	Pipeline Landfall Survey: Sediments and Macrobenthos
Terrestrial / coastal surveys	
2012, 2013, 2014, 2015, 2016, 2018, 2022	Environmental Monitoring Programme - Mammal and Herpetofauna Monitoring around Sangachal Terminal

Date	Title of survey
2011, 2012, 2013, 2014, 2015, 2016, 2018, 2022	Environmental Monitoring Programme - Soil and Vegetation Monitoring around Sangachal Terminal
2011, 2012, 2013, 2014, 2015, 2016, 2018, 2020, 2022	Environmental Monitoring Programme - Bird Monitoring around Sangachal Terminal
2012, 2014, 2016, 2018, 2022	Environmental Monitoring Programme - Wetlands Monitoring around Sangachal Terminal
2011	Interpretive Report Geotechnical Investigation SD2 Project Sangachal Terminal
2011	Noise Surveys in Sangachal Terminal Vicinity, March 2011
2011	June/July 2011 Noise Surveys in Sangachal Terminal Vicinity
2011	Traffic Survey in the Vicinity of Sangachal Terminal
2011	Wetland Characterisation Survey Report
2011	Cultural Heritage Baseline Surveys Report
2011	SD2 Early Infrastructure Work Contaminated Land Risk Assessment
2011	SD2 Early Infrastructure Work Dust Baseline Report
2011	Sangachal Groundwater and Surface Water Monitoring. Piezometer Installation and Monitoring Report
2011	Sangachal Terminal Ambient Air Quality Monitoring
2011	Sangachal Terminal Wetlands Faunal Survey
2010	Sangachal Terminal Bird Survey Report
2010	Soil & Vegetation Survey Report - Spring & Autumn
2010	Sangachal Ambient Air Quality Monitoring
2010	Sangachal Terminal Baseline Noise Survey
2010	Sangachal Terminal Light Baseline Survey Report
2010	Sangachal Terminal Odour Assessment
2010	Sangachal Terminal Visual Context Baseline Survey Report
2010	Sangachal Terminal Phase 2 Expansion: Additional Surface Water Studies
2010	EMP Onshore Ambient Monitoring (Sangachal): Bird Monitoring Survey Report
2010	Wetland Survey Report (AMC) – Water & Sediment Analysis
2010	Soil Bore and Groundwater Monitoring Well Installation, Sampling and Surveying Report
2010	Monthly Water Level of Monitoring Wells at Sangachal Terminal
2010	Sangachal Surface and Groundwater Monitoring 2010 1st Round Report
2010	Sangachal Surface and Groundwater Monitoring 2010 2nd Round Report

Date	Title of survey
2010	Sangachal Terminal Wetland Flora and Faunal Survey 2010
2009	Sangachal Terminal Bird Survey Report
2009	Sangachal Terminal Ambient Air Quality Monitoring
2009	Onshore Ambient Monitoring (Sangachal) Bird Monitoring Survey Report
2009	Terrestrial Monitoring Survey Report - Spring & Autumn
2008, 2009	Hydrological Survey Report
2008	Sangachal Terminal Bird Survey Report
2008	Onshore Ambient Monitoring (Sangachal): Hydrology & Hydrogeology – Phase II
2008	Sangachal Terminal SD2 Expansion Area Flora and Fauna Survey
2008	Sangachal Terminal – Surface and Subsurface Water and Landscape Management Study
2007	Sangachal Terminal Ambient Air Quality Monitoring
2007	Sangachal Terminal Terrestrial Monitoring Survey - Spring
2007	Sangachal Terminal Terrestrial Monitoring Survey - Autumn
2007	EMP onshore ambient monitoring (Sangachal): Hydrology & Hydrogeology Analysis & Monitoring System Phase I
2006	Winter Waterfowl Monitoring Study, Absheron to Kura
2006	Sangachal Terminal Ambient Air Quality Monitoring
2006	Sangachal Terminal Terrestrial Monitoring Survey - Spring
2006	Sangachal Terminal Terrestrial Monitoring Survey - Autumn
2006	Ambient Ground and Surface Water Monitoring
2006	Onshore Ambient Monitoring (Sangachal): Hydrology & Hydrogeology – Phase I
2006	Noise Monitoring Report. Sangachal Environmental Team
2005	Integrated Terrestrial Ecosystem Monitoring Survey - Spring
2005	Integrated Terrestrial Ecosystem Monitoring Survey - Autumn
2005	Breeding Bird Survey, Sangachal
2005	Winter Waterfowl Monitoring Study, Absheron to Kura
2004	Overwintering Bird Survey, Absheron to Kura
2004	Breeding Bird Monitoring Survey Sangachal
2004	Winter Waterfowl Monitoring Study, Absheron to Kura
2004	Integrated Terrestrial Ecosystem Monitoring Survey - Spring
2004	Integrated Terrestrial Ecosystem Monitoring Survey - Autumn
2003	Phase 2 Terrestrial Survey
2003	Sangachal Terminal Watershed Analysis
2003	Sangachal Wetlands Survey Summer/Autumn 2002

Date	Title of survey
2003	Overwintering Bird Survey, Absheron to Kura
2002	Phase 1 Terrestrial Survey
2001	Terrestrial Soil and Groundwater Survey
2000	Sangachal Coastal Environmental Survey
1996	Sangachal Coastal Environmental Survey
1996	1996 EOP Sangachal Terminal Survey

This chapter has also been prepared based on a review of other bp ESIAs and Environmental Technical Notes (ETNs) completed for projects in the Azerbaijan sector of the Caspian Sea, including:

- Shah Deniz Compression Geotechnical Survey ETN (RSK, 2024)
- Shah Deniz 2D UHR Seismic Survey ETN (RSK, 2022)
- Shah Deniz Stage 2 (SD2) Project ESIA (URS, 2013)
- Shah Deniz 2 Infrastructure Project ESIA (URS, 2011)
- Shah Deniz Stage 1 (SD1) Project ESIA (URS, 2002)
- Shallow Water Absheron Peninsula (SWAP) 2D Seismic Survey ESIA (AECOM, 2015a)
- SWAP 3D Seismic Survey ESIA (AECOM, 2015b)
- Azeri Central East (ACE) ESIA (AECOM, 2019)
- ACG Full Field Development Produced Water Disposal Project ESIA (URS, 2007)
- ACG Phase 3 ESIA (URS, 2004)
- ACG Phase 2 ESIA (RSK, 2002)
- ACG Phase 1 ESIA (URS, 2002)
- ACG Phase 1 ESIA (URS, 2002)
- Chirag Oil Project (COP) ESIA (URS, 2010).

6.3 Physical and Geophysical Environment

6.3.1 Geology

The Caspian Basin represents one of the largest continental lake systems in the world and has been an area of major sedimentary deposition since its formation in the late Jurassic to early Cretaceous times (approximately 145 million years before present) (Dyman *et al*. 2001). The recent geological sequence is characterised by fluvial deltaic sandstones and lacustrine shales.

The main geological structure in the Shah Deniz Contract Area is a doubly plunging anticline with extensional faults in the upper section and an intermediate neutral zone free of significant faulting and compressional faults at depth. Extensive shallow faulting is present in the Surahkany formation and above, at the top of the anticline structure.

Due to the ongoing Arabian-Eurasian plate convergence a relatively high level of seismic and mud volcano activity is observed in the Caspian region.

Figure 6.2 shows the location of the five largest mud volcanoes in the Shah Deniz Contract Area.

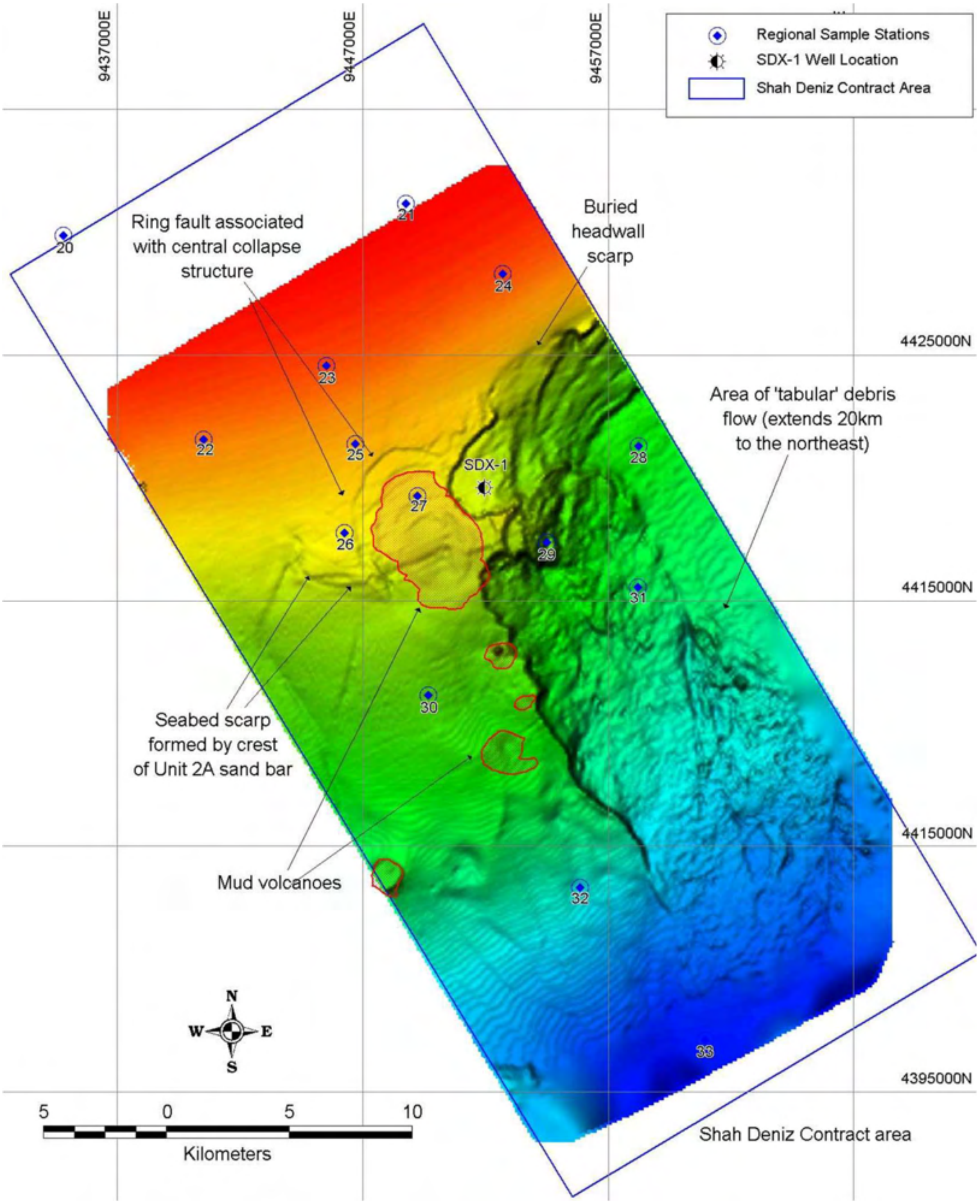

Figure 6.2: Geomorphology of the seabed and location of mud volcanoes in the Shah Deniz Contract Area

Figure 6.3 is a schematic map of the structure and seismicity of the south Caspian region. From this it can be seen that the Southern Caspian Basin is located in an aseismic area surrounded by areas of intense tectonic earthquake activity. A number of seismic epicentres have been registered within the South Caspian Basin, although these are relatively few compared to the number observed around the margins of the basin. The majority of these are located north and west of the Shah Deniz Contract Area. At the time of writing, the most recent earthquake in Azerbaijan waters of the Caspian was a magnitude 5.4 earthquake 44 km northeast of Shurabad in December 2023 (USGS, 2024), remote from the SD Contract Area.

Sediment slumps have been recorded within the Contract Area. The size of these slumps is relatively large, but the frequency of their occurrence is unknown. As described in Chapter 4: Section 4.3, a 2D Ultra High Resolution seismic survey was conducted in September 2023 which allowed siting of the SDC platform to avoid a zone of disturbed soils associated with slope failure in the area of interest.

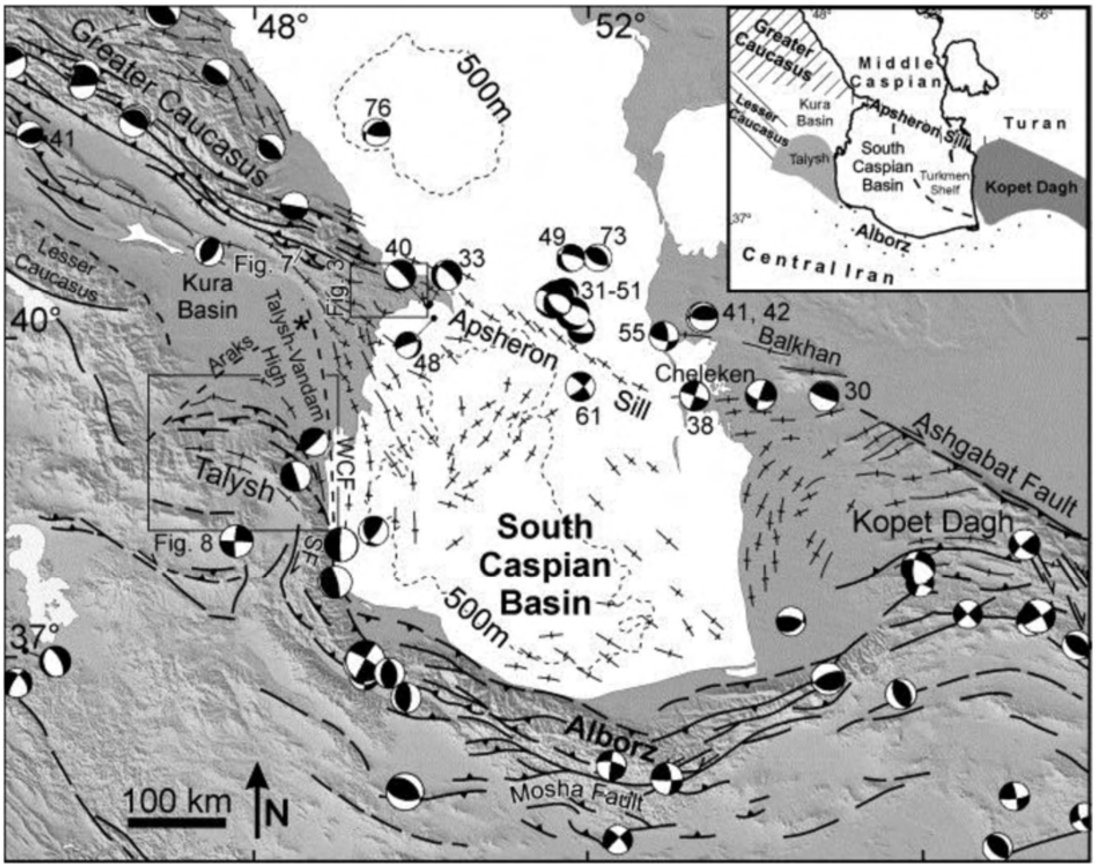

Figure 6.3: Structure and seismicity of the south Caspian region

Source: Allen *et al*. 2003

Note: Centroid depths are only shown for earthquakes deeper than 30 km

SF = Sangevar Fault

WCF = West Caspian Fault

6.3.2 Meteorology and climate

The Caspian Sea region is climatically diverse and encompasses the basins of the vast semi-arid and hot arid plains of northern Kazakhstan and Turkmenistan in the east, and the humid Caucasus and Elburz Mountains in the south-west. The Caspian plays an important role in atmospheric processes, regional water balance and microclimate. Climatic conditions in the Caspian region are linked to the Northern Atlantic Oscillation (fluctuations in atmospheric air pressure) which affects variations in temperatures, humidity and rainfall.

6.3.2.1 Air temperature

The onshore Sangachal area is classified as being warm, semi-arid desert, with an annual mean air temperature of 14.4 °C. July is the warmest month of the year with a 23-year mean average air temperature of 26.4 °C between 1977-2000. January is the coldest month with an average of 0°C. Temperature extremes of –16°C and 41°C have been recorded historically in January and July, respectively (URS, 2013).

Air temperatures show considerable seasonal variation in the Caspian area. According to Kosarev and Yablonskaya (1994), average air temperatures above the Caspian Sea itself typically peak at 25.5 °C during the summer, and may drop to 0 °C for some periods in the winter.

6.3.2.2 Precipitation

Precipitation is highly variable throughout the Caspian region. The highest levels of precipitation occur between September and April where the monthly average can be up to 35 mm. The driest months, July to August, have monthly average precipitation ranging from 7 to 8 mm (AETC, 2011). Annual average precipitation in the offshore environment of Azerbaijan is approximately 300 to 400 mm (AECOM, 2019).

6.3.2.3 Wind

The wind conditions found on the Caspian Sea are formed largely as a result of its north to south orientation, the mountain ranges which surround it and the different weather systems converging on this area (Leroy, 2011). Highest annual average wind speeds of 8 to 9 m/s are observed around the Absheron Peninsula which also experiences the largest number of stormy days (wind speed exceeding 15 m/s) at 60 to 80 days/year. Strong winds and storms can arise at any time of the year but are more common during the winter months (AECOM, 2019). Prevailing winds (i.e., those present for more than 50% of the time) are from the north and northeast, see Figure 6.4.

The wind regime in Sangachal Bay is generally consistent with that for the Absheron Peninsula, although it is recognised that there is a local thermally driven wind system. The effects of the local system are most noticeable offshore within the bay, resulting in a slight (1 m/s to 2 m/s) offshore wind during the early hours of the morning, which reduces and becomes a stronger onshore wind as the land heats up during the warmer months of the year. This thermal influence, coupled with the meteorological dynamics of the region, can result in strong winds occurring with little forewarning (URS, 2013).

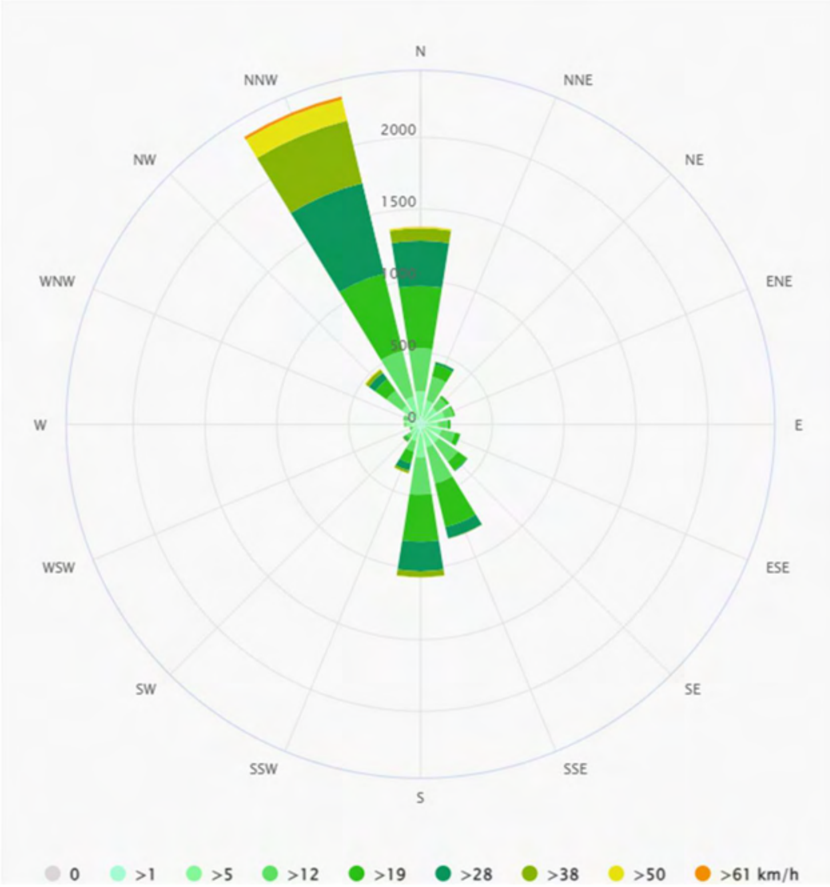

Figure 6.4: Wind rose for Heydar Aliyev International airport (based on 30 years of data)

Source: Meteoblue, 2024

6.4 Terrestrial and Coastal Environment

6.4.1 Construction yards

As described in Chapter 5: Section 5.3.1, the construction yards to be utilised for the SDC project are yet to be confirmed. It has been assumed for the purposes of this ESIA, that a combination of the yards used for the previous SD and ACG projects will be used. The setting of these yards is described below and their location is shown in Figure 5.3.

The yards are in existing industrial areas and no major upgrades or modifications of the sites are proposed for the SDC project. The environmental description provided below reflects the limited impact sources from activities at these sites.

6.4.1.1 Baku Deepwater Jacket Factory yard

The BDJF yard lies approximately 20 km southwest of Baku on the western coastline of the Caspian Sea. The site is approximately 1.5 km^2 in size and bound to the east by vacant land, to the southeast by the Caspian Sea and to the north by the Baku-Alat Highway. The site is located on a coastal plain backed by steep hills that form a ridgeline running approximately parallel to the coast. The coastal area in the vicinity of the yard also includes a number of shallow lagoons, particularly to the west of the yard. There are no residential receptors located within close proximity.

BDJF includes two areas: the area to the north that was previously used for construction of the ACG Phases 1, 2 and 3, West Chirag and SDB-QU and SDB-PR jackets; and the area to the south where a number of bp project topsides have been constructed. The BDJF yard was also used to construct some of the subsea infrastructure for the SD2 project.

The yard has been utilised for industrial purposes in the past and several derelict structures including buildings, storage tanks and wellheads are present in the surrounding area. Based on a study conducted in the vicinity of the yard (ERM, 2003 cited in URS, 2004) it is likely that at least part of the surrounding area will have surficial and buried debris and hydrocarbon contamination associated with previous developments.

No reported aquifers supplying potable drinking water are found in the area. Groundwater sampling has not been undertaken at the BDJF site, however, a survey of surface water in an adjacent area indicated that several contaminants, such as hydrocarbons, polycyclic aromatic hydrocarbons (PAHs), and the heavy metals copper and selenium were present (URS, 2004).

As the BDJF yard is within an existing industrial area, it has limited ecological value and limited flora and fauna. Adjacent areas, and in particular the coastal areas of the Caspian Sea, however host considerable bird life. The artificial dams at the site have been identified as an Important Bird Area by BirdLife International due to their significance for wintering and migratory seabirds (see Section 6.4.3.2). Wintering bird counts for this site for 2022, 2023 and 2024 are included in Appendix 6A.

6.4.1.2 AzFen Bayil yard

The AzFen Bayil yard is an operational yard used extensively for oil and gas industry related construction. It is located approximately 8 km south of Baku and is bound to the east and south by the Caspian Sea. Land to the west of the yard is mostly a mix of industrial sheds and storage yards with the settlement of Bibiheybat located approximately 1 km away. To the north is the Bibiheybat oil field. The yard extends over an area of approximately 1 km^2 .

The Phase 1 Compression and Water Injection Platform (CWP), Phase 3 Production Compression Water Injection and Utilities (PCWU), West Chirag and Shah Deniz Bravo (SDB) Quarters and Utilities (QU) and Production and Riser (PR) topsides were fabricated at this yard. With the exception of the Bibiheybat settlement approximately 1 km to the southwest of the yard boundary, the area in which the yard is located is generally commercial / industrial in nature.

Baseline ambient noise surveys undertaken in the yard vicinity in 2015 (AECOM, 2015b) recorded average daytime noise levels of 63-65 dB (LAeq), which are considered typical of the industrial environment, and were considered to be due to industrial activities and road traffic noise primarily from the Baku-Alat Highway, which was identified as the dominant noise source.

Development activities have been ongoing at the site since the 1920s and these are likely to have contributed to the current contamination status. Groundwater at the yard occurs at shallow depths across the site, typically between 0.6 – 2.7 m below ground level. Groundwater surveys indicate that there is hydrocarbon and heavy metal contamination. Such contamination is attributable primarily to historical oil field development activities (URS, 2004).

Air quality measurements conducted relatively close to Bayil Yard in 2003 found that ambient air conditions did not exceed the World Bank General Environmental Guidelines or WHO Ambient Air Quality Guidelines for 24 hour averages for nitrogen oxides and sulphur dioxide. Exceedances of particulates (PM_{10}) guidelines were recorded, however, it should be noted that PM_{10} measurements vary from day to day and can often be due to local weather conditions such as high winds (URS, 2004).

Being reclaimed land, and an industrial site with historic pollution resulting from oil field activities, Bayil yard and its surroundings are virtually devoid of flora. Given the lack of suitable habitat fauna is also minimal. The coastal area adjacent to the yard is heavily polluted and the benthic sediments are contaminated as a result of urban run-off, sewage discharge from the greater Baku area, and by industrial activity including oil exploration and production both at and near the site.

Sensitivity

Both construction yards are considered to be low sensitivity as they are within existing industrial areas with limited ecological value.

6.4.2 Sangachal Terminal and onshore PFOC route

As described in Chapter 5: Section 5.6, works at Sangachal Terminal associated with the SDC project will be limited to brownfield modifications associated with the PFOC tie-in. No new infrastructure will be required at the Terminal (other than installation of power receiving and transfer kit) and there will be no expansion of the terminal area. Likewise, the onshore power cable route will follow the existing route of the SD2 gas export pipelines. The first part of the PFOC route from the landfall to the first road crossing (approx. 360 m) will be within a fenced security area. The last 2 km of the cable route will be laid within the boundary of Sangachal Terminal and is outside the scope of this ESIA (see Figure 5.13). The environmental description provided below reflects the limited impact sources from these activities.

6.4.2.1 Setting

Sangachal Terminal covers approximately 7 km^2 on a plain sloping towards the southeast and to the shore of the Caspian Sea and surrounded by steep hills to the north, northwest and northeast.

The Terminal was first developed as part of the Early Oil Project (EOP) in 1996 and 1997 to process and export oil produced on the Chirag platform. There have been a number of upgrades and expansions of the Terminal over the years to support the development of the ACG and SD fields. The most recent expansion works at the Terminal for the SD2 Project commenced in 2011 and are now complete.

There are four main residential areas around Sangachal Terminal, see Figure 7.1 (Socio-economic Description chapter). The largest, Sangachal Town is approximately 2.5 km southwest. Both Azmin Kend and Masiv 3 are approximately 2.7 km to the west. Umid is less than 1 km to the southeast.

The Baku-Alat Highway and a raised railway both run parallel to the Caspian Sea coastline, running adjacent to Umid and Sangachal Town. Several pipelines for oil, water and gas also run parallel to highway and railway.

Sangachal Power Station, a state-owned facility located between Sangachal Terminal and Sangachal Town, produces electricity using gas-combustion generators.

6.4.2.2 Hydrology and hydrogeology

The nearest main river to Sangachal Terminal is the Djeyrankechmes River, which flows to the southwest of Terminal and enters the Caspian Sea approximately 2.8 km south of the Terminal (at its closest point). Water flow in this river is primarily seasonal, occurring only after heavy rain.

Other surface water features in the vicinity of the Terminal include the Shachkaiya Wadi (see Figure 6.5) and associated channels and wetland areas, located approximately 500 m to the west of the Terminal and the Caspian Sea itself located approximately 1.5 km to the southeast. The main catchment areas for the Shachkaiya Wadi are located to the north of the Terminal. Surface water to the south of the Terminal principally flows from the northwest through the seasonal Shachkaiya Wadi in a southeasterly to easterly direction, through wetland areas, before discharging to the Caspian Sea.

A drainage channel has been constructed around the northern, western and eastern perimeters of the Terminal to protect it from potential flooding. The channels diverts floodwaters into existing natural drainage lines which exist between the Terminal and the Caspian Sea. The northern arm of this flood protection drainage channel previously carried a small, but steady, stream of water which is understood to be partly derived from treated sewage effluent discharges generated at the Terminal, to the Caspian Sea. In 2018 a new pipeline was installed which now transfers treated water from the Terminal sewage treatment plant to a newly constructed outfall basin (located under the highway) and then out to the sea (after approximately 250 m) (AECOM, 2023a).

As stated above, there is a wetland area located between the Terminal and the Baku-Alat Highway. As part of bp's EMP, surveys are undertaken in this area every two years focussing on wetland ecology, soil, and surface water conditions (surveys commenced in 2012). The most recent wetland survey in the vicinity of Sangachal Terminal was in 2022.

There has been a reduction in the extent of the wetlands since 2007. Recent reductions have been attributable to a dewatering project conducted by SOCAR in 2017, and the Sangachal Terminal sewage treatment plant (STP) outfall upgrade project in 2018 which has resulted in treated water from the terminal STP no longer being discharged into the wetland area directly south of the terminal.

Water sampling conducted in the wetland area in 2022 indicated that TPH, nitrate, ammonium and copper concentrations were found to exceed assessment criteria at a limited number of locations. In the area of the proposed SDC PFOC, exceedances of assessment criteria for ammonium were recorded (0.024 – 0.856 mg/l) and copper (1.56 – 4.45 µg/l).

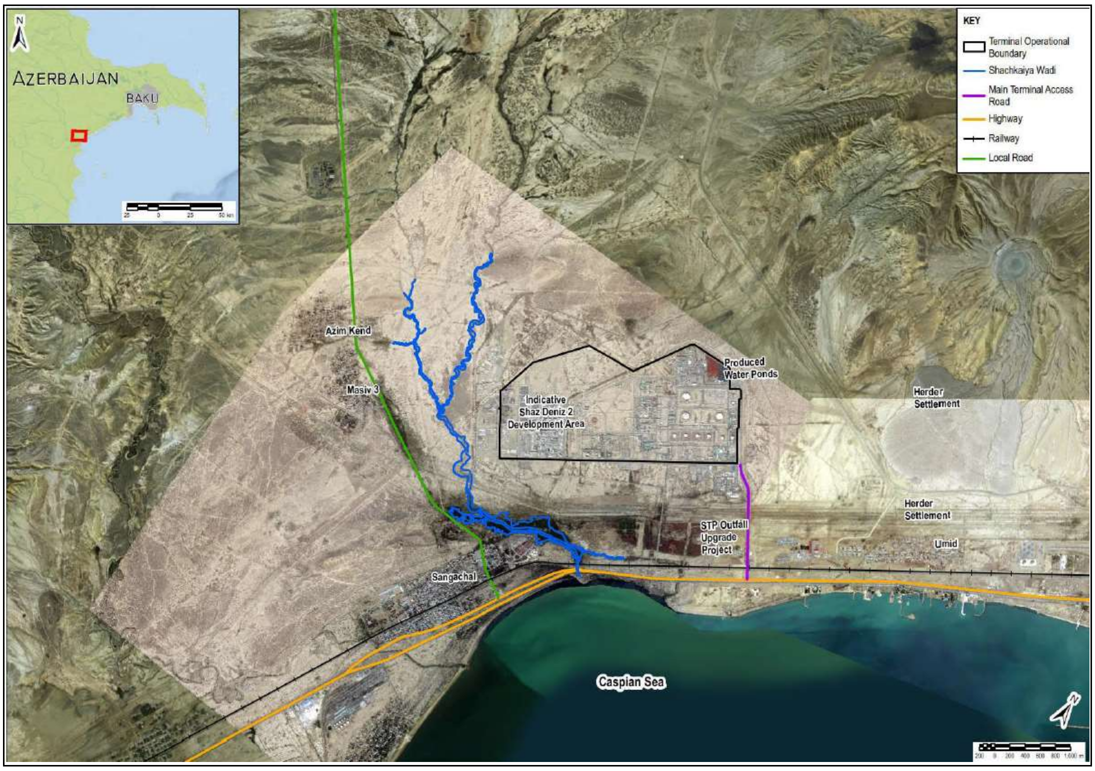

Figure 6.5: Sangachal Terminal and surroundings

Source: AECOM, 2023a

Shallow groundwater is only expected in small quantities in occasional seams or lenses of higher permeability material within the area, which consists of superficial strata of a generally significant thickness and low permeability. Indeed, surveys in the area indicate evidence of little to no intermittent groundwater present and a generally consistent groundwater flow direction from high ground in the north towards the Caspian Sea to the southeast (AECOM, 2019b).

Sensitivity

Surface water sampling at wetland stations closest to the proposed onshore PFOC route indicated elevated level of ammonium and copper (elevated levels also recorded at other sampling stations). In other areas of the wetland elevated TPH (recorded at one station) and nitrate levels were also recorded (recorded at one station).

There is no evidence to suggest that groundwater is abstracted and utilised by the local community for consumption, or for industrial use, and therefore it is of limited value. It may however, provide an intermittent baseflow to the wetlands areas and surface watercourses.

6.4.2.3 *Geology and soils*

The superficial geology of the area is relatively consistent with the wider area, mainly surface deposits overlaying variably weathered sedimentary bedrock units of the Absheron Group.

Long-term monitoring of soil and vegetation has been ongoing in the vicinity of Sangachal Terminal since operations commenced and, more particularly, since systematic monitoring commenced under bp's EMP in 2010. The most recent soil and vegetation survey in the vicinity of Sangachal Terminal was in 2022 (spring and autumn sampling periods). Soil monitoring at the station in closest proximity to the terrestrial SDC PFOC route[1] recorded soils characterised as knoll-solonchak soil, although it is noted that this station is isolated within the wetland band about 250 m south of the Terminal, which lies to the east of the proposed PFOC route. The area that will be crossed by the proposed PFOC route is described as being solonchak[2] saline thickened grey-brown soils, common within the coastal zone. The soil is additionally characterised by thickening of the mid-layer (20-50 cm), large crumpled-prismatic structure, clear vertical cracks and weal threadlike roots of plants (AECOM, 2023a).

Soil sampling indicated no exceedances of soil screening criteria, with the exception of arsenic, which exceeded the Canadian Council of Ministers of the Environment (CCME)[3] criteria at seven locations (including those in the vicinity of the proposed PFOC route where it ranged from 13 – 16 mg/kg dry mass). The report indicated that the concentrations of arsenic were likely to be consistent with natural background conditions and therefore not an indicator of any impact from Sangachal Terminal (AECOM, 2023b).

Sensitivity

Surface soils are considered to be of low general quality supporting little vegetation which is utilised by livestock. Surveys results indicate that heavy metal concentrations and TPH are generally typical for the region.

6.4.2.4 Flora

The plant communities in the Sangachal Terminal area are highly adapted to the desert / semi-desert and coastal saline landscape. The sodic and saline conditions of the soil have resulted in vegetation that is generally species poor and mostly consists of salt-tolerant plants such as mugwort (*Artemesia fragrans*), saltwort (*Salsola* spp), glasswort (*Halocnemum strobilaceum / Salicornia strobilacea)*, and salt cedar (*Tamarix*).

Along the route of the terrestrial SDC PFOC, *Salsola dendroides* and *Artemesia fragrans* communities are dominant, with chal meadow, reed beds and *Tamarix* scrub in the wetland areas.

The most frequently recorded plant species in the wetlands in 2022, in descending order of frequency of occurrence across the 12 stations, were *Phragmites australis*, *Salsola dendroides*, *Alhagi pseudalhagi*, and *Tamarix ramosissima* (AECOM, 2023b).

Vegetation cover surveys carried out in the Terminal area from 2009 to 2022 indicate shrub cover has increased from almost zero to approximately 16-20%, with this increase primarily occurring from 2014 onwards at the same time as a reciprocal decrease in forb cover (herbaceous flowering plants). This woody plant encroachment is consistent with global trends in dryland ecosystems and is considered a major driver of land degradation in arid environments. Bare soil cover has remained largely stable between 2009 and 2022.

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[1] Soil monitoring station S4-1.

[2] Solonchak soils have a high concentration of soluble salts.

[3] CCME Soil Quality Guidelines (SQGs) for the Protection of Environmental and Human Health.

Microbiotic crust cover (surface stability attributed to the presence of lichens, cyanobacteria, etc) has not changed significantly over the survey period. In spring, as compared to bare soil, crust cover was 5% in 2009 and 2% in 2022. Autumn crust cover as compared to bare ground is very consistent over this period and is typically in the order of 2-3%. There is no evidence to indicate a long-term change in cover.

Inter-annual variation in rainfall patterns (and possibly soil stability) is considered likely to be the main influence on vegetation growth and thus the condition recorded in any given year.

Sensitivity

The terrestrial monitoring surveys completed to date have focused on identifying potential changes and trends in floral species present and vegetation cover. These indicate woody plant encroachment consistent with global trends in dryland ecosystems. Wetland habitats generally have the greatest diversity of flora, no unique habitats have been identified in the Terminal vicinity.

6.4.2.5 Mammals, amphibians and reptiles

As part of bp's EMP, annual surveys of mammals and herpetofauna (reptiles and amphibians) have been undertaken since 2011 in the vicinity of Sangachal Terminal. The most recent mammal and herptofauna was in 2022 (June and October sampling periods). A total of 16 species of fauna were recorded - two species of amphibian, seven species of reptile and seven species of mammal. Two species of special conservation interest were identified, namely *Emys orbicularis* (European pond turtle), which is listed as 'Near-threatened' on the IUCN Red List[4], and *Testudo graeca* (spur-thighed tortoise) listed as 'Vulnerable' on the IUCN Red List and included in the 2023 Azerbaijan Red Book (AzRB)[5]. The single sighting of the European pond turtle was recorded to the south of the Terminal adjacent to the wetland area, whereas the spur-thighed tortoise sightings were from locations to north and south of the Terminal.

In the June and October 2022 surveys, at monitoring stations in closest proximity to the terrestrial SDC PFOC route[6], a number of mammals were recorded namely European hare (*Lepus europeaus),* red fox *(Vulpes vulpes),* golden jackal *(Canis aureus) and* Libyan jird *(Meriones libycus)*. In addition the reptiles spur-thighed tortoise *Testudo graeca a*nd the rapid racerunner *Eremais velox* were recorded at the two stations in the vicinity of the wetlands.

Decreases in the distribution of marsh frog (*Pelophylax ridibundus*) continued, with only a single sighting recorded in June 2022 in the wetland to the southwest of the terminal. A partial drying of wetland areas could, in part, explain the decrease (AECOM, 2023c).

[4] The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. It divides species into nine categories: Not Evaluated, Data Deficient, Least Concern, Near Threatened, Vulnerable, Endangered, Critically Endangered, Extinct in the Wild and Extinct.

[5] Red Book of the Republic of Azerbaijan – Fauna (Third Edition).

[6] Monitoring stations M4, M12, M24, M43, M44 and M62.

Sensitivity

While fauna surveys have been undertaken in the vicinity of the Terminal over a number of years, it is not yet possible to identify trends in relation to populations or geographical distribution. This is mainly due to species variation and perceived low populations found to date.

The presence of a number of species included within the IUCN Red List and/or AzRB have been recorded. Spur-thighed tortoise have been consistently recorded in the area surrounding the Terminal. The likely reason for this is due to the relocation programme undertaken prior to and following earlier ACG and SD terminal projects in which spur-thighed tortoise were collected prior to the works and then reintroduced away from the Terminal once the works were completed.

The most sensitive period for spur-thighed tortoise is considered to be April to August, and the most sensitive period for European pond turtle is March to July, as these are the respective breeding periods.

6.4.2.6 Birds

As part of bp's EMP, surveys of birds have been undertaken using a consistent method since 2011 in the vicinity of Sangachal Terminal. The most recent bird survey in the vicinity of the Terminal was in 2022 (winter, spring / summer and autumn sampling periods). This survey recorded the second largest number of individual birds (19,741), with the most species recorded (87 species) since the commencement of monitoring in 2011. Four IUCN Red List species and five AzRB species were recorded[7]. Common pochard, Eurasian coot, tufted duck, common shelduck and European starling were the most abundant species.

Bird counts in the east-southeast segment are of most relevance to the SDC project as this segment encompasses the proposed terrestrial SDC PFOC route (up to the point where it crosses the boundary into the Terminal). Average species diversity[8] within this segment in 2022 was 1.2, the tied highest value for all segments in the survey. This is in line with the fact that the habitats with the highest suitability for breeding birds were associated with the coastal zone to the southeast of Sangachal Terminal.

The populations of waterfowl species, which have been selected as bio-indicators in terms of the environmental conditions for the wetland habitat, appear to be fairly stable over consecutive years. However, the fluctuating numbers of ferruginous duck (*Aythya nyroca)*, an AzRB 'Vulnerable' and IUCN Red List 'Near-threatened' resident species, is a cause for concern (AECOM, 2023d).

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[7] IUCN Red listed species - common pochard *Aythya ferina,* cinereous vulture *Aegypius monachus,* pallid harrier *Circus macrourus and* lapwing *Vanellus vanellus.* Red Book of Azerbaijan Republic species - purple heron *Ardea purpurea*, pallid harrier *Circus macrourus*, European roller *Coracias garrulus*, long-legged buzzard *Buteo rufinus* and black-bellied sandgrouse *Pterocles orientalis*. Note that the survey report was prepared before issue of the updated 2023 AzRB.

[8] Diversity index calculated by dividing the total number of species recorded in a segment with the number of point counts within the segment.

Sensitivity

Birds are most sensitive to disturbance during the breeding season (typically mid-March to end of August). Of the species identified in 2022, five are ground nesting[9], and have been recorded in the vicinity of Sangachal Terminal.

Breeding birds are most sensitive to sudden unexpected and loud noise. The survey results obtained within the Terminal vicinity show there has been little change in the richness and number of bird species over time and suggest that the breeding birds are likely to be habituated to the industrial noise from the Terminal, Sangachal Power Station, highway traffic noise and other industrial activities in the area.

There is no evidence, from the surveys completed to date, that the habitat within the area around the Terminal is of unique value to breeding birds.

6.4.2.7 Air quality

Due to the relatively rural setting of Sangachal Terminal, reported nitrogen dioxide (NO_2) concentrations (considered a key indicator of air quality) have remained relatively consistent and well below the EU standard of 40 µg/m^3, and much lower than the concentrations reported for Baku City (up to 120 µg/m^3).

The most recent passive air monitoring of stations in the vicinity of the Sangachal Terminal occurred in 2023. Air monitoring data for three stations in the immediate vicinity of the proposed onshore SDC PFOC route are shown in Table 6.2. Values for all parameters were lower than the standard values for Azerbaijan daily average and European Union (EU) averages. Air quality parameters for these stations have remained relatively stable over the past five years, although a slight decrease was observed in most parameter values in 2023 compared to previous years. There are no evident trends in deteriorating air quality (Azecolab, 2023a).

Wind-blown dust is a known nuisance issue across the region and considered typical of the semi-arid environment. Ambient air quality monitoring carried out in the vicinity of Sangachal Terminal in 2022 recorded PM_{10} levels of between 12 - 44 µg/m^3 (Azecolab, 2023b). Particulates monitoring data for three stations in the immediate vicinity of the proposed onshore SDC PFOC route are shown in Table 6.2.

Table 6.2: Passive air quality monitoring results of stations in the immediate vicinity of the proposed onshore SDC PFOC route

Parameter (µg/m^3)	Station		
	AAQ13	AAQ18	AAQ20
NO	<0.5	<0.5	<0.5
NO_2	7.39	8.37	7.41
NOx	7.4	8.4	7.4
SO_2	<2	<2	<2
Benzene (sample 1)	0.4	0.5	0.5

[9] These include chukar (*Alectoris chukar*), lesser short-toed lark (*Calandrella rufescens*), Calandra lark (*Melanocorypha calandra*), crested lark (*Galerida cristata*) and black-winged stilt (*Himantopus himantopus*).

Parameter (µg/m³)	Station		
	AAQ13	AAQ18	AAQ20
Benzene (sample 2)	0.3	0.4	0.4
TVOC (sample 1)	35.1	48.4	26.0
TVOC (sample 2)	47.6	48.4	26.0
PM_{10}	12	16	24

Source: Azecolab, 2023a and Azecolab, 2023b

Note: Q2 2023 for all sampling, with exception of PM10 which was Q4 2022.

Duplicate sampling of benzene and TVOC was conducted.

Sensitivity

Air quality concentrations have been regularly monitored at locations in the Terminal vicinity since 2006. Air quality is generally good and relevant air quality standards are met, with the exception of particulate matter where the exceedances are due to the semi-arid environment and natural wind-blown dust.

6.4.2.8 *Noise*

The most recent ambient noise monitoring in the vicinity of Sangachal Terminal was carried out in September 2024. Monitoring results obtained when winds speeds exceeded 5 m/s were excluded as, under these conditions, results are affected by wind noise.

Daytime noise monitoring at Umid, Sangachal and Azim settlements (23 September 2024, wind direction from south) did not detect noise generated from operation of the Terminal, and all results were below the daytime noise limit of 55 dB (LAeq), ranging from 47.6 – 50 dB (LAeq). Other noise sources included traffic noise from the Baku-Alat Highway and from Sangachal settlement electrical station (bp, 2024a).

Similarly, night time measurements at the same locations (24 September 2024, wind direction from north) did not detect noise generated from operation of the Terminal, monitoring results at Umid and Azim settlements were below the nigh time noise limit of 45 dB (LAeq), ranging from 36.7 – 41.1. Monitoring results at Sangachal were slightly above the night time noise limit (47.5 dB (LAeq)) but this was predominantly due to noise from the Baku-Alat Highway and Sangachal settlement electrical station (bp, 2024b).

Sensitivity

Noise from the Terminal was not dominant at any of the receptors during the survey period. The Baku-Alat Highway and Sangachal settlement electrical station were the main sources of noise.

6.4.2.9 *Archaeology and cultural heritage*

In 2011, baseline archaeology and architectural surveys were undertaken with the Institute of Archaeology and Ethnography (IoAE) as part of the studies for the Shah Deniz 2 ESIA. No evidence of buried archaeological remains were found during the survey. The survey results indicated that the SD2 project onshore areas did not contain permanent settlements or buried archaeological deposits. Rather, the discovered artefacts were the results of rural seasonal activities in the area during the late Middle Ages, probably representing shepherds or caravan camps.

In the vicinity of the Shah Deniz 2 gas export pipeline route (the proposed SDC PFOC will follow the same route) 18 isolated finds were identified (see Figure 6.6). The majority of these consisted of red earthenware sherds. Adjacent to the proposed SD2 gas export pipeline landfall area, one isolated find was identified also consisting of red earthenware sherds. Two archaeological sites were also identified – a ceramic scatter was found at Sangachal site 14 (the age of which was unknown), and a 17th/18th century ceramic scatter was found at Sangachal site 15 (see Figure 6.6).

In terms of cultural heritage sites, a sand cave (protected state monument) is in closest proximity to the SDC PFOC route, approximately 250 m to the west, see Figure 6.6. Sangachal Caravanserai protected state monument (medieval inn) is more than 1 km away from the cable route.

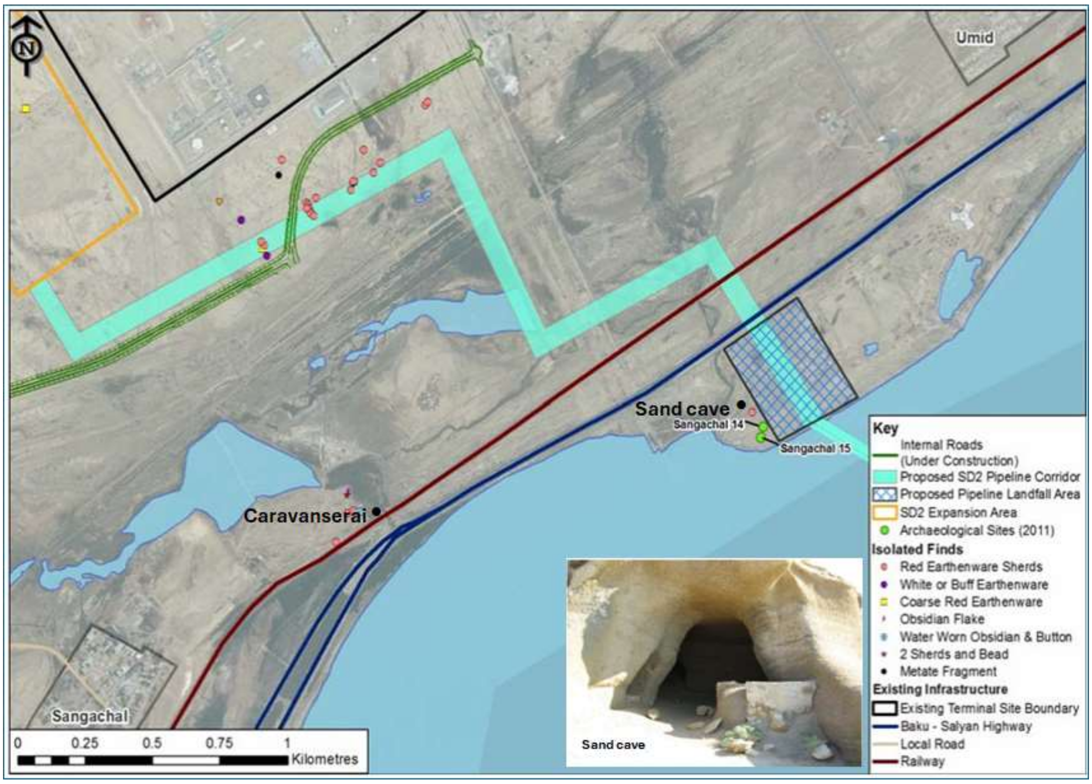

Figure 6.6: Archaeological sites identified near the Shah Deniz 2 gas pipeline export route

Source: Amended from URS, 2013

Sensitivity

No evidence of buried archaeological remains were found during the survey of the area. The discovered artefacts are thought to be associated with rural seasonal activities such as shepherds or caravan camps in the Middle ages.

6.4.3 Azerbaijan coastline

6.4.3.1 Coastal habitat

A variety of coastal habitats, comprising a mixture of natural and man-made, are found along the Azerbaijan coastline. Typical habitats present along the coast from the Absheron Peninsula in the north, to Neftchala in the south (approximately 150 km length of coastline) include:

- exposed rocky shores
- exposed solid man-made structures
- shelving bedrock shores
- eroding scarps
- sand and mixed gravel beaches
- mixture of exposed and sheltered riprap
- mixture of exposed and sheltered sand and mud flats
- backshore sand and mud flats
- marsh, reed beds and bog.

The coastline of the Absheron Peninsula comprises mainly marsh vegetation including dense stands of water reed and soft rush (*Juncus effusus*) interspersed with areas of sand beach and rocky shores. Much of the coastline from Turkan, around Baku Bay and towards Sahil has either been developed, or is in the early stages of development, with only sporadic patches of natural habitat or semi-natural habitat such as Puta Bay near the BDJF yard which consists of coastal lagoons, wet sandy areas and areas of gravelly beach. The coastline around Sangachal Bay comprises several habitats including a rocky coastline with sparse vegetation cover, littoral reedbeds, shallow lagoons, and a salt marsh interspersed with areas of existing or previous urban and industrial development. The coastline from Sangachal Bay to Neftchala in the south is mainly rural in character and is dominated by sandy beaches with some sand and mud flats which are used by birds. Vegetation density varies from sparse to extensive with swamp/marsh areas, together with areas of mudflat, frequently colonised by glasswort grasses, shrubs and some reed beds (depending on the extent of standing water).

Sensitivity

The majority of coastal habitats listed above are unlikely to be affected by the SDC project. Information has been included for completeness, however, to take into account potential accidental events such as a hydrocarbon release.

Off the shoreline types listed above, marshland and mudflats are considered the most sensitive with respect to hydrocarbon pollution as they collect run-off from their surrounding environments, are home to many vital species, and are difficult to access to remediate.

6.4.3.2 Birds

The Caspian region has a high diversity of bird species, with a large number of endemic species present. At a regional level, the coastal zone of the Caspian Sea has been identified as an area of ornithological importance as it supports both internationally and nationally significant numbers of migrating and overwintering birds. Given Azerbaijan's location within the bird migration circuit of Europe, Asia and the Middle East a large number of bird species have been recorded, with onshore and offshore areas providing habitats for 348 avifauna species, including 32 species of seabirds (BirdLife International, 2024a).

A literature review update was undertaken in June 2024 by Nigar Agayeva (Azerbaijan Ornithological Society) to obtain the latest information on birds relevant to the SDC project. Information from the literature review is included in the sections below and the full report is included in Appendix 6A.

Migratory birds

The distribution and abundance of birds in the coastal region is subject to significant seasonal changes, particularly during the spring and autumn migration periods, as birds move between feeding, breeding and overwintering grounds. The coastline of Azerbaijan is a major flyway for migrating waterfowl and coastal birds, who nest in parts of Russia, western Siberia, and northwestern Kazakhstan and migrate to the southern coast of the Caspian Sea, the Kur-Araz lowland, Turkmenistan, southwest Asia and Africa for the winter. The autumn migration begins in the second half of August and continues until mid-December although this may extend into January during years of severe winter in Russia. The most active autumn migration period is November. The spring migration starts in the second half of February and ends in April, with the most active period during March.

Migratory bird surveys have been conducted along the Azerbaijan coastline annually since 2011. Data collated from 2011 to 2023 has identified a total of 360 species – 185 species are non-passerine (50 of which have protected status); 129 species are waterfowl or shorebirds, and 33 are raptors. The list of non-passerine species, with results of migration counts and conservation status, is provided in Appendix 6A.

Overwintering birds

Overwintering bird counts along the Azerbaijan coastline in January 2023 (15 day survey period) recorded 960,000 individuals, comprising 157 species (Sultanov *et al*. 2023). The majority of birds to overwinter are ducks (of the genera *Anas, Netta* and *Aythya*) and coot (*Fulica atra*) but migrating herring, common, black-headed and great black-headed gulls (all of the genus *Larus*) also overwinter along the coastline.

The most important sites for overwintering birds are:

- Gizil Agach Nature Reserve – up to 1,000,000 birds
- Absheron National Park – up to 150,000 birds
- Alat – Gobustan Bay – 80,000 to 90,000 birds
- Pirallahi Island – up to 70,000 birds
- Kura Delta – up to 40,000 birds.

Due to the fall in Caspian sea level since 1996 (see Section 6.6.1) the distribution of birds along the Azerbaijan coastal zone has changed, with numbers decreasing in Gizil Agach Nature Reserve and around the Kura Delta, and numbers increasing in Absheron National Park and Pirallahi Island (Agayeva, 2024).

Nesting birds

The breeding and nesting season along the Azerbaijan coastline begins at the end of April / beginning May and continues until mid-July. At the end of July and beginning of August, the birds leave their nesting places and disperse. The coastline is host to a number of important nesting migratory seabirds, in particular the Mediterranean gull (*Larus melanocephalus*) (listed in the AzRB) and the slender-billed gull (*Larus genei*), and a number of tern species (of the genera *Sterna, Chlidonius and Hydroprogne*). The most recent surveys undertaken in June 2017 indicated three areas of particular importance to nesting birds (see Figure 6.7):

- Shahdili Spit – The Shahdili Spit and associated islands is a designated Important Bird Area (IBA), comprising a mixture of habitats for nesting birds including areas of open dry land, wet sandy areas, rocky areas, reeds and marshes. A wide variety of nesting species are known to use the area (primarily terns and gulls but also wading birds including plover and avocet, herons, grebes and coots). One nesting species of conservation importance (pied avocet) has been recorded in this area.
- Dash Zira – Island located to the immediate south of Baku and comprising open dry lands, rocky, gravelly places, piled shells and wet sandy areas. Also includes an area of long reeds approximately 1 to 2 m wide and between 60 to 70 m long. A rich diversity of birds is found here, which is attributed to the favourable ecological conditions.
- Gil Island – This State Nature Reserve consists of open dry rocky shore with shell and sandy areas throughout and some long reed bush. The most recent surveys carried out recorded five species including Caspian gull, common terns, sandwich tern, black winged stilt and pied avocet.

Previously lagoons along the Caspian coastline supported populations of small nesting birds such as little grebe, little bittern, marsh harrier, moorhen, purple swamphen, black-winged stilt, kentish plover, little ringed plover, common tern, little tern, kingfisher and different passerines. However, the development of tourism, with large parts of the coastline around Baku and Sumgayit taken over for construction of private houses, hotels and guest houses has resulted in a decrease in the nesting population in these areas. The decrease in Caspian sea level has also led to the drying out of lagoons previously used by these species (Agayeva, 2024).

Species of conservation importance

Table 6.3 lists the 15 bird species of conservation importance (included in the IUCN Red List or listed in the 2023 Azerbaijan Red Book[10]) known to be present along the Absheron to Neftchala coastline (predominantly migratory and overwintering birds).

[10] Red Book of the Republic of Azerbaijan – Fauna (Third Edition).

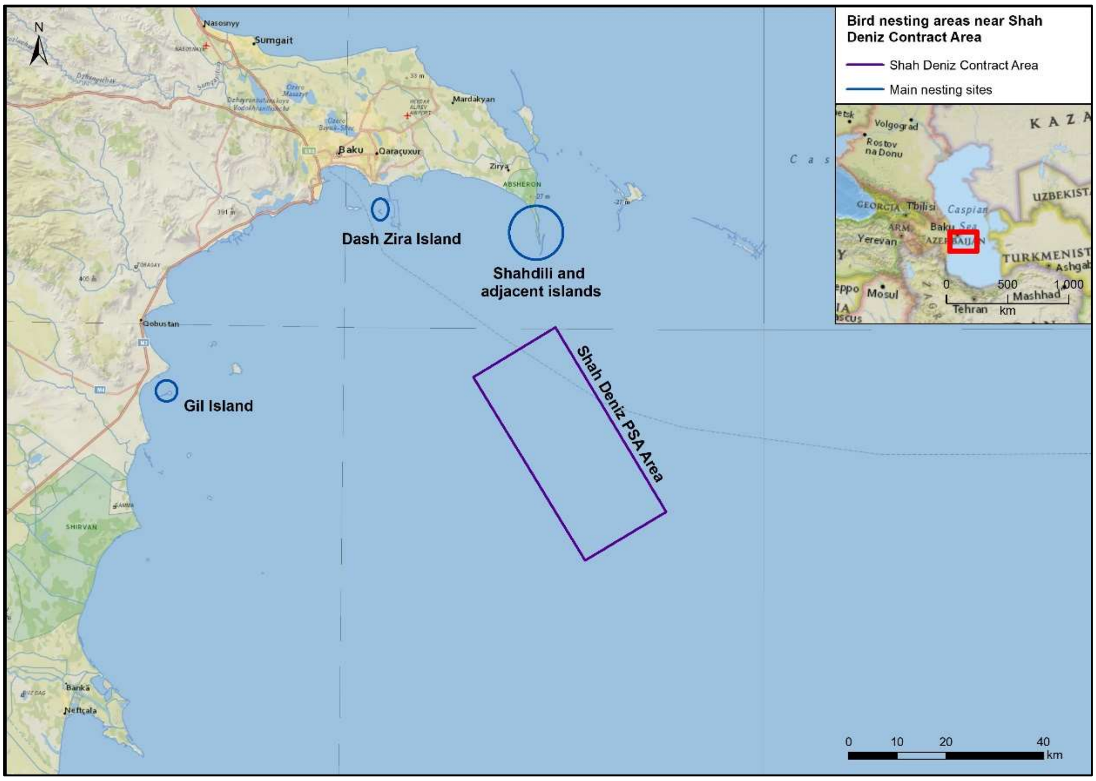

Figure 6.7: Key nesting sites of coastal birds on the Absheron – Gobustan coastline

Source: AECOM, 2019

Table 6.3: Bird species of conservation concern recorded on southwest Caspian coastline

Common name	Scientific name	Protection status
Great white pelican	*Pelecanus onocrotalus*	AzRB – EN IUCN Red List - LC
Dalmatian pelican	*Pelecanus crispus*	AzRB – VU IUCN Red List - NT
Greater flamingo	*Phoenicopterus ruber*	AzRB – VU breeding, NT wintering IUCN Red List - LC
Mute swan	*Cygnus olor*	AzRB – CR breeding, NT wintering IUCN Red List - LC
Bewick’s swan	*Cygnus columbianus bewickii*	AzRB – VU IUCN Red List - LC
Tundra swan	*Cygnus columbianus*	AzRB - VU
Marbled duck	*Marmaronetta angustirostris*	IUCN Red List - NT

Common name	Scientific name	Protection status
Ferruginous duck	*Aythya nyroca*	AzRB – VU IUCN Red List - NT
Common pochard	*Aythya ferina*	AzRB – NT IUCN Red List - VU
White-headed duck	*Oxyura leucocephala*	IUCN Red List - EN
Western swamphen	*Porphyrio porphyrio*	AzRB – VU IUCN Red List - LC
Black-tailed godwit	*Limosa limosa*	AzRB – VU IUCN Red List - NT
Black-bellied sandgrouse	Pterocles orientalis	AzRB - VU IUCN Red List - LC
Eurasian curlew	*Numenius arquata*	AzRB – VU IUCN Red List - NT
Curlew sandpiper	*Calidris ferruginea*	AzRB – NT IUCN Red List - NT
Northern lapwing	*Vanellus vanellus*	AzRB – EN IUCN Red List - NT
Mediterranean gull	*Larus melanocephalu*	AzRB – VU IUCN Red List - LC
Pallid harrier	*Circus macrourus*	AzRB – VU IUCN Red List - NT
Osprey	*Pandon haliaetus*	AzRB – CR IUCN Red List - LC
Eurasian griffon vulture	*Gypus fulvus*	AzRB – VU IUCN Red List - LC
Cinereous vulture	*Aegypius monachus*	AzRB – EN IUCN Red List - NT

Source: Based on information in AECOM, 2019; URS, 2013; AECOM 2023 and updated in line with 2023 AzRB.

Protected areas and sites of ornithological importance

There are eleven important ornithological sites on the Azerbaijan coastline, as shown in Figure 6.8.

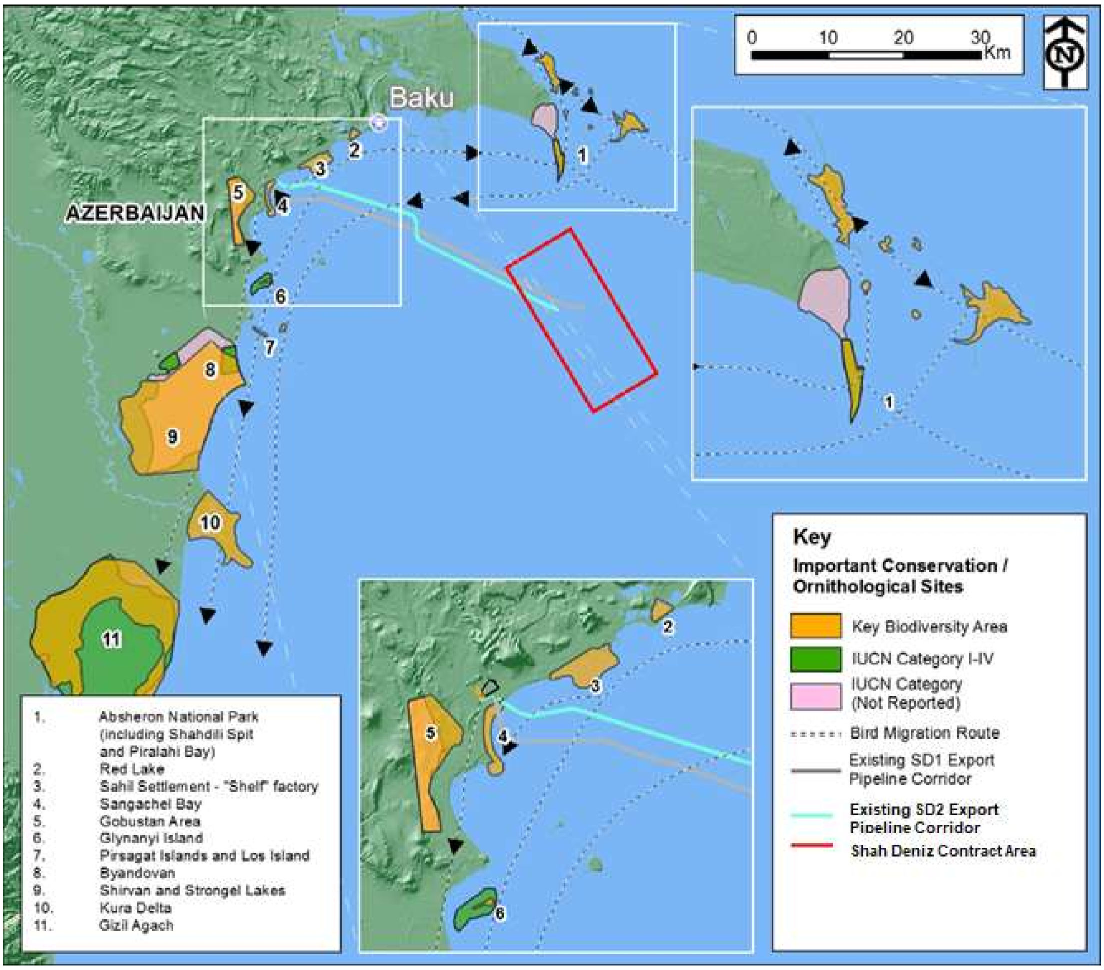

Figure 6.8: Important ornithological sites located on the southwest Caspian coast and migration routes

Source: Adapted from URS, 2013

The nearest protected area to the Shah Deniz Contract Area is the Absheron National Park, which is approximately 12 km north of the Contract Area boundary. Absheron National Park was established on 8 February 2005 within the existing Absheron State Nature Sanctuary and includes the Shahdili Spit IBA and Seal Special Protected Area (SSPA) and Chilov Island and Pirilahi Island (proposed SSPA). The Park covers 783 hectares and is inhabited by species of conservation importance, including Caspian seals and many species of breeding and migratory birds. Salt marshes and seaweed meadows are also important for several species of fish.

Within Sangachal Bay there is an IBA designated by BirdLife International, more information on this site is presented in Section 6.5.5.

Other sites of ornithological importance along the Azerbaijan coastline are described in Table 6.4.

Sensitivity

The majority of bird areas presented in this section are unlikely to be affected by the SDC project. Information has been included for completeness, however, to take into account potential accidental events such as a hydrocarbon release.

Table 6.4: Sites of ornithological importance

Site of ornithological importance	Designation	Reasons for designation
1. Absheron National Park (including Shahdili spit and Pirilahi Island)[7]	KBA[1]/IBA[2] IUCN II[3]	KBA/IBA - Area is important for overwintering and migrating bird species. IUCN II - In 1969 the area was established as a Nature Reserve to protect, amongst others, the endangered Caspian seal and water birds of international importance. It was later designated as a National Park in 2005. Approximately 46 RDB species occur within and in the surroundings of the national park.
2. Red Lake	KBA/IBA	Significant populations of globally threatened bird species are known to occur here. The area is important for breeding bird species.
3. Sahil Settlement – Shelf Factory	KBA/IBA	Significant populations of globally threatened bird species are known to occur here. Area is important for overwintering and migrating bird species.
4. Sangachal Bay	KBA/IBA	Area is important for overwintering and migrating bird species.
5. Gobustan Area	KBA/IBA IUCN not reported	KBA/IBA - Populations of globally threatened bird species are known to occur here. The area is important for breeding bird species. IUCN not reported – Gobustan State Nature Reserve.
6. Gil Island (or Glynanyi Island) State Nature Sanctuary	KBA/IBA IUCN IV[4]	KBA/IBA - The area is important for breeding bird species. IUCN IV – Designated in 1964 due to its importance for migratory and wintering waterfowl birds, seagull colonies and Caspian seals. Two RDB species occur in the area.
7. Pirsagat Islands and Loc Island	KBA/IBA	Populations of globally threatened bird species are known to occur here. The area is important for breeding bird species.
8. Byandovan (or Byandovan) State Nature Sanctuary	IUCN IV	49 RDB species known to occur here.
9. Shirvan National Park	KBA/IBA IUCN II	KBA/IBA - Significant populations of globally threatened bird species are known to occur here. The area is important for overwintering and breeding bird species. IUCN II - In 1969 the area was established as Shirvan State Reserve, focused to protect one of the world's largest population of Persian gazelle (*Gazella sulgutturosa*) and its rich water-wading ecosystem. The wetlands are considered as an important site for many valuable bird species, used for nesting, migration routes and wintering area. It was later designated as a National Park in 2003. Approximately 56 threatened species occur in this area.

Site of ornithological importance	Designation	Reasons for designation
10. Kura Delta	KBA/IBA	Significant populations of globally threatened bird species are known to occur here. The area is important for overwintering and migrating bird species.
11. Gizil Agach State Reserve, National Park and Marine Protected Area	KBA/IBA IUCN Ia[5] Ramsar Site[6]	KBA/IBA - Important breeding and overwintering area for birds. A large number of globally threatened species occur here. IUCN Ia – Gizil Agach State Reserve is located within this area. Fifty nine threatened species occur in this area. Ramsar - A wetland of international importance for migrating and breeding birds. In 2018 the Gizil Agach State Reserve was upgraded and expanded to become a National Park and Azerbaijan's first Marine Protected Area.

[1] Key Biodiversity Areas (KBAs) are 'sites contributing significantly to the global persistence of biodiversity', in terrestrial, freshwater and marine ecosystems and are identified by the KBA Partnership. KBAs comprise an 'umbrella' which includes globally important sites (e.g. Important Bird Areas (IBAs), Important Plant Areas (IPA), Important Sites for Freshwater Biodiversity, Ecologically & Biologically Significant Areas (EBSAs) in the High Seas, and Alliance for Zero Extinction (AZE) sites).

[2] Important Bird Areas (IBAs) are key sites for the conservation of bird species, identified by BirdLife International. These sites are small enough to be conserved in their entirety and are different in character or habitat or ornithological importance from the surrounding area.

[3] The main objective of a national park (IUCN Category II) is to protect functioning ecosystems, rather than focussing on protecting a particular species or habitats through management of the reserves thus prioritising these species or habitats which would come under IUCN category IV.

[4] Category IV refer to Habitat/Species Management Area. It aims protecting a particular species or habitats and its management prioritise these species or habitats.

[5] Strictly protected areas set aside to protect biodiversity and also possibly geological features, where human visitation, use and impacts are strictly controlled.

[6] Ramsar sites are wetlands of international importance under the Ramsar Convention (Convention on Wetlands of International Importance).

[7] Comprises two adjacent IBAs: Shahdili Spit and Absheron archipelago (north) and Pirallahi Bay.

6.5 Nearshore Environment (Sangachal Bay)

6.5.1 Setting

Sangachal Bay is a dynamic shallow water area with a mixture of habitats and sediment types. The seabed slopes gently from the shore to a depth of approximately 10 m around 3 km from the coastline. The centre of the bay features a slight depression that acts as a sediment sink. At the proposed SDC PFOC landfall it is sandy beach and rocky shore habitat.

The deployment of current meters between May 2003 and June 2004 in three nearshore locations showed that the current regime in the bay is complex and governed by seabed topology, large-scale water circulation in the Caspian, as well as local and regional wind strength and direction. The main current direction in the nearshore area of Sangachal Bay follows the seabed contours and is to the southwest. The maximum current speed measured was 40 cm/s, mean speed was between 6 and 9 cm/s. No significant seasonal trends in the current velocity data were identified. Waves within Sangachal Bay are predominantly wind-blown rather than swell due to the enclosed nature of the Caspian Sea.

6.5.2 Nearshore benthic flora

Seagrass and algae are the predominant benthic flora species in Sangachal Bay. Benthic flora surveys were carried out in Sangachal Bay in 2014, 2016 and 2018 at 45 stations using drop down video sampling (Envision Mapping, 2018).

The video data indicates that seagrass habitats (*Zostera noltii*) are restricted to areas of the bay which are shallower than approximately 6 m in depth (see Figure 6.9) and occupy sediment types which are sandy with some gravel component and some silt or mud content. When the depth increases, and therefore the incident light level decreases, there is a cessation in the presence of seagrass and some occurrence of algal film. Foliose turf algae are present in areas of sandy substrate with shelly patches or the very occasional rock.

Survey data from 2014, 2016 and 2018 suggests that Sangachal Bay has become less heavily influenced by silt since 2016, and more by gravelly sandy substrate. There has also been an increase in seagrass, with two additional stations found to have seagrass present in 2018. The survey suggests that seagrass has recolonised these areas and silt levels are similar to that found in 2014.

Although algal film percentage cover has increased slightly since 2016, overall it has decreased significantly. In 2014, five stations had over 61% cover of algal film. Both surveys in 2016 and 2018 showed a maximum percentage cover of 30%.

Macroalgae presence has significantly increased in distribution and abundance since 2014 and 2016. It is short and ephemeral and was observed attached to stable shell and gravel throughout the entire sampling area, with high percentage cover (Envision Mapping, 2018).

Sensitivity

The species of seagrass and algae that are present within Sangachal Bay are neither rare nor threatened. Survey works suggests that the seagrass beds are either stable or expanding. No significant impacts have been identified associated with the previous pipeline construction works within the bay.

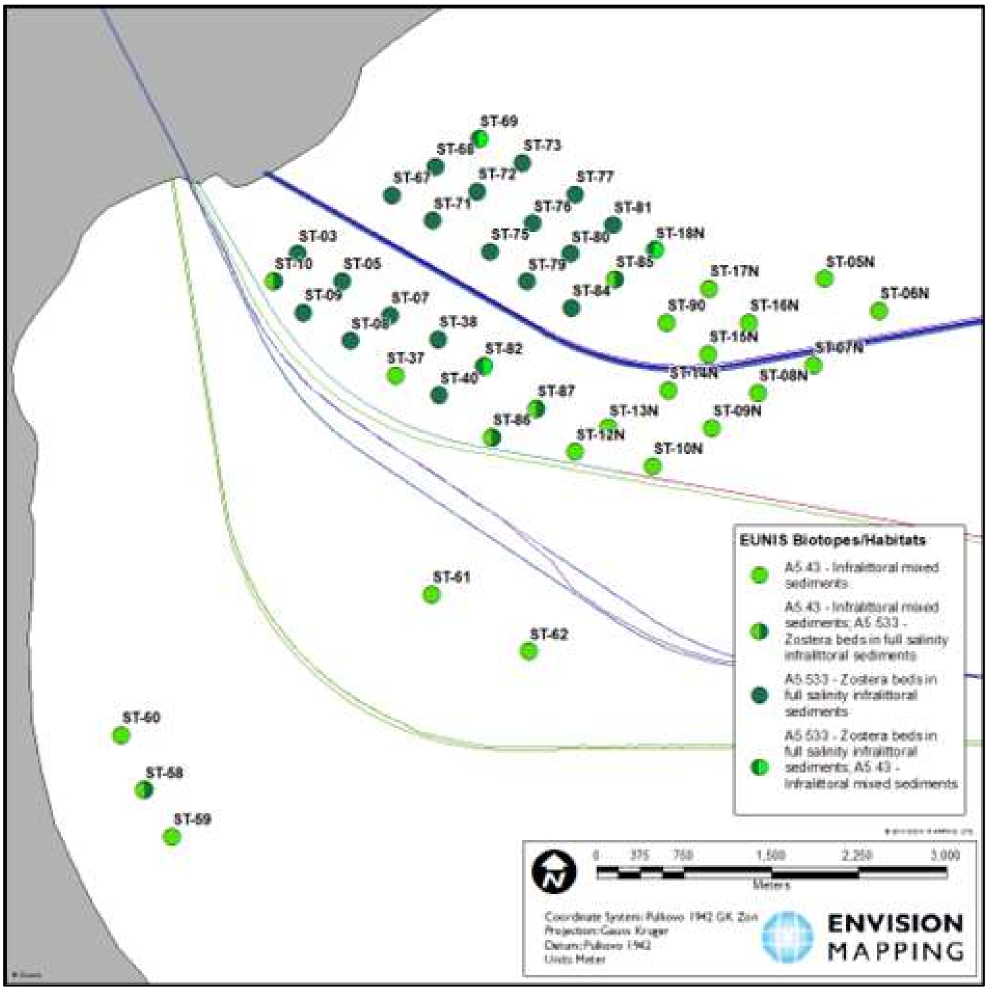

Figure 6.9: Distribution of benthic habitat / biotopes within Sangachal Bay

Source: Envision Mapping, 2018

6.5.3 Nearshore biological, physical and chemical properties

Environmental surveys have been conducted in Sangachal Bay in 1996, 2000, 2003, 2006, 2008, 2010, 2011, 2015, 2018 and 2019. These surveys collected information on sediment chemistry, physical characteristics, benthic fauna and plankton via seabed sediment and water/plankton sampling. Figure 6.10 shows the 2019 sampling stations overlaid on the bathymetry of the bay. The stations in closest proximity to the proposed SDC PFOC route are those on the northern boundary of the study area (Stations 1, 4, 6 and 39).

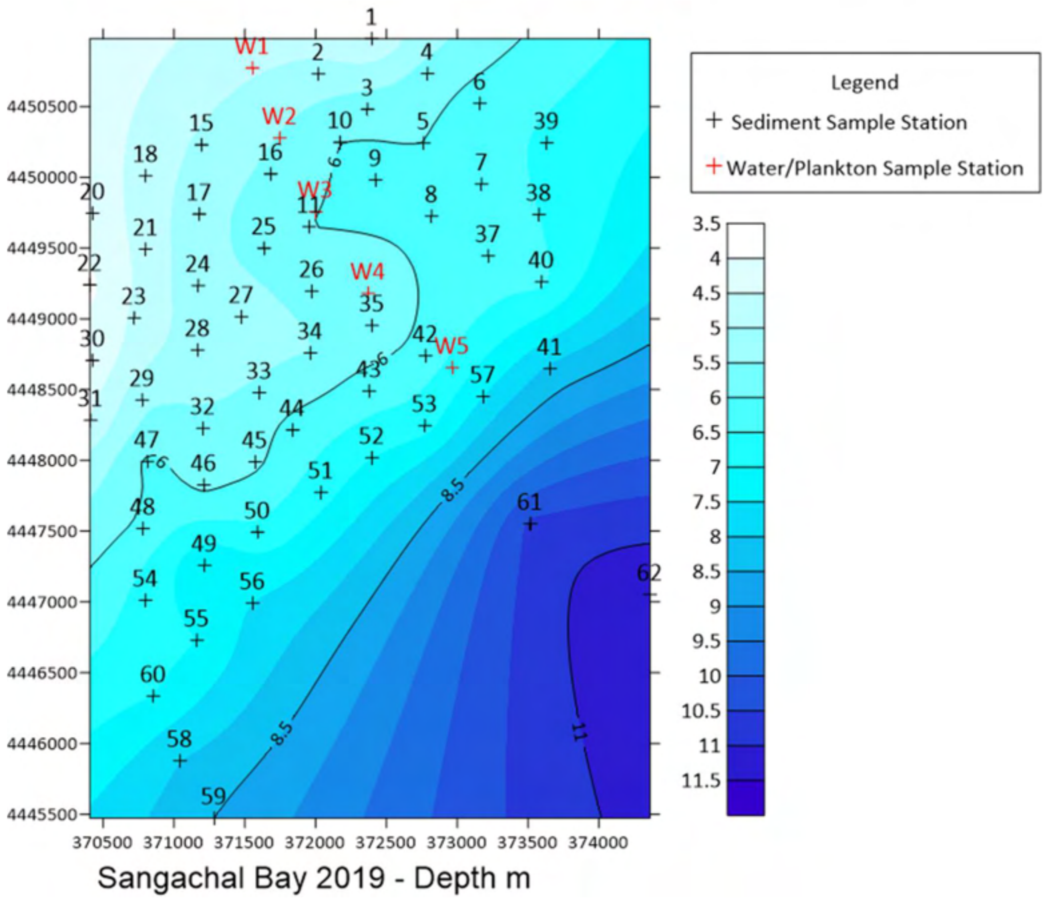

Figure 6.10: Sample stations and bathymetry (m) Sangachal Bay survey 2019

Source: AIOC, 2019

6.5.3.1 Benthic invertebrates

Results from 2019 indicate that the macrobenthic communities were highly variable in species composition, abundance and biomass across the survey area[11]. The survey recorded 37 taxa from the 56 samples collected - nine were annelid worms, twenty were crustaceans, four were gastropods and three were bivalve molluscs, in addition to one species of insect. Samples from the stations closest to the proposed SDC PFOC route (Stations 1,4,6 and 39) had taxa numbers and abundance slightly above average, compared to the rest of the Sangachal Bay study area.

Bivalve molluscs were the most abundant group recorded in 2019, present at all sampling stations and accounting for 58% of total abundance. Bivalve species *Mytilaster lineatus* and *Abra ovata* were particularly abundant, which was also a common finding in previous surveys. In a departure from previous surveys, 2019 was the first year that the polychaete *Spionidae spp* was observed within Sangachal Bay. However, this genus had been encountered within the Caspian for several years. It is thought that the presence of *Spionidae spp* in Sangachal Bay is representative of faunal changes over a much larger area.

Despite being the most taxonomically rich group and present at 52 of the 56 sample stations, amphipods accounted for only 6% of total abundance. *Gammarus pauxilus* and

[11] One 0.1 m^2 grab sample from each station was analysed for macrobenthic species and abundances.

Gmelina brachyura were the most abundant and most frequently encountered amphipod taxa.

A single species of tanaidacea, *Tanais dulongii*, was recorded in this survey, representing 7% of total abundance. This was the first recording of this species within Sangachal Bay or during any EMP offshore or inshore monitoring. Literature does not seem to mention the presence of this species in the Caspian previously. It is expected that transportation within vessel ballast water, or fouling on a vessel hull, is the likely pathway for the introduction of *Tanais dulongii* to this area.

The macrobenthic community in 2019 was largely similar to that observed in 2015, with communities in both surveys dominated by bivalves and polychaetes. The overall community variation across the survey area was very similar in both surveys, and has remained relatively consistent over the monitoring period (AIOC, 2019).

Sensitivity

Although benthic community structure shows little overall change over the series of surveys, there is, between successive surveys, invariably some indication of changes at individual stations. This is a reflection of the dynamic nature of the bay; it is a shallow water environment, in which storm wave action will tend to occasionally redistribute sediment within the bay, and may also occasionally introduce sediment from the adjacent coastal shelf area. Such shallow water areas are generally robust, as the communities are adapted to regular physical disruption. The macrobenthic community is dominated by relatively hardy bivalves and polychaetes; those taxa likely to be most sensitive to turbidity and pollution, such as amphipods and gastropods, are a minor and inconsistently present part of the community.

6.5.3.2 Plankton

Plankton was sampled at five stations in a linear transect extending south-southeast from the shore (see Figure 6.10) using a Bongo-net system for zooplankton, and fine mesh nets to collect phytoplankton and microzooplankton. The nets were towed at 0-5 m water depth for 200 m on each run. In addition water sampling was carried out using a Niskin sampler to collect phytoplankton.

Phytoplankton

During the 2019 survey, a total of 70 phytoplankton species were recorded, a higher taxonomic richness than phytoplankton recorded during previous surveys in Sangachal Bay. As in previous years, Bacillariophyta (diatoms) were the most species rich and abundant taxonomic group with 41 species identified. Bacillariophyta accounted for 96% and 81% of total abundance in net and bottle samples respectively, with net samples dominated by *Chaetoceros peruvianus Brightwell*, and to a much lesser extent *Chaetoceros pendulus Karsten*, which accounted for 77% and 14% of the total phytoplankton cell abundance in net samples. In bottle samples, the most abundant species were the Bacillariophyta species *Thalassionema nitzschioides Grun*, and *Chaetoceros peruvianus Brightwell*, accounting for 22% and 11% of total abundance respectively.

Other than Bacillariophyta, net samples contained 13 species of dinophyta, eight species of cyanophyta and six species of chlorophyta. Bottle samples contained eight species of dinophyte, four species of cyanophta and four species of chlorophyta. In the net trawls, cyanophyta abundance was notably higher in 2019 compared to the three preceding surveys. Abundances of other taxonomic groups were similar to previous surveys. For bottle samples, all abundances for all groups were within previously recorded ranges (AIOC, 2019).

Zooplankton

The zooplankton community was similar in abundance and taxonomic richness to the communities present in previous surveys. A total of 10 zooplankton taxa were recorded in the samples. The non-native species of copepod *Acartia tonsa*, and to a lesser extent the ctenophore *Mnemiopsis leidyi*, were numerically dominant across all sampling locations.

The average abundance of the cladoceran *Pleopis* in 2018 and 2019 samples (124 & 111 individuals / m^3) were notably higher than in the two preceding surveys (22 individuals / m^3) (AIOC, 2019).

Sensitivity

The phytoplankton community within Sangachal Bay is dominated by diatoms, whereas the zooplankton community is dominated by non-native species. Plankton are short lived organisms that reproduce rapidly. Survey results only provide a snapshot of the community present due to dispersal and mixing of water within the bay.

6.5.3.3 Physical and chemical composition of nearshore seabed sediments

The physical composition of sediments varied across the Sangachal Bay area in the 2019 survey, as follows:

- silt / clay dominated sediments, with the highest proportion of organic matter content, were present within the northwest corner of the bay, adjacent to the shore, and at stations in the extreme southwest of the survey area
- heterogeneous gravel dominated sediments, with a high carbonate content, were present at stations within the centre of the southeastern boundary, and the northeastern corner of the survey area.

These results were consistent with previous studies in Sangachal Bay.

The concentrations of both aliphatic and aromatic hydrocarbons exhibited a high level of variation across the study area. Total hydrocarbon concentration (THC) ranged from 7 - 388 µg/g with a mean value of 79 µg/g. Unresolved complex mixture (UCM) as a proportion of THC was very high throughout, with a survey mean of 89%, indicating that the total hydrocarbon content in samples was heavily weathered. Similar to THC levels, PAH concentrations varied widely from below the method detection level of 0.5 ng/g to a maximum of 142 ng/g (USEPA 16 PAH). Overall, the composition of hydrocarbon compounds in sediments were typical of the site and were indicative of weathered material being present throughout the survey area. There was no evidence indicating the presence of recent inputs of hydrocarbons at any sample station.

As previously observed in surveys conducted within Sangachal Bay, a strong positive inter-correlation was present between the metals copper, chromium, iron, manganese, lead and zinc. The distributions of these metals exhibited a positive association with sediment silt and clay content.

Higher concentrations of barium, mercury and lead were recorded at stations within the northeastern corner of the survey area, and at Stations 61 and 62 extending into the deeper water outside of the bay. This feature corresponds to previous surveys carried out within the Sangachal Bay and the wider coastal region, which identified the presence of elevated concentrations of metals and hydrocarbons in the deeper coastal waters as a result of historical industrial contamination, unrelated to bp operations.

As observed in previous surveys, relatively high concentrations of cadmium, manganese and lead were recorded in the centre of the western flank of the survey area, adjacent to the shore; the reason for the distinctive metal characteristics at this isolated location is unknown.

The range and average concentrations of sediment metals were similar to those recorded in previous surveys, and the 2019 spatial distributions were consistent with those observed in 2015 (AIOC, 2019).

Sensitivity

Sampling stations in close proximity to the proposed SDC PFOC route indicate that the seabed sediments are composed of fine and medium sand. THC levels at these stations ranged from 25 – 161 µg/g and heavy metal levels were similar to those recorded in previous surveys.

6.5.4 Nearshore fish

A literature review update was undertaken in June 2024 by Mehman Akhundov (Fisheries and Aquaculture Research Centre Director) to obtain the latest information on fish relevant to the SDC project (see Appendix 6B). According to Akhundov, the following fish species are found in Sangachal Bay:

- Kilka - Caspian common kilka (*Clupeonella delicatula caspia*) and Caspan shad (*Alosa caspia*)
- Carp – Caspian kutum (*Rutilus frisii kutum) and* North Caspian roach (*Rutilus rutilus caspicus)*
- Sandsmelt - *Atherina boyeri caspia*
- Needlefish – Caspian pipe fish (*Syngnathus nigrolineatus caspius)*
- Stickleback – Small south Caspian stickleback (*Pungitius platygaster*)
- Mullet - Leaping grey mullet (*Liza saliens*)
- Gobies - Caspian bighead goby (*Neogobius gorlap*), Caspian sand goby (*Neogobius fluviatilis),* and round goby (*Neogobius melanostomus affinis).*

Of the species recorded, the following spawn in the bay:

- Needlefish – this species lives throughout Sangachal Bay, mainly where the seagrass beds are present, spawning takes place in May to July at water depths up to 4 m.
- Sandsmelt – this species lives mainly in shallow coastal waters up to 2 m in depth, spawning takes place in May to June (sometimes extending into August), eggs are attached to benthic vegetation.
- Stickleback – this species lives in coastal areas of the bay down to 10 m water depth, spawns all year round.
- Gobies – gobies mainly live in coastal areas of the bay down to 10 m water depth, spawning takes place mainly between April and May

(sometimes extending into August) in areas of sandy-shell, pebble and stony ground.

- Leaping grey mullet – present throughout Sangachal Bay, in spring / summer during the spawning migration it moves to coastal waters and spawns in water depths of more than 5 m (Akhundov, 2024a).

None of the fish species found in Sangachal Bay are included in the 2023 AzRB (Akhundov, 2024a).

Regular fish monitoring has been undertaken in Sangachal Bay since 2000 to ascertain the presence and health status of fish populations. The most recent surveys were conducted from 2014 to 2016, with sampling conducted via trawl net at six stations in Sangachal Bay and two control sites (one contaminated station near the village of Zykh, and one clean station in Neftchala district).

The most prevalent species in the study area was sandsmelt. Other common species included Caspian roach, gobies (*Neogobius* spp) and leaping grey mullet, see Table 6.5. Several of the species recorded have commercial value, including Caspian roach, mullet and Caspian kutum. Others, including sandsmelt and gobies, form part of the diet of commercially important species.

Table 6.5: Fish species found in Sangachal Bay in 2014 and 2016 surveys

Fish species	Oct 2014	Oct / Nov 2016
Caspian roach *Rutilus rutilus caspicus* (Jakolev)	392	148
Caspian kutum *Rutilus frisii kutum* (Kamensky)	0	40
Needlefish *Syngnathus nigrolineatus caspius* (Eichwald)	48	34
Caspian shad *Alosa caspia* (Eichwald)	5	101
Sandsmelt *Atherina boyeri caspia* (Eichwald)	976	126
Leaping grey mullet *Liza saliens* (Risso)	60	115
Caspian sand goby *Neogobius fluviatilis* (Pallas)	125	11
Round goby *Neogobius melanostomus affinis* (Pallas)	126	46
Total	**1,732**	**621**

Note: Control site data from stations outside Sangachal Bay have been excluded from the above counts.

Source: Azecolab, 2015 and Institute of Fisheries (MENR), Institute of Physiology (ANAS) & Azecolab, 2016

Histopathological analyses were carried out on gill and liver tissue from a sample of fish caught during the above studies (sandsmelt and gobies), the findings of which are summarised in Table 6.6.

With respect to studies of gill tissue, at Stations 3 and 8 no histological issues were identified in gobies indicating uncontaminated waters at these locations. Quantity and nature of morphological shifts in gobies at Station 1, 2, 4, 6 and 7 indicated water pollution with which the gills of the fish under study were in constant contact. Condition of gill tissue in gobies from Station 5 indicated that there are pollutants in the environment, however, the gills of fish were exposed to a lesser extent. Similar results to the above were also obtained for the gill tissue from sandsmelt (see Table 6.6). In the absence of adverse environmental factors the gill tissue could be restored to its initial state (Palatnikov, 2024)[12].

In terms of studies of liver tissue, the largest changes were observed in fish caught at Stations 1, 2 and 7. Less histological changes were observed in liver tissue from Stations 5 and 6. The lowest number of pathologies were recorded at Stations 3, 5 and 8 (see Table 6.6). It should be noted that all detected changes in liver tissue are reversible and have an adaptive-protective nature (Palatnikov, 2024).

Genotoxic studies found higher levels of nuclear pathology at the Sangachal Bay stations than at the clean control station (Station 8). Levels of nuclear pathology were highest at the contaminated control site (Station 7). Pathological nuclei exceeded background values at Stations 1 to 4, while for the gobies at Stations 5 and 6 the values were very similar to the indexes at the contaminated control site (Station 7). This indicates that polluted water is entering Sangachal Bay from the north and precipitating in the bay's sediments. Examined indexes of micronuclei and nucleus pathologies were higher in comparison to corresponding values obtained during studies of Sangachal Bay in autumn 2008 (Institute of Fisheries (MENR), Institute of Physiology (ANAS) & Azecolab, 2016).

Sensitivity

Fish present in Sangachal Bay will be most sensitive during the spawning season, which is generally from April to August. Histopathological analysis of sandsmelt and goby tissue indicates some abnormalities.

Table 6.6: Summary of histopathology and micronucleus analysis of fish from Sangachal Bay and control sites (2016 sampling period)

Study	Species	Findings
Gill tissue	Sandsmelt	Stations 3, 5 and 8 (control station clean) gill epithelium in normal condition. Stations 1, 2, 4 and 5 only respiratory epithelium hyperplasia was revealed, which was weakly expressed. Station 6 and Station 7 (control station contaminated) proliferative changes affecting the epithelium of lamellae of the first and second order. Thickness of interlamellar epithelium with hyperplasia 2-3 times greater than the thickness of normal epithelium. In addition, detachment of the respiratory epithelium was found in fish from these stations, and rupture and exfoliation of the respiratory epithelium and aneurism in the sandsmelts from Station 7.
	Gobies	Stations 3 and 8 (control station clean) gill epithelium in normal condition. Stations 1, 2 and 4 largest number of disorders including thickening of the apical part of lamellae of the second order, their curvature, exfoliation of the respiratory epithelium, rupture and desquamation of the respiratory epithelium, aneurysm, telangiectasia and uncontrolled hyperplasia of the epithelium of the lamellae of the first order.

[12] A literature review update was undertaken in June 2024 by Grigoriy Palatnikov (Head of Department of Ecotoxicology - Institute of Physiology) to obtain the latest information on the health status of fish populations in Sangachal Bay (see Appendix 6c).

Study	Species	Findings
		Station 5 less disorders, limited to hyperplasia of lamellae of the second order and thickening of the terminal section of the lamellae and exfoliation of the respiratory epithelium. Stations 6 and 7 (control station contaminated) proliferative changes affecting the epithelium of lamellae of the first and second order. The thickness of the interlamellar epithelium with hyperplasia 2-3 times greater than the thickness of normal epithelium. In addition, detachment of the respiratory epithelium was found in fish from these stations.
Liver tissue	Sandsmelt	Highest occurrence of accumulation of blood cells in vessels of the liver was in fish caught from Stations 1, 2, 4, 6 and 7. Melano macrophage centers most often found in sandsmelt from Stations 1, 2 and 7. Negligible vacuolization of hepatocytes marked in sandsmelt from Stations 1, 2 and 4.
	Gobies	Negligible vacuolization of hepatocytes marked in gobies from Stations 1 and 5. A more serious form of vacuolization - hydropic vacuolization in gobies from Stations 1, 2, 4, 6 and 7. Fatty degeneration of liver tissue (the most severe of the pathologies identified) was detected in gobies caught from Stations 1, 2 and 7.
Genotoxic studies	Sandsmelt	General levels of nuclear pathology at the Sangachal stations ranged from 9.05 (Station 6) to 33.6 (Station 2) units per 100 erythrocytes. The levels of nuclear pathology was higher at the contaminated station (Station 7) at 33.61. The levels at the clean control station (Station 8) were the lowest at 0.5.
	Gobies	General levels of nuclear pathology at the Sangachal stations ranged from 6.5 (Station 2) to 47.2 (Station 5) units per 100 erythrocytes. The levels of nuclear pathology was higher at the contaminated station (Station 7) at 48.6. The levels at the clean control station (Station 8) were the lowest at 0.

Source: Information in table extracted from Palatnikov, 2024

6.5.5 Nearshore birds

As stated in Section 6.4.2.6, surveys of birds have been undertaken using a consistent method since 2011 in the vicinity of Sangachal Terminal. The most recent survey was in 2022 (winter, spring / summer and autumn sampling periods). The survey included two coastal bird monitoring points, with the surveyors using a 100 m radius ‘point count’ method to record species and numbers of individuals within Sangachal Bay over a 30 minute period. A total of 12,443 birds comprising 33 different species were recorded (see Table 6.7). This is a large increase from the 2018 and 2020 surveys where only 1,208 birds and 9,554 birds were recorded at the two coastal monitoring points respectively.

Table 6.7: Bird species recorded in Sangachal Bay for each survey cycle during 2022

Common Name	Scientific Name	C1	C2	C3
Barn swallow	*Hirundo rustica*		9	
Black-headed gull	*Larus ridibundus*		2	
Caspian gull	*Larus cachinnas*	25	3	31
Common tern	*Hydroprogne caspia*		3	
Common kestrel	*Falco tinnunclus*		1	

Common Name	Scientific Name	C1	C2	C3
Common pigeon	*Columba livia*		1	6
Common pochard	*Aythya ferina*	5250		
Common redshank	*Tringa totanus*			2
Common shelduck	*Tadorna tadorna*	2330		
Common snipe	*Gallinago gallingano*	30		
Common swift	*Apus apus*		11	
Common teal	*Anas crecca*	50		
Common tern	*Sterna hirundo*		5	
Crested lark	*Galerida cristata*			2
Eurasian coot	*Fulica atr*	1825		
European startling	*Sturnus vulgaris*			10
Gray heron	*Ardea cinerea*		3	2
Gray wagtail	*Motacilla cinerea*			2
Great cormorant	*Phalacrocoraw carbo*	8	3	6
Great crested grebe	*Podiceps cristatus*	2		3
Great white egret	*Egretta alba*	2		8
Green sandpiper	*Tringa onchropus*	6		1
Hooded crow	*Corvus cornix*		2	6
House martin	*Delichon urbica*		7	
House sparrow	*Passer domesticus*			8
Little egret	*Egretta garzetta*	2	1	3
Little grebe	*Podiceps rudicollis*	2		
Little ringed plover	*Chardrius dubius*		1	
Mallard	*Anas platyrhynchos*	200		49
Pygmy cormorant	*Phalacrocorax pygmaeus*	6	2	5
Rook	*Corvus frugilegus*	5		
Tufted duck	*Aythya fuligula*	2500		
White wagtail	*Motacilla alba*			2

Source: AECOM, 2023d

C1 – Cycle 1 January – February; C2 – Cycle 2 June; C3 – Cycle 3 September - October

Sensitivity

Part of Sangachal Bay, immediately south of the SDC PFOC landfall, has been designated as an IBA by BirdLife International as it is used by up to 25,000 migratory and overwintering birds. At least 20,000 diving ducks and 30,000 *Fulica atra* stage here every autumn (BirdLife International, 2024b). Unlike the more important bird areas to the south and north (Absheron National Park and Gizil Agach) the area has not been nationally designated. The area of the IBA nearest the Terminal is currently disturbed year round by noise from highway traffic which passes approximately 50 m from the shoreline. Birds using the area are therefore likely to be habituated to vehicle noise.

6.6 Regional Offshore Environment

Shah Deniz regional environmental surveys, covering the whole of the Contract Area, have been conducted in 1998, 2000, 2001, 2005, 2007, 2009, 2011, 2013, 2015 and 2020. Surveys from 2004 onwards have used bp EMP standardised methods. The sampling stations for the 2020 regional survey are shown in Figure 6.11.

6.6.1 Bathymetry and physical oceanography

6.6.1.1 Overview and bathymetry

The Caspian Sea is the world's largest landlocked water body with a surface area of approximately 371,000 km^2. It is fed by numerous rivers, the largest of which is the Volga in the north.

The main distinguishing features of the Caspian are its isolation and intracontinental situation. As the Caspian has no present connections with the world ocean, total river inflow is the main factor affecting its water balance. Hydrological structures are formed primarily by atmospheric processes.

The Caspian can be divided into three parts (see Figure 6.12) characterised by distinct physical conditions and biological diversity:

- a northern, shallow region (5-6 m deep) covering 80,000 km^2
- a central region (average 190 m deep) covering 138,000 km^2
- a southern region (up to 1,025 m deep) covering 168,400 km^2.

The Shah Deniz Contract Area is in the Azerbaijan sector of the southern region of the Caspian Sea and encompasses a shelf edge and a sloped area. The sloped area ranges from a minimum water depth of approximately 60 m in the northeast to a maximum of almost 700 m in the southeast.

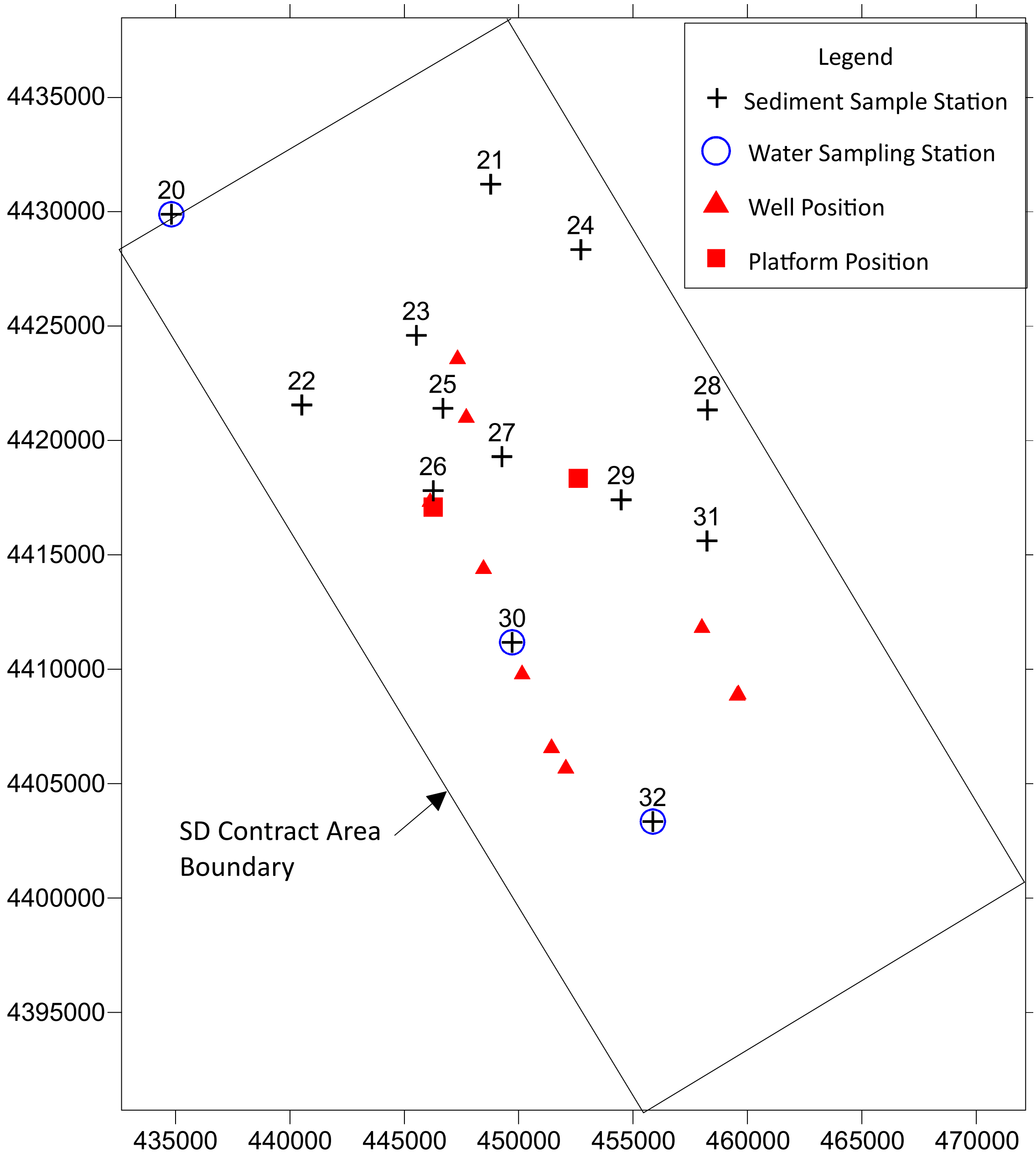

Figure 6.11: Sediment and water sampling stations, Shah Deniz Regional Environmental Survey 2020

Source: bp Exploration Shah Deniz, 2020

Figure 6.12: The Caspian Sea, including river inputs and basins

Source: Aladin & Plotnikov, 2004

6.6.1.2 Water temperature

The southern Caspian is generally warmer than the northern Caspian, with a difference of up to 10°C in surface waters in the winter. The temperature differences between surface and deeper water layers lead to the formation of a seasonal thermocline (an area with a rapid rate of temperature change). The presence of the thermocline restricts mixing of the upper and lower water layers.

Within the southern Caspian a thermocline begins to develop in the upper layers of the water column at water depths of between 20 - 50 m in spring (March – April). During summer and autumn, however, the thermocline moves deeper reflecting the increase in vertical mixing in the upper layers promoted by the increased frequency of storm events. As the thermocline becomes deeper, the range of temperature change gets smaller, until the thermocline eventually breaks down during the winter months (AECOM, 2015c).

During the winter the surface water temperature in the Shah Deniz Contract Area is about 5°C to 6°C. Water temperatures reach their maximum in July and August when temperatures of 25°C and 26°C are common (ERM, 2002).

Water temperatures recorded during the 2020 Shah Deniz regional environmental survey (July 2020) ranged from an average of 25.6°C at the surface to 10.6°C at 140 m depth. A major temperature decline of approximately 14°C was identified between 20-40 m water depth, see Figure 6.13 (bp Exploration Shah Deniz, 2020).

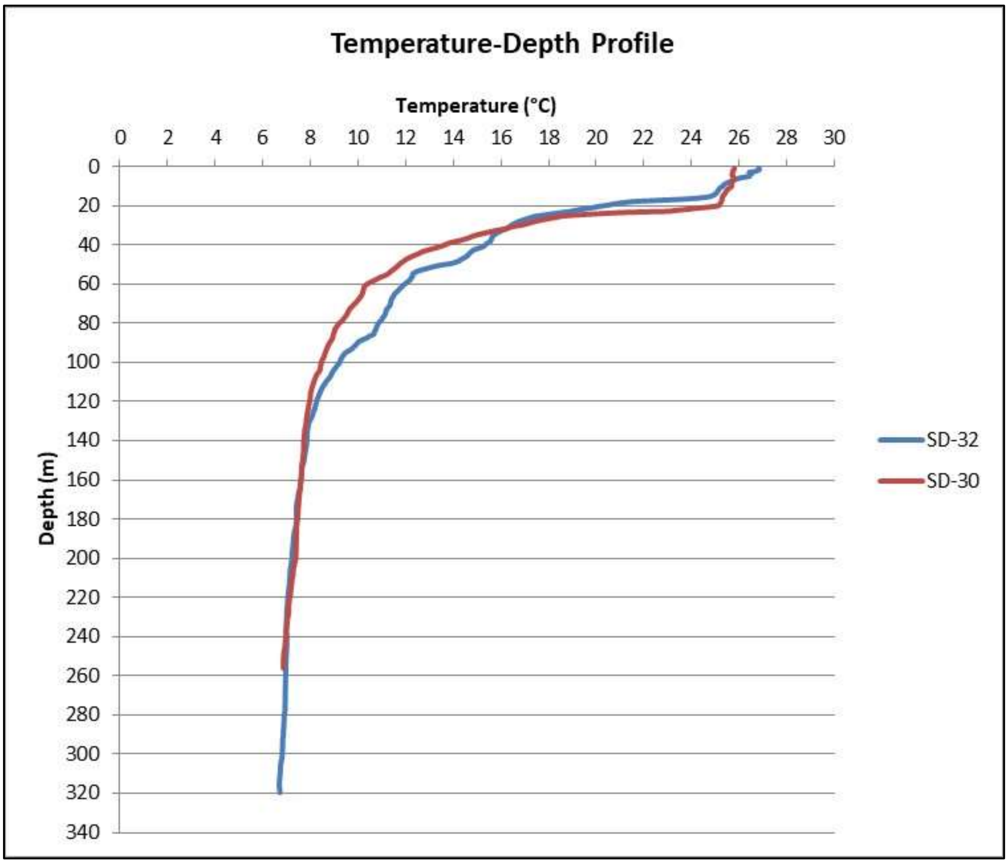

Figure 6.13: Temperature / depth profile – Shah Deniz Regional Environmental Survey, July 2020

Source: bp Exploration Shah Deniz, 2020

6.6.1.3 Salinity

Salinity in the Caspian Sea is almost three times lower than average oceanic salinity, averaging at 12.9 ‰. The salinity of the surface water in the vicinity of the Contract Area remains relatively constant all year round at approximately 12.5 ‰. This is due to the lack of freshwater influxes in this offshore location (Mamaev, 2002).

Salinity levels recorded during the 2020 Shah Deniz regional environmental survey (July 2020) were an average of 11.3 ‰ at the surface to 10.6 ‰ at 140 m depth (bp Exploration Shah Deniz, 2020).

6.6.1.4 Oxygen regime

Offshore areas of the Caspian are characterised by high oxygenation of the surface waters in the winter months and saturation levels in the spring. This is due to increased water mixing during the winter and phytoplankton activity in spring. During the summer months the water column becomes stratified resulting in lowering of oxygen levels below the thermocline (Jamshidi and Bakar, 2011). The deeper waters of the southern basin have lower dissolved oxygen levels, with saturation as low as 10 % at a depth of 600 m (Jamshidi and Bakar, 2011).

Dissolved oxygen levels recorded during the 2020 Shah Deniz regional environmental survey (July 2020) ranged from 90.6% at the surface to 61.6% at 140 m depth (bp Exploration Shah Deniz, 2020).

6.6.1.5 Sea level

Being completely land-locked, the Caspian Sea is one of the few waterbodies in the world with a water level below global mean sea level. Any change in water level is caused by water inflow from rivers (70% of such inflow from the Volga), precipitation, loss from evaporation and discharge to the Kara-Bogaz-Gol in Turkmenistan.

Sea level in the Caspian has fluctuated considerably during historical and recent times due to a combination of climatic, tectonic and human factors (Kroonenberg at al., 2000; Mamaev, 2002). The Caspian experienced a sharp drop in water level of 1.8 m in the 1930s which continued slowly until 1977, resulting in a total decline of 3 m. This sea-level drop was partly linked to a decrease in precipitation over the Volga catchment region and partly to intense reservoir construction on rivers flowing into the Caspian. This period was followed by an increase in sea level until the year 1995, which was suggested to be linked to the hydroclimatic effect of an El Nino-Southern Oscillation teleconnection. Recent sea level changes, studied by satellite altimetry, highlight a drop in the water level by nearly 7 cm/year for the period 1996 to 2015. This decline has slightly intensified in recent years resulting in a 10 cm/year drop between 2006 and 2021 (Samant & Prange, 2023), see Figure 6.14. The water level of the Caspian in 2022 was approximately 28.7 m lower than that of the global oceans (Umarov, 2023). This decrease in sea level has been attributed to climate change and construction of dams on the Volga River (Kaleji, 2023).

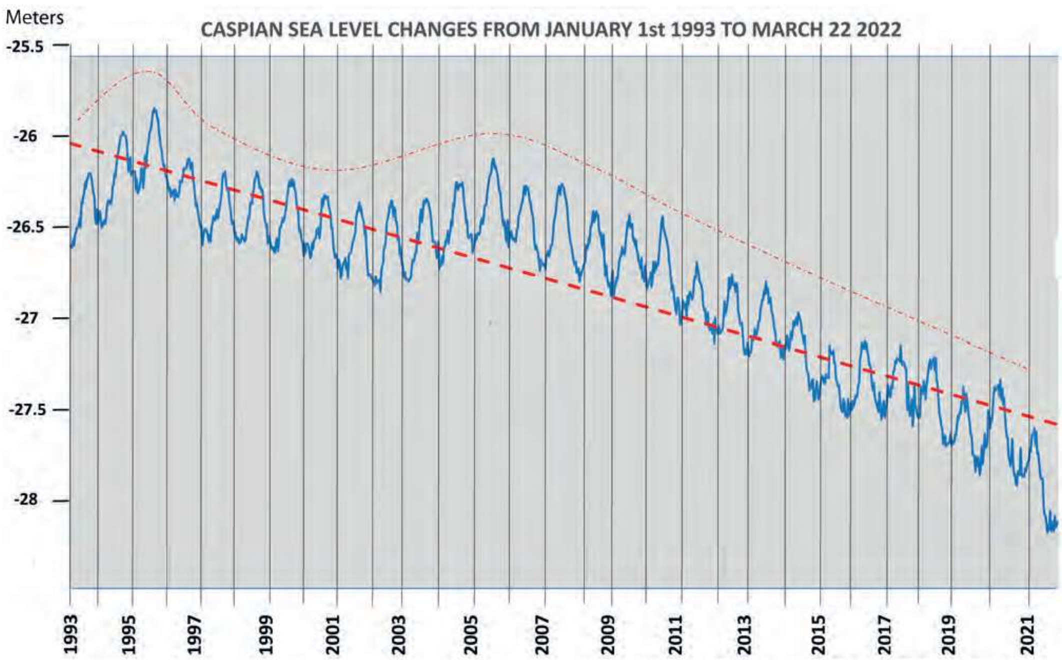

Figure 6.14: Caspian sea level changes from 1993 to 2022

Source: Kuzucuoğlu & Leroy, 2023

6.6.1.6 *Wave and current regime*

Storms in the Caspian region blow along a north-westerly / northerly axis, although the Absheron Peninsula shelters the SD Contract Area from the most severe of these. A large gradient in extremes of waves also exists across the region. The 100-year significant wave height in the SD Contract Area is about two-thirds the size of comparable statistics in the open sea to the east of the Peninsula. The largest waves to affect the Contract Area come from the northeasterly sector. In the Shah Deniz Contract Area maximum expected wave height is around 10.5 m (10 year return period) (bp, 2023a).

Storm surges are a common event in the Caspian causing temporary rises or falls in sea level. Significant sea level changes occur in the southern Caspian including at the proposed SDC project location. These events are associated with persistent strong winds, particularly the strong prevailing regional winds that blow along the axis of the Caspian, from north and northwest or from south and southeast (Kosarev & Yablonskaya, 1994). Waves in the Caspian Sea, including in the SD Contract Area, are wind driven and subsequently the windiest months also exhibit the greatest wave action (Offshore Consulting Group, 2017). The largest waves can be expected when the wind direction is northerly or southerly, as waves have longer time to build up at these wind directions.

The Caspian currents are primarily influenced by wind, seabed relief, water density and temperature variations leading to some isolation between the northern, middle and southern Caspian areas (Kosarev and Yablonskaya, 1994). The resulting large scale circulation pattern includes two anti-clockwise currents in the northern and middle Caspian, and the western anticyclonic and the eastern cyclonic gyres in the southern Caspian (see Figure 6.15).

The predominant direction of the strong currents is from the northeast. The currents may act from surface to seabed, or surface flows may differ from the deepwater flows whereby strong currents may act in either layer. The currents may be driven directly by local weather events or by distant forcing mechanisms. In the latter case the currents may occur during periods of unremarkable local weather. Approximate expected winter maxima current values are shown in Table 6.8.

Table 6.8: SD Contract Area winter maxima current values

Location	Water depth	Current speed
Shah Deniz shelf	Near surface	1.0 m/s
Shah Deniz shelf	Near bottom	0.5 m/s
Shah Deniz slope	Near bottom (200 m)	0.5 m/s
Shah Deniz slope	Near bottom (400 m)	0.4 m/s

Source: URS, 2013

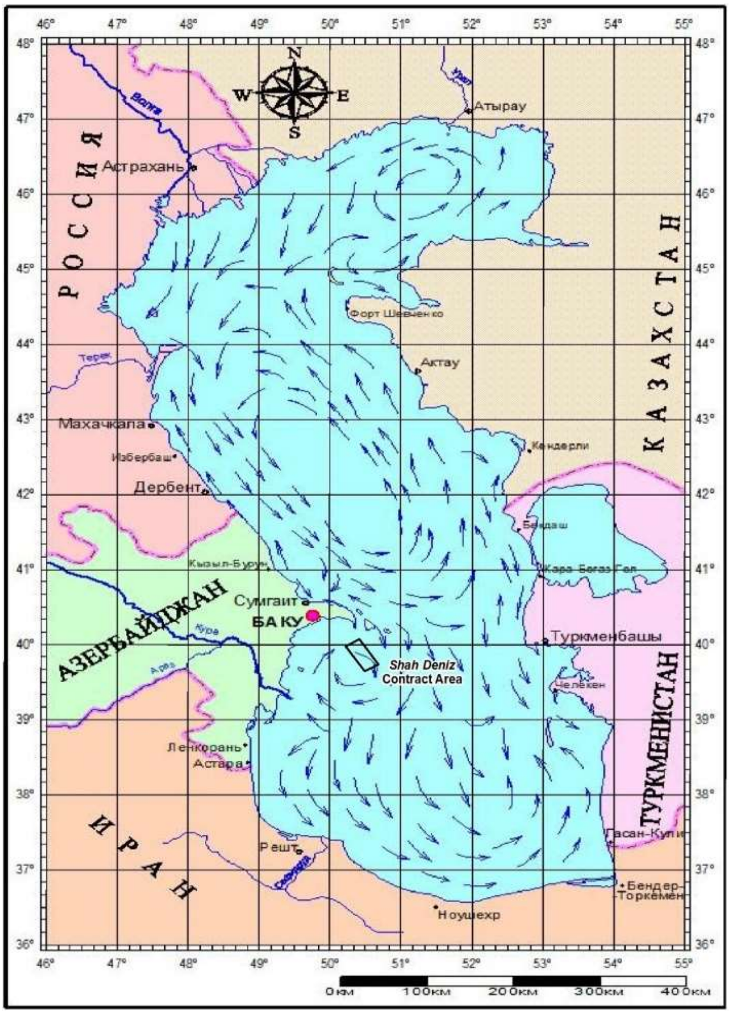

Figure 6.15: Sea surface currents of the Caspian Sea

Source: Mammadov, 2000

6.6.2 Physical and chemical characteristics of seabed sediments

6.6.2.1 Physical properties

During the 2020 Shah Deniz regional environmental survey, three replicate subsamples from each station (see Figure 6.11) were analysed to characterise the sediment.

The physical properties of the sediments throughout the contract area have remained relatively stable across the regional surveys. In the 2020 regional survey, the sediments at most stations were composed entirely, or almost entirely, of the finest silt and clay fractions. On average these sediments had a carbonate content of 26%, and an organic matter content of 6.5% at stations where water depth was <200 m and 8.5% at stations where water depth was greater (bp Exploration Shah Deniz, 2020).

In all surveys the sediments at three stations in the central part of the contract area (Stations 26, 27, and 29 (see Figure 6.11)) differed to the dominant silt / clay sediment type found within the rest of the survey area. Sediments at these three stations contained a wider range of particle size classes and a lower proportion of silt and clay, with a higher average carbonate content and a lower organic matter content. These stations lie close to an area of smaller mud volcano vents which may account for the differing sediments in this area.

6.6.2.2 Hydrocarbon concentrations

Sampling conducted during the 2020 Shah Deniz regional environmental survey found concentrations of THC and PAH were positively correlated. Highest hydrocarbon content was found in the silt and clay sediments in the northwest and southeast of the contract area, while the lowest concentrations were recorded in the central part of the contract area. Maximum levels of THC were recorded at Station 24 (674 µg/g), while the minimum THC level was recorded at Station 29 (20 µg/g) (bp Exploration Shah Deniz, 2020).

Compared to previous regional surveys between 2005 and 2015, the concentrations of both THC and PAH were notably higher at most stations in 2020, and were comparable to the higher concentrations recorded in the 1998 and 2001 surveys. The 2020 results indicate that between the 2015 and 2020 surveys, the background sediment hydrocarbon concentrations had increased within the contract area, especially at stations where the highest concentrations had been recorded in previous surveys.

While concentrations were higher at most stations, the hydrocarbons present were heavily weathered with a composition consistent with previous survey data. There was no evidence that operations within the contract area have affected the hydrocarbon levels at any of the regional sample stations. No hydrocarbons characteristic of operational discharges were detected in the 2020 survey (bp Exploration Shah Deniz, 2020).

6.6.2.3 Heavy metal concentrations

The 2020 Shah Deniz regional environmental survey found a strong positive intercorrelation between concentration of chromium, copper, iron, lead, and zinc. This is consistent with the results of the previous regional surveys.

The patterns of metal concentration throughout the contract area have changed very little over the period of surveys. The majority of the contract area has very fine silt / clay sediments, which have higher concentrations of most metals. Within this sediment type, mercury was more concentrated at northerly shallow water stations, while several metals, notably chromium, copper, manganese and lead, showed the reverse pattern with the highest concentrations found in the deepest part of the survey area. While the concentrations of barium were also at the upper end of the recorded range at the deep-water stations, a similar concentration was recorded at Station 25 which is located within the shallower central northern part of the contract area.

The concentrations of all metals in the 2020 survey were either very similar to, or within the ranges recorded in previous years (bp Exploration Shah Deniz, 2020).

6.6.3 Biological characteristics of seabed sediments

During the 2020 Shah Deniz regional environmental survey, sediment macrofaunal samples (three replicate 0.1 m^2 grabs) were taken at each of the 13 sampling stations (see Figure 6.11). Distinct groups of stations were identified regarding the macrobenthic communities present, related to sediment type, depth, and distance from the coast.

The communities at Stations 20 – 25, located in the shallow northern part of the contract area, were low in abundance and taxonomic richness and were generally numerically dominated by the oligochaete *Isochaetides* and the polychaete *Spionidae*.

Central sampling stations (Stations 26, 27 and 29), which are in the closest proximity to the proposed SDC platform location, had the most abundant and taxonomically rich communities. Communities at Stations 26 and 27 were numerically dominated by amphipods and had relatively high abundances of polychaetes and oligochaetes. The community at Station 29 was numerically dominated by polychaetes, in particular the genus *Spionidae*, which accounted for 78% of the abundance. While the communities at Stations 26 and 27 were similar to those present in previous surveys, the community at Station 29 was markedly different; *Corophium*, which was the most abundant taxa in previous surveys was present in very low numbers and *Gammarus* was absent, resulting in the numerically dominant group changing from amphipoda to polychaeta.

The communities at deep water Stations 28, 31, and 32, located in the southeast and on the northeastern flank of the contract area, were abiotic, or extremely sparse in all surveys.

The most notable feature of the 2020 community was the presence and relatively high abundance of the polychaete *Spionidae spp.* which is non-native and likely to have entered the Caspian in vessel ballast water. This polychaete had not been encountered in any bp offshore or inshore monitoring survey prior to 2019 but was present at the majority of 2019 and 2020 offshore sites in both the SD and ACG Contract Areas. It is expected that the presence of *Spionidae* is representative of faunal changes over a much wider area and is not considered to be associated with operational activities within the SD and ACG Contract Areas (bp Exploration Shah Deniz, 2020).

Sensitivity

Communities at the stations in closest proximity to the proposed SDC platform were numerically dominated by amphipods and had relatively high abundances of polychaetes and oligochaetes. No habitats of particular sensitivity, or species of conservation concern, have been identified in any Shah Deniz Contract Area benthic surveys to date.

6.6.4 Chemical characteristics of the water column

During the 2020 Shah Deniz regional environmental survey, water samples were collected at three sampling stations, see Figure 6.11. Two samples were collected at each station - one from the surface and one from below the thermocline.

While the water analysis results for most parameters were similar to those recorded in previous surveys, and were indicative of uncontaminated offshore waters in the middle Caspian, the concentrations of a number of metals in surface and also sub-thermocline samples were higher than previously recorded, this was most evident for copper, iron and lead. Although higher than those recorded in previous Shah Deniz regional surveys, the results were within the ranges recorded in previous surveys at other locations. The reason for the higher metals concentrations is unclear.

Concentrations of all metals in all samples were within the maximum allowable concentration (MAC) for Azerbaijan fisheries waters. The only exception was the copper concentration of 10.7 µg/l in the surface sample from Station 32 which exceeded the MAC of 10 µg/l (bp Exploration Shah Deniz, 2020).

6.6.5 Biological characteristics of the water column

During the 2020 Shah Deniz regional environmental survey, plankton samples were collected at 13 sampling stations using a Bongo-net system for zooplankton, and fine mesh nets to collect phytoplankton and microzooplankton. The nets were towed at 0-5 m water depth for 200 m on each run. At three of the stations vertical hauls were also collected from a depth of 500 m to the surface. In addition water sampling was carried out using a Niskin sampler to collect phytoplankton at three sampling stations (Stations 20, 30 and 32).

6.6.5.1 Phytoplankton

The phytoplankton community was species rich and numerically dominated by bacillariophyta and dinophyta. There were 42 species recorded, with differences in diversity and abundance between the net and bottle sampling methods. The 21 species present in the net samples were absent from the bottle samples, while three species within the bottle samples were absent from the net samples. Additionally, total abundance per litre was much greater in the bottle samples, despite larger volumes being filtered in the net sampling.

A consistency between both methods was a domination of two or three species accounting for the majority of the phytoplankton density. Such dominance by a small number of species is not uncommon in phytoplankton communities and has been observed in previous regional studies in the area. The combination of results from the horizontal and vertical net trawl sampling strategies suggested that a greater density of phytoplankton was present in deeper waters, rather than in the surface 0 - 5 m.

6.6.5.2 Zooplankton

As observed in previous surveys at offshore and coastal locations, the zooplankton community was numerically dominated by the non-native copepod *Acartia tonsa*, the abundance of which was higher in the 2020 survey (~7150 n/m^3) compared to all previous surveys (~1400 – 2400 n/m^3). Unlike the results for phytoplankton, a greater zooplankton abundance was observed in the horizontal trawl samples than in the vertical trawl samples, indicating that a higher abundance was present in the surface layer 0 - 5 m. The non-native ctenophore *Mnemiopsis leidyi* was present in all samples; on average the abundance of *Mnemiopsis* has remained relatively stable over recent surveys (bp Exploration Shah Deniz, 2020).

Sensitivity

Although phytoplankton and zooplankton are sensitive to chemical contamination at an individual level, this does not mean high sensitivity at the population level. Plankton populations can grow rapidly from just a few individuals (phytoplankton populations can double in 12 hours, copepod zooplankton populations in 2-3 days). This means that populations can re-establish quickly, which is a natural feature of plankton ecology. In some instances, rapid growth can offset the effects of chemical contamination.

6.6.5.3 Fish

The Caspian's unique geography, climate and hydrological characteristics create a range of different habitats that support a large diversity of fish species. The existence of shallow areas, deep depressions, and a wide range of salinities provide different environmental conditions and habitats favourable for species diversity. Approximately 151 species and subspecies of fish can be found in the Caspian and associated river deltas (Ivanov & Komarova, 2008). Due to the Caspian's isolation from other water bodies, the sea is characterised by the presence of many endemic species.

Fish commonly found in the central and southern Caspian Sea can be categorised into the three following categories:

- migratory species – those which feed in the sea before becoming mature and spawning in rivers, includes the anadromous species sturgeon and shad
- semi-migratory – those which feed in the sea, but breed during the flood water season in the freshwater parts of the Caspian and river deltas, includes kilka and mullet
- marine species - those which spend their entire life cycles in the sea, includes gobies and sandsmelt.

In general, the main distribution of fish species in the Caspian is within the shallow water shelf areas. Maximum concentrations of fish are typically found at depths of up to 75 m for the majority of the year, but it is common for Caspian fish species to migrate to warmer waters for overwintering and to migrate to nutrient rich shallow areas of the north or river deltas in the spring / summer for spawning and feeding. The coastal region is important for non-migratory species as it provides breeding and nursery habitat for a number of species during spring, summer and autumn.

Sturgeon species generally spend spring and summer in the northern and central parts of the Caspian Sea, spawning within riverine environments during spring before migrating southwards in autumn and remaining in the south during winter. They are likely to pass through the waters surrounding the Absheron Peninsula during migration, see Figure 6.16.

The seasonal distribution of most shad species and the water depths they are typically found at is similar to sturgeon species, see Figure 6.16. The exception being big eyed shad (*Alosa brashnikovi autumnalis*) that are known to spawn in the shallowest waters along the coast of the southern Caspian during spring before moving to greater depths during summer, autumn and winter.

Pelagic species such as kilka overwinter in the southern Caspian before undertaking short migrations to spawning areas in the southern and central Caspian, see Figure 6.17. Common kilka spawn in shallow waters in spring. Big-eye and anchovy kilka have more extended spawning periods in deeper waters of the southern and central Caspian (see Table 6.9).

Mullet spawn in the waters of the central and southern Caspian in the summer months and migrate south in the autumn to dwell in the very south of the Caspian Sea in the winter, typically in deeper waters. According to Akhundov (2019), leaping grey mullet (*Liza saliens*) is found in the Shah Deniz Contract Area during the wintering period.

Goby species are very common and widespread in the Caspian Sea. Many goby species usually stay in shallow waters (up to 20 to 200 m) and some migrate through and into deeper waters during autumn and into winter.

Table 6.9 summarises the seasonal presence of fish groups within the Shah Deniz Contract Area.

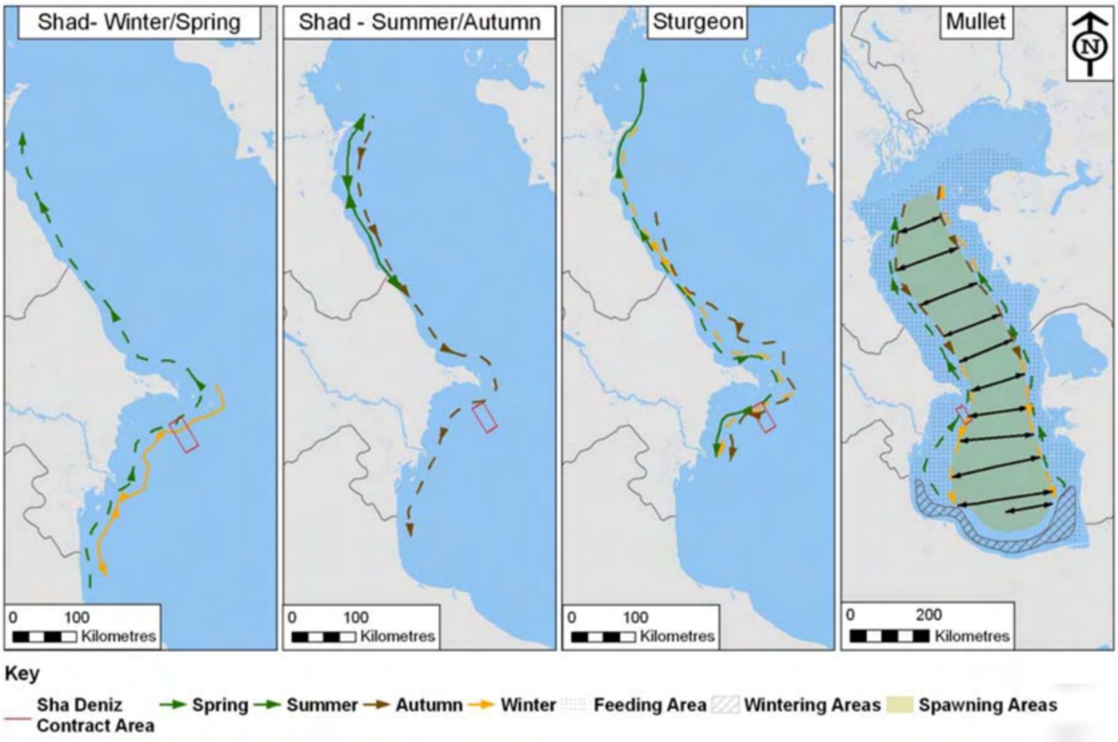

Figure 6.16: Shad, sturgeon and mullet migration routes

Source: URS, 2013

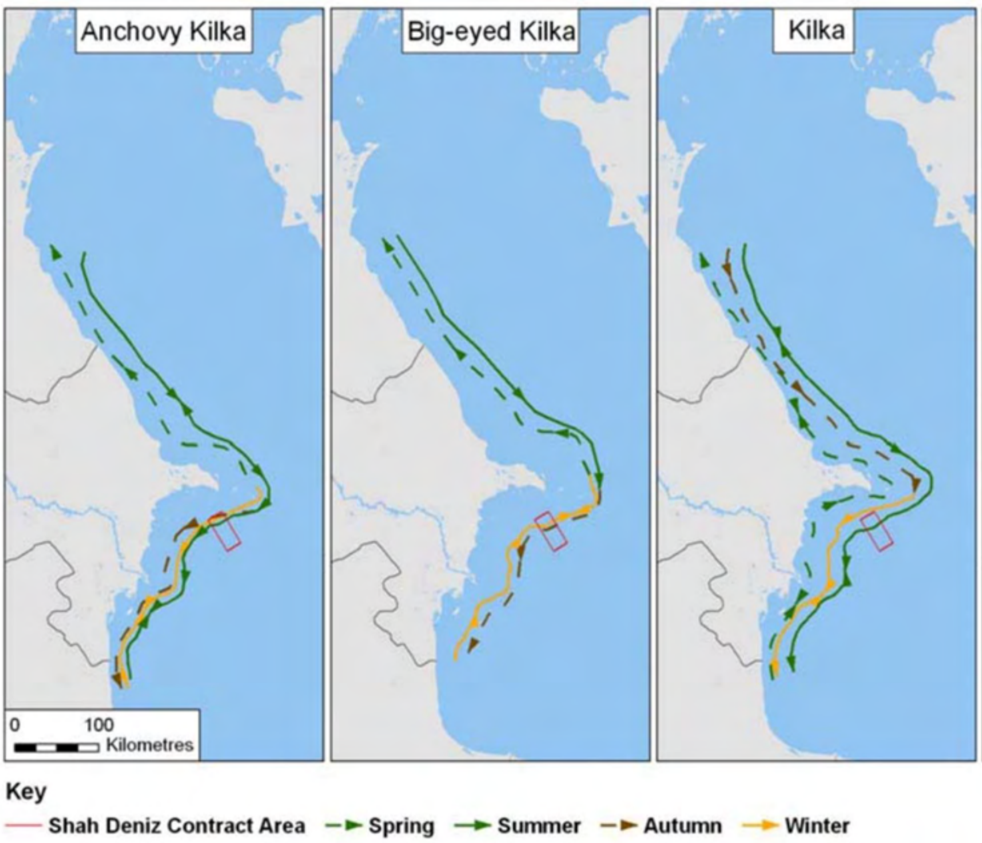

Figure 6.17: Kilka migration routes (anchovy, big-eye and common kilka)

Source: URS, 2013

Sensitivity

Seasonal sensitivity for fish species is shown in Table 6.9. Fish species that are known to breed in the area include resident fish species, such as gobies, kilka and mullet. Gobies breed between April and July, kilka between January and November, and mullet between June and October.

Fish species are vulnerable to oil and chemical spills, specifically during spawning. They are also sensitive to underwater sound, particularly those species with swim bladders (in particular swim bladders that are connected to the ear), see Chapter 9: Section 9.5.1.3.

Common threats to fish populations are over fishing, high levels of pollution (from both man-made and natural events) and habitat loss. In addition in the Caspian, stock collapse of certain species (e.g. kilka) is a result of the invasion and spread of the non-native ctenophore *Mnemiopsis leidyi*.

Table 6.9: Fish species anticipated in the vicinity of the SD Contract Area

Family / Species	Spawning location	Distribution in southern Caspian	Conservation status *
Sturgeon (Acipenseridae)			
Beluga sturgeon (*Huso huso*)	Spawns in the northern rivers and in the Kura river from April to June.	Spring migration through area at water depths between 50 -70 m in spring / summer and 70-100 m in autumn / winter. Winters in southern Caspian at depths up to 200 m.	IUCN RL - CR
Kura sturgeon (*Acipenser stellatus*)	Spawns in southern rivers between May and August and in northern rivers between June and Aug.	Spring migration through area at water depths between 50 -70 m in spring / summer and 70-100 m in autumn / winter. Winters in Caspian at depths up to 100 m.	IUCN RL - CR
Persian sturgeon (*Acipenser persicus*)	Spawns mostly in the Kura river Apr - Aug with a peak in June.	Found in the southern Caspian predominantly at depths of less than 50 m.	IUCN RL - CR
Russian sturgeon (*Acipenser gueldenstaedtii*)	Spawn in the northern rivers between March and November, with a peak in July.	Spring migration through area at water depths between 50 -70 m in spring / summer and 70-100 m in autumn / winter. Winters in southwest Caspian at depths of up to 130 m.	IUCN RL - CR
Spine sturgeon (*Acipenser nudiventris*)	Spawns in Kura river, however, scarce in recent years and rarely found in Kura.	Lives in shallow waters of sea near coast in water depths less than 25 m (Mustafayev et al, 2023).	IUCN RL - CR AzRB (2023)
Kilka (Clupidae, genus *Clupeonella*)			
Anchovy kilka (*Clupeonella engrauliformis*)	Spawns in the circular current system of the central / south Caspian from May to November.	Largest concentrations occur in circular current system at depths of 50 to 200 m. Large concentrations in excess of 200 m, particularly during overwintering.	IUCN RL - EN
Big-eyed kilka (*Clupeonella grimmi*)	Spawns in the circular current system of the central / south Caspian between January and April.	Distributed throughout the open sea area of the middle and south Caspian at depths greater than 40 m. Moves into deeper waters to overwinter.	IUCN RL - EN

Family / Species	Spawning location	Distribution in southern Caspian	Conservation status *
Caspian common kilka (*Clupeonella deliculata caspia*)	Spawns in shallow depths near shores of the middle and south Caspian as well as throughout northern Caspian. Spawns from February to July in the southern Caspian.	Distributed throughout Caspian, predominantly in the littoral 10 to 60 m water depth. Overwinters at depths of 35 to 100 m water depth.	IUCN RL - LC
Caspian shad (*Alosa caspia caspia*)	Spawns in the northern Caspian deltas from April to May.	Winters in southern Caspian at depths of 30 – 40 m but found also in deeper waters during winter. Largest concentrations of overwintering fish in coastal areas from November to February.	IUCN RL - LC
Big-eyed shad (*Alosa saposhnikowii*)	Spawns in shallow waters of northern Caspian from April to May.	Overwinters in middle and southern Caspian. Largest concentrations of overwinter fish from November to February. Occurs from the surface to depths of 30-40 m and deeper in winter.	IUCN RL - DD
Black-backed shad (*Alosa kessleri kessleri*)	Spawns in northern Caspian shallow waters from April to May.	Overwinters in southern Caspian along the eastern and western coasts at depths of 50 - 100 m and more. Largest concentrations overwinter from November to February.	IUCN RL - LC
Dolginka shad (*Alosa brashnikowi brashnikowi*)	Spawns in shallow waters of northern Caspian during April to May.	Overwinters in middle and southern Caspian. Migrates to the brackish waters of the northern Caspian for breeding. Largest concentrations of overwintering fish will be present in coastal areas of south-west Caspian from November to February.	IUCN RL - DD
Volga shad (*Alosa volgensis*)	Spawns in northern shallow waters between May and June.	Mostly distributed in northern Caspian. Migrates to middle and southern Caspian for overwintering. Stock has decreased sharply due to destruction of spawning grounds.	IUCN RL - EN AzRB (2023)
Mullet (Liza spp.)			
Golden mullet (*Liza auratus*)	Spawns from August to October in central Caspian (300 – 600 m water depth)	Migrates to northern Caspian in spring to feed and migrates south in autumn to overwinter. Eggs and larvae are pelagic, with larvae migrating towards shallower coastal areas.	IUCN RL - LC

Family / Species	Spawning location	Distribution in southern Caspian	Conservation status *
Leaping grey mullet (*Liza saliens*)	Mass spawning during June-July in central areas of the southern and middle Caspian (5 – 700 m water depth)	Migrates to northern Caspian in spring to feed and migrates south in autumn to overwinter. Eggs concentrate at water depths of 5-100 m while the later larval stages congregate at depths of 10-40 m.	IUCN RL - LC
Gobies (Gobiidae)			
Caspian goby (*Neogobius caspius*)	Spawns in shallow coastal waters in northern, central and southern Caspian between April and July (1-10 m water depth)	Resident species preferring shallow waters (1-10 m), but can be also found in deeper areas of the sea in winter months (60-150 m).	IUCN RL - LC
Round goby (*Neogobius melanostomus affinis*)			IUCN RL - LC
Caspian syrman goby (*Neogobius syrman eurystomus)*			IUCN RL - LC
Granular pugolovka *(Benthophilus granulosus)*			IUCN RL - LC
Baer pugolovka (*Benthophilus baeri)*			IUCN RL - LC
Slender-snout pugolovka *(Benthophilus leptocephalus)*	Spawns in central and southern Caspian in water depths 40 – 80 m.	Resident species preferring water depths of 100-300 m in spring / summer, but can be also found in deeper areas of the sea in winter months (300-500 m).	IUCN RL - LC
Short-snout pugolovka *(Benthophilus leptorhynchus)*			IUCN RL - LC
Duckbill pugolovka (*Anatirostrum profundorum)*			IUCN RL - LC
Ilyin goby (Knipowitschia iljini)			IUCN RL - DD
Grimm big-headed goby (*Benthophilus grimmi*)	Spawns in central and southern Caspian between March and April (10 - 20 m water depth).	Resident species preferring water depths of 30-200 m in spring / summer months), but can be also found in deeper areas of the sea in winter months (up to 300 m).	IUCN RL - DD

Family / Species	Spawning location	Distribution in southern Caspian	Conservation status *
Salmon (Salmonidae)			
Caspian salmon (*Salmo trutta caspius*)	Spawns in Kura, Terek, Samur, Keyranchay, small rivers of the western coast of the central and south Caspian, on rare occasions Volga and Ural from October to March	Found in the western coastal areas of middle and southern Caspian at depths of 40 - 50 m.	IUCN RL – LC AzRB (2023)

Notes:

* IUCN Red List abbreviations, DD - Data Deficient, LC - Least Concern, NT - Near Threatened, VU – Vulnerable, EN - Endangered, CR - Critically Endangered.

6.6.5.4 Marine mammals

The Caspian seal (*Phoca caspica*) is the only marine mammal in the Caspian Sea and is endemic to the area. It has been listed on the IUCN Red List as 'Endangered' since October 2008 and has been included in the Red Books of all the Caspian states since 2020 (Kydyrmanov *et al*. 2023).

A literature review update was undertaken in June 2024 by Dr Tariel Eybatov (Director of Natural History Museum) to obtain the latest information on Caspian seals relevant to the SDC project. Information from the literature review is included in the sections below and the full report is included in Appendix 6D.

The population of Caspian seals has decreased by more than 90% since the start of the 20th century, considered to be due to a combination of commercial hunting, habitat degradation (through introduction of invasive species), disease, industrial development, pollution and fishing operations using nets (by-catch). The population of seals has been estimated using a number of different methods. One of the most recent estimates of abundance are based on aerial surveys of the breeding population on the northern ice field conducted annually in February between 2005 and 2012 (Härkönen et al. 2008, Dmitrieva et al. 2016). During this period estimated annual pup production ranged between 8,200 and 34,000. This data suggested approximately 68,000 reproductively mature individuals (male and female), with the total population in the region of 104,000 to 168,000 individuals, derived from an age structured model (Härkönen et al. 2008, 2012; Dmitrieva et al. 2016). More recently winter aerial surveys have been carried out in the Russian and Kazakhstan sectors of the Caspian Sea by marine mammal specialists from the Russian Research Institute of Fisheries and Oceanography and the Institute of Ecology and Evolution of Russian Academy of Sciences. As a result of this work population estimates in 2022 were 311,400 individuals, and 259,900 in 2023 (Kaspika, 2023). From these varying figures it can be concluded that the Caspian seal population is very difficult to determine accurately (Eybatov, 2024).

Seal stranding studies on the northern coast of the Absheron Peninsula have been conducted since 1971 by Eybatov, see Figure 6.18. Analysis of the beached carcases indicate that the deaths were due to poaching, destruction of the animals on the shore (either by fishermen seeing seals as competitors for fish, or inhabitants frightened of seal attacks), entanglement in fishing nets or damage from fishing hooks, and urbanisation of the coastline (coastal development and disturbance means emaciated migratory seals cannot go to shore) (Eybatov, 2024). Strandings of animals are generally in the hundreds. The exception to this was the mass beaching of seal carcases in autumn 2022 along the coast of Dagestan, where approximately 2,500 dead seals were recorded (Eybatov, 2024; Independent, 2022). The seals were in a decomposed state and quickly buried. The reasons suggested for the seal deaths were inconclusive, however, poaching of seals for seal skin and fat were suggested.

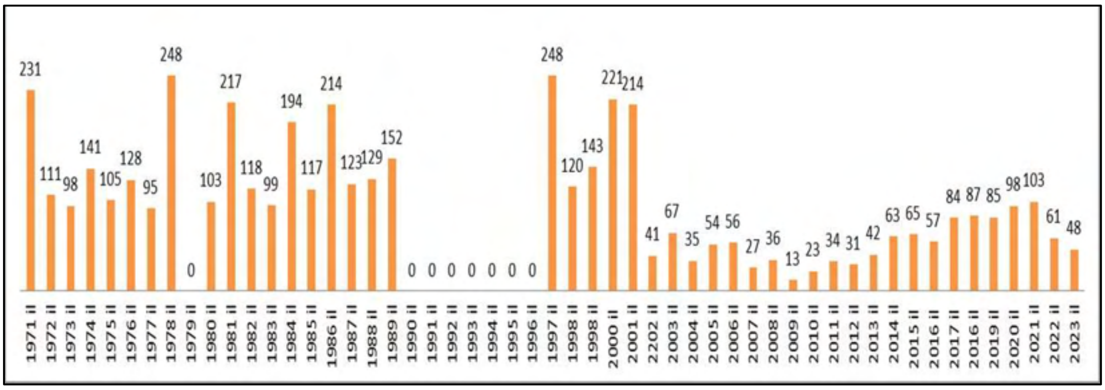

Figure 6.18: Seal beaching on northern coast of Azerbaijan Peninsula (monitoring zone of 10 km Buzovna to Șimali (North GRES-Buznova monitoring area))

Source: Eybatov, 2024

Seal distribution throughout the Caspian Sea is dictated by migration patterns, see Figure 6.19. During late spring, summer, and early autumn, Caspian seals are distributed throughout the Caspian. In late autumn, breeding adults gather in the northeast, hauling out on sandy islands and reefs in increasing numbers until sea ice begins to form. When the northern Caspian Sea surface freezes over, females form aggregations on the ice to give birth to their pups. The location of breeding sites varies according to the severity of the winter and the position of the sea ice front. Pups are generally born from mid-January to late February.

In April or May (and sometimes earlier depending on the extent of sea ice in the northern Caspian, see Table 6.10), seals migrate south from the sea ice to feed in the central Caspian. Although it was previously thought all individuals made this migration, tagging data revealed only 60% of the population moved south (Dmitrieva et al., 2016). Recent tagging of seals (carried out by L. Dmitrieva (2011-2012) and P. Shibanova (2021-2022) demonstrated that seals migrate across the entire width of the central Caspian and move chaotically following schools of fish. The young inexperienced individuals move along the coast, whilst adults actively move in deeper waters where schools of kilka migrate. During feeding, seals typically dive down to a depth of 10 m, remaining underwater for approximately 4-5 minutes. However, they are capable of remaining underwater for up to 15-20 minutes, and diving to depths of 100 to 120 m (Gadjiev, 1999).

In May and June the seals start moving into the deeper waters of the summer feeding and fattening area where the kilka populations are concentrated (see Figure 6.20), returning periodically to their haul out sites. The seals use sandy islands and reefs as haul out sites, preferring the tips of peninsulas and sand bars in many areas, although large concentrations of seals in reed-bed areas of islands also occur.

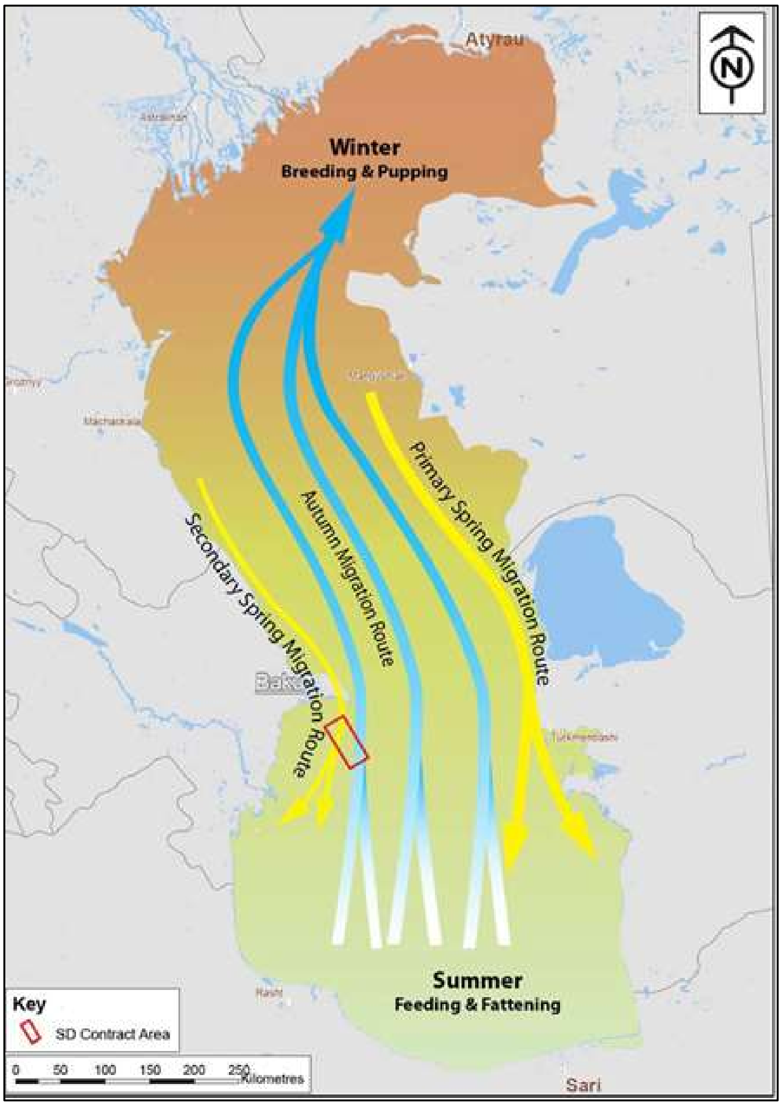

Figure 6.19: Caspian seal migration routes

Source: URS, 2013

Table 6.10: Spring migration of Caspian seals and arrival in Azerbaijani waters

Year	Seal appearance in Azerbaijani waters of northern Caspian	Seal appearance on islands of Absheron archipelago and Absheron strait
2017	Beginning of April (3-4)	Mid-April (13-15)
2018	End of April (22-23)	Beginning of May (1-2)
2019	First days of March (2-3) - rapid melting of ice in northern Caspian	Mid-March (1-13)
2020	End of March (27)	Beginning of April (1-2)
2021	Mid-April (19-20)	Beginning of May (1-2)
2022	Beginning of March (3-4) - sea ice limited in northern Caspian	Mid-March (12-13)
2023	End of March - 12% more sea ice in northern Caspian than previous year	End of March (28)

Source: Eybatov, 2022 and Eybatov, 2024

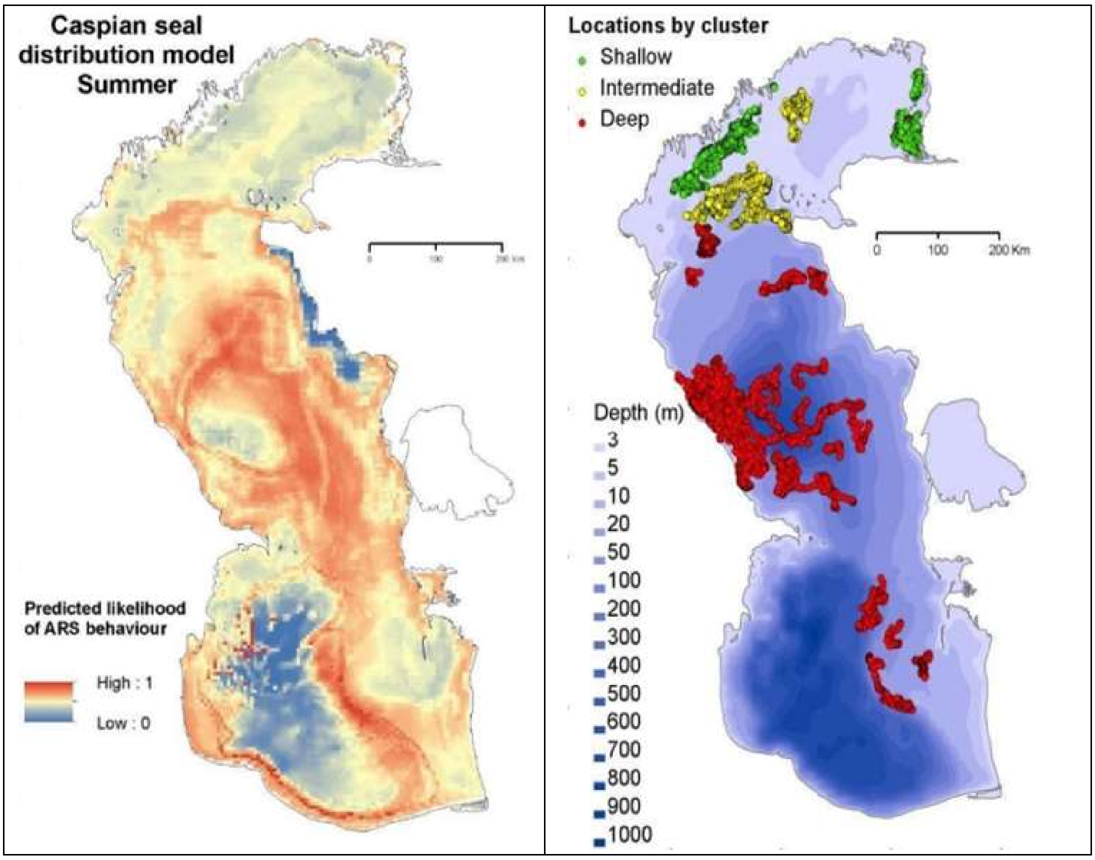

Figure 6.20: Predicted summer (May – September) distribution of Caspian seals (left); foraging locations of tagged seals by dive profile type (right)

Source: IUCN-Marine Mammal Protected Areas Task Force, 2021

During late summer / autumn, seal densities will begin to decrease in the central and southern Caspian as the majority of the seals begin their return migration north. In October / November the seals continue the migration northwards, mainly to islands in the northeast Caspian where they haul-out to wait for the sea ice to form and a new breeding season to begin. In recent years, this northward migration has been delayed, meaning significant numbers of seals may remain present in the Azerbaijani sector of the Caspian during the first half of December (AECOM, 2020).

The most recent seal counts in the Shah Deniz Contract Area were carried out in September 2023 by marine mammal observers during a 2D UHR seismic survey. The results are provided in Table 6.11. As would be expected, sighting rates generally decreased with increasing significant wave height and worsening visibility.

Table 6.11: Sighting of Caspian seals during Shah Deniz 2D UHR seismic survey

Date (2023)	Significant wave height (m)	Visibility (km)	Number of Caspian seals
1 September	3	0.5	0
2 September	2	1	1
3 - 6 September	1	5	21
7 September	4	0.5	0
8 - 9 September	2	2	0

Source: Mustafayev, 2023

Sensitivity

The reasons for the significant decline in the Caspian seal's population in the past century are complex but are thought to be associated with hunting, fishing activities, outbreaks of Canine Distemper Virus (CDV), invasive species and pollution (mainly organochlorides such as dichlorodiphenyltrichloroethane (DDT)). In addition, climate change is anticipated to have a detrimental effect on the population reducing the available sea ice for breeding.

Seals are sensitive to underwater sound while diving or swimming so may be susceptible to high levels of underwater sound generated by vessel movements and construction activities, particularly impact piling. Seals are directly and indirectly sensitive to pollution spills (such as oils or chemicals) and ongoing discharges which contribute to contamination over time.

As discussed above, Caspian seals may be present in the SD Contract Area at any time of year but with an increased likelihood during the spring and autumn migration periods, and during the summer months for feeding (depending on the distribution of kilka). Spring is typically the period when the seals are most sensitive as their fat reserves are depleted after the months spent on sea-ice in the north during winter.

6.7 Offshore Environment Specific to SDC Project Location

6.7.1 SDC platform location

An environmental baseline survey of the seabed and water column was carried out in August 2023 around the planned position of the SDC platform. The 18 sample stations are presented in Figure 6.21. Sediment samples were collected at all stations and subject to chemical and biological (sediment macrofauna) analysis. Water samples were collected from four of the stations (Stations 2, 8, 11, and 17) and subject to chemical and biological (plankton) analysis.

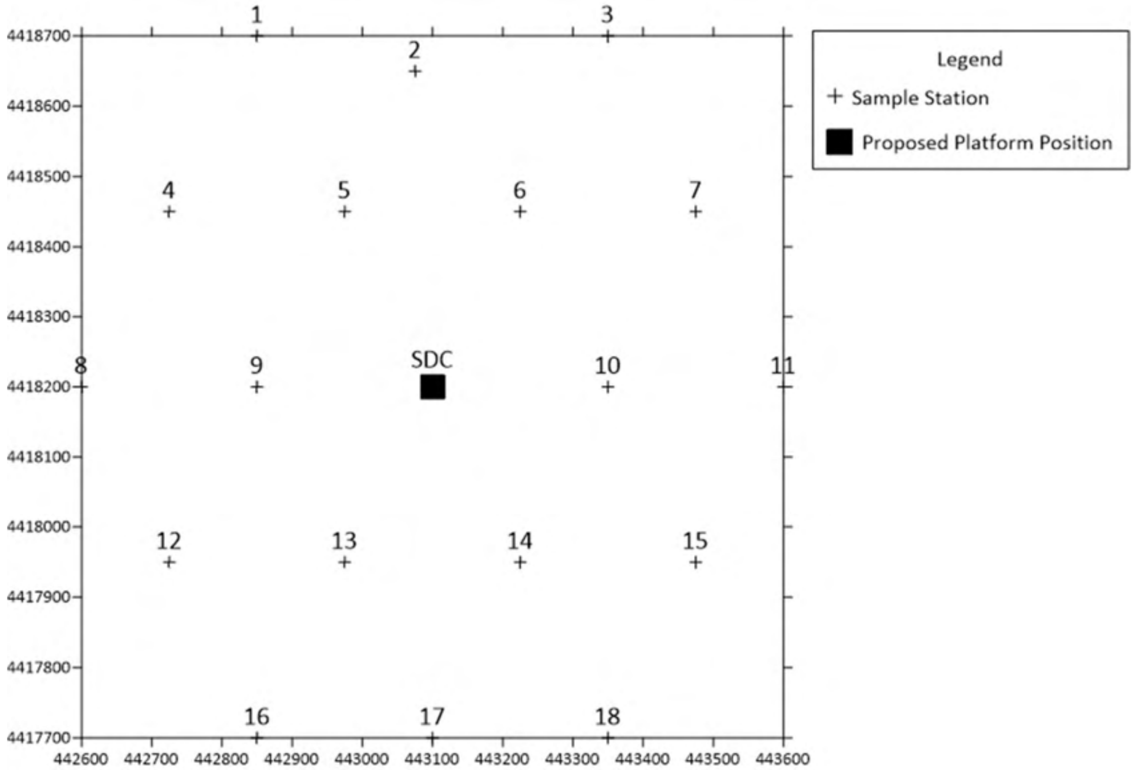

Figure 6.21: 2023 SDC baseline survey sampling stations

Source: bp Exploration Shah Deniz, 2023

6.7.1.1 *Physical and chemical characteristics of seabed sediments*

The seabed was sampled using a double 0.1 m^2 Van Veen grab collecting samples of 10 to 15 cm sediment depth from the surface of the seabed. Two replicate samples were collected at each station for physical and chemical analysis, and three replicate samples were collected for biological analysis (see Section 6.7.1.2).

Surface sediments across the majority of the SDC survey area were dominated by the finest silt and clay fractions and included small and varying proportions of coarser gravel and sand fractions, see Table 6.12. While comparable to the sediments at neighbouring SD regional survey stations, the sediments within the SDC survey area were finer than those present at the adjacent SDB, and to a lesser extent, SDA locations. The finest sediments were present at Stations 1 and 2 (very fine silt) on the western half of the northern boundary, while the coarsest sediments with the highest proportions of gravel, were present at Stations 3 and 11 (medium / coarse silt and very fine sand) on the eastern half of the northern boundary and the centre of the eastern boundary, and Stations 13 and 17 (medium silt) in the southwestern quadrant.

Table 6.12: Summary of sediment properties recorded at SDC platform location

	Mean diameter µm	Carbonate %	Organic matter %	Gravel % (>2mm)	Silt / Clay % (<63µm)	Silt % (3.9 - 63µm)	Clay % (<3.9µm)	Wentworth scale
Min	6	27	4	0	52	25	27	V. fine silt
Max	94	59	8	27	100	53	53	V. fine sand
Median	15	38	5	8	85	40	43	
Mean	19	39	6	10	84	41	43	

Source: bp Exploration Shah Deniz, 2023

SDC survey results showed a strong correlation between THC and PAH, with composition indicative of heavily weathered material being present across the entire survey area. The distribution of THC and PAH was patchy, with concentrations at the upper and lower ends of the recorded ranges being recorded at neighbouring stations. The highest concentrations were recorded at stations in the northwestern quadrant centred on Stations 4 and 5 (THC 269 – 408 µg/g, USEPA 16 PAH 205 – 279 ng/g), and at Station 15 (THC 316 – 318 µg/g, USEPA 16 PAH 218 – 253 ng/g) in the centre of the southeastern quadrant, while the lowest concentrations were recorded at Stations 16 and 18 on the southern boundary (THC 85 – 122 µg/g, USEPA 16 PAH 131 - 175 ng/g) and Station 3 on the eastern half of the northern boundary (THC 124 – 224 µg/g, USEPA 16 PAH 135 – 162 ng/g). When compared to data from neighbouring survey sites the concentrations of hydrocarbons in surface sediments within the SDC survey area (see Table 6.13) were typical of the sediment type and location.

Table 6.13: Summary of sediment hydrocarbon concentrations recorded at SDC platform location

	THC (µg/g)	UCM (µg/g)	% UCM	Total 2-6 ring PAH (ng/g)	NPD (ng/g)	% NPD	USEPA 16 PAH (ng/g)
Min	85	77	89	556	325	55	129
Max	408	380	93	1,303	804	64	279
Median	258	233	92	1,003	612	62	218
Mean	251	230	92	1,010	614	61	213

Source: bp Exploration Shah Deniz, 2023

Sediment metals concentrations across the SDC survey area were generally low for most metals (see Table 6.14), with moderate to strong positive intercorrelation between chromium, copper, iron, manganese and zinc, with copper and iron also being positively correlated to arsenic. Both extracted forms of barium were correlated to each other and weakly correlated to lead, while the concentrations of mercury and cadmium were independent of all other metals. When compared to data from neighbouring survey sites the composition and concentrations of metals in surface sediments within the SDC survey area were typical of the sediment type and location.

Table 6.14: Summary of sediment heavy metal concentrations (mg/kg) recorded at SDC platform location

	As	Ba (HNO_3)	Ba (fusion)	Cd	Cr	Cu	Hg	Fe	Mn	Pb	Zn
Min	7	330	459	0.10	50	23	0.037	26,740	483	18	68
Max	14	1,146	2,540	1.26	76	31	0.077	38,900	643	23	119
Median	10	766	883	0.14	60	27	0.054	32,665	586	20	81
Mean	10	760	954	0.17	60	27	0.055	32,785	584	20	84

Source: bp Exploration Shah Deniz, 2023

6.7.1.2 Biological characteristics of seabed sediments

The macrobenthic community at 17 of the 18 sample stations was sparse and was numerically dominated by the polychaete *Spionidea spp*, the oligochaete *Isochaetides michaelseni*, and the insect *Chironomus albidus*, see Table 6.15. While community variation between stations was low, a generally lower abundance of annelids was observed at stations in the south and southeast of the survey area.

A more taxonomically rich and more abundant community was present at Station 18, located on the eastern half of the southern boundary of the survey area. Amphipods of the genus *Corophium* and the Cirriped *Balanus improvises* were numerically dominant, and the abundance of annelids was the highest within the survey. While *Spionidae* and *Isochaetides* were the most abundant polychaete and oligochaete species, the polychaete *Manayunkia capsica* and the oligochaete *Psammoryctides deserticola* (species which are common and usually abundant across the wider region) were also present.

Previous surveys within the SD Contract Area, and the wider middle Caspian, have identified that macrofaunal community variation is commonly associated with the physical characteristics of seabed sediments; more abundant and taxonomically rich communities were usually present in areas where sediments were more heterogeneous and contained higher proportions of the coarser particle size fractions.

The annelid dominated community present across most of the SDC survey area was very similar to the communities observed at two neighbouring SD regional stations where the sediments were composed of 100% silt / clay.

The more taxonomically rich and abundant community at Station 18 in the southeast of the survey area was very similar to the community at one neighbouring SD regional station where the sediments were slightly coarser, but less abundant than the communities present at SDA and SDB, where more heterogenous and on average coarser sediments were present.

Table 6.15: Macrobenthic species abundance (number/m^2) by sample station recorded at SDC platform location

Taxon / Station	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Class Polychaeta																		
Nereis diversicolor	3	0	7	0	0	0	0	3	3	3	0	0	0	0	0	0	0	23
Spionidae spp	80	37	27	93	40	33	40	43	67	90	83	73	57	43	17	13	43	67
Hypaniola kowalewskii	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Manayunkia caspica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
Class Oligochaeta																		
Isochaetides michaelseni	80	83	27	57	60	37	70	77	60	70	77	33	20	27	13	27	27	67
Psammoryctides deserticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
Order Cirripedia																		
Balanus improvisus	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	237
Order Cumacea																		
Schizorhynchus eudorelloides	23	7	30	17	7	7	7	10	13	33	13	23	13	3	0	33	17	43
Stenocuma diastyloides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
Stenocuma graciloides	0	0	0	3	0	0	0	0	0	0	0	3	3	0	0	0	0	0
Caspiocuma campylaspoides	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Order Amphipoda																		
Derzhavinella macrochelata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
Corophium spp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	107
Corophium curvispinum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
Corophium spinulosum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
Corophium chelicorne	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	93
Corophium nobile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
Order Isopoda																		
Saduria entomon caspia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
Class Insecta																		
Chironomus albidus	277	40	50	20	50	57	63	73	40	87	17	33	0	7	40	17	3	17

Source: bp Exploration Shah Deniz, 2023

As the physical characteristics of the sediments at SDC Station 18 were no different to those found within the rest of the survey area, the richer and more abundant community at Station 18 could not be associated with variation in the physical composition of the seabed sediments. Overall, there were no notable differences in the physico-chemical characteristics at Station 18 that could account for the different macrofaunal community present. As Station 18 is located on the extreme southeast of the survey area, it is possible that the SDC survey area lies on the edge of a natural faunal transition between the annelid dominated communities present within the SDC location, and more abundant and taxonomically rich communities to the southeast.

6.7.1.3 Chemical characteristics of the water column

Water samples were collected at four of the 18 sampling stations using a 12 litre Niskin sampler. Two samples were taken at each station, one from surface waters (0 - 2 m) and another from below the major thermocline (~50 m) which was identified using a conductivity, temperature and depth (CDT) sensor.

Recorded water temperature during the SDC survey was typical for the season with little variation between stations. Temperature, dissolved oxygen and pH were all lower in the samples collected below the thermocline, as expected. Between the two sampling depths salinity, conductivity, redox potential and turbidity were all very similar. These water sample properties were all comparable to those recorded during the 2020 SD regional environmental survey, with one exception being lower redox potential in the SDC samples.

Laboratory analysis concluded concentrations of total suspended solids, nitrates, nitrites and ammonium all below their respective minimum detection limit (MDL) in all samples. Biochemical oxygen demand (BOD) exhibited very little variation between stations or depth while chemical oxygen demand (COD) was higher in samples for both depths at two stations (2 and 8). Concentrations of phosphates, total phosphorus, and silicates were higher in sub-thermocline samples, while the concentrations of total nitrogen were, overall, slightly higher in surface samples. Concentrations for BOD, COD, total nitrogen, phosphates, total phosphorus, and silicates were slightly higher in SDC survey samples than in the 2020 SD regional environmental survey.

THC and PAH concentrations in SDC water samples were below their respective MDL in all samples, while phenol concentrations were below MDL in two samples and between 2 and 5 µg/l in the remaining six samples. These measurements are similar to those recorded in the 2020 SD regional environmental survey.

Metal concentrations were below the MDL for cadmium and lead in all samples, while those that were measurable were very similar between stations and sample depths. Cadmium, cobalt, nickel and zinc were similar in concentration to the 2020 regional environmental survey while copper, iron and lead were slightly lower in the SDC survey, see Table 6.16.

In general, water analyses showed the water column of the survey area to be characteristic of uncontaminated offshore waters in the middle Caspian. The results of all measured parameters were comparable to those recorded in previous surveys within the region.

Table 6.16: Metal concentrations (µg/l) in water samples recorded at SDC platform location

Station	Sample depth	Cd	Co	Cu	Fe	Ni	Pb	Zn
2	Surface	<0.1	0.07	0.62	2.5	0.89	<0.1	0.6
	50 m	<0.1	0.05	0.61	2.5	0.87	<0.1	0.8
8	Surface	<0.1	0.06	0.61	2.4	0.91	<0.1	1.0
	50 m	<0.1	0.07	0.88	2.5	1.00	<0.1	1.7
11	Surface	<0.1	0.06	0.62	2.2	0.94	<0.1	0.7
	50 m	<0.1	0.06	0.59	3.0	1.02	<0.1	2.4
17	Surface	<0.1	0.07	0.63	2.3	0.92	<0.1	1.5
	50 m	<0.1	0.08	0.69	2.3	0.94	<0.1	1.6

Source: bp Exploration Shah Deniz, 2023

6.7.1.4 Biological characteristics of the water column

Plankton samples were collected at 4 stations using a double Bongo-net system: 2 x 200-µm coarse-mesh nets for sampling zooplankton and gelatinous plankton (*Mnemiopsis*), and 2 x 53-µm fine-mesh nets for micro-zooplankton and phytoplankton. The nets were towed in a horizontal trajectory, sampling waters between the surface and approximately 3 m below the surface, for approximately 200 m on each sampling run. Vertical hauls were also collected - using the double Bongo-net system - from a depth of 50 m to the surface; vertical samples were collected to identify the presence of deep dwelling species that may not be collected in the horizontal trawls.

In addition to the net samples, 500 ml of seawater was collected at each of the 4 water sampling stations using a Niskin sampler. These samples were preserved with buffered formaldehyde solution for phytoplankton taxonomy, abundance, and biomass determination.

Phytoplankton

A total of 24 phytoplankton species were recorded during the SDC survey, see Table 6.17. Chlorophyta and dinophyta were present in all samples, with overall abundance dominated by chlorophyta, mainly the genus *Binoclearia* (99% of the total abundance from all samples, suggesting the survey period coincided with a bloom of this taxonomic group). Baccilariophyta were present in all but one net sample and one bottle sample, while cyanophyta were only present in one net sample and one bottle sample. High numerical dominance of a small number of species within the phytoplankton community is not unusual and has been observed in previous surveys carried out at both inshore and offshore locations.

Table 6.17: Taxonomic composition pf phytoplankton communities recorded at SDC platform location

Group	Number of species
Cyanophyta	2
Bacillariophyta	9
Dinophyta	10
Chlorophyta	3
Total	**24**

Source: bp Exploration Shah Deniz, 2023

Zooplankton

Six zooplankton taxa were recorded in the 200 µm net samples and three were recorded in the 53 µm net samples. In both cases, the zooplankton community was dominated in all samples by the non-native copepod, *Acartia tonsa*, which represented 97% of individuals and 99% of sample biomass. This dominance by *Acartia* is common in both inshore and offshore surveys in the wider area, and abundances in the SDC survey were within the ranges recorded in SD regional environmental surveys. The invasive predatory ctenophore *Mnemiopsis leidyi* was also recorded in the SDC survey samples, but in lower numbers than from recent SD regional environmental surveys, see Table 6.18.

Table 6.18: Summary zooplankton information for SDC platform location

Survey	Year	*Acartia tonsa* number/m^3			*Mnemiopsis leidyi* number/m^3			Total abundance number/m^3			Total taxa
		Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	
SDC	2023	1,311	3,348	6,016	30	37	49	1,415	3,468	6,108	6
SD Regional	2020	2,496	7,154	13,439	37	73	129	2,825	7,762	14,802	14
	2015	900	2,096	3,417	79	127	217	1,320	2,685	4,399	14
	2013	377	1,667	2,669	57	78	112	753	2,133	3,522	14
	2011	405	2,403	7,921	42	75	98	811	3,052	9,274	14
	2009	156	1,448	6,188	34	122	476	318	3,441	10,542	13
	2005	687	1,925	4,160	0	9	32	1,363	4,098	7,139	8

Source: bp Exploration Shah Deniz, 2023

6.7.2 Sangachal Terminal to SDC offshore PFOC route

The majority of the proposed Sangachal to SDC PFOC route will follow that of the existing SD2 gas export pipeline, see Figure 6.22. Beyond Sangachal Bay, this route was last subject to targeted survey during and after the installation of the ACG Phase 1 and 2 pipelines (2000, 2006, 2008 and 2010), with sediment sampling Stations 11, 12 ,13, 14 and 15 laying along the SD2 export pipeline and proposed SDC PFOC route.

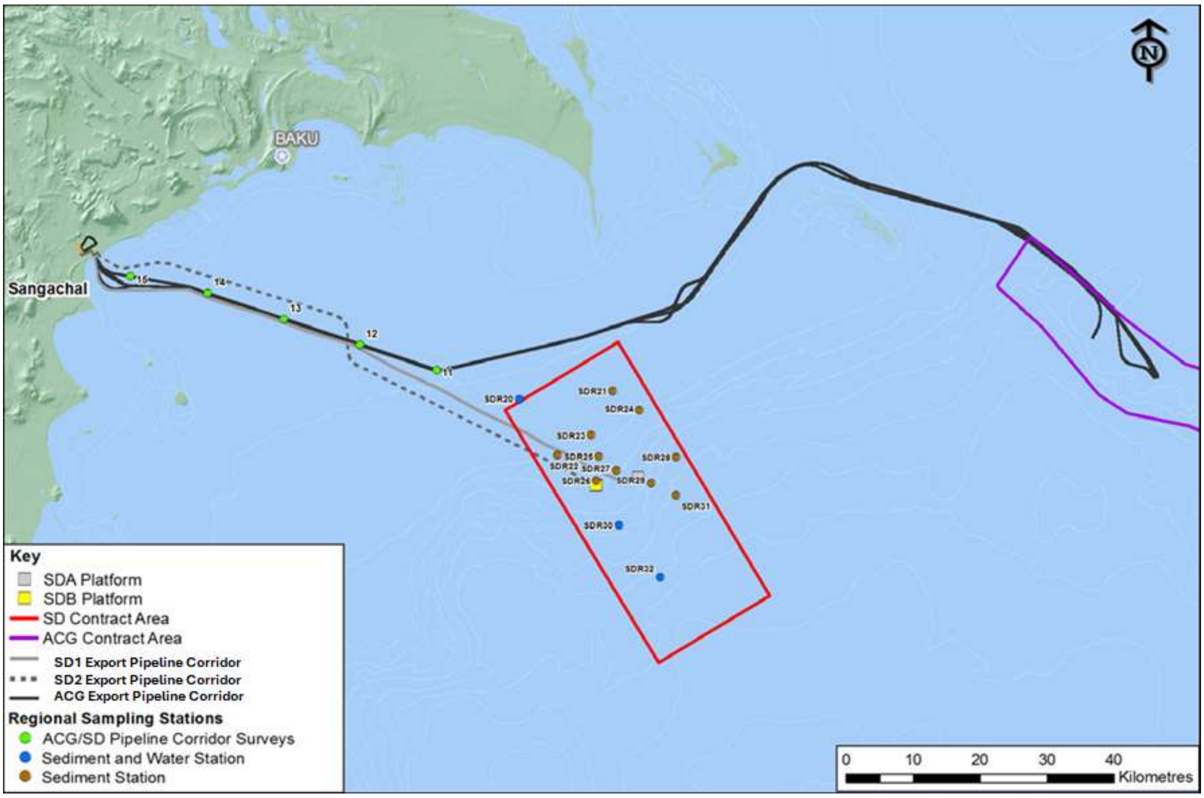

Figure 6.22: Survey sample locations in the vicinity of the proposed Sangachal Terminal to SDC offshore PFOC route

Source: Adapted from URS, 2013

6.7.2.1 Physical and chemical characteristics of seabed sediments

The sediments found closest to shore at Stations 14 and 15 were composed of coarse grained silt with higher carbonate content and lower silt-clay and organic content. This is consistent with the findings of previous Sangachal Bay surveys. For Stations 11 to 13, located further offshore, the sediment had a higher silt-clay and organic content while having lower carbonate content. These results are consistent with the 2020 regional environmental survey and the 2023 SDC survey.

Hydrocarbon concentration in sediments decreased with distance from shore (from Stations 15 to 11), but with some temporal variation, and with a general overall decline over the decade of the survey period, see Table 6.19. The higher concentrations close to shore are predominantly due to the proximity to shore-based sources of contamination.

In terms of trace metals, arsenic concentrations varied little along the route, and were typical of Caspian sediment background levels at all stations. For several metals (copper, zinc, chromium, cadmium and iron) concentrations increased slightly along the shelf route, then decreased again at Stations 14 and 15. The pattern for lead differed from other metals, with concentrations following an almost linear gradient from typical offshore levels and increasing towards the coast. Concentrations of mercury in the shallow-water stations were consistently 3 to 5 times higher than typical offshore background levels. It is probable that most of the mercury present at Stations 11 to 15 are a result of historical industrial contamination (URS, 2013).

Table 6.19: Hydrocarbon concentrations at survey stations along proposed Sangachal to SDC offshore PFOC route

Station number	THC (µg/g)			
	2000	2006	2008	2010
11	453	296	107	69
12	440	435	153	123
13	552	364	149	250
14	465	709	202	215
15	431	1,175	250	206

Source: URS, 2013

6.7.2.2 *Biological characteristics of seabed sediments*

Macrobenthic communities in the sediment along the route suggest that diversity and abundance is influenced by sediment composition. Overall, species richness and abundance were higher in deeper water locations offshore (68 m water depth or more) and reduced considerably at Stations 11 and 12 (see Table 6.20). Species richness varied between years, with communities dominated by a small number of non-native or invasive species. The invasive polychaete *Nereis sp* was dominant or subdominant at all stations. The only typical offshore species *Hypaniola kowalewskii* was consistently present in abundance.

Table 6.20: Summary of species richness and individual abundance along proposed Sangachal Terminal to SDC offshore PFOC route

Station number	Taxa			Individuals per m^3		
	2006	2008	2010	2006	2008	2010
11	9	5	9	593	67	243
12	8	3	5	823	427	493
13	7	10	12	2,023	1,473	1,947
14	5	8	8	2,003	367	1,580
15	11	9	7	597	510	2,280

Source: URS, 2013

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CHAPTER 7: Socio-economic Description

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7 SOCIO-ECONOMIC DESCRIPTION

7.1 Introduction

This chapter describes the existing social and socio-economic conditions relevant to the Shah Deniz Compression (SDC) project.

With the exception of the onshore SDC platform construction and commissioning (at existing construction yards), and the onshore and nearshore installation of the Sangachal to SDC power and fibre optic cable (PFOC), the majority of the SDC project activities will be predominantly located offshore. The focus of this chapter is therefore to provide a general overview of the social environment and establish the national, regional and local employment and community and economic conditions against which construction, commissioning and operational activities can be assessed.

In addition, information on the following socio-economic receptors is also included:

- the local communities in closest proximity to the proposed onshore SDC PFOC route, namely the settlements of Sangachal and Umid
- local communities in the vicinity of the construction yards, limited to Bibiheybat in the vicinity of Bayil yard (as there are no residential receptors in close proximity to BDJF yard)
- offshore and nearshore commercial fisheries
- shipping, navigation and offshore oil and gas infrastructure
- tourism and recreational users.

7.2 Data Sources

Socio-economic data presented in this chapter has been taken from the following sources:

- Review of available bp and third party ESIAs completed for projects in the Azerbaijan sector of the Caspian Sea, specifically within or in close proximity to the SDC project including:
  - Azeri Central East (ACE) ESIA (AECOM, 2019)
  - Shah Deniz Stage 2 (SD2) Project ESIA (URS, 2013)
  - Shallow Water Absheron Peninsula (SWAP) 3D Seismic Survey ESIA (AECOM, 2015).
- Secondary data and literature publicly available on the internet including data, reports and articles published by:
  - The State Statistical Committee of the Republic of Azerbaijan
  - United Nations Development Programme
  - Food and Agriculture Organization of the United Nations

- World Bank
- Local news outlets such as Azernews and the Azerbaijan News Agency.

- Project specific socio-economic literature review commissioned for the SDC project:
  - Fisheries literature review specific to the SDC project - Professor Mehman Akhundov, Fisheries and Aquaculture Research Centre Director, Ministry of Science and Education - Republic of Azerbaijan (June 2024), see Appendix 7A.

7.3 Geographic Context

Onshore construction yards

As presented in Chapter 5 of this ESIA, the SDC project includes the construction and commissioning of the SDC platform topsides, jacket and subsea equipment within a number of yards located on the Azerbaijan coastline. The yards anticipated to be used for the project, and their location and setting are presented in Section 6.4.1.

The Baku Deep Water Jacket Factory (BDJF) yard is located in Garadagh District, approximately 33 km to the southwest of Baku, within a mostly industrial and commercial area. There are no residential receptors in close proximity to this yard, the nearest settlement of Puta is located approximately 3 km to the north.

Bayil Yard is located in Sabail district, approximately 7 km to the south of Baku centre, in an area dominated by commercial and industrial use. The nearest residential settlement is the settlement of Bibiheybat located approximately 1 km to the west of the yard.

Sangachal Terminal and Sangachal to SDC PFOC route

Sangachal Terminal is located approximately 55 km southwest of Baku within Garadagh District. The SDC project does not require any additional expansion or upgrade of Sangachal Terminal, other than installation of power receiving and transfer kit.

The Sangachal to SDC PFOC will be installed between a landfall in Sangachal Bay and Sangachal Terminal, as shown in Figure 5.12. Sangachal and Umid are the closest settlements to the proposed PFOC route, see Figure 7.1.

Offshore and nearshore

The SDC platform will be installed offshore within the Shah Deniz Contract Area. The Sangachal to SDC PFOC will run from the offshore platform into Sangachal Bay where it will landfall close to the existing bp SD2 gas export pipeline route.

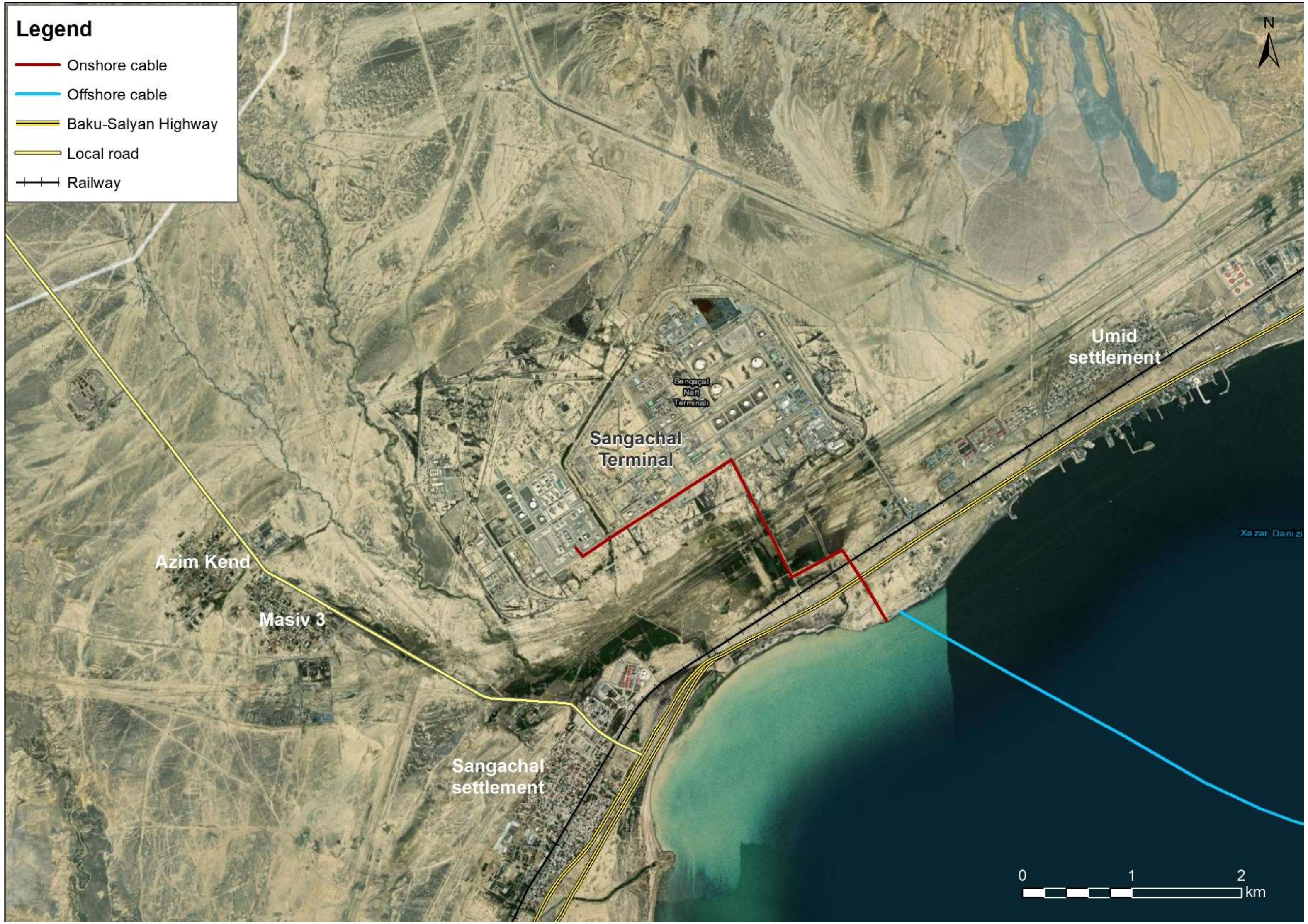

Figure 7.1: Location of settlements in relation to proposed SDC onshore PFOC route

7.4 National Policy

Approved by the President of the Republic of Azerbaijan in February 2021, 'Azerbaijan 2030 – National Priorities for Socio-economic Development' sets out the country's long-term development vector and pathways to socio-economic and environmental development through corresponding national priorities for the subsequent decade.

The priorities aligned with Azerbaijan commitments under the 2030 Agenda[1] include:

- steadily growing competitive economy
- society based on dynamic, inclusive and social justice
- competitive human capital and space for modern innovations
- Great Return to liberated territories (rehabilitation, reconstruction and reintegration of the liberated and conflict-affected areas will be one of the main directions of the development priority of Azerbaijan in coming years)
- clean environment and green growth country (Sustainable Development Goals Knowledge Platform, 2022).

7.5 Overview of Socio-economic Conditions

7.5.1 Population, demography and ethnicity

7.5.1.1 National level

Situated in the southern Caucasus region, Azerbaijan is bordered by the Caspian Sea to the east, Armenia and Georgia to the west, the Russian Federation to the north, and the Islamic Republic of Iran to the south. Most of Azerbaijan's major settlements are located along the coast with the highest population density found in the far eastern area of the country around the capital city of Baku. Apart from a few urbanised areas[2] the rest of the country has a fairly evenly distributed population (CIA, 2024).

As of March 2024, the population of Azerbaijan was estimated at 10,187,539 with a gender distribution of 49.8% male and 50.2% female and an urban-rural mix of 54.5% urban and 45.5% rural. Over 20% of the population of Azerbaijan lives in the city district of Baku (State Statistical Committee of the Republic of Azerbaijan, 2024a).

Population growth between 1994 and 2019 averaged at 1.0% per annum (State Statistical Committee of the Republic of Azerbaijan, 2023a). In recent years, the population growth rate, which was 0.91%, has decreased year on year since 2015, and the trend is expected to continue until 2045 when the population is expected to reach its maximum level before starting to decline. The fertility rate in Azerbaijan is 2.08 births per woman, just below the

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[1] The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blue print for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve oceans and forests.

[2] There are only five cities with a population of over 100,000 namely: Baku, Sumgait, Ganja, Mingachevir and Nakhchivan.

population replacement level of 2.1 (World Population Review, 2023). The sex ratio at birth was 1.126 to 1 (male births to female births) in 2021 (World Bank, 2022). In 2021, the male life expectancy at birth was 66, whereas the figure was 73 for females (World Bank, 2022).

Azerbaijan has a youthful population with the majority aged between 30 and 40 years old, followed by those aged between 5 and 15 years old (see Figure 7.2). The increased life expectancy and a decrease in birth rates has resulted in an increased share of the population belonging to older age groups (Zaidi and Um, 2021). The proportion of older people (aged 60+) reached 14% in 2023 (State Statistical Committee of the Republic of Azerbaijan, 2023a).

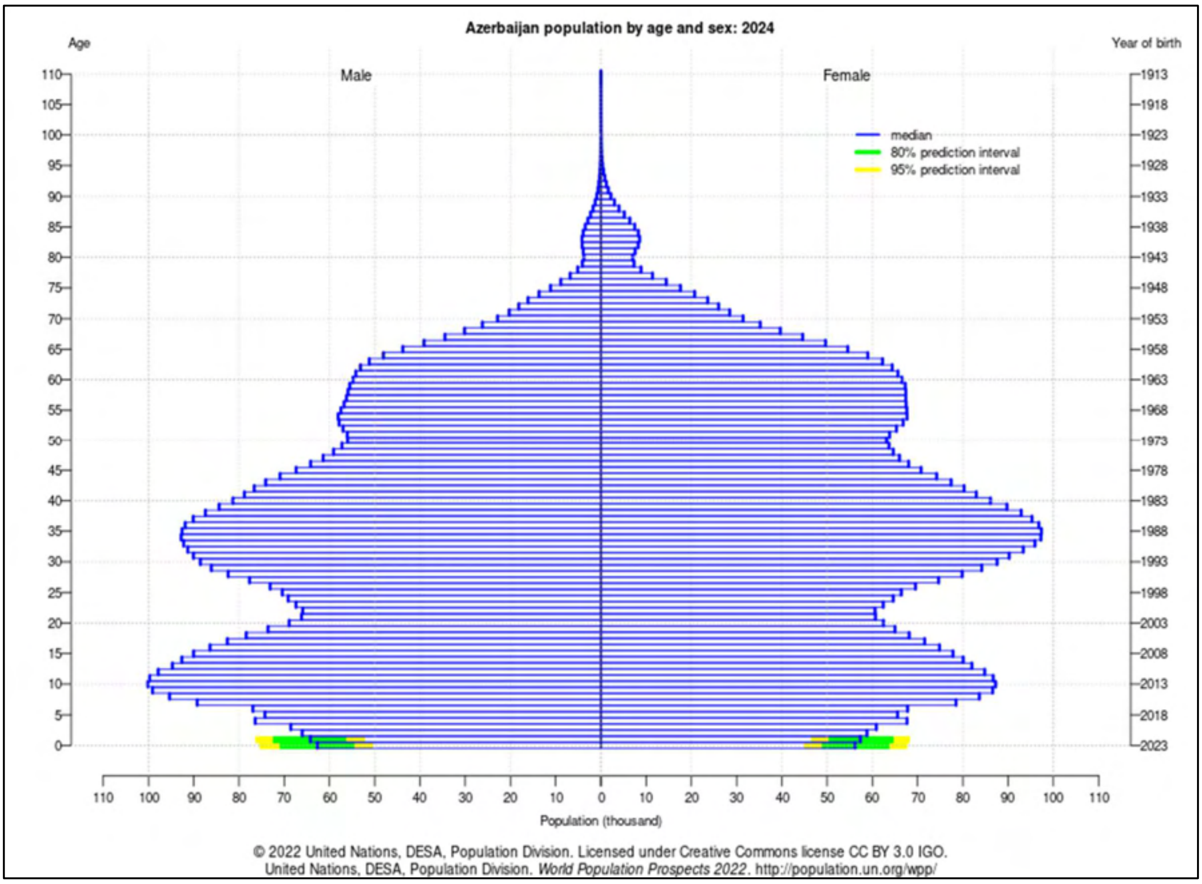

Figure 7.2: Population pyramid of Azerbaijan

Source: United Nations, 2022

The rate of internal migration for labour and better economic conditions has increased since the early 1990s. Migration is generally both between and within economic regions with migration from rural areas to urban areas, particularly around the Absheron Peninsula and more specifically the city of Baku taking place (Social Research Centre, 2020). Recent surveys undertaken by the Social Research Centre found that the average age of labour migrants is 23.

Azerbaijan's population is home to 80 ethnicities. Azerbaijanis constitute the majority (94.8% in 2019). Other significant ethnic groups include Lezgins, Talysh, and Russians. Azerbaijani is the official language and is spoken by 98.6% of the population, Russian and English are also spoken (State Statistical Committee of the Republic of Azerbaijan, 2024a).

Islam is the predominant religion in Azerbaijan, 65% are Shia, while 35% are Sunni (Azerbaijan Report Information Agency, 2015). In addition to Islam, there are other religious minorities in Azerbaijan, such as Christians and Jews (CIA, 2024).

Azerbaijan has one of the highest per capita concentrations of internally displaced persons (IDPs) in the world. IDPs are perceived as vulnerable and often marginalised members of the community, and tend to be excluded from the formal economy and civil, social and political life, often living in poor housing and lacking access to basic services such as water and sanitation. According to Azerbaijan government data, there were about 651,458 IDPs in the country as of December 2019 (Internal Displacement Monitoring Centre, 2020), mainly former residents of the Garabagh region of Azerbaijan previously occupied by Armenia (FAO, 2022). This figure is divided into two distinct groups: The first consists of 351,458 people living in protracted displacement who still have outstanding needs with regards to access to housing. The second refers to more than 300,000 people reported by the government as having been relocated to temporary housing[3] (Internal Displacement Monitoring Centre, 2020). IDPs are concentrated in Baku, Sumgayit and around Mingachevir. The Government of Azerbaijan has established the Great Return programme to facilitate the return of IDPs to their home regions.

7.5.1.2 Local level

Population estimates for settlements in proximity to SDC project infrastructure and onshore construction yards are presented in Table 7.1.

Table 7.1: Population – settlements in proximity to proposed SDC project infrastructure and construction yards

	Settlement	District	Estimated population
Onshore SDC PFOC route	Sangachal	Garadagh	5,100 (2600 male, 2500 female)
	Umid		600 (300 male, 300 female)
Construction yards	Bibiheybat (Bayil Yard)	Sabail	1,700 (800 male, 900 female)

Source: State Statistical Committee of the Republic of Azerbaijan, 2024a

Sangachal

Sangachal settlement formed around a railway station which opened in 1936/1937. During this period, barrack-style houses were built to accommodate the railway workers. Until 1940, a small fishing factory operated in the area, providing jobs for most local residents. In the latter half of the 1940s, additional barrack-type houses were constructed for prisoners of war, and two military units were established, resulting in the creation of a military town. Until 1956, Sangachal was part of the Duvanni district, after which it

[3] Azerbaijan's government has implemented a series of social protection measures, including housing, jobs, education and pensions programs to increase IDPs economic self-reliance and improve their living conditions. To date, more than 100 residential complexes have been built to better the housing conditions of about 300,000 IDPs.

became part of the Garadagh district (Baku City of Azerbaijan Rayon Executive Authority, 2024). From the 1940s onwards the town experienced rapid growth as people from other parts of Azerbaijan migrated in search of jobs and better socio-economic conditions. The population further increased with the establishment of Sangachal Terminal and other developments in the area.

Umid

Umid settlement was established in 1999 on the initiative of the President of the Republic of Azerbaijan, Mr. Ilham Aliyev, with the construction of 110 individual houses for refugees and IDPs (Baku City of Azerbaijan Rayon Executive Authority, 2024). In 2018, four five-story residential buildings were constructed, providing housing for 300 IDP families. Infrastructure improvements were also carried out included asphalting of roads (Office of the President of the Republic of Azerbaijan, 2018).

Official population statistics for Umid are provided in Table 7.1, however, the estimated population is actually closer to 4,500 persons (*pers comm.* bp Governmental Affairs Advisor).

Bibiheybat

In the 1890s a large oil field (Bibiheybat) was discovered offshore from Baku which led to land reclamation (completed in 1932) to produce the field (Azerbaijan International, 2002). Bibiheybat settlement was originally formed to house workers from this industry. In 2007, in connection with the expansion of the Bibiheybat motorway and the reconstruction of the similarly named mosque, dozens of families were relocated to new and modern homes. In addition, a stadium, a kindergarten, and other structures were rebuilt (Baku Metropolitan Closed Joint-Stock Company, 2024). As of 2015, many households were registered as IDPs, originally hailing from the Armenian occupied Garabagh and Zangilan regions. The community also includes many elderly individuals and approximately 30-50 people with disabilities (AECOM, 2015).

7.5.2 Economy

7.5.2.1 National level

Azerbaijan's macro-economic situation remained robust in 2023. Following a strong post-pandemic rebound, the economic growth was at a slower pace of 1.1% in 2023, in comparison to 4.6 % in 2022. This was due to slight contraction of gross domestic product (GDP) in the oil and gas sector and a deceleration of growth in non-energy sectors. Around 37% of the country's GDP and 90% of exports originate from the oil and gas sector. Starting in January 2023, the Government implemented several fiscal policy measures, such as raising the minimum wage, pensions, and subsistence minimum, aimed at mitigating the effects of increased prices on vulnerable populations (United Nations, 2024b). Before the slowdown in growth experienced in 2023, the main drivers of growth were tourism, accommodation and public catering, transport and warehousing, information and communications, and construction (United Nations, 2022).

Key economic sectors for the Azerbaijani economy include:

- **Oil and gas:** Azerbaijan is rich in oil and natural gas resources with extensive operations in the Caspian Sea contributing to the growth of the economy since independence from the Soviet Union in the 1990s. Azerbaijan's heavy dependence on extractive industries has left the country exposed to the effects of oil price volatility (IEA, 2023) and the Azerbaijan government has set a determined course to diversify the economy's sources of growth to lessen its dependence on hydrocarbons. The restructuring is being guided by the Strategic Road Maps on the National Economy Perspective and Main Sectors of the Economy. By 2025, the government aims to have in place the policy frameworks and other conditions needed to advance the diversification process and create a more global and regionally integrated economy (Hampel-Milagrosa *et al*., 2020).

- **Agriculture:** Agriculture plays a key role in the Azerbaijan economy by helping to provide employment opportunities and contributing to food security. Approximately 58% of the total land area is agriculture with almost half classed as arable (Hampel-Milagrosa *et al*., 2020). The country's diverse climatic zones[4] allow for the cultivation of a wide variety of crops and agricultural products.
- **Tourism:** Azerbaijan is developing its tourism sector through capitalising on its cultural heritage, gastronomy offerings and ancient sites (Azerbaijan Travel, 2024). A study undertaken by the accountancy firm PricewaterhouseCoopers estimated that the Azerbaijan economy benefited by USD 506 million through hosting a number of Grand Prix races in Baku between 2016 and 2019 (Baku City Circuit, 2023).
- **Construction and real estate:** Azerbaijan's real estate market is emerging as a promising destination for investment. In the first quarter of 2024 house prices in Azerbaijan saw a 2.2% increase, compared to the fourth quarter of 2023, representing a consistent increased average property price in Baku. Due to the growing economy and increased tourism, the government's focus on infrastructure development is driving demand for both residential and commercial properties particularly in Baku and along the Caspian Sea coast which is gaining popularity for holiday homes (WorldlyAssets.com, 2024).
- **Transportation and logistics**: Azerbaijan is positioning itself as a logistics hub for east-west trade in the region through major infrastructure investments. The completion of the Baku-Tbilisi-Kars railway and the expansion of Alat Port are improving capacity for trade between Asia and Europe. Azerbaijan has also expanded its air cargo facilities at the Heydar Aliyev International Airport in Baku which has undergone several renovations over the last 20 years (International Trade Administration, 2023).
- **Services and trade**: Domestic and international trade are essential components of the country's economic activity with the main export destinations for goods being Italy (46.8% of total exports), Turkey (9.3%) and Israel (4.4%). Main exports include natural gas, beverages, meat, dairy produce and machinery (Britannica, 2024). Service sectors such as telecommunications, banking, construction and real estate accounted for 32.3% of GDP and employed near 50% of the population in 2023 (StanbicBank, 2024).

[4] Nine out of the 11 climate zones are present in Azerbaijan.

- **Industry**: The industry sector consists of mining; manufacturing[5]; electricity, gas, and steam production distribution and supply; water supply; and waste treatment / disposal (State Statistical Committee of the Republic of Azerbaijan, 2023b). In 2021, approximately 15.4% of employees across Azerbaijan were employed in the industry sector (Statista, 2024). After mining and quarrying (74.9%), manufacturing (21%) and electricity, gas and steam production, distribution and supply (3.5%) are the main industrial sectors based on percentage of overall gross national production (State Statistical Committee of the Republic of Azerbaijan, 2023b).

7.5.2.2 Local level

Economic activities in Garadagh district are largely driven by the industrial sector with oil and gas being the primary focus. As of 2013, the district hosted around 180 registered companies, firms, and cooperatives, including 15 that were foreign or joint venture enterprises (URS, 2013). The proportion of total workers (25,300) that work in industry (7,327) is 29%. In Garadagh, industrial production increased by 8% between 2021 and 2022.

A total of 1,979 enterprises have been registered in Sabail district, with 1,108 currently in operation. Among these, 54 are state enterprises, and 1,054 are non-state enterprises (SDEABC, 2024). Out of 112,100 employees that work in the district 17,635 work in the industrial sector equating to approximately 16% of total employees. Between 2021 and 2022, overall industrial production levels declined in Sabail district by 8% (State Statistical Committee of the Republic of Azerbaijan, 2024b).

7.5.3 Employment

7.5.3.1 National level

Azerbaijan has relatively high employment and labour force participation rates and a correspondingly low unemployment rate. According to national data recorded in 2022, 5,194,400 people were economically active in Azerbaijan. Unemployment was recorded at 5.6% (6.5 % for women and 4.8% for men), with 293,300 people unemployed (State Statistical Committee of the Republic of Azerbaijan, 2023c). Young women are more likely than men to be affected by vulnerable and marginal work. The high youth unemployment rate (13.8%) is attributed to limited job opportunities and lack of work experience (ETF, 2020).

In 2021, 50.4% of employees in Azerbaijan were active in the services sector, 34.2% in the agricultural sector, and 15.4% in the industrial sector (Statista, 2024).

As the result of market-oriented reforms applied to the economy, the percentage of people employed in the private sector has been increasing. Furthermore, self-employment, which has risen noticeably since 2000, reached 66.6% in 2019 (ETF, 2020). Self-employment has increased across all sectors, particularly in agriculture and construction (ETF, 2020).

[5] Manufactured goods include food produce (accounting for 5.7% of all industrial production), refined petroleum products (5.1%) and basic metals (1.2%) (State Statistical Committee of the Republic of Azerbaijan, 2023c).

In addition to the above, approximately one in three workers in Azerbaijan participate in the informal sector which involves jobs that are often seasonal and / or temporary in nature (ETF, 2020). In 2021, with a view to facilitating recognition of informal sector jobs and reducing the precarity of working in the informal sector, the first-ever validation process for certifying competences acquired through non-formal and informal learning was introduced by Azerbaijan's state agency on Vocational Education and the European Quality Assurance Agency (EQAA) (EU Neighbours East, 2021).

7.5.3.2 Local level

Based on government statistics from 2022, the unemployment rate in the Baku economic region was 5.7% whereas the rates in the districts of Garadagh and Sabail were 5.5% and 4.4% respectively. In 2022, a total of 59,700 people in Garadagh (51% of the population) were defined as economically active, whereas in Sabail this was 54,700 people (54% of the population) (State Statistical Committee of the Republic of Azerbaijan. 2024b).

In Sangachal settlement the primary employment sources are private industry (including jobs at Sangachal Terminal), private businesses, and public sector employment. In Umid, the primary employment opportunities are in private industry and the public sector.

Findings from the socio-economic survey for the SWAP 3D Seismic survey in 2015, indicated that local residents in the vicinity of Bibiheybat (closest residential settlement to Bayil Yard) typically work in the agricultural sector, or are employed by oil companies who are active in the region (AECOM, 2015).

7.5.3.3 bp project employment

Historically, bp projects (construction and operations) have had a significant impact on local and regional employment levels, as summarised below:

- ACE project – at the peak of project activities 8,500 people were involved in the construction works (bp, 2024e)
- Shah Deniz 2 – at the peak of project activities in 2016 over 24,000 people were involved in construction works across all main contracts
- ACG Phase 3 – employment peaked at approximately 2,500 workers in 2006
- ACG Phases 1 and 2 - employment peaked at approximately 5,500 workers in mid-2004
- Chirag Oil Project – employment peaked at more than 8,000 workers in 2011/2012 (AECOM, 2019).

For the above projects, 80-95% of the construction workers were Azerbaijani nationals.

To maximise positive impacts from employment, the previous bp Shah Deniz and ACG construction projects adopted the measures summarised in Table 7.2. For the SD2 Project, in one yard alone, more than 412,000 HSE training hours and more than 292,000 craft training hours were provided (AECOM, 2019).

As a result of Azerbaijan's Great Return programme, which facilitates the return of IDPs to their home regions in Garabagh, the available workforce may be reduced for the SDC project (depending on the timeframe of return).

Table 7.2: bp project enhancement measures in relation to employment

Local employment enhancement measures	
Targets	bp committed to specific national content targets through each of the projects
Recruitment preferences	Priority given to recruit local residents in Garadagh district and in particular the settlements in close proximity to the construction yards and Sangachal Terminal
Information centres	Local community information centres established in Sangachal settlement, Umid settlement and Sahil to enable local people to register for employment (centres developed a database for future potential projects)
Training	Implementation of training programmes prior to and during employment of the construction workforce with training focused on: • health, safely and environment (HSE) • language • computer skills • driving • certified courses including painting, lifting, scaffolding and welding.

Source: AECOM (2019)

7.5.4 Land use and ownership

7.5.4.1 National level

The Land Code of the Republic of Azerbaijan, adopted in 1999, aims to regulate land relations with respect to ownership rights, including duties of landowners, tenants, leaseholders, protection of land rights, application of rational land tenure, restoration and improvement of soil fertility, land re-cultivation and improvement of natural environment (FAO, 2023).

While many rural women generate income from their farms and are engaged in agricultural activities, fewer women than men own land (UN Women, 2021). Despite there being no recognised legal barriers to prevent women from owning land in Azerbaijan, in practice it is generally accepted that male family members inherit and manage land. Women often give their consent to land being awarded to a male relative, or for parents to sell land shares and pass the derived income from the sale of the land to their daughters. Female-headed households are reported to possess smaller plots of land (i.e. one acre or less) than male-headed households (FAO, 2022).

7.5.4.2 Local level

Land use within the vicinity of the proposed SDC onshore PFOC route includes, the Baku-Alat highway, the railway, and industrial facilities (see Figure 7.1). Open land is generally used for animal herding activities (primarily cattle, goats and sheep) and local roads are mostly unsealed. A wetland area is present near the highway and railway line, south of the Terminal. Along the shoreline area between Sangachal settlement and Umid settlement, recreational fishing activities occur (see Section 7.7.3), along with informal use such as recreational walking. Between the coastline and highway to the northeast of the proposed SDC PFOC landfall a number of holiday homes (dachas) have been constructed.

No additional land acquisition is required for the SDC project. Temporary access will be required along the route of the SDC PFOC for installation purposes.

Land use in the vicinity of Bayil yard is dominated by commercial and industrial use with the nearest residential settlement of Bibiheybat located approximately 1 km to the southwest (AECOM, 2019). Available GIS imagery[6] indicates that there are restaurants, public parks, a mosque and a school within the settlement of Bibiheybat.

Land use in the vicinity of BDJF yard is commercial and industrial. There is one hotel and one restaurant that are presumably used by visitors to, and workers at, the yard.

7.5.5 Income and poverty

7.5.5.1 National level

In 1995, it was estimated that 68.1% of Azerbaijan's population was living under the absolute poverty line[7] (State Statistical Committee of the Republic of Azerbaijan, 2023d). However, following significant economic and political reforms from the early 2000s, poverty has decreased substantially, and in 2022 only 5.5% of the population lived below the national poverty line (ADB, 2023).

Although poverty rates have declined in Azerbaijan, rates are still higher for rural communities (compared to urban communities) and for women compared to men. Self-employment is the primary source of income for rural households, followed by agriculture. Rural households rely more on social benefits and government financial aid than their urban counterparts. Female-headed households (typically led by older single women or single mothers), derive a large proportion of their income from social transfers or sources not-derived from employment, thus putting them at a greater risk of poverty (FAO, 2022).

Analysis of poverty rates amongst vulnerable groups such all IDPs, refugees, ethnic minorities, older people, single parents, children and people with disabilities is complicated given that disaggregated statistics are not available. Each of these groups is especially vulnerable to poverty and social exclusion, with vulnerabilities specially compounded for rural households and households led by persons with a low level of attained education (FAO, 2022).

The average national monthly nominal income, which was 500 Azerbaijani Manat (AZN) in 2006, is now approximately AZN 936 (State Statistical Committee of the Republic of Azerbaijan, 2024b). Significant economic disparities in salaries between rural and urban areas, between economic sectors, and between men and women exist. The average monthly salary in 2022 for a state employee in the mining sector was AZN 2,123 whereas the average salary for a worker in the education or arts and entertainment sector was approximately AZN 630 (ibid). In terms of disparities between urban and rural areas, in 2022 the average monthly income in a predominantly rural region such as Salyan (located 50 km south of Baku) was AZN 595 compared to AZN 1,081 in Baku (ibid). In 2023, the

[6] Data obtained from GEOFABRIK.de

[7] Absolute poverty line is characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to services. In 2015, the international poverty line stood at USD 1.90 a day (World Bank).

average monthly salary for women was AZN 739 whereas the figure for men was AZN 1,067 (Aze Media, 2024).

There has also been discrepancies between urban and rural areas in terms of poverty reduction, with poverty reducing at a faster rate in more urban environments (AECOM, 2019). Although significant improvements have been made to reduce poverty levels, a lack of access to stable and formal job opportunities in the labour market means that many Azerbaijanis are involved in informal and low-paying jobs (AECOM, 2019). Only 1% of the workforce holds higher wage jobs in the petroleum sector, which generates about half of GDP, while 44% of the population works in the informal economy (ibid).

7.5.5.2 Local level

Table 7.3 outlines the average monthly nominal salaries in Baku Economic Region and the districts of Garadagh and Sabail. Nominal salaries across Baku, Garadagh and Sabail are higher than the national nominal monthly average of AZN 936. Amongst the highest earners are people that work in industry in Sabail district (where the Bayil yard is located).

Table 7.3: Average nominal salaries in Baku Economic Region and Sabail and Garadagh districts

Administrative division	Average monthly nominal salary by year in AZN			Average salary for employees in industry by year in AZN			Average salary for employees in construction by year in AZN		
	2016	2019	2022	2016	2019	2022	2016	2019	2022
Baku economic region	1,062	890	1,080	1,408	1,445	1,574	1,062	890	1,193
Sabail district	1,388	1,526	1,824	4,431	4,251	3,998	1,382	1,439	1,950
Garadagh district	995	1,177	1,404	1,709	1,382	1,709	1,443	1,310	1,568

Source: State Statistical Committee of the Republic of Azerbaijan, 2023c

In Baku Economic Region, Garadagh district, and Sabail district, recipients of social assistance are given, on average, 89 AZN a month. Pensioners in Garadagh district receive an average of AZN 366 a month, while in Sabail they receive AZN 393 per month. Only 0.05% of the population received public social protection payments in 2022 in Sabail, whereas in Garadagh it was nearly 5%.

7.5.6 Infrastructure

7.5.6.1 National level

Azerbaijan has well-established transportation infrastructure, covering air, rail, road, and maritime routes. It is an important logistics hub connecting Europe to Central Asia, the Middle East, and the Far East. It serves as a key transit point on transport corridors like TRACECA (Transport Corridor Europe-Caucasus-Asia) and the North-South routes that connect the Black Sea to the Caspian Sea.

Azerbaijan's transport infrastructure includes:

- railways which extend 2,476 km (half is electrified)
- highways covering 78,349 km
- metro lines covering 40 km (State Statistical Committee of the Republic of Azerbaijan, 2023e)
- Heydar Aliyev international airport and five other international airports (Azerbaijan Airlines, 2024).

Between 2003 and 2023, over 20,000 km of new roads were either built, reconstructed or repaired in Azerbaijan (APA, 2024). Investment in road and railways infrastructure has facilitated increased volumes of freight and goods. Between 1995 and 2002, the volume of goods transported internationally to / from Azerbaijan increased from 1,686,000 million tonnes to 15,273,000 million tonnes (State Statistical Committee of the Republic of Azerbaijan, 2023e). Domestic transportation of goods has reduced by approximately 50% from 7,353,000 million tonnes in 1995 to 3,457,000 million tonnes in 2022 (ibid).

Based on data collected between 2006 and 2019, Azerbaijan was ranked 38th out of 141 countries in the Global Competitiveness Index for the quality of its road infrastructure (WEF, 2023). While the condition of highways is generally acceptable, some do not meet international transit standards. Minor roads particularly in rural areas are poorly maintained (ibid). There are ongoing efforts to modernise and expand all types of roads through rehabilitation and extensions (APA, 2024).

Commercial shipping is covered in Section 7.8.

7.5.6.2 Local level

The 502 km Baku-Alat Highway / Salyan Highway (M2) follows the coastline southwest of Sangachal Terminal (see Figure 7.1). This road is well maintained and provides a rapid link from Baku to Astara, Iran. The local roads within Sangachal settlement and Umid settlement are generally graded and in poor condition. Following heavy rain, local roads can become impassable.

The main railway line to Georgia runs parallel to the M2 (see Figure 7.1). Its operational length is 2140 km, a total of 1,169 km is electrified while the rest is operated by diesel locomotives. The railway line is predominantly used for freight purposes, though a small number of passenger services connect towns to Baku and Georgia (Wood Group Ltd, 2022).

There are several bus routes that provide public transport between the local communities and regional centres. With the exception of Sangachal settlement, there are no direct bus services to Baku. The Baku to Hajigabul passenger train stops twice per day at Sangachal train station.

7.5.7 Utilities

7.5.7.1 National level

Energy supply

Azerbaijan has achieved 100% electricity access, but power generation, transmission, and distribution networks are ageing, resulting in some service disruptions, with distribution losses between 15-20% in some places (Asian Development Bank, 2019). It is estimated that only 70% of households have access to electricity for the entire day, even though the power network is widespread. The systems are particularly degraded in suburban areas, where available facilities cannot provide a reliable source of energy to customers. Electricity generation in Azerbaijan has increased by more than 50% since 2010 and continues to be mostly generated by natural gas (IEA, 2023). In rural area, electricity is not the main source of energy used for cooking / heating homes or heating water for domestic use (FAO, 2022). Rural households often rely on gas or interior stoves / fireplaces for heating. In 2022, nearly 40% of all electricity consumed in Azerbaijan was consumed in Baku city (State Statistical Committee of the Republic of Azerbaijan, 2023f).

Water supply and sanitation

According to the WHO/UNICEF Joint Monitoring Programme for Water Supply, Sanitation and Hygiene (2015), Azerbaijan has 91% of the population using an improved water source, with 98% of urban residents having an improved water source compared to 83% of rural residents. Only approximately 40% of rural households have access to sanitation compared with close to 90% of urban households. With regards to piped water, the figures are around 47% for rural households and 96% for urban households (ACAPS, 2020).

Considering the above, the Government has been investing in a Strategic Roadmap for the Development of Utilities Services (i.e., electric energy, heating, water, and gas), with the aim of improving services to better meet consumer demand and installing an efficient and responsive service (Asian Development Bank, 2019).

Nationally, there have been a number of recent initiatives to improve water supply and sanitation infrastructure. A World Bank loan of USD 230 million was approved in June 2007[8] to build on the Greater Baku Water Supply Project and support the improvement in the water and sanitation sector. Another World Bank loan of USD 234 million was approved in July 2014 to carry out the Second National Water Supply and Sanitation Project to improve the quality, reliability and sustainability of water supply and sanitation services in 21 rayons of Azerbaijan[9]. In 2016, a major EU-funded project, the European Union Water Initiative Plus (EUWI+) was started to help strengthen water management in Azerbaijan (EU4 Environment, 2024).

Wastewater treatment plants are available in 16 cities and regions of Azerbaijan, however, most of them are partially or completely non-functional (RSK, 2023). There are currently six waste water treatment plans in Baku which have a capacity to treat between 10,000 and 640,000 m^3 of water per day (Azersu, no date).

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[8] World Bank Loan ID P096213 (June 2007)

[9] World Bank Project ID P147378 (July 2014) https://projects.worldbank.org/en/projects-operations/project-detail/P147378

Waste

Annually, 350 kg of waste is generated by each person in Baku. Official data indicates the presence of 2,540 garbage collection points distributed across the city, alongside three designated waste landfills situated in the regions of Sabunchu (Balakhani landfill), Surakhani, and Garadagh (Tamiz Shahar, 2024).

According to the State Statistical Committee, 79% of total solid domestic waste (2,719,000 tonnes) was transported to landfill for disposal in 2023, 20% was used for obtaining energy (waste-to-energy plant), and 1% was sold in the country (State Statistical Committee of the Republic of Azerbaijan, 2024c).

It should be noted. however, that illegal dumping remains a problem, especially in rural areas (RSK, 2023). Solid waste collection services are low outside of the Greater Baku Area with no official waste collection carried out in villages and settlements (International Evaluation Group, 2021).

7.5.7.2 Local level

Information on household amenities is only presented at regional level in State statistical documentation. Garadagh and Sabail district are part of the larger Baku economic district. In 2023 households in Baku economic district had access to the following amenities:

- electricity supply - 100% of population had access
- centralised gas supply - 99.7% of population had access
- centralised water supply - 97.6% of population had access
- sewer line connected to centralised sewerage facilities - 92.9% of population had access (State Statistical Committee of the Azerbaijan Republic, 2023l).

7.5.8 Public safety and security

7.5.8.1 Road safety

Despite investments in road infrastructure and improved enforcement of traffic rules, road fatalities in Azerbaijan remain much higher than in most European countries.

In 2023 there were a total of 1,688 road traffic accidents in Azerbaijan, 85% of which occurred in built-up areas, and 15% on motorways. 94% of road traffic accidents happened on dry road surfaces, thus only the remaining 6% occurred in the presence of particular road conditions, such as wet or icy roads. Among these events, 41% were accidents between pedestrians and vehicles, 37% were accidents between vehicles, and 22% were single vehicle accidents. These events killed a total of 834 people, and injured a total of 1,456 people (72% of which were aged 25-64) (State Statistical Committee of the Republic of Azerbaijan, 2023e).

7.5.8.2 Crime

In 2023, Azerbaijan ranks 112 out of 193 countries on general criminality according to the Global Organized Crime Index (Organized Crime Index, 2023). Main crime areas of priority concern include trafficking of drugs, people and fake goods, with these crimes often leading to money laundering and violent crime (Interpol, 2024). Most common crimes carried out in Azerbaijan by people over 30 years old in 2022 are listed in Table 7.4.

7.5.8.3 *Gender-based violence*

Approximately 25% of women and girls in Azerbaijan have experienced some form of either physical, sexual or emotional violence in their lifetimes. Some support services, such as a national telephone hotline established in 2020, are accessible throughout the country. However, critical specialised services, including temporary shelters for victims of violence, remain insufficient and lacking in rural communities (FAO, 2022).

Table 7.4: Crimes carried out by people aged 20+ in 2022

Parameter[10]	Number of cases
Number of persons aged 30 and over that have committed a crime	17,399
Premeditated murder and attempted murder	155
Intentional infliction of grave injury on health	151
Forcible rape and attempted rape	16
Larceny	1,662
of which relates to vehicles	34
Fraud	1,271
Robbery	97
Hooliganism	383
Crimes concerning with illegal turnover of drugs and psychotropic substances	6,540
Violation of traffic rules and operation of vehicles	1,852

Source: State Statistical Committee of the Republic of Azerbaijan, 2023g

7.6 Human Development

The latest Human Development Index (HDI)[11] for Azerbaijan in 2022 was 0.76 putting it in the 'high human development' category and positioning it 86 out of 204 countries and territories. When adjusted for inequality, the HDI declines to 0.71, revealing challenges related to disparities within the country (United Nations, 2024b). From 1990 to 2019, the HDI value for Azerbaijan increased by 25.2% (UNDP, 2020d).

The Gender Inequality Index (GII)[12] showed a value of 0.329, ranking Azerbaijan 77 out of 166 countries in 2022 (UNDP, 2024b). In November 2022, Azerbaijan repealed a

[10] Translations into the English of the 'types of crime' are from the referenced State Statistical Committee of the Republic of Azerbaijan document.

[11] The HDI is a measure used by the United Nations Development Programme (UNDP) that considers a long and healthy life, average years in education and a decent standard of living (income per capita).

[12] The GII is a combined metric of gender inequality using three dimensions: reproductive health, empowerment and the labour market. Reproductive health is measured by maternal mortality ratio and adolescent birth rates; empowerment is measured by the shares of parliamentary seats held and population with at least some secondary education by each gender; and labour market participation is measured by the labour force participation rates for women and men.

number of job restrictions on women’s employment, working with the World Bank to show that these roles posed no specific threat to women’s health (Michael & Michalko, 2023).

Although Azerbaijan is making positive progress towards achieving the United Nations Sustainable Development Goals with continued investment in human capital through quality education, health and social protection services, regional disparities are observed across multiple socio-economic indicators including availability of pre-school facilities and secondary schools, healthcare facilities and healthcare professionals and access to improved living conditions (United Nations, 2024b).

7.6.1 Education

7.6.1.1 National level

The Azerbaijan education law guarantees the right to education for all its citizens irrespective of race, nationality or sex. The Ministry of Education is the central executive body that implements and regulates the government’s education policy and manages the education processes (RSK, 2023).

The Law on Education adopted by the Azerbaijan Republic in 1992 provides for the following system of education throughout the country (general education is compulsory):

- pre-school education
- general education:
  - primary (years 1 to 4) - 1st level
  - basic (years 5 to 9) - 2nd level (certificate of basic education)
  - secondary - (years 10 to 11) - 3rd level (certificate of secondary general education).

Azerbaijan has moderate levels of educational attainment among its adult population. In 2023, 99.9% and 98% of people aged 25+ had completed primary and lower secondary school respectively. In addition, 91% had completed upper secondary school. Only 32% had completed post-secondary education. The reported literacy rate is very high, at 99.8% (World Bank, 2024).

In terms of years of schooling and levels of education completed, Azerbaijan is classed as a highly educated country. However, the quality of education and student learning outcomes are underperforming (Garcia-Moreno & Patrinos, 2020). Key challenges for education in Azerbaijan relate to poorly maintained infrastructure, particularly in conflict-affected regions (ICRC, 2023), and high levels of stress amongst school teachers (Abdullayeva, 2022). Although expenditure on education in 2023 was approximately AZN 4.4 billion[13], marking an increase from 2022, schools are reportedly in a poor physical state and in need of renovation (Geybullayeva, 2023). In April 2024 the Minister of Science and Education announced plans to increase the number of high schools, vocational high schools, and gymnasiums in all regions of Azerbaijan (Azernews, 2024).

Figure 7.3 presents the number of pupils enrolled in educational institutions in urban and rural areas of Azerbaijan. In 2022/23 a total of 620,100 children from rural areas were enrolled in educational, whereas 1,084,700 children were enrolled from urban areas. The

[13] USD 2.58 billion - based on exchange rate obtained from xe.com on 11 July, 2024

decreasing number of children enrolled in rural localities is representative of the increased rate of urbanisation in the country as a whole (State Statistical Committee of the Republic of Azerbaijan, 2023b).

The State Agency for Vocational Education is an executive body providing and coordinating the implementation of state policy in the field of vocational education and organising the activities of vocational education institutions under the Ministry of Science and Education of the Republic of Azerbaijan. In 2023 there were 99 vocational education institutions with over 25,000 students undertaking courses (State Statistical Committee of the Republic of Azerbaijan, 2023h).

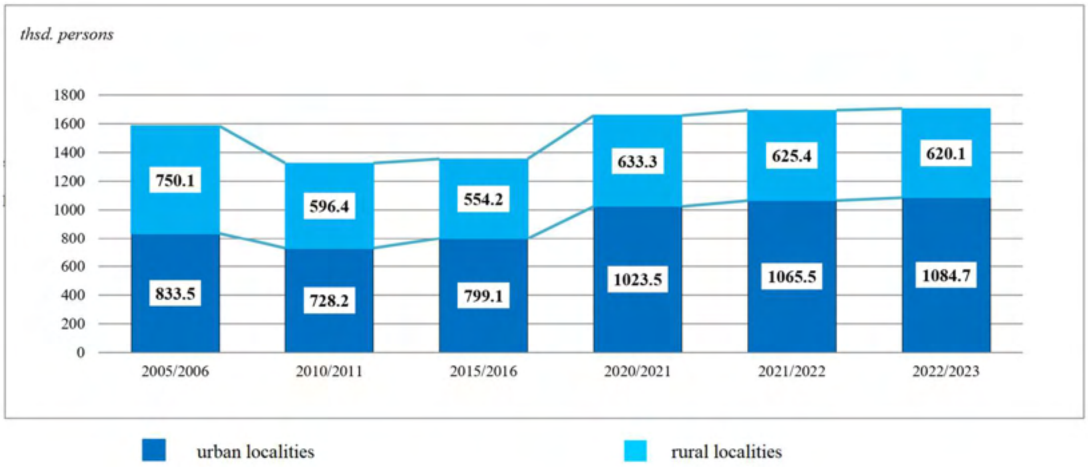

Figure 7.3: Number of pupils enrolled in educational institutions

Source: State Statistical Committee of the Republic of Azerbaijan, 2023b

With respect to gender, a large proportion of girls remain in education after completing lower secondary school (i.e. after completing grade 9) but represent a minority in the overall student base in terms of technical and vocational education and training. Vocational training that prepares students for skilled manual labour and incorporation into the industry sector is viewed principally as a male-oriented training option. After completing compulsory education women are often attracted to taking on further studies in disciplines such as teaching, health care and social services. These disciplines are reported to help prepare students for work in the public sector that is often poorly remunerated, but conversely also provides greater social protections and support to help women balance work and family duties (FAO, 2022).

Women represent a relatively high proportion of higher education graduates in the fields of science, technology, engineering and mathematics (STEM). However, they also encounter barriers to advancing their careers in these fields (FAO, 2022).

7.6.1.2 Local level

In Garadagh district there are 24 preschools, 27 general education schools, one boarding school, and five vocational education institutions (Knoema, 2021).

Schools and kindergartens in the vicinity of the Sangachal to SDC PFOC route include:

- Sangachal settlement: one secondary school (No. 222) and one kindergarten

- Umid settlement: one secondary school (No. 294), IDPs school of Lachin district (No. 7), and one kindergarten.

In the district of Sabail there are five higher education institutions, the Azerbaijan Finance and Economics College, Baku Vocational School No. 6, seventeen secondary schools, eighteen pre-school educational institutions, three children's creative centres, three youth sports schools, and the private Baku-Oxford School (SDEABC, 2024).

In Bibiheybat (closest settlement to Bayil yard), there is one secondary school (No. 50).

7.6.2 Public health

7.6.2.1 National level

The socio-economic development of Azerbaijan has facilitated significant progress in terms of improving the country’s health system (Azerbaijan.az, 2024). Reforms and large-scale measures have been taken to manage health care and strengthen the technical base of the system. Significant progress has been made over the past 15 years on key health indicators including life expectancy (increased from 64 years in 1999, to 73 in 2023) and infant mortality (reduced from 65 per 1000 live births in 1999, to 16 in 2023) (World Bank, 2024). Maternal mortality fell from 28.9 (per 100,000 population) in 2005 to 14.7 in 2023 (State Statistical Committee of the Republic of Azerbaijan, 2023i).

The cause of most deaths in the country in 2022 was related to diseases of the circulatory system (341 cases for 10,000 population), followed by neoplasms (83 cases for 10,000 population) (State Statistical Committee of the Republic of Azerbaijan, 2023i).

Health concerns

Despite advances in the standard of healthcare and a consistent overall increase in life expectancy, Azerbaijan is experiencing emerging health issues related to communicable diseases, non-communicable diseases (NCDs), food insecurity, mental health, and road safety.

Communicable diseases – are an issue in Azerbaijan, particularly tuberculosis (TB), as a drug resistant strain of TB is present in the country. Based on a survey conducted by WHO, Azerbaijan is one of 18 high-priority countries to combat tuberculosis (Asian Development Bank, 2019). In 2022, the incidence of new tuberculosis infections was twice as high in males as it was in females (State Statistical Committee of the Republic of Azerbaijan, 2024d).

NCDs - the mortality rate for NCDs among the population aged 30-70 years was 22% in 2019 with most deaths attributed to either diabetes, hypertension, obesity or smoking-related illnesses (United Nations, 2022). The top causes of death in 2019 were ischaemic heart disease (333 deaths per 100,000 population), strokes (129), and cirrhosis of the liver (35) (WHO, 2023).

Nutrition and food security - malnutrition, anaemia, and obesity remain significant public health issues, particularly among children and women. The United Nations continues to provide technical assistance, funding, and expertise to help the government address these challenges and improve nutrition outcomes for its citizens (RSK, 2023).

Mental health - during a study conducted by United Nations Population Fund (UNFPA) on health and gender equality in Azerbaijan in 2018, approximately 15% of men, and about 33% of women screened positively for depression (UNFPA, 2018). The Nagorno-Karabakh conflict has made many Azerbaijanis internally displaced, missing, wounded, disabled, or killed. The war and its aftermath have drastically impacted the mental health of these populations, leading to depression, anxiety, and stress-related psychosomatic illnesses such as dissociative disorder (Shoib, S et al, 2022).

7.6.2.2 Local level

Garadagh district – in 2023 there were 8 hospitals (2.3% of national hospitals) and 11 ambulance polyclinic service organisations (0.7% of national ambulance polyclinic service organizations) in the district. The number of hospital beds per 10,000 inhabitants was 28.4 (lower than the national average of 37.5), and the numbers of physicians and paramedical staff per 10,000 people were equal to 28.0 and 59.4, respectively (State Statistical Committee of the Republic of Azerbaijan, 2023j).

Sabail District – in 2023 there were 13 hospitals (3.8% of national hospitals) and 26 ambulance polyclinic service organizations (1.6% of national ambulance polyclinic service organizations) in the district. The number of hospital beds per 10,000 inhabitants was 90.0 (significantly higher than the national average of 37.5), and the numbers of physicians and paramedical staff per 10,000 people were equal to 133.9 and 151.5, respectively (State Statistical Committee of the Republic of Azerbaijan, 2023j).

Access to healthcare resources is generally low in Sangachal settlement and Umid settlement, with the high cost of medicines being a significant barrier. In Sangachal settlement, available healthcare facilities include Sangachal Hospital (an outpatient hospital of Baku City Hospital), an ambulance emergency station No. 20, and a pharmacy. Umid has a pharmacy.

7.7 Fisheries

A literature review update was undertaken in June 2024 by Professor Mehman Akhundov (Fisheries and Aquaculture Research Centre Director) to obtain the latest information on fisheries relevant to the SDC project. Information from the literature review is included in the sections below and the full review report is presented in Appendix 7A.

7.7.1 Fisheries regulations

7.7.1.1 Legislation regulating fishing activity in the Republic of Azerbaijan

The legal basis for the organisation, management, development, usage and protection of fish resources in Azerbaijan is regulated by the Azerbaijan Republic Law “On Fishing” adopted in 1998 (No. 457-IQ, 27.03.1998).

In 2017, the “Regulations for Fishing and Hunting of Other Water Bioresources” (No. 243) was adopted to outline the hunting means, including seasonal restrictions and equipment to be used in the Caspian Sea. The Annexes to Regulation No. 243 include:

- Annex I – prohibited and permitted areas, fishing gear and seasons, and the types and sizes of fish and aquatic animals allowed for commercial fisheries
- Annex II – prohibited and permitted areas, fishing gear, and the types, quota and sizes of fish and aquatic animals allowed for recreational fishing

- Annex III – valuable fish and aquatic species
- Annex IV – fish and aquatic species intended for fishing.

In addition to these Annexes, templates for fishing permits are attached to this Decree.

In Accordance with Annex I of Regulation No. 243, there is a ban on commercial fishing in the Azerbaijan sector of the Caspian Sea from 1st May to 1st September. During the rest of the year approximately 70-80% of the quota is taken in autumn (September-October) and spring (March-April) (Akhundov, 2024b).

Amendments to Regulation No. 243 include for the maintenance of a single register of fishing permits in line with the Azerbaijan Republic Law "On Licences and Permits", with fishing quotas not being allocated unless reports on commercial fishing catches are submitted to the authorities.

Coastal fishing is regulated by the "Rules for State Registration of Small Tonnage Vessels, approved pursuant to Resolution 97 (dated 23 April 2008) of the Cabinet of Ministers of the Republic of Azerbaijan". The "Classification of Small Tonnage Vessels Sailing under the State Flag of the Republic of Azerbaijan", Order 073 issued by the Ministry of Emergency Situations on 16 June 2007 and Ministry of Justice Certificate 3350 on 26 June 2007 stipulate that the region in which small-tonnage vessels can fish is limited to 5 km from the coastline.

Other recent legislation relevant to fisheries includes:

- Law of the Azerbaijan Republic on Food Safety (No. 523-VIQ 05.05.2022).
- Law on Regulation of Inspections Which Are Carried Out in the Field of Entrepreneurship (No. 714-IVQ 02.07.2013, amended 05.03.2024). State control in the field of fishing is exercised in accordance with this law.

Table 7.5 summarises the principle state authorities and their functions in relation to fishing regulations.

Table 7.5: Fishing regulatory authorities and their functions

Regulatory state authority	Function
State Maritime Administration (SMA)	Issue documents identifying the vessel owner, crew members of the vessel and the country where the vessel is formally registered.
Ministry of Emergency Situations (MES)	Inspect the technical condition of the vessel and issue a certificate of seaworthiness. Technical certificates for large vessels are issued by Vessel Class.
Ministry of Ecology and Natural Resources (MENR) – Department for Protection of Aquatic Biological Resources (DPABR)	For vessels in possession of SMA and MES issued relevant documents MENR (DPABR) shall: • Issue formal permission to specific vessels and determine the catch quotas for biological marine products • Conduct inspections to confirm that volume and species of the biological marine products caught by the vessels are in accordance with licence conditions.

Regulatory state authority	Function
Marine Transport Police (MTP) at the Ministry of Internal Affairs (MIA)	For vessels holding respective documents issued by SMA, MES and MENR, MTP-MIA shall: • Inspect the vessel appropriate documents • Confirm whether the vessel is designed for fishing or other purposes such as transporting dry cargo • Verify and confirm that the vessel is in possession of MENR issued formal documentation and shall not allow the vessel to head for sea without the correct documents.
State Border Service (SBS)	For vessels holding the respective documents issued by SMA, MES and MENR, SBS shall: • Inspect to check the purpose of a vessel's journey out to sea • Not allow a vessel to head to sea for catching fishery products within the economic zone of 10-nautical mile territory, unless it has the correct documentation.

Source: Adapted from AECOM, 2019

7.7.1.2 *Fisheries licencing*

The MENR is responsible for issuing fishing licences. The fishing licences are issued to entities (stating the name of the captain) and individual fishermen, and specify the number of fishermen in the crew and their names, the area the fishermen are permitted to fish (i.e. fishing area), and the fishing quota per species per fishing area authorised for the licenced period of one year. Licences are also issued for the fishing vessels and boats. A summary of 2024 commercial fisheries licencing data is presented in

Table 7.6.

Coastal fishing areas for which licences are granted are generally named after the adjacent coastal town or settlement, and it is understood that the MENR authorises fishing activities within these coastal areas adjacent to these towns or settlements, extending up to 3 nautical miles from the shoreline.

Unlicensed fishing activity relates to both fish catch exceeding the quota and species authorised by the regulatory authorities, as well as fishing without any licence, i.e. unlicenced vessels or unlicensed fishermen. There is evidence of violations of fishery protection legislation every year as well as instances of fishing gear and catch being confiscated. In 2023, there were 223 recorded cases of violations and 217 individuals subjected to administrative and criminal charges. Twenty-six boats and 893 nets were confiscated. In addition, catches of 32 different types of fish species were confiscated. The total amount of claims filed for damages caused to biological resources was AZN 161,012[14] (Akhundov, 2024b).

[14] USD 94,649 - based on exchange rate obtained from xe.com on 11 July, 2024

Table 7.6: Summary of 2024 commercial fisheries licencing data for Azerbaijan coastline south of Absheron Peninsula

MENR data 2024	
Number of legal fishing entities	Garadagh district – 8 Alat settlement – 5 Salyan district – 3 Neftchala district – 2 Lankaran and Astara district – 1
Number of fishing vessels authorised to fish commercially per district and equipment used	Garadagh district: • 8 vessels (187 – 740 tonnes) using pelagic trawl, cone net and pump • 5 small boats (0.2 – 0.4 tonnes) using carp and shad nets Alat settlement: • 5 small boats (0.3 – 0.5 tonnes) using carp nets, shad nets and seine Salyan district: • 5 small boats (0.3 – 0.8 tonnes) using carp nets, shad nets and seine Neftchala district: • 1 small / medium boat (46 tonnes) using carp net and shad net • 1 small boat (0.6 tonnes) using shad nets and seine Lankaran and Astara districts: • 1 small / medium boat (75 tonnes) using carp nets, shad nets and seine
Species for which quotas are specified	Sprat (kilka) Shad Black Sea roach Leaping grey mullet Roach Common roach Bream Zahrte Common carp Danubian bleak Shrimp Crayfish
Species that cannot be fished under Azerbaijani fishing regulations	Beluga – *Huso huso* Ship sturgeon – *Acipenser nudiventis* Russian sturgeon – *Acipencer guldenstadti* Kura sturgeon – *Acipenser persicus* Sturgeon – *Acipenser stellatus* Caspian trout – *Salmo trutta caspius* Zander – *Sander marinus*

Source: Akhundov, 2024b

7.7.2 Commercial fishing

7.7.2.1 Fish catch

Information on quantities of fish and other bioresources caught in the Caspian in 2023 by vessels and small boats is provided in Table 7.7.

Table 7.7: Fish and other aquatic resources caught in Azerbaijan sector of Caspian Sea (2023)

Species	Quantity caught (tonnes)
Sprat	2,300
Shad	79
Black Sea roach	84
Roach	40
Common carp	19
Bream	3
Zahrte	2
Danubian bleak	1
Leaping grey mullet	74
Crayfish	0.5
Shrimp	1

Source: Akhundov, 2024b

7.7.2.2 Fisheries trends

Overall, Caspian fish stocks are considered to be extremely depleted, in part due to extensive overfishing, and a lack of recruitment from the larval and juvenile populations as a result of the introduction of the invasive ctenophore *Mnemiopsis leiydi* into the Caspian.

Historically, kilka has been the main commercial species caught in Azerbaijan and anchovy kilka was the single authorised commercial fishing species until 2012. Commercial catch of kilka has gradually decreased during the last 12-15 years. Due to reduced kilka reserves there has been a recent change (between 2012-2016) in the commercial fishing licences issued by MENR where both the number of licences issued and the number of larger kilka fishing vessels has decreased. In parallel, the number of licences issued for other fish species and for small boats has increased.

Azerbaijan has also experienced a reduction in the number of recorded violations of fish protection legislation. The likely reason for this change is decreased activity of the DPABR during the last 5-7 years in the prosecution of violations, coupled with the reduction in natural reserves of sturgeon (including beluga, sturgeon, sturgeon stellate, ship sturgeon) and the corresponding reduction of illegal fishing of these prohibited species.

7.7.2.3 *Offshore fisheries*

Heavy tonnage fishing vessels made of steel and approximately 30 m length and 5 m width are used to undertake offshore commercial fishing. Due to decline of the anchovy kilka population which used to be caught at 80-120 m depth, fishing vessels have adjusted their methods to catch kilka at shallower depths of 20-40 m (focusing on common kilka).

Fishing methods and equipment typically used in offshore commercial fishing are:

- Underwater electric light method: Electric lights is the most common method used in the Caspian Sea to catch kilka. The lights attract kilka, which are then caught using cone-shaped bag nets, centrifugal fish pumps, or air hoist.
- Cone-shaped fishing nets: Involves launching the nets from the boat and encircling the fish. The net is left under water for approximately 5-10 minutes before being lifted out the water.

Commercial fishing effort varies throughout the year due to fish presence and weather conditions. Low season is generally May to June when the kilka species migrate to the northern and central Caspian for spawning. High season is typically March to April, with fishing also taking place in December to February although fishing effort is reduced during these months due to unfavourable weather (cold and windy). Favourable conditions are typically dull, cloudy weather conditions when electric lighting used to attract fish is particularly effective.

Fisheries in vicinity of SD Contract Area

Historically fishing of kilka has been carried out on a number of banks offshore from the coast of Azerbaijan, see Figure 7.4. The closest bank to the SD Contract Area and the route of the proposed Sangachal to SDC PFOC is Makarov Bank.

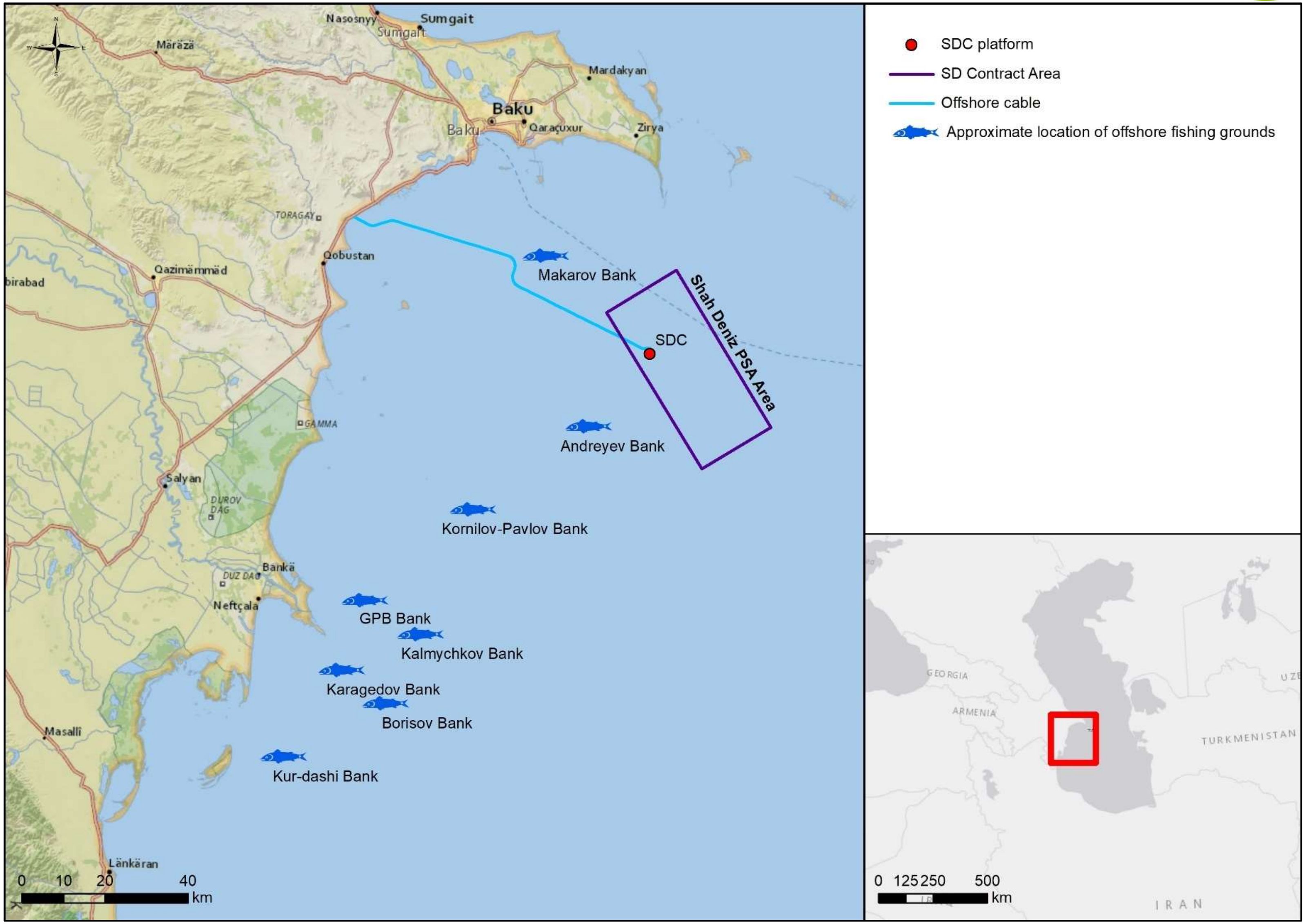

Figure 7.4: Principle offshore commercial fishing grounds in relation to proposed SDC platform and PFOC route

Until 2017, commercial fishing of common kilka was carried out from October through March south and southwest of Zhiloy Island to Makarov Bank (at depths of 20-40 m) by the large-capacity vessel “Shakhriyar” owned by the Caspian Fish Company (Akhundov, 2024b). However, in 2018, the company operating this vessel did not request a license for fishing in these areas with the reason given that it was not economically viable due to low fish stocks (*pers comm*. Mehman Akhundov, 2019).

Offshore commercial fishing of common kilka continues on the shallow waters banks (30 – 70 m water depth), mainly in the areas of Andreyev, Kornilov-Pavlov and Karagedov (see Figure 7.4), remote from the SD Contract Area.

7.7.2.4 Nearshore fisheries

Small scale coastal fishing is undertaken using medium sized small tonnage vessels made of aluminium or wood of approximately 5 m length and 2 m width. The distance from the shore where small scale coastal fishing is permitted is 3 nautical miles from the coastline. The following fishing gear is typically used:

- Fish nets: Scale and seine nets are mainly set at a depth of 2-8 m. The length of the nets is 18-25 m and do not lie on the seabed.
- Stationary seines: Stationary nets are normally no longer than 1 km and typically start from the shoreline with posts placed directly on the seabed. The posts are placed at various depths ranging between 1.5 – 2.5 m. One end of the net is placed at the seabed at different water depths and the other end can normally be seen from the surface.
- Karavas and trap-type nets: These types of net are normally 20 m long and start at the shore with posts placed on the seabed at water depths ranging between 1.5 and 2.5 m.

Typically, March-April and September-November are the peak seasons for fishing with many of the fish caught being sold to local markets.

Commercial fisheries in vicinity of Sangachal to SDC PFOC route

The proposed Sangachal to SDC PFOC will run from the proposed offshore SDC platform location to Sangachal Terminal, with the landfall in Sangachal Bay.

In 2024, 12 entities (individuals) have been allocated quotas to fish in the Sangachal-Gobustan area. Quotas for specific species are as follows:

- Shad – 1.1 tonnes
- Black Sea roach – 1.4 tonnes
- Leaping grey mullet – 1.4 tonnes
- Roach – 0.4 tonnes
- Common carp – 0.5 tonnes
- Bream – 0.3 tonnes
- Shrimp – 0.45 tonnes (Akhundov, 2024b).

The findings of a Livelihood Baseline Study carried out in 2014 indicated that a total of 50 people were involved in fishing activities in Sangachal Bay (URS, 2014). It should be noted, however, that commercial fishing is reportedly no longer carried out in this area. Small fisheries households that used to be present were relocated as part of the SD2 project, in conjunction with government bodies, to alternate nearshore areas. Although this was intended as a temporary measure, most fishermen have remained in the new location (indicating fair conditions were created at the relocation area). It may also be a reflection of the fact that new security infrastructure in Sangachal Bay restricts access to the beach in certain areas and fishing activity is not allowed in the export pipeline corridor.

7.7.3 Recreational and sport fishing

The main fish species targeted by recreational and sport fisheries are mullet, roach, bream, Black Sea roach, carp, redfish and Danubian bleak.

In accordance with Annex II of Regulation No 243, there is a ban on recreational and support fishing in the Azerbaijan sector of the Caspian Sea from 1st May to 30th June. During the legal fishing period, peak periods for recreational and sport fishing (hook and spinning) are from September to October, and March to April (Akhundov, 2024b).

Recreational fisheries in vicinity of the Sangachal to SDC PFOC route

Sport and recreational fishing is carried out from the shore in Sangachal Bay and from inflatable boats (length up to 3-4 m) equipped with a motor. Permission for these boats to go out to sea is issued by representatives of the Border Guard Service and they are only permitted within 2 miles of the shoreline. One to four inflatable boats with a motor can go out daily for the purpose of recreational and sport fishing in different seasons of the year (Akhundov, 2024b).

7.8 Shipping, Navigation and Offshore Infrastructure

7.8.1 Shipping routes

The primary commercial ports of Azerbaijan are situated on the Absheron Peninsula and in the vicinity of Baku. Shipping activities in the waters of the central and southern Caspian Sea include commercial trade, passenger, scientific and supply vessel operations to the offshore oil and gas industry (AECOM, 2019).

There are three bp recommended shipping routes for accessing the offshore Shah Deniz Contract Area from ports near the Absheron Peninsula, see Figure 7.5. No commercial shipping routes cross the Shah Deniz Contract Area.

In the nearshore zone the proposed Sangachal to SDC PFOC route crosses recommended shipping routes No. 24 and No. 35, see Figure 7.5 and Figure 7.6.

7.8.2 Restricted / prohibited areas

There are a number of restricted areas in the vicinity of the Shah Deniz Contract Area, as follows:

- Restricted Area No. 10 overlaps the southeast corner of the Contract Area and is a military exercise area
- Restricted Area No. 36 overlaps the southern part of the Contract Area and is thought to contain dumped munitions
- Restricted Area No. 23 overlaps a small part of the northwest corner of the Contract Area and is a military training area.

In the nearshore zone the proposed Sangachal to SDC PFOC route crosses Prohibited Areas No. 67 and 133, and passes close to Prohibited Areas No. 31 and 62 (see Figure 7.6). Restrictions in these areas are provided below:

- Prohibited Areas No. 67 and No 133 – no anchoring, fishing with seabed interaction, dredging works and navigation with veered anchor chains zone
- Prohibited Area No. 31 – soil dumping area for bay and channel dredging, no vessel anchoring
- Prohibited Area No. 62 – anchoring zone for Azpetrol terminal, no vessel anchoring.

7.8.3 Existing oil and gas infrastructure

7.8.3.1 bp infrastructure

The following bp pipelines are in the vicinity of the proposed Sangachal to SDC PFOC route:

- Three existing Shah Deniz 1 (SD1) pipelines (26” gas, 12” condensate with 4” MEG piggyback) and a fibre optic cable routed from the existing SDA platform back to the onshore Sangachal terminal.
- Four existing Shah Deniz 2 (SD2) export pipelines (2 x 32” gas, 16” condensate with 6” MEG piggyback) routed from the existing SDB platform back to Sangachal terminal.
- Five existing Azeri, Chirag Gunashli (ACG) pipelines and a fibre optic cable routed from ACG field to Sangachal terminal.

7.8.3.2 Third party operated fields

Two third party operated fields are in the vicinity of the proposed Sangachal to SDC PFOC route; the SOCAR operated Bahar Field and the SOCAR operated March 8th Field.

The Bahar Field is approximately 55 km from shore and consists of a large number of platforms in around 20 m water depth. It is approximately 10 km north of the proposed Sangachal to SDC PFOC route (which typically parallels the SD2 export pipelines), see Figure 7.7. Some platforms to the south of the Bahar field have been affected by mud flow from a nearby mud volcano. The operational status of these platforms is not known.

The March 8th Field is approximately 18 km from shore and consists of a number of platforms, grouped closely together in approximately 16 m water depth. The operational status of these platforms is not known. The March 8th field is approximately 3km away from the proposed Sangachal to SDC PFOC route, see Figure 7.7.

A wreck has been identified between the March 8th Field and the 26” SDA gas export pipeline. For the Sangachal to SDC PFOC routeing purposes a 150 m exclusion zone has been placed around the wreck.

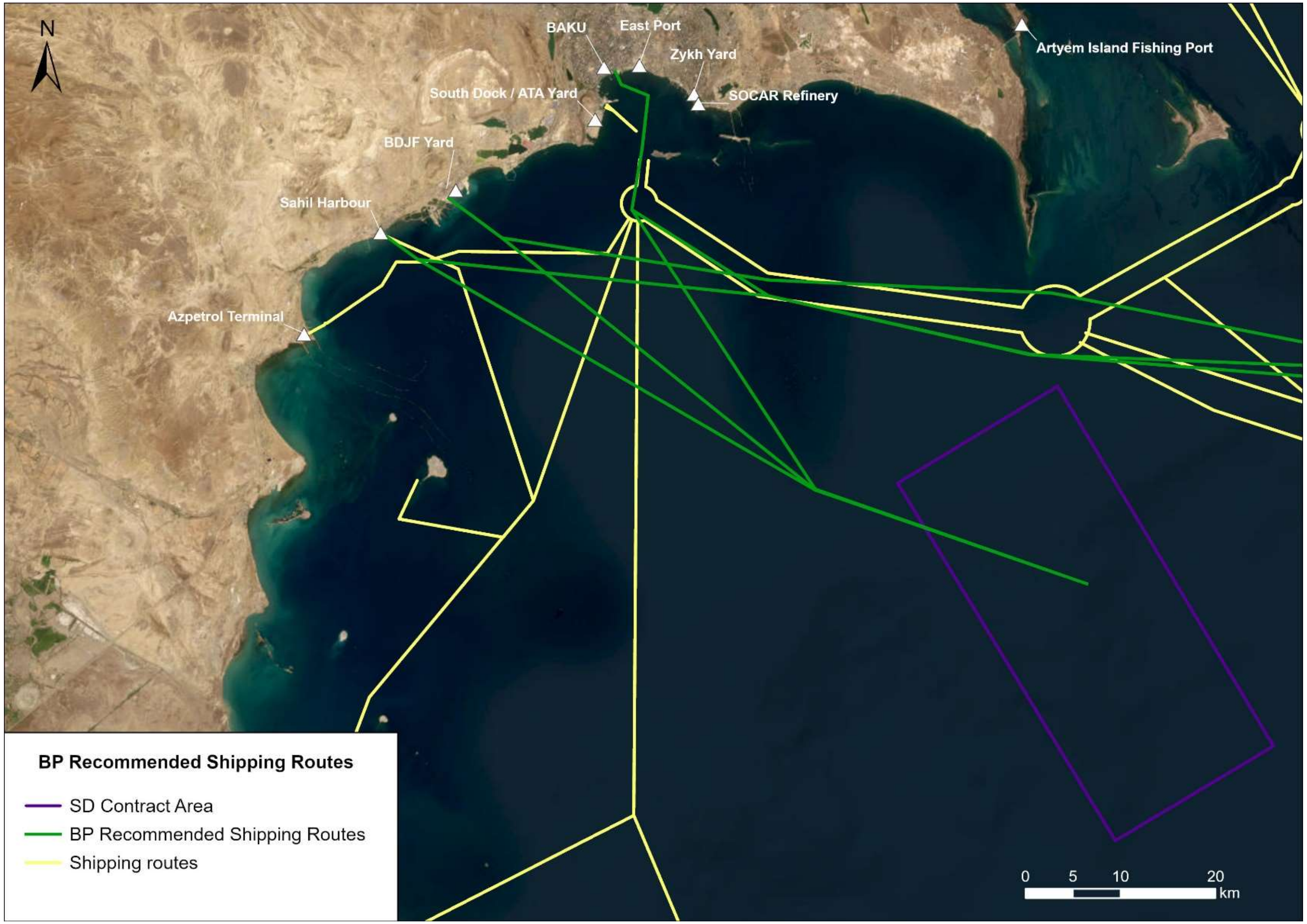

Figure 7.5: Shipping routes in the vicinity of the Shah Deniz Contract Area

Source: Shapefiles provided by bp

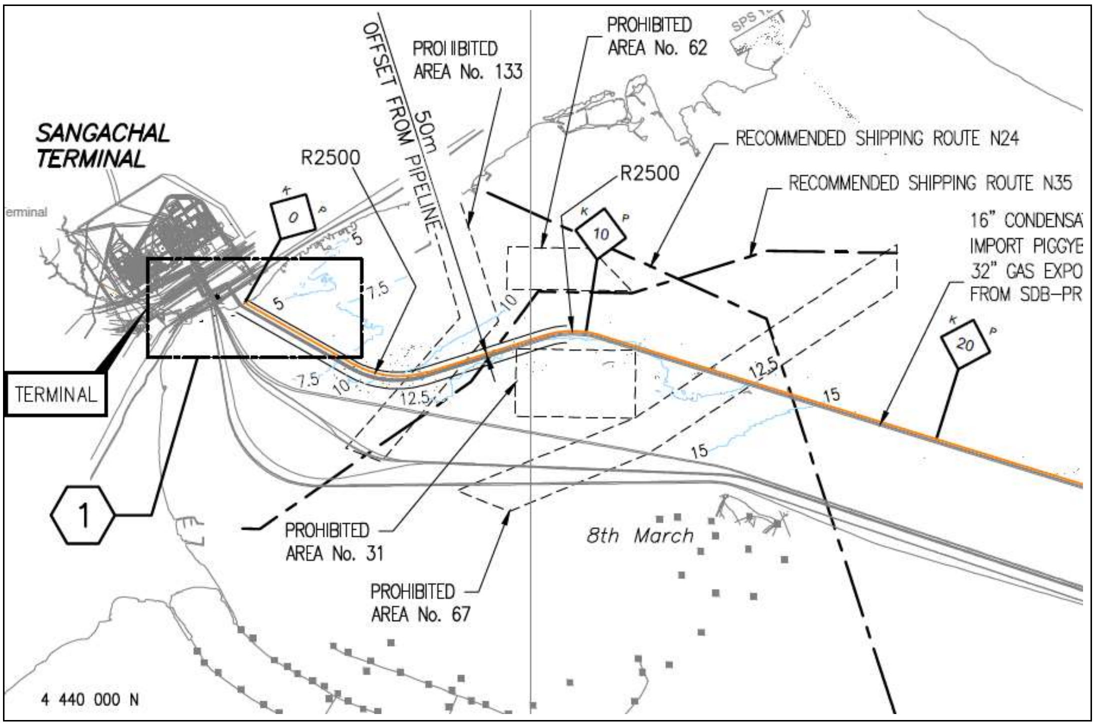

Figure 7.6: Shipping routes and prohibited areas in nearshore zone of proposed Sangachal to SDC PFOC route

Source: bp / Wood, 2023

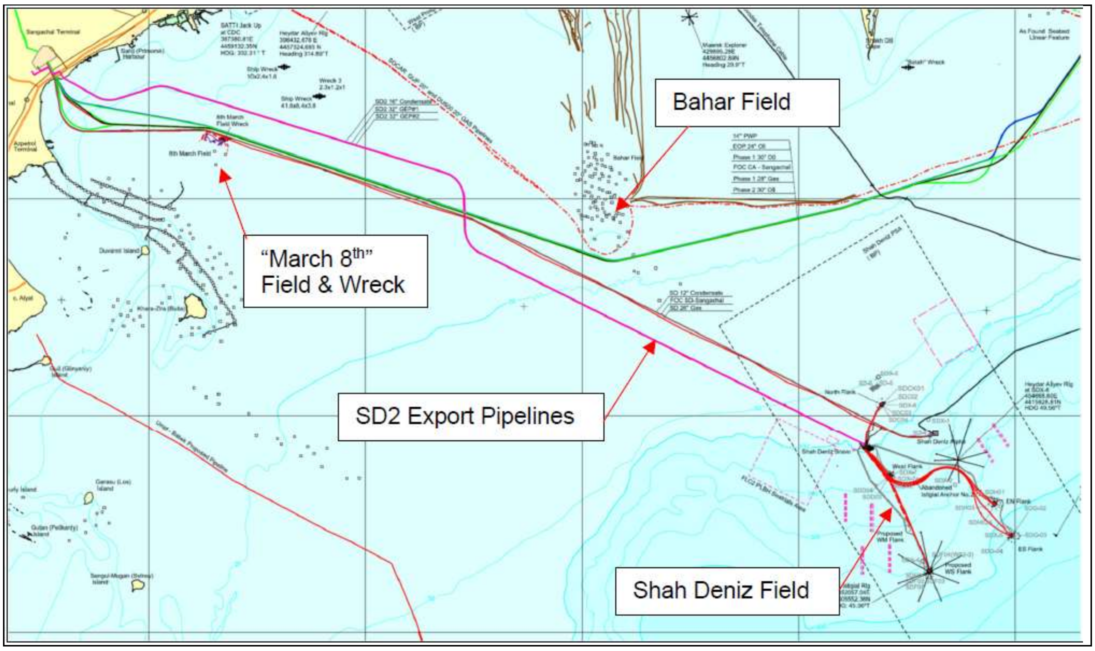

Figure 7.7: Third party oil and gas infrastructure in vicinity of Sangachal to SDC PFOC route

Source: bp / Wood, 2023

Note: Sangachal to SDC PFOC route typically parallels the SD2 export pipelines.

7.9 Tourism and Recreation

7.9.1.1 National level

In 2022 a total of 63,109 persons were employed by the tourism industry in Azerbaijan and tourism contributed 2.9% of the national GDP (State Statistical Committee of the Republic of Azerbaijan Republic, 2024k).

By 2028, travel and tourism is forecast to support 834,000 jobs (18.1% of total employment), an increase of 2.7% per annum over the period (World Tourism Council, 2018 – cited in AECOM, 2019). By 2040, it is estimated that 37,000 new jobs will be created in the tourism sector of Baku with the increase in share of tourism sector jobs in total employment raising to 4.9% (Xalqqazeti.az, 2024).

7.9.1.2 Local level

There are 325 rooms across 5 hotels in Garadagh District and 2,335 hotel rooms across 38 hotels in Sabail district (State Statistical Committee of the Republic of Azerbaijan, 2023k). Expenditure on hotel stays in Sabail district doubled in six years between 2016 and 2022, increasing from AZN 49,000[15] in 2016 to AZN 98,242[16] in 2022. Expenditure in Garadagh also doubled during the same time frame[17]. According to government statistics there were 1,676 employees working in hotels or similar establishments in Sabail in 2022, whilst in Garadagh district there were only 19 employees.

There are a number of locations along the coast of the Absheron region, and south of Baku city, that are used for recreational activities and water sports (including diving, sailing and kite surfing) and are available for beach users, particularly in the beach clubs and hotels. A number of these beach clubs and hotels rely on seasonal income, and offer employment opportunities to the region, particularly during high season (AECOM, 2015). Between the coastline and highway, to the northeast of the proposed Sangachal to SDC PFOC landfall, a number of holiday homes (dachas) and a hotel have been constructed.

bp and its co-venturers previously financed the renovation of a sports facility for Secondary School No. 222 in Sangachal settlement, which was completed in February 2004.

7.10 Social Investment

In 2020 bp set a target to focus 70% of its social investment expenditure on programmes to progress its sustainability aims and support local communities where it works (bp, 2020).

bp's work to support sustainable livelihoods is guided by three themes:

- building capability for the future
- supporting thriving and resilient communities

[15] USD 28,805 - based on exchange rate obtained from xe.com on 11 July, 2024

[16] USD 57,759 - based on exchange rate obtained from xe.com on 11 July, 2024

[17] Available statistics on tourist receipts

- partnering with local communities on climate and environmental sustainability (bp, 2024a).

In Azerbaijan bp aims to create a positive impact on society through delivering sustainable projects and relationships. Their goal for the country is to improve conditions in project affected communities, and conditions for nationwide economic development in selected non-oil & gas sectors. bp aim to reach this goal through the following objectives:

- improving environmental protection
- increasing rural household income
- introducing new or improved education standards
- developing small and medium enterprises
- improving need-based and targeted community infrastructure (bp, 2024b).

For more than three decades bp and the co-venturers have shown commitment in implementing major social investment projects in Azerbaijan. These include educational programmes, building skills and capabilities in local communities, improving access to social infrastructure in communities, supporting local enterprises through provision of access to finance and training, support for cultural legacy and sport (bp, 2024c).

Gross social spend in Azerbaijan, by bp and its co-venturers between 2004 and 2023 is presented in Table 7.8.

Table 7.8: bp and co-venturers social spend in Azerbaijan (USD million)

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
8.6	6.3	6.8	7.4	6.4	3.4	4.8	3.1	4.5	2.7	5.9	4.5	1.5	5.7	4.1	4.2	3.2	3.8	5.4	2.9

Source: AECOM, 2019 and bp 2024f

In the first half of 2024, bp and its co-venturers spent about USD 0.5 million in Azerbaijan on social investment projects. This included 16 ongoing educational projects, three local capacity-building and enterprise development programmes, and one environmental initiative. Some examples are provided below:

- **Capacity building – skills and techniques:** New capacity building initiative aiming to help vulnerable people from 13 districts of Azerbaijan acquire new skills and techniques, improving employment opportunities, and enhancing income generation activities and stimulate self-employment. During the first quarter, 61 beneficiaries have completed the training as part of the project. Training sessions for 121 beneficiaries are currently ongoing, with plans to increase the number of training participants to 300 people in total.
- **Capacity building – youth entrepreneurship:** Project in support of developing youth entrepreneurship in rural areas including communities in the Samukh, Yevlakh and Agdash districts. This initiative is based on a three-stage development

programme. Stage 1 includes selection and training of business-oriented young people from low-income families, Stage 2 aims to provide them with necessary equipment and tools to start their small businesses, and Stage 3 supports the project participants through a mentorship programme to help them efficiently use the knowledge, skills and equipment provided by the project. During the first quarter, a total of 45 beneficiaries received support as part of the project.

- **Education projects – English:** Educational project aimed at enhancing the knowledge of English and developing innovative teaching skills of 80 teachers from Sumgait State University and Nakhchivan State University and 60 teachers from Ganja universities.
- **Education – autism specialists:** Project aiming to empower autism specialists in Azerbaijan by providing them with access to international best practices delivered by international and local experts. The project covered Baku and Ganja, as well as the Dashkasan, Samukh, Agstafa, Tovuz, Goranboy and Shamkir districts.
- **Education - digital innovative entrepreneurship:** Project aimed at creating an online educational platform for digital innovative entrepreneurship to enhance the educational capacity of local universities and support students in establishing sustainable businesses. As part of the project, training materials and an educational guide was prepared, and a web platform was developed.
- **Education - Learning Management System technology**: Project in support of integration and expansion of professional inclusive educational programmes through Learning Management System technology. As part of the project, CHED (Childhood Health, Education and Social Development) and 'Mektebim' courses and training material were adapted and placed into a newly created online web platform.
- **Education – vocational training:** Initiative aiming to increase employment opportunities for 60 local skilled workers from vulnerable households. As part of the project, the skilled workers will receive trades training and official diplomas required for building sustainable job careers.
- **Education – facilities:** New initiative aiming to equip rural schools with innovative solar heating system and heat pump.
- **Education – entrepreneurship:** Successful completion of a project aiming to support entrepreneurship education at secondary schools. As part of the project, teachers from across Azerbaijan received training in teaching entrepreneurship. The trained teachers then conducted sessions and other learning activities for around students at 150 schools.
- **Education – IT professionals:** Project contributing to the development of national IT professionals within the 'Technest' scholarship education programme initiated by the Ministry of Digital Development and Transport in 2021. The first phase of the project was successfully completed. A new phase is currently ongoing aiming to help 289 new participants from low-income families obtain necessary skills in various IT areas to meet the demand of IT specialists in the local labour market.

- **Education – inclusive educational culture:** Successful completion of a project designed to promote an inclusive educational culture at high schools. The project covered 24 schools selected from across the country including Baku, Sumgayit, Shirvan, Ganja, Absheron, Guba, Sheki, Gazakh, Khachmaz, Gabala and Aghjabadi. It helped enhance 280 schoolteachers` theoretical knowledge and practical skills in inclusive education through a specifically developed training programme developed together with foreign specialists.
- **Capacity building – agrotourism:** Project to support development of community-based agricultural tourism in the Tovuz district. The initiative aims to create income generation and employment opportunities for selected low-income families in the region. The project scope includes training of the staff of seven selected agro-tourism service providers, provision of equipment and tools, refurbishment support (if required), and mentorship. To date, 27 beneficiaries have received training as part of the programme.
- **Education - cybersecurity:** Project for the establishment of a ICT cybersecurity laboratory at the Mingachevir State University. The initiative aims to enhance the quality of teaching and learning for the benefit of over 850 students annually in computer engineering, information technologies, computer sciences and cyber/information security specialties. An initiative to strengthen the educational capacity in the field of cybersecurity at the Azerbaijan University of Technology is also underway.
- **Capacity building – livelihoods:** Project to help war affected people in the Tovuz and Agstafa districts build sustainable livelihoods. The project provides psycho-social and legal assistance, as well as organising a networking (social integration) camp for war affected people. To date, around 590 people have received psycho-social and legal support and 25 war-affected people have benefitted from a networking camp organized in the Gakh district.
- **Education – inclusive teaching skills:** Successful completion of a training programme for students of the Azerbaijan State Pedagogical University. The programme aimed to develop inclusive teaching skills of undergraduate students specialising in primary school teaching. 140 students enrolled in the training programme and received international certificates mastering innovative methods and specifics of inclusive teaching.
- **Education – video lessons:** New project to develop five educational products comprised of video lessons, homework, and quiz questions with a focus on mathematics for the benefit of schoolchildren in grades 5-9. The project outputs will be made public in a form of a free of charge application (bp, 2024c).

In addition to the above, in the first quarter of 2024, bp spent around USD 0.4 million on various social and sponsorship projects in Azerbaijan. These included 11 ongoing educational initiatives, one local capacity-building and enterprise development programme, four environmental initiatives, one project promoting the country's cultural heritage and sport, as well as two conferences and workshops on various themes.

Examples include:

- Translation from English into Azerbaijani and publication of 14 academic textbooks.
- Development and publication of an 'Interdisciplinary Relations – Generation of New Knowledge' textbook for teachers, students and administrative staff at universities.
- Provision of 400 schoolchildren with career guidance enabling them to make informed decisions about their future job endeavours.
- Development and publication of textbooks on international medical law, mediation law, and international public law for the benefit of local university students and teachers.
- Expansion of laboratory infrastructure of three departments of the Azerbaijan University of Architecture and Construction.
- Establishment of the publication centre and support for restoration of greenhouse at the Azerbaijan State Agricultural University.
- Support for the establishment of the dual master's degree programme in renewable energy at the Azerbaijan State Oil and Industry University.
- Funding of 20 talented Azerbaijani nationals' training to prepare them for admission to leading international universities.
- Support for the restoration of two underground water-supply sources in Tovuz district. After restoration the two sources will be able to provide up to 2.5 million cubic metres of fresh water annually - enough to meet household consumption and land irrigation needs of about 15,000 community members.
- Support to the establishment of a new water supply system in the Goychay district. The system will be designed to collect, settle and clean floodwater making it suitable for land irrigation - capacity 500,000 cubic metres of water annually enough to irrigate up to 100 hectares of land.
- Support to setting up to 25 water systems for drinking, irrigation and sanitation in Kurdamir, Ujar, Agdash, Yevlakh, Goranboy and Samukh districts. The project will cover about 20 rural communities with a total population of approximately 25,000.
- Support for the restoration of biodiversity of the Zangilan district of Azerbaijan by planting indigenous tree species and providing aftercare.
- Support for the enhancement of work skills and knowledge of up to 80 volunteers of the "ASAN Volunteers" Youth Organization Public Union.
- Support for the development of Azerbaijan's national sport by extending bp's decade-long partnership with Azerbaijan's National Olympic and Paralympic Committees until the end of 2024.

A summary of bp's community project carried out in 2023 is provided in Table 7.9.

Table 7.9: Summary of bp's community project achievements in 2023

Overview
bp spent USD 3 million on social projects in Azerbaijan, benefiting over 10,000 people
Education and capacity building
54 young people from low-income families accessed higher education, 14 more entered foreign universities
61 teachers from 3 universities in Ganja improved their English language skills
More than 200 people enhanced their cybersecurity and IT skills
723 students from 13 universities in Baku, Ganja and Mingachevir completed startup incubation programme
162 autism experts enhanced their skills in treating people with special needs
280 schoolteachers from 97 schools in 55 regions received training to improve entrepreneurship teaching skills
International inclusive society experience rolled out
4 international textbooks translated into Azerbaijani, published and presented to universities, publication of 4 books on Azerbaijan's modern energy saga sponsored
Local entrepreneurship
65 young people from rural areas enhanced their business acumen with the aim of starting their own business
Support to Patriotic War veterans and families
356 veterans received legal and psychological support
Environmental protection
173,400 trees planted in Samukh, Gobustan and Garadagh

Source: bp, 2024c

7.11 Local Content Development

Through the Enterprise Development Programme (EDP), launched by bp and its co-venturers in 2007, local companies with strong business potential have been identified and supported to enable them to meet international standards and competitiveness.

The EDP was completed in 2022. The multi-million-dollar initiative to support local business development was part of the efforts to increase the local content of contracts in Azerbaijan and contribute to the healthy and transparent development of the local economy. During 2022, the programme provided capacity development support to local organisations. This included vocational education capability development of the training centres and capacity development of three local organisations. In addition, 20 individual entrepreneurs (Patriotic War veterans) completed their training within the vocational skills development programme implemented in cooperation with the 'Kulane' vocational education and training centre (bp, 2022).

In 2023, bp worked with 245 small and medium enterprises (SME) across the AGT region, 27 state-owned companies, and had 14 joint ventures with national partners (bp, 2024d). bp and its co-venturers' operations and projects expenditure in the Azerbaijan, Georgia Turkey (AGT) Region from 2006 to 2023 is presented in Table 7.10.

Table 7.10: Local content spend 2006 to 2023 (USD million)

Year	SMEs	State-owned enterprises	Joint ventures	Total
2006	77	60	520	657
2007	111	43	450	604
2008	128	37	408	573
2009	132	29	320	481
2010	147	28	366	541
2011	255	36	285	576
2012	481	51	490	1,022
2013	835	175	533	1,543
2014	1233	284	759	2,276
2015	1,075	180	1,174	2,429
2016	1,178	108	1,442	2,728
2017	701	58	1,017	1,776
2018	305	34	585	924
2019	292	33	589	914
2020	331	41	958	1,330
2021	351	46	963	1,360
2022	399	45	652	1,096
2023	310	39	713	1,062

Source: bp, 2024d

Building a strong national workforce in Azerbaijan remains one of bp's key priorities. bp Azerbaijan implemented a five-year nationalisation plan for increasing the share of national staff with an ultimate target of reaching 90% by the end of 2017. In 2017, 90% of bp Azerbaijan's permanent professional workforce were national citizens, compared to 89% in 2016 (AECOM, 2019). As part of the workforce nationalisation strategy, bp is also working to improve the national representation of its contractors' workforce. The strategy is designed to make sure bp contractors are accountable for the planning and delivery of the workforce nationalisation agenda at the early sourcing stage and set out the target for 90% of the professional workforce to be nationals, as set out in production sharing agreements that bp operate on behalf of government of Azerbaijan and co-venturers (AECOM, 2019).

In the first half of 2024, a total of 2,386 Azerbaijani nationals were employed by bp and 90% of bp's professional staff in Azerbaijan were national employees. Non-professional staff of bp Azerbaijan are 100% nationalised (bp, 2024d).

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CHAPTER 8: Consultation & Disclosure

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8 CONSULTATION & DISCLOSURE

8.1 Introduction

Stakeholder consultation is an important element of the Environmental and Social Impact Assessment process. Soliciting, collating and documenting the input of potentially affected people and interested parties ensures that project design and the ESIA reflects the collective views of key stakeholders.

This chapter presents an overview of the consultation and stakeholder engagement relevant to the SDC project and the process for ESIA disclosure.

8.2 Overview of Consultation and Disclosure Process

SDC project ESIA stakeholder consultation has:

- made use of the consultation framework and methods established for the earlier Shah Deniz and other bp projects in Azerbaijan
- been developed with reference to applicable national legislation, ratified international conventions, and accepted guidance on expectations of ESIA consultation and disclosure
- considered the extent of consultation and disclosure already undertaken in recent years.

bp has been operating in Azerbaijan since the mid-1990s and built relationships with key local, regional and national stakeholders. For the earlier SD and ACG ESIAs, extensive consultation with stakeholders including government, academic and scientific bodies, non-governmental organisations (NGOs) and communities potentially affected by the project activities was undertaken. This consultation continued throughout the construction of each project and is ongoing during operations, led by bp's Communications and External Affairs Team. The lessons learnt from the previous and ongoing consultation have helped to inform the SDC project ESIA and the consultation approach.

Figure 8.1 illustrates the SDC project consultation and disclosure process. A Public Consultation and Disclosure Plan (PCDP) has been prepared to support the SDC Project ESIA. The PCDP outlines the consultation and disclosure objectives and the national and international regulatory regime that project consultation and disclosure will follow to ensure best practice approaches are adopted.

The PCDP also sets out the:

- process by which stakeholders are identified and consulted
- the consultation completed and planned over the duration of the ESIA
- process for lodging and responding to complaints.

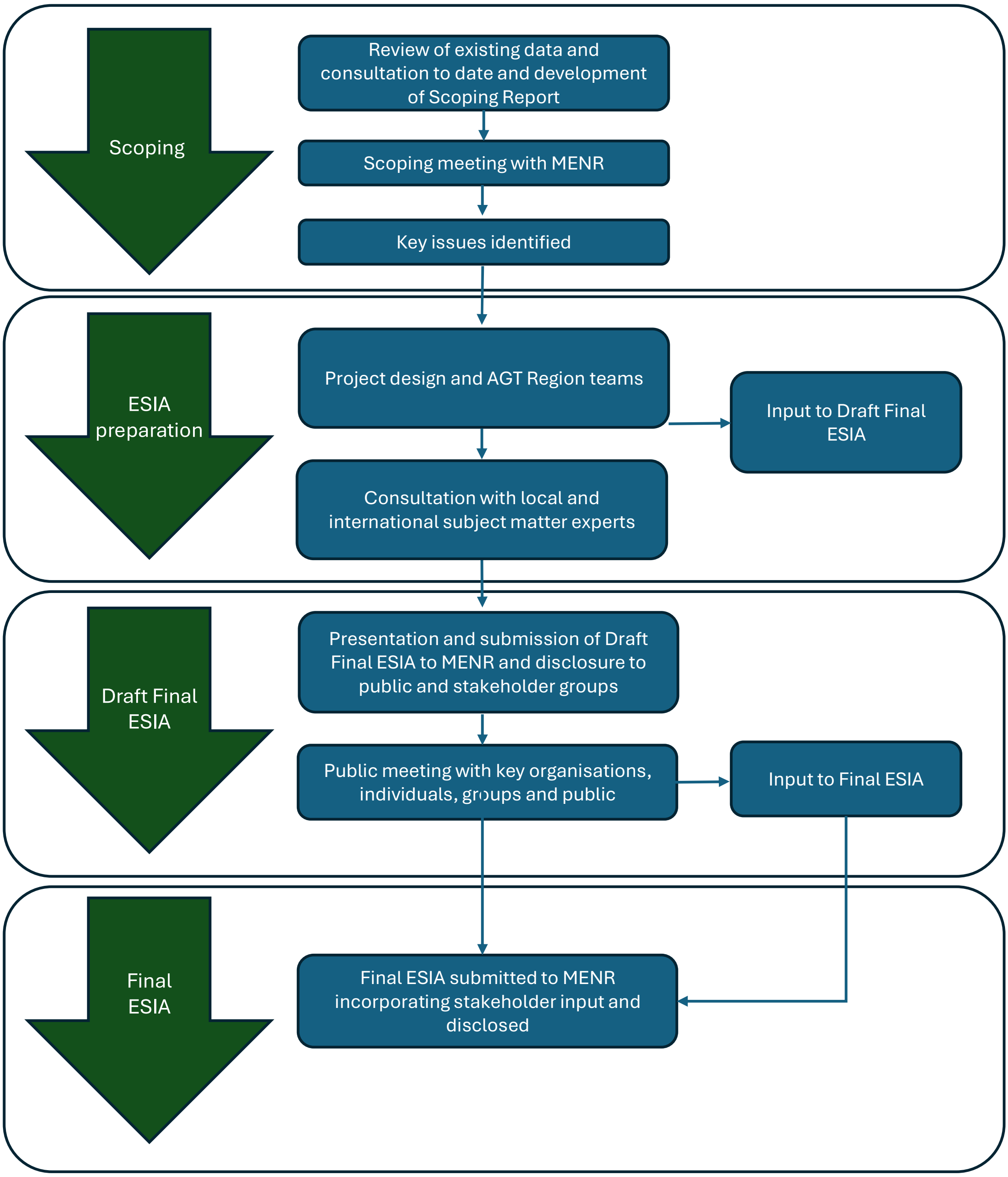

Figure 8.1: ESIA consultation and disclosure process

8.3 SDC Scoping Consultation

A scoping meeting with the MENR for the SDC project was carried out on the 3rd June 2024. The purpose of the meeting was to provide the attendees with an overview of the proposed SDC project and scope of the SDC project ESIA (including planned baseline studies, modelling, and PCDP engagement programme), and offer the opportunity for feedback from the stakeholders.

Key concerns / queries raised are summarised below:

- Compression – How does it work and what are the functions and benefits?
- Venting - Can it be avoided? What are the periods of venting, its duration and estimated volumes? Why venting rather than flaring?
- Onshore power cable route – Will it following the existing bp pipeline corridor? Will there be finger piers to lay the cable in the nearshore zone? If yes, how will the soil be managed?
- Hydrotesting - will biocides be discharged as part of project activities?
- Platform maintenance – how will the platform be accessed, will there be a helipad, how will the platform be accessed if there is an incident?
- ESIA - What sources of data / information used to inform the ESIA? Only literature review, or are site surveys also planned?

The sections within the ESIA where these have been addressed are presented in Table 8.1.

Table 8.1: Key issues raised during SDC project ESIA scoping meeting and where addressed in ESIA

Issue raised	ESIA section where addressed
How compression works and its benefits	Section 1.4
Why venting is required on SDC platform (and why flaring is not being utilised) Venting duration and volumes	Section 4.4 Section 5.7
Route of onshore SDC power cable and management of soil from finger pier construction	Section 5.6 Section 9.6.2
Hydrotesting and management of hydrotest discharge water containing biocides	Section 5.3.3, 5.3.4 and 5.4.5 (onshore hydrotesting at yards) Section 5.5.4 (offshore hydrotesting of infield pipelines) Section 9.5.2
Access to SDC platform	Section 5.7
ESIA sources of data / information	Section 6.2

The scoping presentation and meeting notes are included within Appendix 8A.

8.4 Draft Final ESIA Report Public Consultation and Disclosure

The Draft Final ESIA report will be subject to a disclosure process in compliance with Azerbaijani law[1]. It will be submitted to the MENR and simultaneously released to public and stakeholder groups for comment. The Draft Final ESIA Report and Non-Technical Summary, in English and Azerbaijani, will be disseminated and made available (along with feedback forms) for a 60 day consultation period at the following locations and via the internet:

- bp website
- bp Xazar Centre Office reception
- M.F. Akhundov Public Library
- the Scientific Library of the Azerbaijan Ministry of Science and Education
- the Library of the Azerbaijan State University of Oil and Industry
- Aarhus Public Environmental Information Centre, MENR
- the Library of Baku Higher Oil School, Campus.

As part of the Draft Final ESIA consultation process the following meetings will be held:

- meeting with the MENR, Baku
- public meeting, Baku.

Comments received on the Draft Final ESIA Report will be collated, analysed and responses issued where relevant. The ESIA will subsequently be revised and finalised for MENR approval.

8.5 Consultation under the Espoo Convention

As a signatory to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention) the Azerbaijan Government is obliged to provide early notification to countries that may be subject to transboundary impacts as a result of a development within Azerbaijan.

Potential transboundary impacts are presented in Chapter 12 of this ESIA.

[1] Law on Environmental Impact Assessment (12/06/2018) and the Law on Public Participation (01/06/2014).

CHAPTER 9: Construction, Installation, & HUC Environmental Impact Assessment, Mitigation and Monitoring

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9 CONSTRUCTION, INSTALLATION, & HUC ENVIRONMENTAL IMPACT ASSESSMENT, MITIGATION AND MONITORING

9.1 Introduction

The assessment of potential environmental impacts from the SDC construction, installation and HUC phase uses a systematic process that involves:

- identifying project aspects (activities) or sources of impact (see Chapter 5: Project Description)
- identifying related environmental receptors (see Chapter 6: Environmental Description);
- evaluating project effects on those receptors.

In accordance with the impact assessment methodology (see Chapter 3), ESIA scoping has been undertaken to identify selected activities that may be ‘scoped out’ from the full environmental impact assessment process based on anticipated magnitude of effect and the likely receptor interaction. In addition, existing controls and mitigation have been identified. These include:

- existing Azerbaijan Georgia Turkey (AGT) Region procedures that will be used to ensure that activities are consistent with environmental expectations; and
- feedback from existing operational and ambient monitoring of environmental performance and / or impacts.

Those activities that have not been scoped out have been assessed on the basis of magnitude of effect and receptor sensitivity, taking into account the existing controls and mitigation, to determine impact significance. Monitoring and reporting activities undertaken to confirm that these controls are implemented and effective, as well as additional mitigation and monitoring to further minimise impacts, are provided.

Assessment of operations environmental impacts; social impacts; and assessment of cumulative and transboundary impacts and accidental events have also been undertaken and are provided in Chapters 10, 11 and 12 respectively.

The structure of the impact assessment within this ESIA is provided within Table 9.1 below.

Table 9.1: Structure of SDC project impact assessment

<table>
<tr><th>Chapter No.</th><th>SDC project phase</th><th>Content</th></tr>
<tr><td>9</td><td>Onshore construction and commissioning of offshore facilities
Platform installation, hook-up and commissioning
Infield pipeline installation, tie-in and commissioning
Installation of power and fibre optic cables (PFOCs)</td><td rowspan="2">• Scoping assessment of SDC project activities and interactions
• Identification of existing controls, mitigation, monitoring and reporting
• Environmental impact assessment of SDC project activities based on magnitude of effect and receptor sensitivity
• Identification of any additional mitigation measures</td></tr>
<tr><td>10</td><td>Offshore operations
Onshore operations
Electricity import</td></tr>
<tr><td>11</td><td>All phases</td><td>Assessment of socio-economic impacts</td></tr>
<tr><td>12</td><td>All phases</td><td>Assessment of cumulative and transboundary impacts (including impacts associated with greenhouse gas emissions) and impacts arising from accidental events (including hydrocarbon spills and spill management).</td></tr>
</table>

9.2 Scoping Assessment

The SDC project construction, installation and HUC activities that have been scoped out due to their limited potential to result in discernible environmental impacts are presented in Table 9.2 (see Appendix 9A for all SDC project construction, installation and HUC activities).

The scoping process has used judgement based on prior experience of similar project activities, especially with respect to earlier Shah Deniz (SD) and Azeri Chirag Gunashli (ACG) developments. In some instances, scoping level quantification / numerical analysis has been used to justify the decision. Reference is made to relevant quantification, analysis, survey and/or monitoring reports in these instances.

Table 9.2: Scoped out SDC project activities

ID	Activity	Project descript-tion reference	Justification for 'scoping out'
Onshore construction and commissioning of offshore facilities			
C-R2	Grit blasting / welding and painting of jacket components, piles, topsides and pipework	5.3.3	• Grit blasting, welding and painting of jacket components, piles, topsides and pipework is required. • The majority of grit blasting and anti-corrosion painting of jacket, pile and topside components will be undertaken in a paint shop with a fume extraction and grit recovery system in place. Grit blasting and anti-corrosion painting of sections which are too large to be accommodated within a paint shop will be undertaken within a temporary enclosure. • Preference to use garnet for grit blasting which is inert, non-hazardous and suitable for disposal under European Union (EU) legislation in a non-hazardous landfill. **Conclusion:** No discernible impact on ecological / biological receptors is expected.
C-R3	Construction yard utilities (drainage / sewage)	5.3.7.2	• Sewage will either be treated by a sewage treatment plant at the construction yard(s) or collected onsite and transferred by road tanker or by sewer pipes to a MENR approved sewage treatment plant for treatment and disposal. If sewage is treated and discharged from a construction yard, the construction yard contractor will be responsible for agreeing and maintaining the discharge permit for sewage with the MENR[1]. • Contaminated drainage water will be collected and delivered to an appropriate licensed waste management contractor in accordance with existing Azerbaijan Georgia Turkey (AGT) management plans and procedures[2]. • Only uncontaminated rainwater will be discharged directly to the onshore / marine environment. **Conclusion:** Discharge of treated sewage from the construction yards will be in accordance with MENR requirements.

[1] Including agreeing discharge standards and maintaining the discharge permit conditions stipulated by the MENR.

[2] Waste management plans and procedures are discussed within Chapter 13.

ID	Activity	Project description reference	Justification for 'scoping out'
CR-4	Onshore hydrotesting of risers, spools / structures, and topsides piping at construction yards	5.3.3 5.3.4	• No discharge to environment associated with onshore hydrotest of risers, spools / structures. Hydrotest will be carried out using freshwater supplied from a tank, with the water returned to the tank following use and removed from site by a licensed AGT Region approved contractor. • Onshore hydrotesting of SDC topsides piping will be carried out using demineralised water. If biocides are used in the hydrotest water it will be single use and drained into tanks and removed from site by a licensed AGT Region approved contractor. If no chemicals are used the waste hydrotest water will be discharged to the construction yard drainage system (or used for site dust suppression in summer months). Construction contractor will be responsible for maintaining the discharge permit conditions stipulated by the MENR. **Conclusion:** Only hydrotest water with no chemical additives (i.e. demineralised water) will be discharged to yard drainage system. No impact on ecological / biological receptors expected.
Offshore platform installation, hook-up and commissioning			
C-R6	Installation of jacket, pin piles and skirt piles, and vessel anchoring (seabed disturbance)	5.4.1	• Temporary seabed disturbance activities include anchoring and chain drag associated with the installation vessels. • The primary impact associated with anchor setting and chain drag will be the disturbance and displacement of the sediment. The organisms living in the sediment are too small to be crushed by anchors and chain drag, although a small amount of mortality might occur at the point where the anchor initially impacts the seabed • The displacement of sediment will not cause significant levels of mortality in benthic organisms. A small proportion of animals may be buried too deeply to recover to a position near the sediment surface, but the majority of organisms will be able to re-establish themselves once the anchor and chain have been moved to their next position. • Up to approximately 1,495 m^3 of seabed may be excavated prior to jacket installation. This is anticipated to have a localised and very small impact in the context of the Contract Area. Organisms are not anticipated to be significantly impacted and will rapidly recover. **Conclusion**: It is considered that impacts are minimised as far as practicable and no discernible impact to the marine environment is anticipated due to seabed disturbance. Permanent presence of the facilities (platform, infield pipelines, and subsea infrastructure) is discussed in Chapter 10: Section 10.2.

ID	Activity	Project descript-tion reference	Justification for 'scoping out'
C-R7	Jacket buoyancy tank dewatering and topsides sand jacks operation	5.3.3	• A number of the buoyancy tank compartments fitted to the jacket will be flooded with seawater during jacket installation. • When jacket installation is completed, the seawater will be released and compartments emptied. • It is not planned to treat the seawater used to ballast the buoyancy tanks with chemicals. • No change in composition or temperature of the seawater used is anticipated. • Sand jack operation during topsides installation will result in the discharge of ~35m^3 of clean sand. **Conclusion:** No discernible impact on the marine environment is expected.
C-R8	Discharge from J-tubes during PFOC hook up	5.4.3	• Tie-in of the PFOCs to the SDC platform will require the use of sealed pipes (termed J-tubes) that extend from the topside into the sea. • The J-tubes are estimated to contain approximately 17m^3 of treated seawater introduced when the platform was constructed to provide corrosion protection. • Prior to unsealing both ends of each J-tube, a sample will be taken and analysed to confirm ecotoxicity, and a risk assessment completed to confirm potential impacts to the marine environment associated with discharge to sea. • Depending on the outcome of the risk assessment the contents of the J-tube will either be discharged to sea or recovered to the topside, contained and shipped to shore for disposal. • Once emptied it is then planned to flush the pipe casing twice using seawater treated with Hydrosure HD-5000 at a dose of 1000 parts per million (ppm) (i.e. the same product and dosage planned to be used during cleaning and hydrotesting of the new infield pipelines - refer to Chapter 5: Section 5.5.4). **Conclusion:** Through the implementation of the existing control measures above no discernible impact on the marine environment is expected.
C-R9	Brownfield works at SDA and SDB platforms	5.4.4	• Modifications proposed at SDA and SDB platforms are small-scale engineering works (replacement of pumps, valves, pipework, etc). • SDA will be provided with electrical power from SDB for the brownfield works. SDB will only have train outages, therefore power generation from fuel gas will still be available on this platform. • No flaring is anticipated during shutdown or start-up of the platforms (except topsides depressurisation after shutdown for maximum 15 minutes). **Conclusion:** Due to limited emission sources, no discernible atmospheric impacts are anticipated.

ID	Activity	Project descript-tion reference	Justification for 'scoping out'
Installation of PFOC nearshore			
C-R12	Geotechnical survey of PFOC route	5.6.2	• A geotechnical survey may be required of the PFOC route in the nearshore zone. This would involve the collection of seabed samples using either a corer, or through the drilling of boreholes. • In the case of boreholes, a bentonite drilling fluid may be required to facilitate sample retrieval. • Any borehole drilling fluid used will be low toxicity, biodegradable and not known to bioaccumulate. **Conclusion**: It is considered that impacts are minimised as far as practicable and no discernible impact to the marine environment is anticipated from the survey activities.
General – all phases			
C-R20	Waste generation		• Waste generated during SDC project construction, installation and HUC activities will be consistent with the type and quantity that have been routinely generated during previous construction works. • Waste generated at the cable installation site, construction yards and onboard the installation and HUC vessels will be segregated at source, stored and transported in fit for purpose containers. • All waste generated during onshore platform and subsea infrastructure construction and commissioning activities will be managed in accordance with the existing AGT management plans and procedures. • Waste minimisation and management plans will be established for the construction, installation and HUC phase and all waste transfers controlled and documented. **Conclusion:** Waste generated during the SDC project will be managed as described within Chapter 13. No discernible impact to the terrestrial or marine environment expected.
Note: Transport of SDC materials / equipment to site (construction yards and PFOC installation site) is scoped out in the socio-economic impact assessment (see Chapter 11: Section 11.2.3).			

The SDC project routine and non-routine activities that have been assessed with the full impact assessment process are presented in Table 9.3.

Table 9.3: Assessed SDC project construction, installation and HIC activities

ID	Activity	Project description reference	Event	Receptor
Onshore construction and commissioning of offshore facilities				
C-R1	Use of yard plant (generators and engines) during jacket, topside and subsea equipment fabrication and commissioning	5.3.	Emissions to atmosphere	Atmosphere
			Onshore noise	Terrestrial environment
Offshore platform installation, hook-up and commissioning				
C-R5	Use of vessels for jacket and topside installation e.g. STB-1 Barge, DBA / SCV Khankendi, support vessels	5.4.5	Emissions to atmosphere	Atmosphere
			Generation of underwater sound	Marine environment
			Vessel operational discharges to marine environment	Marine environment
C-R6	Installation of jacket, pin piles, skirt piles and grouting	5.3.3	Generation of underwater sound	Marine environment
		5.4.1	Discharge of cement grout	Marine environment
Infield pipeline and subsea infrastructure installation, tie-in and commissioning				
C-R10	Use of vessels for infield pipeline installation and subsea installation (including PFOCs) e.g. Pipelay barge, SCV Khankhendi, support vessels	5.5.5	Emissions to atmosphere	Atmosphere
			Generation of underwater sound	Marine environment
			Vessel operational discharges to marine environment	Marine environment
C-R11	Cleaning, testing and dewatering of infield pipelines (and PLM controls commissioning)	5.5.4	Discharge to marine environment	Marine environment
Installation of PFOC nearshore				
C-R13	Installation of finger piers	5.6.2	Coastal erosion	Marine environment
			Seabed disturbance – benthos	Marine environment

ID	Activity	Project description reference	Event	Receptor
C-R14	Trenching (from coastline to 12.5 m water depth) and installation of PFOC	5.6.2	Coastal erosion	Marine environment
			Seabed disturbance – benthos	Marine environment
			Potential disturbance / damage to cultural heritage	Marine environment
C-R15	Use of vehicles and vessels during nearshore trenching and cable lay	5.6.2	Emissions to atmosphere	Atmosphere
			Generation of underwater sound	Marine environment
			Vessel operational discharges to marine environment	Marine environment
Installation of PFOC onshore				
C-R16	Use of plant and vehicles during PFOC installation	5.6.1	Emissions to atmosphere	Atmosphere
			Onshore noise	Terrestrial environment
C-R17	Removal and storage of surface soil layer and vegetation along cable route and at cable transition joint pit	5.6.1	Direct / indirect effects to wildlife	Terrestrial environment
			Loss of habitat	Terrestrial environment
C-R18	Cable trenching including movement, temporary storage of excess spoil	5.6.1	Potential mobilisation of contamination	Terrestrial environment
			Potential disturbance / damage to cultural heritage	Terrestrial environment
C-R19	Construction of cable transition joint pit and temporary vehicle access, parking and construction site facilities	5.6.1	Disturbance / indirect effects to wildlife	Terrestrial environment
			Loss of habitat	Terrestrial environment
			Potential disturbance / damage to cultural heritage	Terrestrial environment
Note: Brownfield works at Sangachal Terminal, and installation of the onshore PFOC within the Sangachal Terminal boundary (within the new security fence), are outside the scope of this ESIA.				

9.3 Impacts to the Atmosphere (emissions)

Non greenhouse gas (GHG) emissions to the atmosphere from construction, installation and HUC activities will be associated with construction plant and vehicles onshore, and installation and support vessels and use of a helicopter offshore. GHG emissions associated with the SDC project are discussed within Chapter 12 of this ESIA. This section focuses on the assessment of potential air quality impacts.

9.3.1 Mitigation

Existing controls associated with emissions from construction, installation and HUC activities include:

- construction plant, vehicles, and vessels will be well maintained in accordance with written procedures based on manufacturer's guidelines, applicable industry code, or engineering standards to ensure efficient and reliable operation
- helicopters will be maintained in accordance with existing AGT Region practices
- fuel supplied to the construction plant, vehicles, vessels and helicopters will be low in sulphur (typically < 0.05%)
- all shipboard emissions will be in compliance with MARPOL 73/78 (Annex VI) that aims to reduce global emissions of SO_x and NO_x
- where practicable, mains electricity will be used instead of mobile generators as a power source (in the construction yards)
- a Pollution Prevention Management and Monitoring Plan will be developed and implemented
- community disturbance management and engagement plans (refer to Chapter 13: Section 13.3) will be implemented and maintained as a mechanism of communicating with the community and responding to community grievances.

It should be noted that, due to the SDC platform being electrically driven, there will be no onshore commissioning of platform generators at the construction yards and therefore no commissioning emissions associated with this source.

9.3.2 Construction yard emissions

9.3.2.1 Magnitude of effect

Description

Construction yard plant and vehicles

As stated in Chapter 5 (Section 5.3), the SDC jacket, topsides, and associated subsea infrastructure will be fabricated at established construction yards in Azerbaijan. It has been assumed for the purposes of this ESIA that BDJF yard will be used for construction of the pin piles and jacket, and Bayil yard for construction and commissioning of the topsides.

At each yard, the majority of power required for construction activities such as steel cutting, rolling and shaping will be provided from the Azerbaijan national grid. Onsite plant and equipment used including cranes, generators and vehicles will consume diesel and gasoline, resulting in emissions to atmosphere. In addition NMVOCs (non-methane volatile organic compounds) will be emitted from the use of paints, coatings, etc.

The anticipated use of plant and vehicles at the yards, typical fuel consumptions, and operational periods were provided by the bp Project Team, along with anticipated paint use quantities (see Appendix 5A). Emissions from these sources are provided in Chapter 5: Table 5.2.

Onshore commissioning

As stated within Chapter 5 (Section 5.3.4), testing of the topsides vent system, compression trains and process systems at Bayil yard will be carried out using a nitrogen / helium simulated process gas, as such there will only be emissions of these inert gases from this process.

Assessment

An air quality screening assessment was undertaken to determine the potential magnitude of effect of onshore construction yard emissions to nearby receptors using an advanced air dispersion model, ADMS 6 (see Appendix 9B).

The study focused on emissions of nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), non-methane volatile organic compounds (NMVOCs), and particulate matter (PM_{10}), considering the short term averaging periods and the associated ambient air quality limit value, set for the protection of human health.

The assessment demonstrated that no exceedance of the assessment criteria (derived from national and international standards / guidelines) is predicted at receptors in the vicinity of BDJF yard, or Bayil yard, and the short-term and long-term process contribution concentrations of all pollutants are well below the assessment criteria.

The primary atmospheric pollutant of concern is NO_x, which comprises nitrogen dioxide (NO_2) and nitrous oxide (NO). This is based on the larger predicted emission volumes as compared to other pollutants and the potential to impact human health. Moreover, the predicted concentration of other pollutants modelled was extremely low, well below the air quality assessment criteria. Contour plots illustrating the dispersion profile of NO_2 are provided in Figure 9.1 for BDJF yard, and Figure 9.2 for Bayil yard.

For BDJF yard the highest predicted maximum hourly NO_2 concentration at a receptor is 74 $\mu g/m^3$ at industrial receptor R4. For the residential receptors the maximum hourly predicted NO_2 concentrations are much lower, 17 $\mu g/m^3$ in Puta settlement (receptor R1) and 7 $\mu g/m^3$ in Sahil settlement (receptor R2).

For Bayil yard the highest predicted maximum hourly NO_2 concentration at a receptor is 91 $\mu g/m^3$ at industrial receptor R12. For the residential receptors the maximum predicted hourly NO_2 concentrations are lower, 34 $\mu g/m^3$ in Bibiheybat settlement (receptors R8 and R9).

As stated above, no exceedance of the assessment criteria for maximum hourly NO_2 (200 $\mu g/m^3$) is anticipated at any of the residential receptors.

Based on the results of the air screening assessment, which indicate a localised impact on air quality, a magnitude of effect score of 2, low, has been assigned.

9.3.2.2 *Receptor sensitivity*

The candidate construction yards are currently operational, are located within an industrial setting and have been used previously for Shah Deniz and ACG construction works. Residential properties are not located within close proximity to the construction yard site boundaries (no settlements within 1 km). As such a human receptor sensitivity score of 2, low, has been assigned.

9.3.2.3 *Impact significance*

Table 9.4 summarises impacts on air quality and human receptors associated with construction yard emissions during the construction, installation and HUC phase.

Table 9.4: Impact significance – construction yard emissions

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Emissions from construction yard plant and vehicles	2 – low	2 – low	4 – minor negative

Figure 9.1: Maximum short term (hourly) NO_2 concentrations – BDJF yard

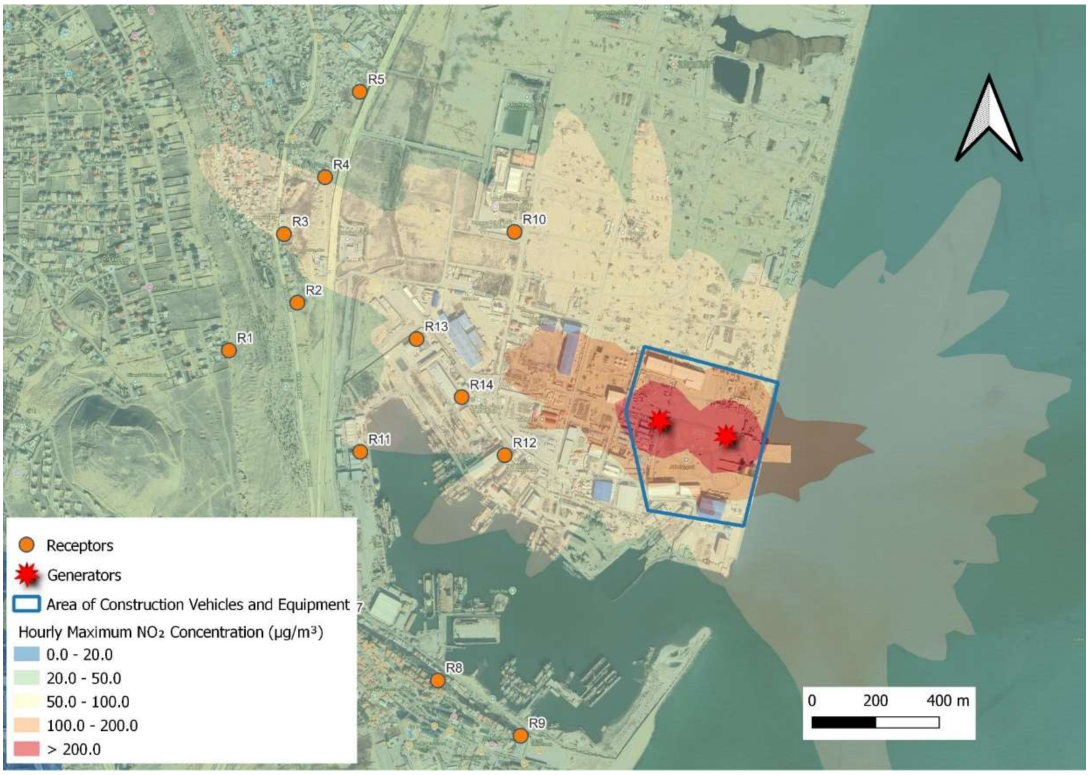

Figure 9.2: Maximum short term (hourly) NO_2 concentrations – Bayil yard

Note: Short term (hourly) limit is 200 µg/m^3 (World Health Organisation Guidelines and EU ambient air quality objective)

9.3.3 Onshore PFOC installation emissions (Sangachal)

9.3.3.1 Magnitude of effect

Description

As stated in Chapter 5 (Section 5.6.1) the Sangachal to SDC PFOC will landfall in Sangachal Bay and follow the existing route of the SD2 gas export pipelines to Sangachal Terminal (it should be noted that cable installation within the terminal boundary is outside the scope of this ESIA). Excavators, construction trucks, testing trucks, cranes and horizontal drilling equipment will be used for the cable installation works.

The anticipated use of plant and vehicles, typical fuel consumptions, and operational periods were provided by the bp Project Team (see Appendix 5A). Emissions from these sources are provided in Chapter 5: Table 5.14.

Assessment

An air quality screening assessment was undertaken to determine the potential magnitude of effect of onshore PFOC installation emissions to nearby receptors using an advanced air dispersion model, ADMS 6 (see Appendix 9B).

The study focused on emissions of NO_2, SO_2, CO, NMVOCs, and PM_{10}, considering the short term averaging periods and the associated ambient air quality limit value, set for the protection of human health.

The assessment demonstrated that no exceedance of the assessment criteria (derived from national and international standards / guidelines) is predicted at receptors in the vicinity of the onshore PFOC route, and the short-term and long-term process contribution concentrations of all pollutants are well below the assessment criteria.

A contour plot illustrating the dispersion profile of NO_2 along the onshore PFOC route is provided in Figure 9.3.

For the onshore PFOC route the maximum hourly NO_2 concentrations at all receptors are very low. The highest predicted concentration at a receptor is 0.0025 μg/m^3 at industrial receptor R8. For the residential receptors the maximum predicted hourly NO_2 concentrations are 0.0009 μg/m^3 in Umid settlement (receptor R3) and 0.0001 μg/m^3 in Sangachal settlement (receptor R1). These values are much lower than the maximum hourly NO_2 assessment criteria of 200 μg/m^3.

Based on the results of the air screening assessment, which indicate a very localised impact on air quality, a magnitude effect score of 1, very low, has been assigned.

Figure 9.3: Maximum short term (hourly) NO_2 concentrations – onshore PFOC route

Note: Short term (hourly) limit is 200 μg/m^3 (World Health Organisation Guidelines and EU ambient air quality objective)

9.3.3.2 Receptor sensitivity

The nearest settlements to the onshore PFOC route, Sangachal and Umid, are more than 1 km away. There are some individual dwellings along the coast, approximately 350 m from the cable route. A human receptor sensitivity score of 2, low, has been assigned.

9.3.3.3 *Impact significance*

Table 9.5 summarises impacts on air quality and human receptors associated with onshore PFOC installation during the construction, installation and HUC phase.

Table 9.5: Impact significance – onshore PFOC installation emissions

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Emissions from onshore PFOC installation plant and vehicles	1 – very low	2 – low	2 – negligible

The following monitoring and reporting activities will be undertaken with respect to air emissions:

- the volume of fuel usage at the construction yards, from the onshore PFOC installation plant and vehicles, and for the project vessels will be monitored and reported to MENR by contractor.

It is considered that impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and no additional mitigation is necessary.

9.3.4 Offshore installation - vessel / helicopter emissions

9.3.4.1 *Magnitude of effect*

Description

As stated in Chapter 5, a number of vessels will be used during the construction, installation and HUC phase to support the float out and installation of the jacket, topsides, infield pipelines and PFOCs. In addition, a helicopter will be used periodically to transfer crew to shore. These activities result in emissions to atmosphere, see Chapter 5: Table 5.2.

The anticipated use of vessels and helicopters, typical fuel consumptions, and operational periods were provided by the bp Project Team (see Appendix 5A). Emissions from these sources are summarised in Chapter 5: Sections 5.4.6; 5.5.6; and 5.6.5.

Assessment

As stated above, the primary atmospheric pollutant of concern is NO_x based on the larger predicted emission volumes as compared to other pollutants and the potential to impact human health and the environment. NO_x emissions from vessels and the helicopter used during construction, installation and HUC activities are anticipated to total approximately 389 tonnes (this also includes emissions from a temporary 1 MW generator on the SDC topsides prior to PFOC hook up for a period of approximately 2 months). The vessel and helicopter emissions will occur throughout the installation and HUC activities which take place across a large geographic area, although mainly within the offshore SD Contract Area. They are expected to disperse rapidly and will result in increases in NO_x concentrations that will be indiscernible from background levels at onshore receptors.

Based on efficient operation, regular maintenance, and planned use of good quality low sulphur fuel, the extent of the impact is anticipated to be localised and of short duration with the emissions dispersing rapidly in the offshore location of the Shah Deniz Contract Area. A magnitude of effect score of 2, low, has been assigned.

9.3.4.2 Receptor sensitivity

There are no permanently present (i.e. resident) human receptors within approximately 30 km of the Shah Deniz Contract Area where the majority of the vessel activity will take place. Laying of the nearshore section of the Sangachal to SDC PFOC will be in closer proximity to receptors, however, vessel works will only be carried out for a period of approximately 35 days in Sangachal Bay. As such a human receptor sensitivity score of 1, very low, has been assigned.

9.3.4.3 Impact significance

Table 9.6 summarises impacts on air quality and human receptors associated with vessel activities during the construction, installation and HUC phase.

Table 9.6: Impact significance – vessel and helicopter emissions

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Emissions from installation and support vessels and helicopter	2 – low	1 – very low	2 – negligible

9.4 Impacts to the Terrestrial Environment (noise)

This section presents the potential noise impacts to the terrestrial environment from jacket and topsides construction activities at the construction yards, and cable installation along the onshore section of the Sangachal to SDC PFOC route.

9.4.1 Mitigation

Existing controls associated with airborne noise from construction, installation and HUC activities include:

- onshore construction plant and vehicles will be operated and maintained in accordance with written procedures based on the manufacturer's guidelines, applicable industry code, or engineering standards to ensure efficient and reliable operation
- engines of vehicles, plant and equipment will be switched off when idle or not in use
- silencers or mufflers will be used on high noise generating equipment
- where practicable, mains electricity will be used instead of mobile generators as a power source (in the construction yards)
- steel works will be undertaken in fabrication sheds, where practicable and feasible
- grit blasting will be undertaken in sheds, or within enclosures, where practical and feasible

- community disturbance management and engagement plans (refer to Chapter 13: Section 13.3) will be implemented and maintained as a mechanism of communicating with the community and responding to community grievances.

9.4.2 Construction yard noise

9.4.2.1 Magnitude of effect

Description

As stated in Chapter 5 (Section 5.3), noise at the selected construction yard(s) will arise from the use of plant and machinery to undertake steel rolling, cutting and shaping, welding, grit blasting and the movement of materials around the site(s) by vehicles and cranes. Noise will also be generated for short periods from the onshore commissioning of the topsides compressors and vent system at Bayil yard.

The anticipated use of plant and vehicles at the yards, noise source levels and operational hours, were provided by the bp Project Team.

Assessment

A noise screening assessment was undertaken to determine the potential magnitude of effect of onshore construction yard noise to nearby receptors (see Appendix 9C).

The calculations showed that noise from construction activities at the yards is likely to be below the proposed criteria[3] during both the daytime (65 dB LAeq,T)[4] and the night-time (45 dB LAeq,T) at all identified receptors, see Table 9.7.

Table 9.7: Predicted noise levels at human receptors in the vicinity of the construction yards

Construction activity	Receptors	Predicted noise levels, in dB(A)
Jacket construction at BDJF yard	Puta settlement	28
	Individual dwellings	39
Topsides construction and commissioning at Bayil yard	Bibiheybat settlement	40

Based on the results of the noise screening assessment, which indicates that noise impacts are localised in extent, a magnitude of effect score of 2, low, has been assigned.

9.4.2.2 Receptor sensitivity

The candidate construction yards are currently operational, are located within an industrial setting and have been used previously for Shah Deniz and ACG construction works. Residential properties are not located within close proximity to the construction yard site boundaries (no settlements within 1 km). As such a human receptor sensitivity score of 2, low, has been assigned.

[3] Criteria taken from BS 5228-1:2009+A1:2014 '*Code of Practice for Noise and Vibration Control on Construction and Open Sites*'

[4] LAeq.T is the A-weighted, equivalent continuous sound level, in decibels having the same total sound energy as the fluctuating level measured over a specified period of time (T).

9.4.2.3 Impact significance

Table 9.8 summarises impacts to human receptors from noise due to construction yard plant and vehicle operations and compressor and vent commissioning.

Table 9.8: Impact significance – construction yard noise

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Noise from construction yard plant and vehicles, and from commissioning activities (Bayil only)	2 - low	2 - low	4 – minor negative

It is considered that impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and no additional mitigation is necessary.

9.4.3 Onshore PFOC installation noise (Sangachal)

9.4.3.1 Magnitude of effect

Description

As stated in Chapter 5 (Section 5.6.1), noise along the onshore PFOC installation route will arise from the use of construction and testing trucks and plant to lay the cable and dig the cable transition pit (excavators, cranes, horizontal drilling equipment).

The anticipated use of plant and vehicles for PFOC installation, noise source levels and operational hours, were provided by the bp Project Team.

Assessment

A noise screening assessment was undertaken to determine the potential magnitude of effect of onshore PFOC installation to nearby receptors (see Appendix 9C).

The calculations showed that noise from construction along the onshore PFOC installation route is likely to be below the proposed criteria during the daytime (65 dB LAeq,T) at all identified receptors. However, it is was identified that noise from the PFOC laying activities may be above the night-time criteria (45 dB LAeq,T) at the nearest receptors (individual dwellings located approximately 350 m along the coast), when working near the landfall part of the route, see Table 9.9.

It should be noted, however, that there is a 3 m high brick wall running adjacent to the cable lay route separating the construction corridor from the individual dwellings that has not been taken into account in the noise calculations. The brick wall is likely to bring the predicted noise levels down, at the receptors, by around 5 to 10 dB, which would be below the proposed night-time criterion.

Table 9.9: Predicted noise levels at human receptors in the vicinity of the onshore PFOC installation route

Construction activity	Receptors	Predicted noise levels, in dB(A)
Installation of onshore section of PFOC	Umid settlement	38
	Sangachal settlement	35
	Individual dwellings (near landfall)	47

Based on the results of the noise screening assessment, which indicates that noise impacts are localised in extent, a magnitude of effect score of 2, low, has been assigned.

9.4.3.2 Receptor sensitivity

There are no residential areas within close proximity of the onshore PFOC installation route (the settlements of Umid and Sangachal are more than 1 km away), however there are individual dwellings approximately 350 m from the cable route near the landfall. As such a human receptor sensitivity score of 2 / 3 – low / medium has been assigned.

9.4.3.3 Impact significance

Table 9.10 summarises impacts to human receptors from noise generated during onshore POC installation.

Table 9.10: Impact significance – onshore PFOC installation noise

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Noise from onshore PFOC installation plant and vehicles	2 – low	2 / 3 – low / medium	4 / 6 – minor / moderate negative

Additional mitigation measures

Although it is anticipated that noise criteria will not be exceeded from the use of PFOC installation plant and vehicles, it should be noted that rocky stone is present in the area of the beach where the cable route and cable transition pit will be excavated. Construction activities at the landfall, in particular any rock breaking, will be scheduled for the hours of daylight where feasible.

9.5 Impacts to the Marine Environment (discharges and underwater sound)

Potential impacts to the marine environment may arise from discharges associated with infield pipelines and subsea pre-commissioning and commissioning activities; other discharges (operational discharges from project vessels, cement discharges from grouting of the pin and jacket piles); and from underwater sound generated by piling and vessel activities.

9.5.1 Mitigation

9.5.1.1 Infield pipelines and subsea pre-commissioning and commissioning discharges

Existing controls associated with infield pipeline and subsea pre-commissioning and commissioning include:

- chemicals used for the pre-commissioning and commissioning activities will not be persistent in the marine environment and will have been approved for use by the MENR
- a Pipeline Pre-Commissioning and Commissioning Discharge Management and Monitoring Plan will be prepared prior to the activities and subsequently maintained (it will contain a schedule of discharge events together with a detailed set of infield pipeline and subsea cleaning and commissioning procedures).

9.5.1.2 Other discharges

Existing control measures associated with operational vessel discharges include:

- Sanitary waste - grey water will be mixed with the black water on the vessels and sent to the onboard approved sewage treatment plant[5]. Treated sewage water will only be discharged >12 nm from the nearest land when the ship is enroute and proceeding at not less than 4 knots (MENR requirement). Under non routine conditions when the sewage treatment system is not available black water will be managed in accordance with the existing AGT Region plans and procedures. Sewage sludge will be shipped to shore for disposal in accordance with the existing AGT Region waste management plans and procedures.
- Galley waste – depending on the availability of the food waste treatment capabilities onboard of the vessel, galley food waste will either be sent to vessel maceration units designed to treat food wastes to applicable MARPOL 73/78 Annex V requirements, or contained and shipped to shore for disposal.
- Drainage – bilge will be stored onboard the vessels and transferred onshore for treatment and disposal at licensed waste facilities. Deck wash water (water and cleaning agents / additives) will be discharged to sea in accordance with MARPOL 73/78.
- Ballast – vessel ballast tanks will be designed to ensure that oil and chemicals do not come into contact with ballast water.
- Project vessels will be subject to periodic performance reviews, the scope of which includes environmental performance indicators[6].

Existing control measures associated with grouting of the pin and jacket piles include:

- Pile grouting - cement chemicals in the grout will be of low toxicity (UK OCNS “Gold” or “E” category, or equivalent toxicity to those chemicals previously approved for use).

A Pollution Prevention Management and Monitoring Plan will be developed and implemented.

[5] See Chapter 5: Table 5.5 for definition.

[6] The scope of environmental performance reviews are expected to include, but may not be limited to, the following: energy efficiency and diesel usage, sulphur content of diesel used, ballast water management, waste management, sewage treatment plant operation and management of bilge water.

9.5.1.3 Underwater sound

Existing control measures associated with underwater sound from piling and vessel movements include:

- for vessels undertaking piling activities the relevant nominated vessel crew will be trained in marine mammal observations (MMOs) and equipped with binoculars and night vision binoculars
- the project will establish a mitigation zone of 500 m radius around the piling site prior to any piling – this is an area in which the MMOs will monitor for marine mammals before piling commences
- a pre-piling search will be carried out by the trained MMOs for a minimum of 30 minutes prior to piling, however if pilling is planned to commence during nighttime hours MMO observation will commence during the daytime and continue through nighttime using available observation equipment
- piling will not be commenced if marine mammals are detected within the mitigation zone, or until 20 minutes after the last visual detection (the MMOs will track any marine mammals detected and ensure that they are satisfied the animals have left the mitigation zone before they advise the crew to commence piling activities)
- an acoustic deterrent device (ADD) (specifically set for the hearing range of pinniped seals) will be activated at the start of the pre-piling search to encourage any nearby seals to exit the mitigation buffer (when piling starts the ADD will be turned off)
- a piling soft-start (where the initial hammer energy is reduced for a period at the start of piling) or a slow-start (where the hammer strike rate is reduced) will also be used to give any near-by seals the opportunity to move away from the pile and reduce the potential for injury
- if piling activity stops for less than 30 minutes, for any reason, the ADD will be immediately activated
- for planned pauses in piling of greater than 30 minutes, the pre-piling search, activation of the ADD, and piling soft-start / slow-start will be repeated as described above
- trained vessel crew will conduct ongoing visual observations of Caspian seals present in the vicinity of the piling vessel and any sightings will be logged (daily and final summary reports will be prepared)
- no project vessels will intentionally approach seals for the purposes of casual (recreational) marine mammal viewing, or feeding, which may result in disturbance.

9.5.2 Infield pipeline and subsea infrastructure HUC discharges

9.5.2.1 Magnitude of effect

Description

As described in Chapter 5 (Section 5.5.4) following installation, a series of activities will be undertaken to clean, gauge and hydrotest the new SDC infield pipelines and subsea infrastructure prior to dewatering. These activities will involve the use of treated dyed seawater. It is intended to use chemicals for this purpose that are of equivalent environmental performance to those currently used and approved within the region.

The following chemicals are planned to be used in the test water for the infield pipelines and risers (dosage rates are provided in Chapter 5: Table 5.8):

- Hydrosure HD-5000 - combined biocide, corrosion inhibitor and oxygen scavenger)
- Preservan 2140 – dye (detection of leaks)
- Roemex RX-9022 – dye (detection of leaks)
- Monoethylene glycol – used for drying and hydrate inhibition.

In addition to the above, the following will be used in the subsea spools (dosage rates are provided in Chapter 5: Table 5.9):

- Hydrosure sticks - biocide, corrosion inhibitor, oxygen scavenger and dye sticks.

Small quantities of hydraulic fluid (Castrol Transaqua HT2) will also be discharged during commissioning of the pigging loop module (PLM) control valves.

A summary of the expected volume and location of discharges associated with the SDC infield pipeline pre-commissioning and commissioning activities is presented in Chapter 5: Table 5.10.

Up to approximately 27 separate discharge events ranging from approximately 0.4 m^3 (SDC risers leak test) to 6,416 m^3 (dewatering of the 26" gas export pipeline) are expected to take place during the infield pipeline and subsea pre-commissioning and commissioning period. The four worst-case discharge scenarios have been selected for modelling using CORMIX GTS[7]. The dilution and dispersion modelling was conducted by Xodus Group. The full report is included in Appendix 9D.

The modelled scenarios are as follows:

- Scenario 1a - infield flood, clean and gauge (FCG) of the 32" gas export pipelines with chemically treated dyed filtered seawater
- Scenario 1b - infield FCG of the 26" gas export pipelines with chemically treated dyed filtered seawater
- Scenario 2 – dewatering of the 32" gas export pipeline with chemically treated filtered seawater, potable water, dyed MEG and chemical sticks
- Scenario 3 – dewatering of the 26" gas export pipeline with chemically treated filtered seawater, potable water, dyed MEG, and chemical sticks.

The model input parameters are provided in Table 9.11.

Table 9.11: Model input parameters

Parameter	Scenario 1a	Scenario 1b	Scenario 2	Scenario 3
Flow rate (m^3/hr)	504	324	504	324
Flow velocity (m/s)	17.03	11.07	1.55	1.01
Discharge volume (m^3)	782	1,631	2,828	6,416
Density (kg/m^3)	1,012 (same as seawater density)			

[7] Software developed by the US Environmental Protection Agency to assess the mixing zone of discharges to the aqueous environment.

Parameter	Scenario 1a	Scenario 1b	Scenario 2	Scenario 3
Port orientation	Vertically upwards			
Port internal diameter (m)	0.1016	0.1016	0.337	0.337
Height of discharge	2 m above seabed			
Depth of water column at discharge location (m)	96 (SDA and SDB platforms)			
Current speed	Modelling considered four current speed ranges to understand how dilution changes with varying currents			

Scenarios 2 and 3 include the discharge of additional chemicals from Hydrosure sticks used to treat the seawater in the subsea spools when they are tied-in. The concentration at which the chemical sticks will be applied to the spools is provided in Chapter 5: Table 5.9. These are excluded from the modelling because their concentrations would be significantly diluted by the seawater throughout the entire pipeline, rendering their concentrations in the ambient environment negligible during the dewatering process.

Scenarios 2 and 3 also include the discharge of MEG during dewatering operations. MEG is a low toxicity highly biodegradable substance that is classified as a “Pose Little or No Risk” (PLONOR) substance as defined by The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) Harmonised Mandatory Control Scheme (HMCS). MEG is not expected to cause an impact to the marine environment and has therefore been excluded from the modelling.

The scenarios selected for modelling do not include the discharge of hydraulic fluid (Castrol Transaqua HT2) during testing of the pigging loop module (PLM) control valves. This is due to the small quantities under consideration (see Chapter 5: Table 5.10) and the low toxicity of the discharge. Caspian specific ecotoxicity testing has been carried out on this product. Six control fluid samples were tested for acute toxicity using the zooplankton (*Calanipeda aquae dulcis*) and the phytoplankton (*Chaetoceros tenuissimus*), the 48 hr LC50 ranged between 2,523 – 5,317 mg/l; and the 72hr EC50, ranged from 1,672 to 1,786 mg/l, respectively, across the six fluid samples tested. Transaqua HT2 is compliant with OSPAR legislation and has been tested according to OSPAR requirements with all components being tested for ecotoxicity (4 species), alongside biodegradation and bioaccumulation potential. The results reported using Caspian specific ecotoxicity procedures, at relevant salinity and using Caspian species, indicated low toxicity across all samples tested.

Assessment

The results of the modelling are presented in terms of dilution, chemical composition and plume behaviour, see below.

Dilution

When assessing an offshore discharge, the dilution factor at 500 m is the value that is commonly referenced when considering whether a discharge will cause harm to the environment. Table 9.12 presents dilution factors across the different scenarios. In summary at 500 m:

- Scenario 1a – dilution factor is 2,800, resulting in an effluent concentration of 0.036%
- Scenario 1b – dilution factor is 4,250, resulting in an effluent concentration of 0.024%
- Scenario 2 – dilution factor is 2,740, resulting in an effluent concentration of 0.037%
- Scenario 3 – dilution factor is 4,210, resulting in an effluent concentration of 0.024%.

It should be noted that all scenarios would be indistinguishable from the ambient environment at 500 m (i.e. discharge plume cannot be detected).

Table 9.12: Flow weighted average dilution calculations

Scenario	Flow weighted average dilution at defined distance		
	30 m	100 m	500 m
Scenario 1a	315	1,020	2,800
Scenario 1b	344	1,130	4,250
Scenario 2	233	816	2,740
Scenario 3	267	1,020	4,210

Chemical composition

The pipeline hydrotest fluids in all four scenarios will be treated with Hydrosure HD-5000 at an initial application rate of 1000 ppm, and Preservan 2140 at a rate of 100 ppm. In Scenarios 2 and 3 the fluorescent tracer dye Roemex RX-9022 is also added to the pipelines at a concentration of 100 ppm.

The dilution required for the chemicals to reach their respective 'Predicted No Effect Concentrations' (PNECs)[8] is dependent on the concentration of the chemicals discharged, which in turn is dependent on the quantity of each chemical used in achieving its primary function in the hydrotest process. Chemicals are used up in providing protection to the pipeline (oxygen scavenger biocide, corrosion inhibitor) and therefore their discharge concentration is lower than the concentration of chemicals added to the pipeline. The assessment here considers chemical discharges at 20% of the concentration applied to the pipeline. For the less toxic components (Roemex RX-9022 and Preservan 2140 dye) PNECs were achieved within 1 m. For the Hydrosure HD-5000 the PNEC was achieved at a maximum of 252 m (see Table 9.13).

[8] PNEC value is calculated by the lowest toxicity for a substance divided by an assessment factor taken from regulatory guidance. Hydrotest discharges are short duration one off discharges for which it is appropriate to use an assessment factor of 100 to calculate the PNEC based on the worst OSPAR HCMS toxicity data. PNEC values used in the modelling are as follows: Hydrosure HD-5000 (0.1349 mg/l), Roemex RX-9022 (55.8 mg/l), Preservan 2140 (2024.11 mg/l).

Table 9.13: Flow weighted average distance (m) to achieve the dilution required to achieve the PNEC (assuming 20% of concentration applied to pipeline)

Scenario	Hydrosure HD-5000
	20%
Scenario 1a	231
Scenario 1b	168
Scenario 2	252
Scenario 3	184

Pipeline dewatering discharges are short duration discharges that do not re-occur after commissioning of the pipeline has been completed. The FCG and dewatering chemicals that are added to the pipeline are intended to prevent microbes and oxidants in the seawater causing corrosion of the pipeline that could reduce the service life of the pipeline and potentially lead to a failure.

The plume takes up only a small proportion of the water column and is only present for a limited period. When the discharge is completed, the plume will dissipate into the environment. During discharge any mobile organisms in the water are able to move away from the plume if they encounter it and find conditions unfavourable. In addition, water column organisms are unlikely on a behaviour basis to remain static in the water column and therefore are unlikely to experience a prolonged exposure to the hydrotest chemicals.

As the discharge concentration will be less than the amount of chemicals added to the pipeline, and the discharge will occur over a relatively short period of time and occupy only a very limited volume of the water column, it is not anticipated that any ecotoxic effects would be seen as a result of these discharges.

Plume analysis

The flow-weighted average plume area at 30 m, 100 m and 500 m away from the discharge location for the four scenarios are presented in Table 9.14. The greatest average plume area is predicted to occur 500 m from the discharge location in Scenario 1a. In this scenario, the plume is expected to have a cross-sectional area of 634 m^2. Notably, even this worst-case plume cross-sectional area would occupy less than 1% of the water column at this distance. This suggests that mobile marine organisms, such as fish and seals could actively avoid contact with the plume.

Table 9.14: Flow-weighted average plume cross-sectional area at different distances from the discharge location

Scenario	30 m from discharge	100 m from discharge	500 m from discharge
	Average plume cross sectional area (m^2)	Average plume cross sectional area (m^2)	Average plume cross sectional area (m^2)
Scenario 1a	151.2	386.8	633.5
Scenario 1b	168.1	516.8	453.0
Scenario 2	163.5	316.8	571.3
Scenario 3	131.9	462.8	421.6

The generalised behaviour of the plume within 500 m of the point of discharge is presented graphically in Figure 9.4. The lateral displacement is primarily affected by the strength of the current. Dotted lines represent the upper and lower boundary of the circular cross section plume.

For the near-field jet / plume phase of the discharge the variation in concentration across the plume can be calculated using a Gaussian profile. This profile predicts that, in the jet / plume phase, the edge concentration is 0.46 of the centreline concentration. After interaction with the sea surface the plume behaviour transitions to a plume diffusion stage, with the edge concentration of 0.37 of the centreline concentration. The flow-weighted average edge concentrations at 30 m, 100 m, and 500 m for all scenarios are presented in Table 9.15. This indicates that the potential impact on marine life is minimised as the plume disperses.

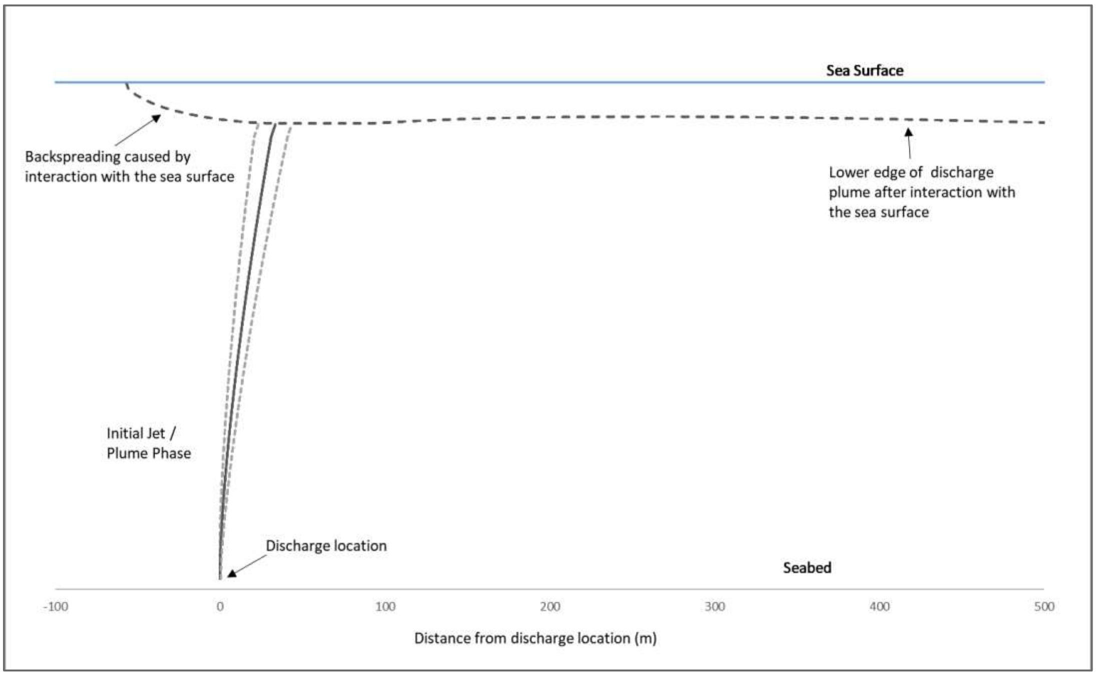

Figure 9.4: Plume behaviour within 500 m of discharge

Table 9.15: Flow weighted average edge concentration at different distances from discharge location

Scenario	Edge concentration 30 m from discharge (ppm)	Edge concentration 100 m from discharge (ppm)	Edge concentration 500 m from discharge (ppm)
Scenario 1a	0.017	0.006	0.003
Scenario 1b	0.020	0.005	0.002
Scenario 2	0.035	0.009	0.003
Scenario 3	0.030	0.007	0.002

Under typical use and discharge conditions of the chemically treated dyed test water it is expected that the plume will occupy a very small volume of the available water column at the discharge location and will rapidly achieve dilution of the hydrotest chemicals to below toxic concentrations.

The duration of the discharge will also be short and therefore there will not be sufficient exposure of any extant water column organisms to toxic concentrations of chemicals in the discharges to cause a discernible impact. Furthermore, larger marine fauna such as fish and seals are expected to actively avoid chemically contaminated areas of the water column which in turn would reduce exposure.

The modelling results for the worst case discharge scenarios indicate that impacts are localised (generally within 500 m of the discharge point) and short-term (discharges are only for a number of hours and the resulting plume rapidly dissipates and dilutes). Based on this a magnitude of effect score of 2, low, has been assigned.

9.5.2.2 Receptor sensitivity

Dispersion modelling indicates that the treated seawater discharges during pre-commissioning and commissioning of the infield pipelines and subsea infrastructure will not impact the seabed, with the plume travelling up through the water column. Plankton and zooplankton are most likely to be exposed and affected. Treated seawater plumes are predominantly long and narrow, and residence time within a plume for fish would be too short to result in either acutely or chronically toxic exposure. Seals, as air-breathers, are unlikely to be affected by exposure.

The phytoplankton community in the Shah Deniz Contract Area is numerically dominated by bacillariophyta and dinophyta. The zooplankton community is dominated by the non-native copepod, *Acartia tonsa*. The species present are widespread and comparatively abundant and are therefore not considered vulnerable at a population level to the proposed discharges. Based on this a biological / ecological receptor sensitivity score of 2, low, has been assigned.

9.5.2.3 Impact significance

Table 9.16 summarises impacts to biological / ecological receptors from infield pipeline and subsea infrastructure pre-commissioning and commissioning discharges.

Table 9.16: Impact significance – infield pipeline and subsea commissioning discharges

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Infield pipeline and subsea infrastructure commissioning discharges	2 – low	2 - low	4 – minor negative

The following monitoring and reporting activities will be undertaken with respect to infield pipelines and subsea pre-commissioning and commissioning activities:

- the MENR will be informed of the cleaning and hydrotest schedule (contained in the Pipeline Pre-Commissioning and Commissioning Discharge Management and Monitoring Plan) and will be notified of any changes to the schedule
- the amounts of chemicals used, together with the dosage rates and water flow rates during all pipeline filling, top-up and pressure testing activities will be recorded
- the actual volumes of treated seawater released during each pipeline discharge event will be recorded
- laboratory prepared samples of representative pre-commissioning and commissioning discharges will be periodically subjected to Caspian specific toxicity testing.

The information collected as a result of these monitoring and assurance measures will be collated, interpreted, and issued in the form of a final close-out report to the MENR once all pipeline pre-commissioning and commissioning activities have been completed.

It is considered that impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and no additional mitigation is necessary.

9.5.3 Other discharges

9.5.3.1 Magnitude of effect

Description / Assessment

Vessel discharges

As stated in Chapter 5, other discharges to sea will result from the operation of construction and support vessels associated with the installation of the SDC jacket and topside, infield pipelines and PFOCs, and subsea infrastructure (see Chapter 5: Sections 5.4 to 5.6). These discharges are as follows:

Sanitary waste - Black water can contain harmful microorganisms, nutrients, suspended solids, organic material with a chemical and biological oxygen demand, and residual chlorine from sewage treatment. Grey water discharge includes drainage from baths, showers, laundry, wash basins and dishwater and may introduce pollutants into the water column negatively impacting water quality. Sanitary waste water generated on the project vessels (grey and black water) will be treated and discharged in accordance with MARPOL 73/78 Annex IV and MENR requirements, any impacts are anticipated to be small-scale and localised.

Galley waste - Macerated food waste discharged from project vessel galleys will introduce nutrients and organic material to the water column, which can cause a local increase in biological oxygen demand. Biodegradable food waste will be discharged to sea in accordance with MARPOL 73/78 Annex V, any impacts are anticipated to be small-scale and localised.

Drainage - Discharges from the project vessels will be limited to deck drainage and wash water (bilge water will not be discharged, it will be stored on the vessels and transferred to shore for treatment and disposal at licensed waste facilities). Deck wash water (water and cleaning agents / additives) will be discharged to sea in accordance with MARPOL 73/78 Annex V, any impacts on water quality are anticipated to be negligible.

Ballast water - Project vessels will occasionally take up and discharge ballast water during installation and support activities. Vessel ballast tanks are designed to ensure that ballast water does not come into contact with oil or chemicals, as such impacts on water quality are not anticipated. Deballasting has the potential to introduce invasive marine species into the marine environment. However, as the project vessels will already be on contract in the Caspian, introduction of alien (non-native) species in ballast water is not considered an issue for this project.

Grouting discharges

During SDC platform installation, cement could be discharged during grouting of the platform piles. The volume of cement used to cement the piles into position will be calculated prior to the start of the activity. Sufficient cement will be used to ensure that the piles are cemented securely, while minimising excess cement discharges to the sea. A grout seal / packer will ensure that as much of the cement grout as possible is retained inside the pile sleeve annulus. The low toxicity of the grout, and the fact that cement is designed to set in the marine environment without widespread dispersion, indicates that any impacts will be small-scale and localised.

Based on the localised impacts on water quality and sediment quality from these discharges, a magnitude of effect score of 1, very low, has been assigned.

9.5.3.2 Receptor sensitivity

Water analysis results for the Shah Deniz Contract Area are indicative of uncontaminated offshore waters in the middle Caspian. As stated previously, the planktonic species present are widespread and comparatively abundant and are therefore not considered vulnerable at a population level to the proposed small-scale discharges.

The macrobenthic community at the SDC platform location is sparse and numerically dominated by the non-native polychaete *Spionidea spp*, the oligochaete *Isochaetides michaelseni*, and the insect *Chironomus albidus*. No benthic species of conservation concern have been identified.

Based on the above, a biological / ecological receptor sensitivity score of 2, low, has been assigned.

9.5.3.3 Impact significance

Table 9.17 summarises impacts to biological / ecological receptors from other discharges.

Table 9.17: Impact significance – other discharges

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Vessel operational discharges	1 – very low	2 - low	2 - negligible
Discharge of cement during grouting of piles	1 – very low	2 - low	2 - negligible

It is considered that impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and no additional mitigation is necessary.

9.5.4 Underwater sound

9.5.4.1 Magnitude of effect

Description

As stated in Chapter 5, underwater sound will result from pile driving activities as part of platform installation (see Section 5.3.3), and from construction and installation vessel movements (see Sections 5.4 to 5.6). Sound characteristics of these sources are provided in Table 9.18.

The sections below focus on the impact of underwater sound on seals and fish (based on underwater acoustic propagation modelling and comparison with physiological injury and behavioural reaction thresholds). Thresholds are provided in Table 9.19 and Table 9.21.

Underwater acoustic propagation modelling has been undertaken using the RAM and BELLHOP acoustic models by Award Environmental Consultants.

Sound sources

Table 9.18 presents the derived underwater sound source levels for the SDC project.

Table 9.18: Example estimated acoustic source levels for SDC underwater sound generating activities

Noise type	Noise type	Acoustic source level SL_{peak}	
Impact piling	2.74 m diameter pile	239.4 dB re 1 μPa @ 1 m	
Vessel class	**Example vessel**	**Source level @ 4 knots**	**Source level @ 14 knots**
Survey vessel	*Altay*	146.7 dB	179.1 dB
Supply vessel	*Caspian Supplier*	153.3 dB	185.9 dB
Pipelay barge	*Israfil Huseynov*	157.6 dB	190.3 dB
Anchor handling tug vessel	*Jura*	168.1 dB	200.7 dB
Subsea construction vessel	*Khankendi*	159.3 dB	192.0 dB

Sound threshold criteria for seals and fish

Responses of marine mammals and fish to underwater sound have been studied and reported within scientific literature over many years with threshold criteria developed and revised for a number of species and groups of species. Thresholds are usually proposed in terms of one or more different sound level metrics and for different levels of potential impact ranging from mortality, physical injury and hearing damage through to behavioural reactions denoted by changes in feeding, breeding, respiration or movement patterns.

Sound can be described using various acoustic metrics, including sound pressure levels (SPL) and sound exposure levels (SEL). The former is the instantaneous pressure which can be defined as a peak, peak-to-peak, zero-to-peak or rms (root-mean-square) value while the latter is a measure of received sound energy over some defined period of time.

Thresholds for physiological damage consider potential permanent and temporary effects on hearing, as follows:

- permanent threshold shift (PTS) is a permanent, irreversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level (this is considered to be auditory injury)
- temporary threshold shift (TTS) is a temporary, reversible increase in the threshold of audibility at a specified frequency or portion of an individual's hearing range above a previously established reference level.

From reviewing available data derived from extensive tests involving marine mammals, Southall *et al*. (2019) proposed thresholds representing the onset of PTS and TTS for marine mammals. The only marine mammal in the Caspian is the Caspian seal. Auditory injury thresholds used in the acoustic propagation modelling for phocid pinnipeds (seals) in water are summarised in Table 9.19.

In terms of behavioural impacts (disturbance), guidance is given by the US National Marine Fisheries Service (NMFS, 2005) where it considers that the threshold likely to cause behavioural disruption for impulsive sounds (Level B harassment) is 160 dB re 1 µPa (rms)[9]. Similarly, for continuous sounds, the low level behavioural response threshold is set at 120 dB re 1 µPa (rms).

Table 9.19: Acoustic impact threshold criteria for physiological and behavioural impacts on Caspian seals (phocid pinniped)

Impact	Impulsive type noise		Continuous type noise	
	SPL thresholds dB re 1 µPa	SEL thresholds dB re 1 µPa^2.sec	SPL thresholds dB re 1 µPa	SEL thresholds dB re 1 µPa^2.sec
PTS	218 dB Peak	185 dB SEL	N/A	201 dB SEL
TTS	212 dB Peak	170 dB SEL	N/A	181 dB SEL
Level B Harassment	160 dB rms	N/A	120 dB rms	N/A

Source: Based on Southall *et al*, 2019 and NMFS, 2005

[9] Level B Harassment is defined as having the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioural patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild.

In terms of fish, Popper *et al*. (2014) reviewed a number of studies and subsequently suggested various noise thresholds related to potential acoustic impacts that were a function of the hearing sensitivity of fish species. The functional hearing groups refer back to studies of either the internal physiology of the fish, or else to their auditory sensitivity. The latest categories, along with key characteristics of each group, are defined in Table 9.20.

Table 9.20: Fish hearing groups

Functional hearing group	Description	Characteristics
Group 1	Fish with no swim bladder	Generally, these fish have no swim bladder or other gas chamber. They are relatively unsusceptible to barotrauma and are sensitive only to particle motion rather than sound pressure.
Group 2	Fish with swim bladders in which hearing does not involve the swim bladder	Although fish in this class have a swim bladder and thus the organ is able to respond to sound pressure, the swim bladder is not connected to the inner ear hence the hearing ability of fish depends only on particle motion. Fish in this class are relatively sensitive to only a narrow range of frequencies.
Group 3	Fishes with swim bladders that are close, but not intimately connected, to the ear	Fish in this class are sensitive to both particle motion and sound pressure. They are sensitive to a wider range of frequencies compared with Groups 1 and 2.
Group 4	Fish where hearing involves a swim bladder	Fish in this class have a connection between the swim bladder and the inner ear and are sensitive to both particle velocity and sound pressure. Species in this class are sensitive to sounds over a wide frequency range (~several kHz) and have a higher sensitivity than fish in the preceding groups.
Group 5	Fish eggs and larvae	Studies show that the hearing abilities are similar to those of the adult of the species. Swim bladders may develop during the larval stage hence those species are particularly sensitive to barotrauma.

Source: Popper & Hawkins, 2019

Threshold levels for impulsive sound and continuous sound for these fish functional hearing groups, are summarised in Table 9.21.

Table 9.21: Summary of acoustic impact threshold criteria in SPL_{peak} and unweighted SEL metrics for fish functional hearing groups

Functional hearing group	Mortality and potential mortal injury	Recoverable injury	TTS
Impulsive sound - piling noise			
Fish Group 1	>213 dB re 1 μPa SPL_{peak}	>213 dB re 1 μPa SPL_{peak}	186 dB re 1 μPa^2.sec SEL
	>219 dB re 1 μPa^2.sec SEL	216 dB re 1 μPa^2.sec SEL	
Fish Group 2	>207 dB re 1 μPa SPL_{peak}	>207 dB re 1 μPa SPL_{peak}	186 dB re 1 μPa^2.sec SEL
	210 dB re 1 μPa^2.sec SEL	203 dB re 1 μPa^2.sec SEL	
Fish Group 3/4	>207 dB re 1 μPa SPL_{peak}	>207 dB re 1 μPa SPL_{peak}	186 dB re 1 μPa^2.sec SEL
	207 dB re 1 μPa^2.sec SEL	203 dB re 1 μPa^2.sec SEL	
Fish eggs and larvae Group 5	>207 dB re 1 μPa SPL_{peak}	(N) Moderate (I) Low (F) Low	(N) Moderate (I) Low (F) Low
	210 dB re 1 μPa^2.sec SEL		
Continuous sound – vessel noise			
Fish Group 1	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low
Fish Group 2	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low
Fish Group 3/4	(N) Low (I) Low (F) Low	170 dB rms for 48 hours	158 dB rms for 12 hours
Fish eggs and larvae Group 5	(N) Low (I) Low (F) Low	(N) Low (I) Low (F) Low	(N) Moderate (I) Low (F) Low

Source : Based on Popper *et al*, 2014

Notes: Relative risk (high, moderate, low) is given for animals at three distances from the source defined in relative terms as near (N), intermediate (I), and far (F). Popper *et al*. defines "near" to be considered to be some tens of metres from the source, "intermediate" in the hundreds of metres, and "far" in the thousands of metres.

The US Fish and Wildlife Service (USFWS) works with a level of 150 dB re 1 μPa as a threshold for behavioural responses in fish (Stadler & Woodbury, 2009). Popper *et al*. 2014 state that it is not clear whether this is a peak or rms metric. They also affirm that the corresponding criterion does not specify a particular behavioural response, or whether it merely assumes that at that sound level there is the potential to experience a behavioural reaction. Further, Hastings (2008) declares that the scientific origin of this threshold is unknown and thus the validity of the criterion is uncertain. As such fish behavioural responses have been omitted.

Seasonal variability

A review of historical oceanographic data indicates that owing to the seasonal variability in oceanographic parameters (e.g., temperature, salinity, and hence sound speed) in the Caspian Sea, acoustic propagation is very dependent on the nature of the sound speed profile over the water column. A high-level analysis indicated that, given the upwardly refracting profile in February and March, levels of noise tend to propagate furthest during these months. By contrast, the downwardly refracting profile prevalent in August means that noise is likely to propagate over significantly shorter distances. Accordingly, propagation modelling has been carried out for the months of March and August for piling activities, and February and August for vessel activity. It is likely that modelling undertaken at these months will indicate the extremes of acoustic propagation conditions that are likely to arise in the project area over the course of a year.

Assessment

Piling

Piling noise is generated through the impacting of a hydraulically powered hammer onto the end surface of a foundation pile. Using published data for similar activities it is possible to establish an approximate relationship between pile diameter and the resulting noise levels associated with piling. As a result, it is estimated that the peak source level associated with the 108” (2.74m) diameter piles used in the project is likely to be 239.4 dB re 1 µPa @ 1 m. The scale of any acoustic impacts arising was determined by comparing the noise levels propagating through the underwater environment with threshold values representing the onset of physiological and behavioural impacts for Caspian seal and fish groupings. The threshold levels and results of the modelling are summarised in Table 9.22.

Table 9.22: Threshold criteria for seals and fish and predicted distance at which the criteria are met – piling activities

<table>
<tr><th>Effect</th><th>Threshold</th><th>Distance at which SPL / SEL has fallen to threshold criteria level (mean data)</th></tr>
<tr><td>Seals</td><td></td><td></td></tr>
<tr><td rowspan="4">PTS</td><td>218 dB re. 1µPa peak</td><td>93 m (March and Aug)</td></tr>
<tr><td rowspan="3">185 dB re. 1µPa²s
SEL M-Weighted</td><td>Single strike: 93 m (March and Aug)</td></tr>
<tr><td>1 hour exposure: 1.2 km (March) 743 m (Aug)</td></tr>
<tr><td>8 hour exposure: 8.5 km (March) 1.5 km (Aug)</td></tr>
<tr><td rowspan="4">TTS</td><td>212 dB re. 1µPa peak</td><td>101 m (March and Aug)</td></tr>
<tr><td rowspan="3">170 dB re. 1µPa²s
SEL M-Weighted</td><td>1 sec exposure: 93 m (March and Aug)</td></tr>
<tr><td>1 hour exposure: 18.6 km (March) 2.4 km (Aug)</td></tr>
<tr><td>8 hour exposure: 46.3 km (March) 4.2 km (Aug)</td></tr>
<tr><td>Level B</td><td>160 dB re 1 mPa rms</td><td>13 km (March) 3 km (August)</td></tr>
</table>

Effect	Threshold	Distance at which SPL / SEL has fallen to threshold criteria level (mean data)
Fish		
Fish Group 1 – mortality	213 dB re. 1μPa peak	93 m (March and Aug)
	219 dB re. $1\mu Pa^2 s$	Single strike: 93 m (March and Aug)
		1 hour exposure: 94 m (March and Aug)
		8 hour exposure: 220 m (March) 209 m (Aug)
Fish Group 2 - mortality	207 dB re. 1μPa peak	93 m (March and Aug)
	210 dB re. $1\mu Pa^2 s$	Single strike: 93 m (March and Aug)
		1 hour exposure: 218 m (March) 208 m (Aug)
		8 hour exposure: 853 m (March) 715 m (Aug)
Fish Group 3 / 4 - mortality	207 dB re. 1μPa peak	93 m (March and Aug)
	207 dB re. $1\mu Pa^2 s$	Single strike: 93 m (March and Aug)
		1 hour exposure: 317 m (March) 328 m (Aug)
		8 hour exposure: 1380 m (March) 980 m (Aug)
Fish Group 5 (eggs and larvae) - mortality	210 dB re 1 $mPa^2.s$	Single strike: 93 m (March and Aug)
		1 hour exposure: 218 m (March) 208 m (Aug)
		8 hour exposure: 853 m (March) 715 m (Aug)
Fish Group 1 – recoverable injury	213 dB re. 1μPa peak	93 m (March and Aug)
	216 dB re. $1\mu Pa^2 s$	Single strike: 93 m (March and Aug)
		1 hour exposure: 108 m (March) 107 m (Aug)
		8 hour exposure: 317 m (March) 328 m (Aug)
Fish Group 2 / 3 / 4 – recoverable injury	207 dB re. 1μPa peak	93 m (March and Aug)
	203 dB re. $1\mu Pa^2 s$	Single strike: 93 m (March and Aug)
		1 hour exposure: 541 m (March) 618 m (Aug)
		8 hour exposure: 3.4 km (March) 1.6 km (Aug)

With reference to Caspian seals, when assessed using SPL metrics, sound levels fall to meet the PTS and TTS thresholds at a mean distance of 93 m from the piling site. As this distance is relatively short, the modelling indicates that it is unaffected by seasonal changes in oceanography.

The Level B threshold (behavioural reactions) is met at a mean distance of 13 km from the piling location in March and 3 km in August.

When assessed using SEL metrics, over an operational period of 8 hours, sound levels fall to meet the PTS threshold at a mean distance of 8.5 km from the piling location in March and 1.5 km in August. Sound levels remain above the TTS threshold for 46 km in March and 4 km in August.

It should be noted that the use of the SEL metrics for a stationary source and receptor are likely to be overestimated, since it is likely that the receptor would attempt to move away from a disturbing sound source, and as such the actual exposure duration is likely to be significantly less than 8 hours (and more in the region of maximum 1 hour).

When fish species are assessed using SPL metrics, sound levels fall to meet the thresholds for mortality and recoverable injury criteria at a mean distance of 93 m from the piling site.

When assessed using SEL metrics, all fish groups are relatively insensitive to piling noise compared with the Caspian seal. Over an operational period of 8 hours, for the most audiologically sensitive of fish groupings (Fish Groups 3 and 4), the mortality threshold is met at a mean distance of 1.4 km from the piling location in March and 1 km in August, and the recoverable injury threshold is met at a mean distance of 3.4 km from the piling location in March and 1.6 km in August.

Based on the extent of the piling underwater sound propagation, a magnitude of effect score of 3, medium, has been assigned.

Vessel movements

The vessels planned to support the jacket and topside installation, infield pipelay and installation of subsea infrastructure are detailed in Chapter 5. These will include survey and supply vessels, tugs, the pipelay barge, the STB-1 barge, and the Khankendi SCV. The acoustic source levels for these vessel are provided in Table 9.18. The anchor handling tug travelling at 14 knots gives the most conservative results with regard to the generation of underwater sound from vessels (source level of 201 dB re 1µPa @ 1m), the results of the modelling for this vessel are presented in Table 9.23.

Table 9.23: Threshold criteria for seals and fish and predicted distance at which the criteria are met - vessels (anchor handling tug at 14 knots)

Effect	Threshold	Distance at which SPL / SEL has fallen to threshold criteria level (mean data)
Seals		
PTS	201 dB re. 1µPa²s SEL M-Weighted	0.5 hour exposure: 49 m (Feb and Aug)
		1 hour exposure: 49 m (Feb and Aug)
		8 hour exposure: 118 (Feb) 98 m (Aug)
TTS	181 dB re. 1µPa²s SEL M-Weighted	0.5 hour exposure: 285 m (Feb and Aug) 245 m (Aug)
		1 hour exposure: 777 m (Feb) 363 m (Aug)
		8 hour exposure: 3917 m (Feb) 687 m (Aug)
Low level behavioural response	120 dB re 1 µPa rms	48 km (Feb) 2 km (August)
Fish		
Fish Group 3 / 4 – recoverable injury	170 dB re 1 µPa rms for 48 hr exposure	49 m (Feb and Aug)
Fish Group 3 / 4 – TTS	158 dB re 1 µPa rms for 12 hr exposure	147 m (Feb and Aug)

When Caspian seal is assessed using SEL metrics and exposed to vessel noise for a 8-hour period, noise levels are likely to fall to the threshold corresponding to PTS at a mean distance of 118 m in February and August. The TTS impact threshold is reached at a mean distance of 3,917 m in February and 687 in August.

When Caspian seal is assessed using SPL metrics and exposed to noise from vessels transiting at a speed of 14 knots, the low level behavioural response threshold is met at a mean distance of 48 km in February and 2 km in August. When the vessels are transiting at 4 knots, being a more representative speed for movements in and around the project infrastructure, noise levels are much lower. Subsequently, sound levels fall to the low level behavioural response threshold at much shorter distances (a mean of 278 m in February and 245 m in August).

All fish hearing groups are deemed to be relatively insensitive to vessel noise compared with the Caspian seal. When assessed using SPL metrics, sound levels fall to the threshold for the recoverable Injury impact criterion at a mean distance of 49 m assuming a 48-hour continuous exposure. Sound levels fall to the TTS impact threshold at a mean distance of 147 m assuming a 12-hour continuous exposure. Such long exposure durations are deemed extremely unlikely to arise in practice. The corresponding distances for shorter, more typical exposure durations, are likely to be very much less.

For fish species there are no quantitative threshold values against which an assessment using SEL metrics may be made.

Based on the extent of the vessel underwater sound propagation, a magnitude of effect score of 1, very low, has been assigned.

9.5.4.2 Receptor sensitivity

The only relevant biological receptors to underwater sound are seals and fish. Plankton cannot sense the low frequency sound generated because the wavelength is longer than the organism, and there is a lack of scientific data to suggest benthic invertebrates have sophisticated sound-sensing apparatus.

Caspian seal

The Caspian seal is classified on the IUCN Red List as ‘Endangered’, and has been included in the Red Books of all the Caspian states since 2020. The sensitivity of this species is highly season dependent. During the winter months the majority of the population is breeding in the northern Caspian remote from the SD Contract Area and therefore sensitivity is low. There is an increased likelihood of seal presence with the Contract Area during the during the spring and autumn migration periods, and during the summer months for feeding (depending on the distribution of kilka).

The Caspian seal is a highly intelligent animal and will rapidly move away from any disturbance or sound. Similarly the use of the ADD prior to piling activities, and a piling soft-start / slow-start, will alert any seals present to the activity, allowing them to leave the area as soon as they detect the sound source and reducing the risk of underwater sound injury.

Fish

There are a number of species, including those with moderate and high sensitivity to underwater sound, expected to be present within the vicinity of the proposed SDC platform location and across the SD Contract Area.

Herring (Clupidae) species (including kilka and shad) are considered to be the most sensitive fish to underwater sound in the study area as they are classed as Functional Hearing Group 4. It should be noted, however, that these species are generally common and widespread in the Caspian.

Sturgeon (IUCN Red List 'Critically Endangered') migrate through the SD Contract Area in March and April and September to November. These species are considered less sensitive to underwater sound as they specialise in feeding through detecting benthic or epibenthic prey using particle motion / electrosense and are classed as Functional Hearing Group 2.

Gobies are common in the Caspian and do not have a swim bladder and are therefore classed as Functional Hearing Group 1.

No fish species is present exclusively within the SD Contract Area and their migration routes are typically concentrated in the shallower water shelf areas between the Absheron Peninsula and the northern edge of the SD Contract Area.

Based on the above, a biological / ecological receptor sensitivity score of 3, medium, has been assigned.

9.5.4.3 Impact significance

Table 9.24 summarises underwater sound impacts to biological / ecological receptors (fish and seals) from piling and vessel movements.

Table 9.24: Impact significance – underwater sound

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Underwater sound from pin and skirt piling	3 - medium	3 - medium	9 – moderate negative
Underwater sound from vessel movements	1 - low	3 - medium	3 – minor negative

The following monitoring and reporting activities will be undertaken with respect to seals:

- daily logs of Caspian seal sightings will be completed by the trained vessel crew (MMOs) in line with the Joint Nature Conservation Committee (JNCC) marine mammal recording form[10]
- a final report summarising the Caspian seal observations over the duration of the piling activities and including all the daily log forms will be completed by the trained vessel crew and submitted to bp within eight weeks of completion of the piling activities.

[10] Marine mammal recording form (protocol for piling) https://hub.jncc.gov.uk/assets/31662b6a-19ed-4918-9fab-8fbcff752046

Additional mitigation measures

Any additional mitigation measures, if required, will be adopted following consultation with local seal experts.

9.6 Impacts to the Nearshore Environment (ecology and coastal processes)

This section assesses the potential for impacts in the nearshore / coastal environment from the construction and presence of a finger pier and the nearshore Sangachal to SDC PFOC installation works.

9.6.1 Mitigation

Existing controls related to impacts in the nearshore / coastal environment include:

- vessels and equipment will be subject to periodic performance reviews, the scope of which includes environmental performance indicators
- a process will be established to promote the selection of hydraulic fluids used on the trenching equipment that have the best environmental performance.

9.6.2 Nearshore PFOC installation (Sangachal Bay)

9.6.2.1 Magnitude of effect

Description

As discussed in Chapter 5: Section 5.6.2, within the nearshore zone the Sangachal to SDC PFOC will cross Sangachal Bay following the existing route of the SD2 gas export pipelines.

In order to carry out PFOC installation in shallow water it is anticipated that one temporary finger pier 4-5 m wide (10 m at the base) will be constructed, extending approximately 300 m into Sangachal Bay (to approximately 3 m water depth). The pier will be constructed from aggregate and will only stay in place for the duration of the nearshore cable installation works (approximately 6-12 months).

The PFOC will be trenched to a minimum cover height of 1 m out to the 12.5 m water depth contour (just beyond the shipping lane). For the very nearshore area (first 300 m from the shore) elevated excavators will construct the trench, and once the cable is installed, the side cast material will be used to backfill the cable trench and provide cable protection. For the rest of the trenched section (300 m out to 7.5 km) an excavator on a flat-bottom barge will be used to dig the cable trench. Once the cable is installed in the trench this section will be allowed to backfill naturally.

Assessment

Potential impacts related to PFOC installation in the nearshore zone include:

- physical destruction of habitat through finger pier construction and excavation of the cable trench
- increased turbidity in the water column caused by sediment resuspension and smothering of benthic flora and fauna by redistribution and resettlement of sediments

- changes to coastal processes caused by the presence of the finger pier.

These are discussed in more detail below.

Physical destruction of habitat

Construction of the finger pier, and the trenching required to bury the nearshore section of the PFOC, will result in a degree of direct physical habitat disturbance.

Benthic communities will be smothered by the material utilised to construct the finger pier (area of approximately 1,500 m^2) and the trenching activity will also impact on benthic communities directly. However, the area impacted will be localised and limited in extent and will have no significant impact on the overall populations of the benthic communities that are widespread in the nearshore areas. Rapid recolonisation by benthic organisms is anticipated following removal of the finger pier and backfilling of the cable trench.

Increased turbidity and redistribution of sediments

The construction activities will also result in increased water turbidity and redistribution of sediments. This will have an indirect impact on benthic communities over a wider area in the bay. Monitoring surveys undertaken during trenching operations for ACG Phase 1 and 2 export pipelines in Sangachal Bay showed the extension of the plume of turbid water during the trenching operations to be approximately 0.3 km^2 on the two days of plume monitoring. Increased turbidity may temporarily affect plankton, benthos and benthic flora such as seagrass beds downstream of the construction activities. However, it is important to note that the nearshore environment in Sangachal Bay is naturally dynamic with storm surges and wind driven waves resulting in increased turbidity and sediment redistribution on a regular basis. Benthic communities present are therefore anticipated to be acclimated to these conditions.

Changes to coastal processes

The presence of a 300 m long finger pier could interrupt the natural littoral sediment fluxes, especially under storm conditions. The finger pier will act as a barrier, effectively blocking the north to south net drift within the intertidal and part of the sub tidal zones. This will lead to accretion of sediment on the eastern side of the pier, and erosion along the coastline to the western side of the structure. Local scour effects and locally enhanced suspended sediment concentrations, within the shallow active zone may also occur, due to wave breaking particularly under extreme storm wave conditions.

The construction of the finger pier will also cause a barrier to the typically weak mainly coastal parallel currents, with the structure acting to deflect the flows of offshore currents around the end of the pier. Local acceleration of flows may be experienced, with slacker variable flows expected in the shelter of the structure.

As the finger pier will only stay in place for the duration of the nearshore cable installation works (approximately 6-12 months) the effects on littoral sediment fluxes and current flows are anticipated to be short-term and localised to the immediate surroundings of the structure.

Based on the short term nature of the impacts, and the fact that the cable route will follow the existing route of the SD2 gas export pipelines (thus minimising impacts to more pristine parts of the bay), a magnitude of effect score of 2, low, has been assigned.

9.6.2.2 *Receptor sensitivity*

The receptors present in, and adjacent to, the nearshore PFOC installation corridor are common in local coastal waters. Sangachal Bay is a shallow water environment which is regularly disturbed by wave action, and the biological communities are adapted to periodic turbidity. Seagrass detached by wave action is frequently observed on the shoreline, and the seagrass beds are clearly able to sustain natural stresses which are considerably greater than the effects of finger pier construction or cable trenching. Survey data from 2014, 2016 and 2018 in the bay suggests that seagrass beds are either stable or expanding, with two additional stations found to have seagrass present in 2018. The species of seagrass and algae present are neither rare nor threatened.

The benthic community present in Sangachal Bay is typical of local coastal waters, it comprises a small number of native species but has also been colonised by a number of alien and invasive species. Regular surveys in the bay have indicated that neither seagrass nor benthic invertebrates have suffered permanent adverse effects due to previous pipeline installation.

Based on the above, a biological / ecological receptor sensitivity score of 2, low, has been assigned.

9.6.2.3 *Impact significance*

Table 9.25 summarises impacts to the coastal biological / ecological receptors and coastal processes from construction and temporary presence of the temporary finger pier and nearshore cable installation.

Table 9.25: Impact significance – nearshore PFOC installation

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Construction of finger pier and nearshore PFOC installation works	2 – low	2 - low	4 – minor negative

Monitoring of Sangachal Bay is part of bp's long-term Environmental Monitoring Programme (EMP). The EMP will take into account the SDC construction activities in its upcoming survey scheduling.

It is considered that impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and no additional mitigation is required.

9.7 Impacts to the Terrestrial Environment (ecology)

This section presents the potential impacts to terrestrial ecology from onshore PFOC installation works.

9.7.1 Mitigation

Existing control measures associated with terrestrial ecology include:

- a construction corridor will be established following the existing SD2 gas export pipelines, works outside of this corridor will be strictly controlled by bp in order to minimise the area of ground disturbed

- prior to removal, vegetation will be inspected to detect the presence of wildlife and activities will cease until appropriate action is taken to ensure any wildlife encountered is not harmed
- areas for laydown of soil or loose construction materials will be identified to minimise impacts to habitats and potential for erosion and sedimentation into waterbodies or drains
- checks for wildlife will be undertaken prior to backfilling of the cable trench, any reptiles or mammals in the trench will be removed
- an Ecological and Wildlife Management and Monitoring Plan will be developed and implemented to manage the relocation of any mammals or reptiles (including any IUCN Red List or Azerbaijan Red Book species) encountered within the areas affected by the cable lay works, the plan will also outline measures to minimise impacts on the wetland area south of the Terminal
- a Restoration and Landscape Management and Monitoring Plan will be developed and implemented that will include details of how to restore all areas of disturbed land used on a temporary basis during the cable lay works to a condition which is similar to that at pre-construction.

9.7.2 Onshore PFOC installation (Sangachal)

9.7.2.1 Magnitude of effect

Description

Onshore cable installation comprises open cut trenching within the proposed onshore cable corridor and horizontal drilling at road, railway and third party pipeline / service lines, as discussed in Chapter 5: Section 5.6.1. A cable transition joint pit will be constructed in the beach area approximately 20-25 m above the shoreline. Vehicle access, parking, and temporary construction site facilities will be required at the pit location during these works.

Assessment

The proposed onshore cable corridor is approximately 2.2 km in length (a further 2 km of cable route are inside Sangachal Terminal boundary and outside the scope of this ESIA). It is anticipated that a Right of Way (RoW) of approximately 20 m in width will be established (and up to 30 m in width at road, rail crossings, etc). During clearance works the vegetation and surface soil will be removed and stored for later reinstatement of the corridor, in order to maintain the environmental characteristics of the area.

The proposed onshore cable route will pass through predominantly desert / semi-desert habitat and along the eastern fringes of the wetland area south of the Terminal. The cable installation works will require the removal of vegetation and surface soil from an area of approximately 0.07 km^2. The impact will be temporary as it is planned to reinstate the area affected along the route to its pre-construction condition.

A temporary gravel road will be built, from an existing slip road off the Baku-Alat Highway to the cable transition joint pit (a distance of approx. 220 m). This temporary road will be removed after cable pull-in is complete.

Surveys completed following previous more significant SD and ACG installation works in this area (pipelines rather than cable) have shown reinstatement has been successful and no significant impacts to terrestrial ecology have been recorded.

Based on the temporary nature of the impacts, and the fact that the cable route will follow the existing route of the SD2 gas export pipelines, a magnitude of effect score of 2, low, has been assigned.

9.7.2.2 *Sensitivity of receptor*

The sodic and saline conditions of the soil in the vicinity of Sangachal Terminal have resulted in vegetation that is generally species poor and mostly consists of salt-tolerant plants. Along the proposed PFOC route *Salsola dendroides* and *Artemesia fragrans* communities are dominant. The wetland habitats generally have the greatest diversity of flora with *Phragmites australis*, *Salsola dendroides*, *Alhagi pseudalhagi*, and *Tamarix ramosissima* common. No unique habitats have been identified in the Terminal vicinity and no Azerbaijan Red Book (AzRB) flora species have been identified along the route of the onshore PFOC.

Bird surveys undertaken in the Terminal vicinity have identified ground nesting breeding birds within the area surrounding the Terminal (see Chapter 6: Section 6.4.2.6). However, the habitat along the proposed onshore PFOC route is not considered critical to breeding birds. They have been recorded throughout the area surrounding the Terminal and use no area exclusively for feeding or nesting. The populations of waterfowl species, which have been selected as bio-indicators in terms of the environmental conditions for the wetland habitat, appear to be fairly stable over consecutive years. However, the fluctuating numbers of ferruginous duck (*Aythya nyroca)*, an AzRB ‘Vulnerable’ and IUCN Red List ‘Near-threatened’ resident species, is a cause for concern.

Faunal surveys in 2022 identified the presence of the following at monitoring stations in closest proximity to the proposed PFOC route: European hare (*Lepus europeaus),* red fox *(Vulpes vulpes),* golden jackal *(Canis aureus) and* Libyan jird *(Meriones libycus)*. In addition the reptiles spur-thighed tortoise *Testudo graeca* and the rapid racerunner *Eremais velox* were recorded at the two stations in the vicinity of the wetlands. *Testudo graeca* is listed as ‘Vulnerable’ on the IUCN Red List and is included in the 2023 Azerbaijan Red Book (AzRB). Spur-thighed tortoise have been consistently recorded in the area surrounding the Terminal. The likely reason for this is due to the relocation programme undertaken prior to and following earlier ACG and SD terminal projects in which spur-thighed tortoise were collected prior to the works and then reintroduced away from the Terminal once the works were completed.

Based on the above, a biological / ecological receptor sensitivity score of 3, medium, has been assigned.

9.7.2.3 *Impact significance*

Table 9.26 summarises impacts on terrestrial biological / ecological receptors associated with onshore PFOC installation works.

Table 9.26: Impact significance – onshore PFOC installation (ecology)

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Onshore PFOC installation (ecology)	2 - low	3 - medium	6 – moderate negative

The following monitoring and reporting activities will be undertaken with respect to terrestrial ecology:

- records will be maintained of any species relocated from the cable corridor (including coordinates of where they were found and coordinates of where they were relocated to)
- records will be maintained of all landscape management works implemented.

It is considered that impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and no additional mitigation is necessary.

9.8 Impacts to the Terrestrial Environment (soils, groundwater and surface water)

9.8.1 Mitigation

Existing control measures associated with terrestrial soils, groundwater and surface water include:

- stockpiles of subsoil from the cable trench will be appropriately shaped and compacted to avoid erosion and sedimentation of any nearby waterbodies
- analytical testing will be undertaken on excavated soil, surface water, or groundwater that is potential contaminated (based on visual assessment), to classify the material with regard to re-use and disposal options
- fluids used for horizontal directional drilling will be low toxicity, biodegradable and not known to bioaccumulate
- dust management and suppression measures will be implemented during the onshore PFOC installation works
- a Pollution Prevention Management and Monitoring Plan for the onshore PFOC installation will be developed and implemented.

9.8.2 Onshore PFOC installation (Sangachal)

9.8.2.1 Magnitude of effect

Description

See Section 9.7.2.1.

Assessment

For the majority of the PFOC route the cable will be trenched and installed at a minimum depth of 1 m below ground level. All soil removed from the trench being excavated will be placed aside and stored so that it will be used later for trench backfilling and reinstatement of the cable route, in order to maintain the environmental characteristics of the area. To control surface water flow, temporary berms and dykes will be constructed where required.

The PFOC will need to cross the Baku-Alat Highway, the railway and various third party pipeline / service lines. It is currently planned to horizontally drill these sections at a depth of approximately 1.5 m below the existing service or pipeline. At each trenchless crossing it will be necessary to excavate launch and reception pits to enable crossing installation.

All soil excavated from the pits will be placed aside and stored so that it may be used for later reinstatement.

While monitoring to date (see Chapter 6: Section 6.4.2) has not indicated any significant or widespread contamination in the PFOC area, it is possible that localised areas of contaminated surface soil and spoil are present which may become mobilised by physical disturbance. Localised contamination of third party origin has been observed within the wetland area south of the Terminal. The onshore PFOC corridor route will pass through the eastern fringes of the wetland area and dewatering of excavations will be required. If visual contamination of the water in the trench is observed, analytical testing of the water will be conducted prior to any pumping out.

Based on the temporary nature of the impacts, and the fact that the cable route will follow the existing route of the SD2 gas export pipelines, a magnitude of effect score of 2, low, has been assigned.

9.8.2.2 *Sensitivity of receptor*

Relevant receptors include soil and surface water in the vicinity of the onshore PFOC route. Monitoring undertaken to date suggests little to no intermittent groundwater present within 20 m of the surface (see Chapter 6: Section 6.4.2).

As reported in Chapter 6, recent soil sampling indicates no exceedances of soil screening criteria, with the exception of arsenic, which exceeded the Canadian Council of Ministers of the Environment (CCME)[11] criteria at seven locations (including those in the vicinity of the proposed onshore PFOC route where it ranged from 13 – 16 mg/kg dry mass). Elevated concentrations of arsenic in the area are considered to be naturally occurring. Total petroleum hydrocarbon concentrations at stations in close proximity to the onshore PFOC route were all less than 20 mg/kg dry mass (AECOM, 2023b).

Water sampling conducted in the wetland area in 2022 indicated that TPH, nitrate, ammonium and copper concentrations were found to exceed assessment criteria at a limited number of locations. In the area of the proposed SDC onshore PFOC route exceedances of assessment criteria for ammonium were recorded (0.024 – 0.856 mg/l) and copper (1.56 – 4.45 µg/l).

Surface water bodies are not used for public water supply and the area of the PFOC route is not used for grazing purposes.

Based on the above, a receptor sensitivity score of 2, low, has been assigned.

9.8.2.3 *Impact significance*

Table 9.27 summarises impacts on soil and surface water associated with onshore PFOC installation works.

Table 9.27: Impact significance – onshore PFOC installation (soil and surface water)

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Onshore PFOC installation (soil and surface water)	2 - low	2 - low	4 – minor negative

[11] CCME Soil Quality Guidelines (SQGs) for the Protection of Environmental and Human Health.

The following monitoring and reporting activities will be undertaken with respect to soils and surface water (and the mobilisation of contamination):

- records will be maintained of the amount of spoil generated, reused, disposed of and the contamination potential of the spoil
- any contaminated soil or surface water encountered will be recorded (coordinates of location, photographs, quantities of material, analytical results and action taken) and submitted to bp.

It is considered that impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and no additional mitigation is necessary.

9.9 Impacts to the Terrestrial / Nearshore Environment (cultural heritage)

This section presents potential impacts to cultural heritage from onshore and nearshore PFOC installation works.

9.9.1 Mitigation

Existing controls associated with terrestrial cultural heritage include:

- an Archaeology and Cultural Heritage Management and Monitoring Plan will be developed and implemented detailing how the SDC project will be managed in relation to potential cultural heritage impacts (this will include a chance finds procedure)
- an on call archaeological watching brief will be established during terrestrial earthworks using representatives from the Institute of Archaeology and Anthropology to identify and record the presence of any cultural heritage sites or artefacts
- where sites or artefacts are identified, the watching brief archaeologist will advise on the controls required to minimise or avoid impacts with notification of any finds provided to the Ministry of Culture and Tourism (MoCT)
- prior to excavation activities at the landfall (and any associated rock breaking) a toolbox talk will be held with site personnel to raise awareness of the proximity of the sand cave, and visual inspection will be made of this protected state monument prior to and during rock breaking activities to monitor any vibrational impacts.

Existing controls associated with nearshore (marine) cultural heritage include:

- data collected from previous surveys (e.g. detailed bathymetry surveys, seabed surveys) will be reviewed by a marine cultural heritage specialist to identify any potential sites of cultural heritage value which lie in the areas affected by the works
- in the event that a potential site is identified in the nearshore zone, an assessment of the potential importance of the feature will be undertaken by a marine cultural heritage expert and the cable infrastructure potentially repositioned (depending on the importance of the feature).

9.9.2 Onshore and nearshore PFOC installation

9.9.2.1 Magnitude of effect

Description

See Section 9.7.2.1.

Assessment

The following excavations are associated with the terrestrial and nearshore PFOC installation works:

- open cut trenching of the onshore section of the PFOC to a minimum depth of 1 m
- trenchless crossings of the onshore section of the PFOC 1.5 m below railway, roads etc and excavation of launch and reception pits
- excavation of a cable transition pit at the landfall to a depth of 2 m
- trenching of the nearshore section of the PFOC to a depth of 1 m below seabed out to the 12.5 m water contour.

All of the above have the potential to disturb unknown artefacts of cultural importance. It should be noted, however, that the onshore and nearshore PFOC route will follow that of the existing SD2 gas export pipelines so the likelihood of chance finds is reduced.

Excavation of the cable transition pit and cable trench at the landfall will require breaking through rocky stone, with potential vibration impacts on the sand cave protected state monument located approximately 300 m from the landfall (see Chapter 6: Figure 6.6). Monitoring of the sand cave will be carried out (see Section 9.9.1) and it should be noted that trenching conducted for the SD2 pipelay, and piling for the SD2 water winning lagoon, were carried out in closer proximity to the sand cave with no impacts registered.

Based on the above a magnitude of effect score of 2, low, has been assigned.

9.9.2.2 Receptor sensitivity

In 2011, baseline archaeology surveys were undertaken in the vicinity of Sangachal Terminal with the Institute of Archaeology and Ethnography[12] as part of the studies for the Shah Deniz 2 ESIA. No evidence of buried archaeological remains were found during the survey.

The onshore SD2 export pipeline corridor (which the PFOC route will follow) was subject to varying levels of investigation. The portion of route north of the third party pipeline corridor was surveyed and no archaeological sites were identified. A series of isolated finds, consisting predominately of Medieval Period pot sherds, were identified in this area. The portion of the SD2 export corridor between the third party pipeline corridor and Baku-Alat Highway was not intensively surveyed due to the presence of extensive vegetation and standing water. However, during installation of the SD2 export pipelines no significant chance finds were made. As stated above, a sand cave (protected state monument) is in relatively close proximity to the SDC PFOC landfall (see Chapter 6: Figure 6.6).

[12] In 2024 it was renamed the Institute of Archaeology and Anthropology

Based on the available data, the archaeological potential of the onshore PFOC route is interpreted as being low to moderate. There is no evidence to suggest the presence of any large, extensive settlements. However, the onshore PFOC route is located along a historic trade route running from the Sangachal Caravanserai to Karachi Caravanserai (north of the Sangachal Terminal). There is, therefore the potential to encounter small campsites on the route between two caravanserais.

Known marine wrecks are presented in Chapter 7: Section 7.8.3, no sites of cultural heritage importance have been identified in the nearshore zone where the PFOC will be trenched.

Based on the above, a receptor sensitivity score of 2/3, low / medium, has been assigned.

9.9.2.3 *Impact significance*

Table 9.28 summarises potential impacts on cultural heritage from onshore and nearshore PFOC installation.

Table 9.28: Impact significance – onshore and nearshore PFOC installation (cultural heritage)

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Onshore and nearshore PFOC installation	2 – low	2 / 3 – low / medium	4 / 6 – minor / moderate negative

The following monitoring and reporting activities will be undertaken with respect cultural heritage:

- a watching brief, with representatives from the Institute of Archaeology and Anthropology will be maintained during PFOC groundworks
- an Archaeology and Cultural Heritage Close Out Report will be issued to the Institute of Archaeology and Anthropology, and the MoCT, at completion of construction activities.

It is considered that impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and no additional mitigation is required.

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CHAPTER 10: Operations Environmental Impact Assessment, Mitigation and Monitoring

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10 OPERATIONS ENVIRONMENTAL IMPACT ASSESSMENT, MITIGATION AND MONITORING

10.1 Introduction

This chapter of the ESIA presents the assessment of environmental impacts associated with the SDC project offshore operations phase.

The impact assessment methodology followed, and the structure of the SDC project impact assessment, are described in full in Chapters 3 and 9 of this ESIA respectively.

10.2 Scoping Assessment

The SDC project operations activities have been determined based on the SDC project base case, as detailed in Chapter 5: Project Description.

Table 10.1 presents the activities that have been scoped out of the full assessment process due to their limited potential to result in discernible environmental impacts. Judgement is based on prior experience of similar projects, especially with respect to earlier Shah Deniz (SD) and Azeri Chirag Gunashli (ACG) developments. In some instances, scoping level quantification / numerical analysis has been used to justify the decision. Reference is made to relevant quantification, analysis, survey and / or monitoring reports in these instances.

As stated in Section 5.7, the SDC platform is an electrically powered Normally Unattended Installation (eNUI) that has been simplified to minimise the offshore maintenance burden. As such sources of impact are very limited as there is no discharge of sanitary waste, galley waste, cooling water, produced water, or fire water / firefighting foam from the platform. In addition there is no flaring, no permanent closed drains, and no topside pigging facilities. Drilling activities will not be carried out from the platform, as it is purely for compression facilities only. The activities / sources of impact remaining, from operation of the SDC platform (and associated activities at Sangachal Terminal), have all been scoped out of full assessment, see Table 10.1.

Table 10.1: SDC project operations activities scoped out of impact assessment

ID	Activity	Project description reference	Justification for 'scoping out'
Offshore operations (SDC platform)			
O-R1	Operation of the compression trains (fugitive emissions)	5.7	Fugitive emissions are defined as the unintentional emission, leakage or discharge of gases from pressure-containing equipment or facilities and components inside plants such as valves, piping flanges, pumps, storage tanks, valves, compressors, etc. Fugitive emission calculations for the SDC platform, based on the number of anticipated valves and connections, estimate that 2.4 tonnes of gas will be

ID	Activity	Project description reference	Justification for 'scoping out'
			released per year from the compression trains, see Chapter 5: Table 5.18. **Existing controls** • Fugitive losses will be reduced as far as practicable through minimising the number of non-welded joints and the specification of low loss fittings. • Estimated quantities of fugitive emissions will be reported to MENR based on component emission rates. **Conclusion:** The small volumes of fugitive emissions released from the compression trains are expected to result in no discernible impact to air quality at the offshore SDC location, or at onshore human receptors. GHG emissions resulting from fugitive releases are discussed in Chapter 12.
O-R2	Venting of the compression trains during maintenance	5.7	The maximum quantity of gas that would be vented for a total shutdown of the SDC alpha and bravo compression trains would be 17 tonnes (see Chapter 5: Table 5.17). It is anticipated that compressor inspection will be required every two years resulting in a maintenance depressurisation of the compressor trains inventories. The primary component of natural gas is methane. The composition of SDC vent gas is provided in Appendix 10A. **Existing controls**: • No continuous routine venting will be carried out at the SDC platform. Venting will only be carried out, when necessary, during maintenance activities (or during facility trip / emergency situation) and the amount vented will be minimised as far as practicable. • Quantity of gas vented will be monitored and reported to the MENR. **Conclusion:** The small volumes of gas vented, on an intermittent basis, are expected to result in no discernible impact to air quality at the offshore SDC location, or at onshore human receptors. GHG emissions resulting from venting are discussed in Chapter 12.
O-R3	Open drains discharge	5.7	Discharges to sea from the SDC platform open drains are limited to deck drainage (rainwater) and wash down water. **Conclusion**: The limited discharges are not anticipated to result in any discernible impact to the marine environment.
OR-4	Pigging loop module (PLM) operational discharges	5.7.1	During pigging of the SDC infield pipelines there will be small volumes of hydraulic fluid discharge (Transaqua HT2) from PLM valve actuation (total of 0.48 m^3 during lifetime of facility) see Chapter 5: Table 5.19. As stated in Chapter 9: Section 9.5.2, Transaqua HT2 has been subject to Caspian specific ecotoxicity testing and confirmed as low toxicity (with low biodegradation and bioaccumulation potential). **Conclusion:** The small volumes of the discharges, and low toxicity of the fluid, are not anticipated to result in any discernible impact to the marine environment.

ID	Activity	Project description reference	Justification for 'scoping out'
O-R5	Maintenance of platform transformers	5.7	There will be 4 transformers on SDC platform (2 x 40 MVA and 2 x 3.15 MVA). The 40 MVA will contain 15 tonnes of transformer fluid and the 3.15 MVA will contain 2 tonnes of transformer fluid. A biodegradable synthetic ester transformer fluid will be used on the SDC platform. It should be noted that the transformer fluid will not need topping up, or replacing, under normal circumstances for the lifetime of the facility. **Conclusion**: Maintenance activities involving the handling of transformer fluid are not anticipated. The potential for accidental releases of transformer fluid are discussed in Chapter 12.
O-R6	Waste generation	5.7	As the SDC platform will be normally unattended, and no drilling activities will be carried out from the platform, wastes generated during operations phase will be limited to small volumes of maintenance wastes. The types of waste generated will be consistent with maintenance wastes generated by existing SD and ACG offshore facilities. All waste will be stored in temporary fit for purpose containers and transported off by vessel at the end of each maintenance campaign. Waste will be managed in accordance with the existing AGT Region management plans and procedures and will benefit from the operational experience that has been gained from continuing bp operations. bp will manage the collection, transportation, treatment, disposal and storage of waste generated during the operational phase via specialised approved waste management contractors, the destinations of the waste types are provided in Chapter 5: Table 5.25. **Conclusion:** Waste generated during the SDC project will be managed in accordance with existing AGT Region management plans and procedures as described within Chapter 13. No discernible impact to the terrestrial or marine environment is anticipated.
OR-7	Permanent physical presence of the SDC platform and subsea infrastructure	5.4 5.5 5.7	The presence of the SDC jacket, infield pipelines and associated subsea infrastructure will result in loss of seabed over a small area. In total the SDC pipelines and infrastructure will occupy an area of 0.02 km^2, 0.000005% of the Caspian Sea. In practice, it is likely that the majority of the organisms within these areas would be sufficiently mobile to re-establish themselves on either side of the pipelines and subsea infrastructure since this would involve movement of only 30 cm to 40 cm at most. The concrete coating of the pipelines is chemically inert by design and will have no-effect on either the adjacent sediments or water column. The platform will have navigation lights during the hours of darkness (in line with International Convention of Safety of Life at Sea (SOLAS) requirements). However, the Contract Area is not located within a bird migration flyover route. Birds found in the area will be transient and not resident. **Conclusion:** It is considered that impacts are minimised as far as practicable and no discernible impacts on ecological / biological receptors are anticipated.

ID	Activity	Project description reference	Justification for 'scoping out'
			In addition, the SDC platform complex will not be visible from onshore (located approximately 45 km from Azerbaijan coastline) and therefore there will be no visual intrusion to onshore human receptors.
Offshore operations (walk-to-work maintenance vessel)			
O-R8	Use of a vessel for periodic maintenance visits (emissions to atmosphere)	5.7	Anticipated emissions from maintenance vessel visits to the SDC platform (just 10-14 days each quarter) are presented in Chapter 5: Table 5.16. **Existing controls:** • Shipboard emissions will be in compliance with MARPOL 73/78 (Annex VI) which aims to reduce global emissions of SOx and NOx. • Vessel propulsion systems, power generation equipment and exhaust systems will be well maintained and operated efficiently. • Low sulphur fuel will be used (typically <0.05% weight). • Volume of fuel usage will be monitored and reported to the MENR. **Conclusion:** Emissions released from the walk-to-work vessel will be dispersed along the entire vessel route and the wider area. Increases in pollutant concentrations will be very small and indistinguishable from background concentrations.
O-R9	Use of a vessel for periodic maintenance visits (underwater sound)	5.7	Underwater sound from the walk-to-work vessel will be similar to that from the support vessels used during the construction phase. Propagation modelling for a typical crew transfer vessel (travelling at 14 knots) demonstrates that: For seals the PTS threshold (SEL data 1 h exposure) is met at a distance of just ~ 50 m from the vessel, and the TTS threshold at distances of ~ 350 m. Low level disturbance may extend tens of kilometres. Fish are relatively insensitive to vessel noise with recoverable injury thresholds met at a distance of ~ 50 m from the vessel, TTS thresholds at ~150 m, and low level behavioural response within ~ 2 km. **Conclusion**: Underwater sound from the walk-to-work maintenance vessel will be transitory within the offshore environment. Modelling has shown there is a limited potential for impacts to seals and fish.
O-R10	Use of a vessel for periodic maintenance visits (operational discharges from vessel)	5.7	**Existing controls:** • Existing controls to ensure vessel operational discharges are in line with MARPOL 73/78 and MENR requirements are listed in Chapter 5: Table 5.5. **Conclusion**: The limited discharges, in accordance with the relevant standards, over the short duration of the maintenance periods are not anticipated to result in any discernible impact to the marine environment.

ID	Activity	Project description reference	Justification for 'scoping out'
Onshore operations (Sangachal Terminal)			
O-R11	Use of existing processing and storage facilities	5.8	The SDC project will use existing capacity within the onshore SD facilities at Sangachal Terminal. Potential incremental emissions at the terminal have not been assessed as part of this ESIA and are not included in the SDC emissions forecast. This is because terminal activities are outside of project scope, and including these emissions may lead to potential double counting with the long-term Sangachal Terminal emissions forecast. Waste types generated at the Terminal are not expected to change as a result of the SDC project. There may be a small incremental increase in pigging waste from pigging of the SDC infield pipelines (pigs launched from SDA and SDB platforms). **Conclusion**: Contribution of the SDC project is not expected to result in any significant impact to air emissions or waste volumes at Sangachal Terminal.
O-R12	Maintenance of onshore PFOC	5.6	Effective operation of the Sangachal to SDC PFOC will be consistently monitored from Sangachal Terminal (dedicated operator workplace). In addition electrical testing will be carried out to monitor the cable's insulation resistance and continuity. Periodic on-site inspections of the onshore transmission infrastructure will take place. Unplanned maintenance may involve the repair of cable faults, although this is anticipated to be a rare occurrence. **Conclusion:** Onshore PFOC maintenance activities are not expected to result in any significant environmental impacts.
Electricity import for SDC			
O-R13	Electricity import from Azerbaijan national grid	5.9	SDC platform being a 'directly electrified' eNUI will receive its electrical power via an interconnector cable from onshore power generation. Total Scope 2 GHG emissions, based on electricity import from the Azerbaijan national grid, are estimated to be 2,387 ktonnes CO_2 equivalent for SDC between 2028-2041. SDC is aligned with bp's drive to reduce the carbon footprint of its operations. Current regional projects such as bp's project Sunrise (a photovoltaic power facility in Azerbaijan) and the Sangachal Terminal Electrification (STEL) project (which aims to electrify Sangachal Terminal and establish a framework to operate the terminal without direct or indirect CO_2 emissions) are all part of this drive. GHG emissions resulting from Scope 2 emissions are discussed in Chapter 12. **Conclusion**: The provision of electricity to SDC is aligned with bp's Net Zero Aim 1 which envisages bp becoming net zero across its operations on an absolute basis by 2050 or sooner.

CHAPTER 11: Socio-Economic Impact Assessment, Mitigation and Monitoring

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11 SOCIO-ECONOMIC IMPACT ASSESSMENT, MITIGATION AND MONITORING

11.1 Introduction

The assessment of potential socio-economic impacts from the SDC project uses a systematic process that involves:

- identifying project aspects (activities) or sources of impact (see Chapter 5: Project Description)
- identifying related socio-economic receptors (see Chapter 6: Socio-economic Description)
- evaluating project effects on those receptors.

In accordance with the impact assessment methodology, ESIA scoping has been undertaken to identify project activities that may be “scoped out” from the full impact assessment process based on anticipated magnitude of effect and the likely receptor interaction (refer to Appendix 11A). Those activities that have not been scoped out are described, assessed and quantified, where possible, in accordance with the impact assessment methodology defined in Chapter 3.

The assessment of socio-economic impacts for the SDC project takes into consideration experience gained from Shah Deniz 1 and Shah Deniz 2 projects, Azeri Central East (ACE), Azeri Chirag Gunashli (ACG) Phases 1-3, and Chirag Oil Project (COP).

The SDC project is predominantly an offshore development with the majority of SDC project related activities taking place within the SD Contract Area offshore. Onshore activities are limited to installation on the onshore section of the SDC power and fibre optic cable (PFOC) between Sangachal Terminal and the landfall in Sangachal Bay, and construction of the jacket, topsides and subsea infrastructure at onshore construction yards. It is anticipated that the same existing onshore construction yards that have been used previously for SD and ACG construction activities will be used for SDC project activities.

The scale of impacts assessed in this chapter includes changes that are predicted to occur at a local, regional and national level as a result of the project.

11.2 Assessment of Scoped-out Activities

The scoping process has used professional judgement based on prior experience of activities for similar projects in Azerbaijan and across the world. The process has resulted in the scoping out of a number of SDC project activities based on their limited potential to result in discernible socio-economic impacts, or if they have been already assessed in other chapters of the ESIA. Justification for the scoping out of specific activities is presented below for the following:

- community disturbance from the construction yards and onshore PFOC installation
- community health and safety considerations from operation of the construction yards and onshore PFOC installation
- disruption to road and rail users from construction related traffic and onshore PFOC installation
- access restrictions to public and recreational fisheries along the shoreline from PFOC installation
- disruption to commercial fishing and shipping operations from the enforcement of marine exclusion zones.

11.2.1 Community disturbance

11.2.1.1 Construction yards

As described in Chapter 5 (Section 5.3) the construction yards to be used for the fabrication of the SDC jacket and topsides, as well as elements of the subsea infrastructure, are yet to be confirmed. For the purposes of the ESIA it has been assumed that yards used for previous SD and ACG projects will be utilised (Baku Deep Water Jacket Factory yard and AzFen Bayil yard). No major upgrades or modifications at the potential construction yards to be used for the SDC project have been identified. Both potential yards are existing industrial sites with few residential premises in close proximity to their site boundaries.

An assessment of potential noise and air quality impacts from SDC project activities at the construction yards is provided in Chapter 9: Construction, Installation and HUC Environmental Impact Assessment (based on air quality and noise screening provided in Appendices 9B and 9C). The assessment concluded that the potential for disturbance to occur from construction yard activities to residential receptors is minor.

The yards are well established and have been in operation for more than 10 years undertaking construction activities for the oil and gas industry. Information on the construction yards contractors' environmental management systems and plans that will be implemented for the SDC project are described in Chapter 13: Section 13.2.2. The potential for significant community disturbance to occur from SDC project related construction works at the yards is limited.

11.2.1.2 Onshore PFOC installation

The route of the onshore PFOC will follow the existing route of the SD2 gas export pipelines between Sangachal Bay and Sangachal Terminal, a distance of approximately 4.2 km. The last 2 km of the cable route will be laid within the boundary of Sangachal Terminal and is outside the scope of this ESIA. The closest residential receptors are the settlements of Umid and Sangachal which are both more than 1 km from the route (although there are some individual dwellings along the coast approximately 350 m from the cable route).

An assessment of air quality impacts from PFOC onshore installation activities is provided in Chapter 9: Construction, Installation and HUC Impact Assessment (based on air quality screening provided in Appendix 9B). The assessment concluded that the potential for impacts to residential receptors is negligible, due to the localised impact on air quality from the construction activities.

An assessment of airborne noise impacts from PFOC onshore installation activities is provided in Chapter 9: Construction, Installation and HUC Impact Assessment (based on noise screening provided in Appendix 9C). The assessment concluded that the potential for noise impacts to residential receptors is minor / moderate. Although it is anticipated that noise criteria will not be exceeded from the use of PFOC installation plant and vehicles, the requirement to break through rocky ground in the area of the landfall has the potential for additional noise impacts.

Due to the transitory nature of the cable installation works, and the limited time period that receptors would be subjected to noise and air quality impacts, the potential for significant community disturbance to occur from SDC onshore PFOC installation works is anticipated to be limited.

11.2.2 Community health and safety

11.2.2.1 Construction yards

As stated above, the SDC platform and associated infrastructure fabrication activities will be undertaken within existing onshore construction yards. Each of the potential construction yards have existing controls and plans in place to manage health and safety risks and interaction with the local community (refer to Chapter 13: Section 13.2.2). As these yards have been used for previous bp projects their plans have been developed over the years to meet bp's health, safety, security and environment project requirements. Taking this into account, impacts to community health and safety are expected to be negligible.

11.2.2.2 Onshore PFOC installation

The majority of the PFOC will be installed into a trench excavated to a depth of approximately 1 m. After installation the trench will be backfilled and the topsoil replaced so that the right of way can be reinstated to its original condition.

The following controls will be in place to maintain community health and safety during onshore cable installation works:

- the first 360 m of the cable route from the landfall to the crossing of the Baku-Alat Highway will be within a fenced security area, the remainder of the route (before it enters the Sangachal Terminal boundary) will be security patrolled by bp and there is a formal permit system in pace for any third parties entering the area
- the period of time when the cable trench and any other excavated areas are left open will be minimised through the use of careful planning.

Considering the type of existing controls that are listed above, impacts to community health and safety are expected to be negligible.

Driver management and vehicle standards will be developed and monitored, to minimise the risk to community safety, as part of the contractor Traffic and Transportation Management Plans (see Section 11.2.3).

11.2.3 Disruption to road and rail users (transport of materials / equipment to site)

Both potential construction yards, and the onshore PFOC route, are located in close proximity to the Baku-Alat Highway (M2) which will be the primary route used for the transport of construction materials and workforce on a daily basis. Road users may experience temporary disruption (in the order of hours) through potential delays associated with the transport of oversized and heavy loads and additional traffic associated with deliveries. To minimise the number of vehicle movements associated with the SDC project, the use of buses to transport the construction workforce to site will be maximised.

bp and its main construction contractors have implemented successful driving and vehicle management plans during the previous SD and ACG projects. In order to ensure that any disruption to road users is minimised, a Transportation and Traffic Management Plan will be developed and implemented by each of the yard's main construction contractors and by the onshore cable installation contractor. Each plan will require a risk assessment to be undertaken prior to the transportation of oversized and heavy loads which will include an inspection of the transport route for obstructions and hazards, the requirement for traffic diversions and the use of lifting, loading and rigging equipment. The Azerbaijan Ministry of Transport and the State Police will be notified in writing before the scheduled movement of oversized and heavy loads, and the exact time and date of the movement will be agreed. Once approved, oversized and heavy loads will be accompanied by front and back escort vehicles equipped with appropriate warning signage and / or lights as required. Any received grievances associated with vehicle movements will be logged and appropriate corrective action determined in accordance with the Transportation and Traffic Management Plans.

There is no planned disruption to users of the Baku-Alat Highway, or adjacent railway, from the installation of the onshore PFOC, as the cable will be installed by horizontal drilling under these features at a depth of approximately 1.5 m below the surface. Consequently, the onshore cable installation works will not require any temporary road or rail closures.

Overall, the impact to road and rail users from the SDC project is considered to be negligible.

11.2.4 Access restrictions along the shoreline

The PFOC installation works within Sangachal Bay involve the construction of a temporary finger pier to provide access for construction plant (excavators) to the nearshore for trenching. The works also include the construction of a cable transition joint pit on the beach (20-25 m above the shoreline) to allow the pulling in and splicing of the submarine and onshore sections of the cable, as well as an access road from the Baku-Alat Highway to the joint pit location.

All of these works will be carried out within an existing restricted area that is fully isolated from the public by fencing. No additional shoreline restrictions will be imposed outside this area. The impact to members of the public and recreational fishermen is expected to be negligible, as the works will be within an existing restricted area. Alternative sites for recreational walking and fishing (and the launching of small inflatable boats) are available along other parts of the shoreline in the bay.

Currently the beach area to the northwest of the landfall appears to have been allocated for future residential development (with some individual dwellings about 350 m from the cable route). A third-party 3 m high brick wall separates the cable corridor from this area.

11.2.5 Disruption to commercial fishing and shipping operations

For safety reasons the following marine exclusion zones will be enforced around key marine activities during the SDC construction, installation and HUC phase:

- PFOC cable lay – 500 m radius either side of the cable lay spread in the nearshore and offshore zones
- SDC infield pipelay – 500 m radius either side of infield pipeline spread
- SDC jacket and topside installation – 500 m radius around the barge transporting the jacket and topside offshore to the SDC location, and 500 m radius around the SDC platform during installation and hook up.

During operations phase the following permanent marine exclusion zone will be in place:

- SDC platform: 500 m radius around the facility.

There is potential that these activities (and their associated marine exclusion zones) could interfere with commercial fisheries and shipping, potentially resulting in economic displacement due to an increase in travel time and the quantity of fuel consumed by vessels, or by restricting access to fishing grounds.

11.2.5.1 Offshore

Offshore marine exclusion zones will be focused around the installation of the SDC jacket and topsides, infield pipelines, and PFOCs in the northern part of the Shah Deniz Contract Area. Following installation a permanent 500 m exclusion zone will be in place around the SDC platform.

With respect to offshore fisheries, there is a lack of fishing activity in the Shah Deniz Contract Area and along the offshore PFOC route. Until 2017 commercial fishing was carried out on Makarov Bank, to the north of the PFOC route (see Chapter 7, Figure 7.4), however this is no longer the case due to it being uneconomically viable (see Chapter 7, Section 7.7.2.3). Disruption to offshore fisheries from SDC related marine exclusion zones is therefore not anticipated.

In terms of shipping, no commercial shipping lanes cross the Shah Deniz Contract Area. The majority of shipping in the area consists of vessels servicing the existing SD platforms using bp recommended routes (see Figure 7.5). Shipping lanes accessing Baku Bay will be crossed during offshore Sangachal to SDC PFOC installation and during jacket and topsides float out (see Figure 7.5). As most of shipping operations that occur are directly related to the oil and gas industry, mariners working in the area of the southern Caspian Sea are used to avoiding marine exclusion zones and any economic displacement or disruption to services is anticipated to be negligible.

Restricted Area No. 23 (military training area) is located to the west of the Contract Area, the northern boundary of which will be crossed by the bp recommended shipping routes and the Sangachal to SDC PFOC installation spread (see Figure 7.5). Liaison with the authorities will be undertaken prior to any works in this area.

11.2.5.2 Nearshore

Nearshore marine exclusion zones will be in place during jacket and topsides float out from the yard quaysides (approximately 40 days) and during PFOC installation (approximately 35 days in the Sangachal Bay area).

With respect to nearshore fisheries, commercial fishing is no longer carried out within Sangachal Bay due to relocation of fishermen during the Shah Deniz 2 project, and new bp security infrastructure in the bay which restricts access to some parts of the beach and fishing within the export pipeline corridor. There are no known fisheries offshore from the industrial areas where the construction yards are located. As a result disruption to nearshore fisheries are not anticipated from the SDC project activities.

In terms of nearshore shipping, the Sangachal to SDC PFOC route crosses recommended shipping route 24 (vessels accessing Sahil harbour) and shipping route 35 (vessels accessing Azpetrol Terminal), see Figures 7.5 and 7.6. Float out of the jacket from BDJF yard will also cross shipping route 35. It is possible that there will be minor disruption to commercial vessels using these routes. However, the SDC installation vessels will be continuously moving and will not be present in an area for any significant period of time, therefore disruption is anticipated to be negligible.

The nearshore PFOC route in Sangachal Bay will cross Prohibited Areas No. 67 and 133 where no anchoring, fishing with seabed interaction, or dredging works are allowed. Liaison with the authorities will be undertaken prior to any cable installation works in these areas.

Control measures included in the project design to minimise potential disruption to commercial shipping and fishing include the following:

- an official notification letter will be sent to the Azerbaijan State Maritime Administration (ASMA) by the installation fleet owner one month prior to activities offshore (this will include the extent and duration of marine exclusion zones), ASMA will issue a 'Notice to Mariners' to all marine interests
- appropriate radio broadcasts will be made on the relevant shipping channels to make other marine users in the area aware of the installation activities
- for activities within Restricted Area No. 23, and Prohibited Areas No. 67 and 133, liaison with the State Maritime and Port Agency under the Ministry of Digital Development and Transport will be carried out prior to the works
- the location of the SDC platform (and its permanent exclusion zone) will be clearly marked on marine navigation charts provided to the appropriate relevant authorities
- all project vessels will comply with the relevant IMO Maritime Codes with regard to appropriate radar, radio, lights, flags and other visible signals, and good navigational practices and seamanship - these include the International Convention for the Safety of Life at Sea (SOLAS); the Convention on the International Regulations for Preventing Collisions at Sea (COLREGs); and the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW)
- any grievances raised by affected commercial shipping companies, or fishermen, will be managed through a grievance procedure which sets out the processes through which complaints are logged and recorded; and the approach to managing the complaint in an appropriate and timely manner. Where corrective actions are required, they will be implemented effectively and in a timely manner.

11.3 Impact Assessment

11.3.1 Employment

As set out in Chapter 5 (Section 5.12), it is anticipated that the SDC project will generate a number of employment opportunities during the construction phase (peak workforce estimated at 2,600 persons). During the operational phase only a limited number of maintenance personnel will be employed by the project as the SDC platform is unattended.

11.3.1.1 Mitigation

The main construction and installation contractors (including their sub-contractors) used by bp during the SDC project are required to develop and implement their own Employee Relations Management Plan (ERMP) which will include, as a minimum, the following:

- project labour arrangements including the need to recruit new labour and potential sources of new workers
- how the contractor will comply with the national requirements of Azerbaijan labour law
- details of a grievance mechanism that is available for use by the workforce
- training and development activities in the form of a Training and Development Plan
- demobilisation and demanning measures (see Section 11.3.2)
- a nationalisation programme
- cultural awareness and language familiarisation
- statistical reporting and monitoring associated with employment and training.

Site specific Labour Management Forums (LMF) will be established by bp and regular meetings will occur between the bp project site management team and the main construction and installation contractors to discuss workforce welfare and related matters (representatives from bp’s Communications and External Affairs (C&EA) team will also attend when recruitment issues are being discussed). The role of the LMFs are to undertake:

- a regular review of labour management performance and identify any trends
- a review of work plans within the site for the next three to six months, discussing labour requirements and potential risks for labour management
- review the actions taken to mitigate the identified risks
- discuss the results of statistical monitoring and the content of reports which have been submitted to bp.

The main construction and installation contractors and their sub-contractors will:

- actively design and implement training and skills development programmes for their national staff
- prepare and submit a Training and Development Plan to bp on an annual basis which includes details of the training initiatives to be undertaken in the next 12 months, and a summary of training activities completed in the past 12 months.

bp will conduct periodic reviews of contractors' ERMP and Training and Development Plan implementation.

Existing controls associated with the onshore PFOC installation contractor are as follows (these controls do not apply at the construction yards):

- information will be provided to the local communities by bp's C&EA team, in collaboration with the main construction and installation contractors, on the nature and levels of employment required
- at all times the individual recruited will be the person who is most suited to the particular post, based on the applicant's abilities, qualification, experience and merit as measured against the job description and person specification
- measures will be implemented by main construction and installation contractors to maximise employment as far as practical from the local communities, to achieve, or improve if practical, the local content percentages achieved for the previous SD and ACG projects
- where local employment falls below the local content percentage targets, the reasons for this non-compliance will be investigated by bp and practical measures will be developed to meet the local content percentages targets
- a grievance procedure for managing all community complaints related to the recruitment process will be established - all employment-related grievances, including those associated with recruitment processes, will be recorded and reported, along with details of measures taken to resolve concerns raised
- a formal system of competency assurance will be implemented and records maintained of competency testing and training activities completed, with training certificates provided to workers who are eligible to receive them.

bp and their main contractors will implement measures to achieve, or improve if practical, the local content percentages achieved for the previous ACG Phases 1-3, COP, SD1 and SD2, and ACE projects with an ultimate nationalisation target of 90%. Particular objectives for the SDC project with regard to employment will include preferential hiring of local residents where the relevant skills are available and advertising employment opportunities within the local labour market.

11.3.1.2 Magnitude of effect

Based on experience from previous in-country bp projects, the SDC project is anticipated to generate employment opportunities similar to those arising from the construction of previous ACG and SD platforms, although employment numbers may be slightly lower due to the simplified design of the SDC compression platform.

It is anticipated that the main construction yard contractors for the SDC project will employ between approximately 300 and 2,500 people over the duration of the construction and commissioning works with employment numbers anticipated to peak at 2,600 people during 2027 (see Chapter 5: Figure 5.17). During the operational phase only a limited number of maintenance personnel will be employed by the project as the SDC platform is unattended.

Every effort will be made to re-hire workers who have demonstrated competence whilst working on previous oil and gas construction projects. Upon hiring workers, a gap analysis will be undertaken by the main construction and installation contractors between relevant competence criteria and the contractor's Training and Development Plan. Where gaps are identified training will be provided to bring each worker up to the minimum standards for the role expressed in the Training and Development Plan. The training will commence before the start of construction activities and will continue throughout the SDC project.

It is not anticipated that employment for the SDC project will require establishment of workforce accommodation, or significant migration of populations to the construction areas.

As the employment impacts will be beneficial to nationals and local communities, a magnitude of effect score of 0, positive effect, has been assigned.

11.3.1.3 Receptor sensitivity

As discussed in Chapter 7 (Section 7.5.3.3) bp projects have historically had a significant impact on local and regional employment levels. Among job seekers based in the local communities, there are high expectations associated with the provision of employment, training and skills development activities. This is partly a result of the previous employment and training provided by bp during the ACG Phases 1-3, COP, SD1 and SD2, and ACE projects. Receptor sensitivity is therefore considered to be high, sensitivity score of 4.

11.3.1.4 Assessment

The benefits of employment to successful job seekers are expected to include, at a household and individual level, an increase in socio-economic status, improvement to their quality of life and living conditions, and the benefits from greater household expenditure on education and healthcare resources. Employment will benefit a greater number of individuals than the total workforce number, as positive changes at a household level will benefit partners (including women), relatives and young people. Increased household expenditure also increases local economic activity, thereby creating further economic benefits to the local communities.

It is expected that almost all (temporary or permanent) employed workers will benefit from the provision of training and skill development activities during the SDC project. Such activities will commence before the start of construction activities as workers will be required to undergo competency-based training to undertake their role to the standard required. Similar to the previous ACG Phases 1-3, COP, SD1 and SD2, and ACE projects, the training and skills development activities will include the enhancement of technical skills in parallel with health and safety, information technology and communication / administrative skills.

Table 11.1: Impact significance – SDC project employment

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Employment during SDC project construction and installation	0 - positive	4 – high	0 – positive

11.3.1.5 Monitoring

The following workforce monitoring information will be submitted by the main construction and installation contractors to bp on a monthly basis:

- the total percentage of local and non-local employment, broken down for each job category

- the number of grievances that have been received from the workforce, the actions taken to resolve the grievance and whether the grievance was resolved within 30 days
- the number of hours lost due to sickness or other reasons of absence (the reason of absence should be recorded)
- the number of hours of training and skill development activities delivered, broken down into each job category and a percentage of the workforce.

In addition, the main construction and installation contractors will be required to maintain records of the workforce demographics e.g. gender, age, the geographical origin of the applicant (the community name) and whether the applicant has any special needs due to a disability or other reason.

11.3.2 Demanning

As the onshore construction works at the construction yards pass the point of peak activity, the construction contractor's workforce will need to be reduced. This process will be undertaken in accordance with relevant Azerbaijan legislative and regulatory requirements.

11.3.2.1 Mitigation

The existing controls associated with a reduction in employment numbers (referred to as demobilisation) are:

- development and implementation of the contractors' ERMPs which include training and development activities, and a specific requirement to plan for demanning activities
- regular communication between bp and the main construction and installation contractors associated with the demanning activities during LMF meetings
- adequate staff communications between the main construction and installation contractors and their workforce which will inform the workforce of project progress and expected completion dates, so they can start to seek alternative employment positions in advance of their position being made redundant - workforce contracts will set out the terms of the employment including the expected duration of the contract.

11.3.2.2 Magnitude of effect

The process of demanning will occur after peak employment is reached in the first half of 2027 (see Chapter 5, Figure 5.17). Employment levels will gradually reduce until Q1 2028, before reducing more rapidly in the second half of 2028 and 2029 as the jacket and topsides ready for sail away (RFSA) dates are reached and the construction yard activities are completed.

Individuals who are demanned from the SDC project may experience increased psychological stress associated with the uncertainty of securing future household income and reduction in their household income, general well-being, quality of life and access to private healthcare and educational resources. Changes in the employment status of heads of households may also disrupt family life, personal relationships and the welfare of children. Individuals, who are able to obtain alternative employment, or return to their previous role prior to their involvement in the SDC project, may experience a temporary change in household income during the transition between employment roles. Workers unable to obtain an alternative source of employment may experience more serious impacts across a longer timescale.

Azerbaijan's macro-economic situation remained strong in 2023, with the economy growing by 1.1% between 2022 and 2023 (Asian Development Bank, 2024). Azerbaijan has relatively high employment and labour force participation rates and a correspondingly low unemployment rate. Based on government statistics from 2022, the unemployment rate in the Baku economic region was 5.7% whereas the rates in the districts of Garadagh and Sabail were 5.5% and 4.4% respectively (State Statistical Committee of the Republic of Azerbaijan, 2024b). There are a variety of regional industrial developments either planned, or under construction, across the Baku City economic region (which includes the Sabayil and Garadagh districts) that are creating numerous professional and non-professional employment opportunities[1]. However, within the local communities, there are unlikely to be sufficient vacancies available that can immediately absorb the number of workers coming off the SDC project, many of whom will have similar non-professional skill sets to offer the employment market.

However, training and skills development activities will continue throughout the SDC project, and will provide workers with transferable skills that can be used to obtain future employment positions after their involvement in the SDC project is complete. The main contractor's Training and Development Plans will include providing practical support to individuals to find alternative sources of employment, which aims to minimise the time workers spend between employment positions.

As a result of the demanning measures in place, a magnitude of effect score of 2, low, has been assigned.

11.3.2.3 Receptor sensitivity

Receptor sensitivity is considered to be high, sensitivity score of 4, in relation to demanning as the individuals made redundant will be forced to find alternative sources of employment after their involvement in the SDC project is complete.

11.3.2.4 Assessment

It is expected that a large proportion of the construction workforce will be able to seek out alternative job opportunities after their involvement in the SDC project is complete. The provision of training and skills development to the workforce, certificates to provide competence for certain types of professional positions, and adequate warning in advance of their position being made redundant, will reduce the impact of demanning to the extent possible. The residual impact assigned in Table 11.2 is scored as moderate due to the high sensitivity of the receptor. No additional mitigation is proposed.

[1] Examples include:
- Second phase of construction of Baku International Sea Trade Port (in Alat) commenced as part of the Trans-Caspian Transport Corridor initiative (News.Az, 2024).
- First 100 MW renewables auction for a 100 MW solar power plant in Garadagh announced in April 2024 (Ministry of Energy of the Republic of Azerabaijan, 2024).
- Tenders requested for a 240 MW Absheron-Garadagh Onshore Wind Project in June 2024 (Tendersinfo, 2024).

Table 11.2: Impact significance – SDC project demanning

Activity	Magnitude of effect	Sensitivity of receptor	Impact significance
Demanning following SDC project construction and installation	2 - low	4 – high	8 - Moderate

11.4 Indirect socio-economic impacts

As potential indirect socio-economic impacts of the SDC project are outside of bp and their main construction contractors' control, and cannot be mitigated to any reasonable extent, the impact assessment provided below is necessarily qualitative in nature.

11.4.1 Increased economic flows

The increase in local employment levels within the nearby communities that will occur during the construction phase may result in a rapid, temporary increase in local economic capital flows. While affected individuals and business owners will typically consider this to be a positive change, there is a potential for local inflation to occur through an increase in the demand for the same types of goods and services. Business owners may also seek to maximise the local rise in household income by increasing prices to take full advantage of increased capital that becomes locally available.

A variety of contractors based in Azerbaijan will be used during the SDC project which will result in an increase to their business revenue. Any increase in business revenue has the potential to benefit business owners through increased profits, the workforce through extended employment contracts, individuals who gain new employment with contractors, and government revenues through the collection of additional tax revenues.

The use of local, regional and national businesses to provide supply chain goods and services to bp's major contractors will be maximised, where possible. The use of in-country businesses for the construction of the SDC jacket and topside will support the strong expectation amongst local, regional and national business owners that a significant proportion of the total procurement will be allocated to in-country suppliers. In addition, the procurement of additional goods and services through the supply chain used by the construction yards will further contribute towards socio-economic development at a local, regional and national level.

The SDC project requirement for professional staff to be preferentially sourced from the local communities may divert individuals from existing professional roles to the SDC project, with the aim of securing higher paid employment. This may have negative consequences to the local community should professionals leave their current role, particularly if they are currently a professional public worker (e.g. in a governmental or social service role).

The negative impacts associated with increased economic flows cannot be mitigated to any reasonable extent, as bp does not have control over the way in which third-parties will use their additional income, or have any control on which individuals will apply for a professional job in the local workforce. However, lessons learned during the development of earlier SD and ACG developments over the last 20 years will be utilised to maximise economic flows and minimise the potential negative impacts. All job advertisements associated with the SDC project will emphasise the temporary nature of the employment offered, to try and reduce existing professionals from leaving their current positions. In addition, the salaries of professional roles will be similar to those offered nationally and benchmarked using the most recent data available. The use of benchmarked salaries will avoid large discrepancies occurring between public sector roles and the temporary employment offered by bp's major contractors.

On balance, it is considered that increased economic flows will result in a positive impact.

11.4.2 Social conflict

There is the potential for conflict to occur from (perceived or actual) competition between individuals seeking jobs. Such conflicts could occur between members of the same settlement, between individuals from the local communities, or between 'local' and 'non-locals'. Such conflicts may be exacerbated by pre-existing tensions between groups of people and in particular, between non-locals and vulnerable groups (such as internally displaced persons).

Local targets (for professionals and non-professionals) will be used to maximise employment as far as practical for the existing residents of settlements in proximity to the construction yards, which will be verified by the prospective employee's identification card and supporting information, in accordance with the ERMP. This will act to minimise the potential for in-migration by job seekers located outside of these communities.

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CHAPTER 12: Cumulative and Transboundary Impacts and Accidental Events

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12 CUMULATIVE AND TRANSBOUNDARY IMPACTS AND ACCIDENTAL EVENTS

12.1 Introduction

This chapter of the ESIA presents the potential cumulative and transboundary impacts of the SDC project. It also includes accidental events that could possibly occur during the SDC project activities and the control, mitigation and response measures designed to minimise event likelihood and impact.

12.2 Cumulative and Transboundary Impacts

As discussed in Chapter 3, cumulative impacts are those that act together with other impacts, from the same or other projects, to affect the same environmental or social resource or receptor. They can be either:

- intra-project impacts - interactions between separate project-related residual impacts
- inter-project impacts - interactions between project-related residual impacts in combination with impacts from other known future projects and their associated activities.

Transboundary impacts are impacts that occur outside the jurisdictional borders of a project's host country.

As outlined in Chapter 1 of this ESIA, the SDC project follows on from previous phases of development in the SD Contract Area. The Shah Deniz Alpha platform commenced production in 2006 as part of SD1 project, and the Shah Deniz Bravo platform in 2018 as part of the SD2 project. Other ongoing and future key activities in the SD Contract Area include:

- the drilling and completion of further SD2 wells until 2027 (the SDB platform is approximately 3 km from the proposed SDC platform)
- the Shah Deniz 2025-2034 seismic survey programme monitoring changes to the gas reservoir through a number of acquisition programmes.

Within the adjacent Azeri Chirag Gunashli (ACG) Contract Area, the ACE project comprises the most recent stage of development. The earlier Early Oil Project (EOP), ACG Phase 1, 2, 3 and Chirag Oil Project (COP) development phases included the construction of the Chirag-1, Central Azeri (CA), East and West Azeri (EA and WA), Deep Water Gunashli (DWG) and West Chirag (WC) offshore platforms, which are currently operational. Other ongoing and future key activities in the ACG Contract Area include:

- the drilling and completion of further ACE wells (around 4 production wells will be drilled each year over the next 6 years)
- the ACG 4D High-Definition Ocean Bottom Node Seismic Programme seismic acquisition programme taking place over the period 2024 to 2028.

The ACG Contract Area is approximately 100 km from the SD Contract Area.

Production from SD and ACG Contract Areas is transferred through subsea pipelines to Sangachal Terminal for processing and export. Upcoming projects at the terminal include the Sangachal Terminal Electrification (STEL) project. bp has signed a Memorandum of Understanding (MoU) with the Azerbaijan government to swap solar-generated power from bp's Sunrise project (a photovoltaic power facility in Azerbaijan) for electricity supply to the terminal as a measure to decarbonise the facility[1]. Electrification of the terminal is planned for 2026.

In addition to the above, bp and SOCAR signed an MoU announcing bp's intention to join agreements on two exploration and development blocks in the Azerbaijan sector of the Caspian Sea (Karabagh, and Ashrafi-Dan Ulduzu) in September 2024 (bp, 2024). These areas are located to the north and northeast of ACG, see Figure 12.1. The schedule for exploration / development activities in these prospects is not currently known.

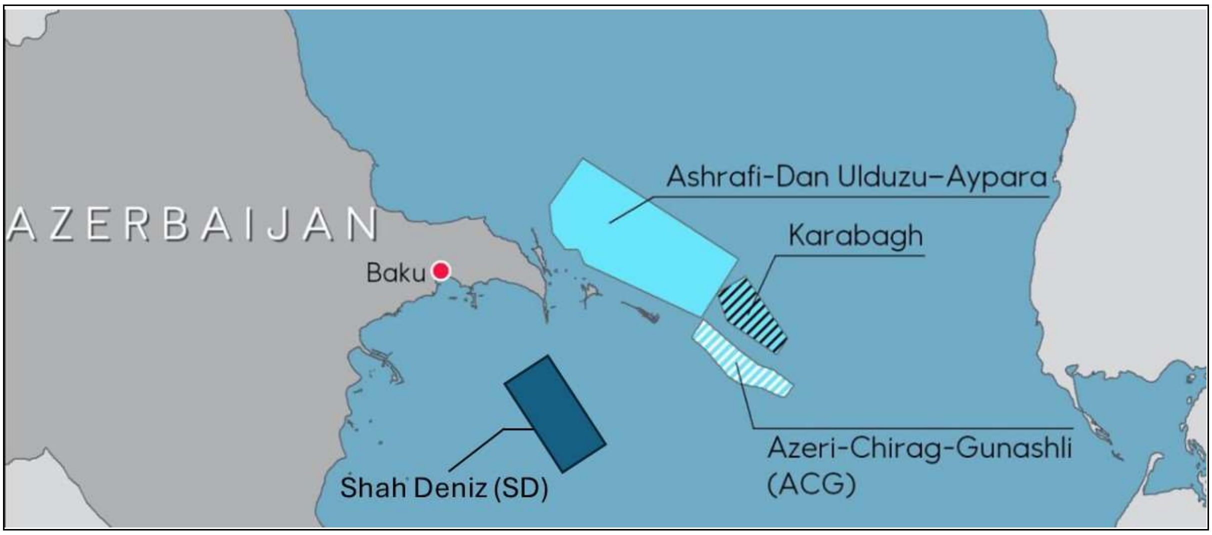

Figure 12.1: Approximate locations of SD and ACG Contract Areas, and Ashrafi-Dan Ulduzu and Karabagh prospective areas

Source: Adapted from Equinor, 2024

In terms of other operators, gas and condensate production has commenced in the Absheron Contract Area (operated by Joint Operating Company of Absheron Petroleum B.V) as part of the first stage of development. According to SOCAR's annual report for 2023, project participants plan to make a final investment decision by the end of 2024 to continue to the next stage (full field development) with first gas scheduled for the second quarter of 2029 (Interfax, 2024). The Absheron Contract Area is located between the Shah Deniz and ACG Contract Areas. As this field is operated by a third-party, the schedule for any further field development is not currently known.

Due to the uncertainties with regard to upcoming activities in the new MoU areas (and the distance of Karabagh and Ashrafi-Dan Ulduzu Blocks from the SD Contract Area), and uncertainties regarding third-party activities in the Absheron Contract Area, the cumulative assessment below focuses on potential cumulative effects with known activities in the SD and ACG Contract Areas and at Sangachal Terminal only.

[1] The scheme would supply solar-generated electricity from bp's Sunrise project to national power grid operator Azerenergy in the Jabrayil region. Azerenergy would then deliver the equivalent amount of electricity to bp's Sangachal Terminal (Upstream, 2024).

12.2.1 Approach to the cumulative assessment

The approach taken to assessing cumulative impacts between individual SDC project impacts focuses on assessing the potential temporal and geographic overlap between environmental impacts based on the current schedule (see Chapter 5: Section 5.2) and the results of any modelling assessments demonstrating the expected geographical extent of the impacts (refer to Chapter 9). A detailed assessment of environmental and social project impacts, based on expected activities and events, is presented in Chapters 9 to 11 of this ESIA. The assessment takes into account each activity and the existing controls and additional mitigation measures identified to minimise and manage impacts. An analysis of the potential for these impacts to overlap and result in additive or synergistic effects within the marine, terrestrial and social environments is presented in Sections 12.3 to 12.5 below with potential cumulative and transboundary impacts identified with emissions to atmosphere discussed in Sections 12.6 to 12.8.

The potential for cumulative impacts with other planned projects[2] has been determined based on a review of available information and taking into account geographic and temporal scope of the individual project impacts and hence the potential to result in cumulative impacts in combination with the SDC project impacts.

12.3 Marine Environment: Cumulative Impacts

12.3.1 Cumulative impacts between separate SDC project impacts

A detailed assessment of individual SDC project environmental impacts, based on expected activities and events, is presented in Chapters 9 and 10 of this ESIA. The assessment takes into account each activity and the existing controls in place to manage the impact. All impacts are considered to be minimised as far as practicable.

Potential environmental interactions will arise from the following SDC project activities and operations:

- infield pipeline and subsea (PFOC, spools, umbilicals, etc) installation (physical disturbance)
- infield pipeline commissioning (treated seawater discharges and hydraulic fluids from control commissioning)
- platform installation (physical disturbance)
- platform operations.

Physical disturbance associated with pipeline, subsea, and platform installation will be primarily restricted to the footprint of the infrastructure and the immediate surroundings. While the platform and infrastructure permanently occupy areas of the seabed, the area affected is small in the context of the SD Contract Area (less than 0.003%) and the Caspian Sea as a whole. Disturbance to benthic communities in the vicinity of the installation activities will be transient and localised and cumulative impacts are considered insignificant.

[2] The cumulative assessment does not take into account projects or facilities that are operational where their effects are captured within the existing baseline against which the SDC project impacts have been assessed. The assessment is focused on other proposed bp projects within the vicinity of the proposed SDC project, or those not operational when the baseline was established.

Discharges of chemically treated seawater associated with the cleaning and hydrotesting of the SDC infield pipelines will result in a number of discrete and intermittent discharge events occurring over a period of months and varying in volume between 0.4 and 6,416 m^3 see Chapter 5: Section 5.5.4. Modelling of the worst-case discharge events has confirmed that the discharge plumes will rapidly disperse in the water column and be largely undetectable within 500 m of the discharge location (refer to Chapter 9: Section 9.5.2). The larger discharge events (i.e. dewatering of infield pipelines) are distributed in space and time (dewatering of 32" gas export pipeline at SDB platform location and dewatering of 26" gas export pipeline at SDA platform location), and water quality impacts will not overlap. It is considered that there will be no cumulative interaction between these discharges, and no cumulative interaction with other impacts.

During routine SDC platform operations, there will be no discharge of sanitary waste, galley waste, cooling water, produced water, or fire water / firefighting foam. Discharges to sea from the platform are limited to those routed through the open drains caisson (deck drainage (rainwater) and wash down water) and small-scale pigging loop module valve discharges. There shall be no discharged to sea from the closed drains system. Routine discharges are small in volume and will have no persistent or cumulative effect.

Overall, it is considered very unlikely there will be cumulative impacts resulting from individual SDC project activities and interactions to the marine environment.

12.3.2 Cumulative impacts with other projects

Based on the findings of the SD2 Project ESIA (URS, 2013), SD2 offshore activities resulting in potential impacts to water column and seabed, such as the discharge of water based muds (WBM) and cuttings, underwater sound from drilling and vessels, and discharge of cooling water, were predicted to result in minor and localised impacts. Given the scale of the impacts anticipated, and the distance between the project activities (3 km between SDC and SDB platforms), it is considered very unlikely there will be cumulative impacts between the SDC project and SD2 project activities within the marine environment.

The same argument applies to the ACE project in the ACG Contract Area. Based on the findings of the ACE ESIA (AECOM, 2019), impacts to the marine environment are localised and unlikely to have cumulative effects with the SDC project which is approximately 100 km distant.

There are a number of seismic acquisition surveys scheduled in both the SD and ACG Contract Areas as part of long-term plans. While there is no bioaccumulation of sound in the marine environment, there is the potential for an additive effect if sounds from one activity coincide and overlap spatially and temporally with other concurrent activities. The main source of underwater sound from the SDC project is underwater piling which is anticipated to take a total of 10 days for the jacket pin piles (2.5 days per pile) around August 2026, and 20 days for the jacket skirt piles around March 2028. There is therefore the potential for cumulative underwater sound impacts if seismic survey activities (particularly in the Shah Deniz Contract Area) are being carried out concurrently.

The exact timing of seismic survey activities in the SD and ACG Contract Areas are not currently known. As part of bp's simultaneous operations (SIMOPs) planning, seismic survey activities in the Shah Deniz Contract Area will not be conducted at the same time as the piling activities for the SDC project in order to mitigate the potential for underwater sound cumulative impacts on marine fauna.

12.4 Terrestrial Environment: Cumulative Impacts

12.4.1 Cumulative impact between separate SDC project impacts

Air emissions and noise will be generated at the onshore construction yards and along the onshore SDC PFOC installation route. Air and noise screening conducted for these sites shows that the potential for cumulative impacts is negligible due to the distance between them and the localised zones of impact.

12.4.2 Cumulative impacts with other projects

The works for the upcoming Sangachal Terminal Electrification (STEL) project will be carried out at the terminal prior to installation of the onshore section of the SDC PFOC by the national grid operator Azerenergy. The positive cumulative effects on greenhouse gas emissions are discussed in Section 12.8.

Although other onshore projects are planned in Garadagh district by third parties (see Chapter 11: Section 11.3.2), there is not enough information on activities and scheduling for cumulative impacts to be assessed.

12.5 Social Environment: Cumulative Impacts

12.5.1 Cumulative impact between separate SDC project impacts

A detailed assessment of individual SDC project social impacts, based on expected activities and events, is presented in Chapter 11 of this ESIA. The assessment takes into account each activity and the existing controls in place to manage the impact. No requirement for additional mitigation was identified and all impacts were considered to be minimised as far as practicable.

The expected activities and events that may result in a cumulative social impact from different components of the SDC project are:

- a rise in employment opportunities during the construction phase
- a rise in economic flows from the use of major construction and installation contractors and their associated supply chain network of companies
- an increase in road traffic on the Baku-Alat Highway associated with the onshore construction yards and onshore PFOC installation activities.

12.5.1.1 Employment

The estimated employment levels associated with the SDC project construction phase are outlined in Chapter 5: Section 5.12. In summary it is estimated the project will generate a workforce demand of:

- up to 1,300 workers at the onshore construction yard used to fabricate the jacket and subsea equipment which is expected to peak during the first half of 2027
- up to 1,200 workers at the topside onshore construction yard, which is expected to peak in 2027 and early 2028

- up to 150 workers for the onshore PFOC installation, which is expected to peak in 2028.

During the operational phase only a limited number of maintenance personnel will be employed by the project as the SDC platform is unattended.

While almost all of the jobs associated with the SDC project will be temporary, workers will be provided with an opportunity to develop their skills and experience during their employment. This will be achieved through implementation of the Employee Relations Management Plan (ERMP) and formal training activities.

It is considered that appropriate measures are in place to appropriately maximise the positive cumulative impacts associated with employment.

12.5.1.2 Economic flows

The SDC project is expected to increase economic flows at a regional (Baku City economic region) and national level through increased employment and the procurement of goods and services. This is expected to occur from the use of different construction and installation contractors at the same time during the construction phase. The increase in economic flows is expected to contribute at a regional level, to social development and improvement in social infrastructure.

12.5.1.3 Increased traffic on the Baku-Alat Highway – congestion

The Baku-Alat Highway is the main traffic route in the local area and is expected to be used by traffic associated with the construction contractors working at the onshore construction yards, and by the onshore PFOC installation contractor. There is the potential for increased traffic on the Baku-Alat Highway to cause disruption to other road users from increased congestion, particularly during 2027 when both yards and onshore PFOC installation activities overlap.

bp and its main construction contractors have implemented successful driving and vehicle management plans during the previous SD and ACG projects. All of the main construction and installation contractors will implement a Traffic and Transportation Management Plan, one of the aims of which will be to minimise impacts to road users and ensure that adherence to bp's strict procedures associated with vehicles and safe driving are enforced. The Traffic and Transportation Management Plan will be subject to regular review and update and will take into account any changes in traffic flows or routing issues during the SDC project duration. Further details on construction traffic are provided in Chapter 11: Section 11.2.3.

Considering the use of the Traffic and Transportation Management Plan, the contribution of the SDC project to potential traffic impacts are minimised as far as possible.

12.5.2 Cumulative impacts with other projects

It is considered that the social cumulative impacts that may arise as a result of the SDC project in combination with the SD2 project and ACE project (where construction and installation activities are complete) and STEL (which will use a minimal workforce within the terminal boundary and will mostly be completed by Azerenergy or their subcontractors) are very limited.

12.6 Atmosphere: Cumulative impacts associated with non-greenhouse gas atmospheric emissions

Non-greenhouse gas (non GHG) emissions will be generated from each SDC project phase due to:

- operation of combustion plant (during construction and installation)
- operation of vessels (during construction and installation and to a lesser extent during operation)
- operation of helicopters (crew transfer during offshore construction and installation)
- volatile materials used during construction (e.g. paints and solvents).

Figure 12.2 presents the volumes of non GHG emissions comprising nitrogen oxides, sulphur oxides, carbon monoxide and non-methane hydrocarbons for each phase of the SDC project.

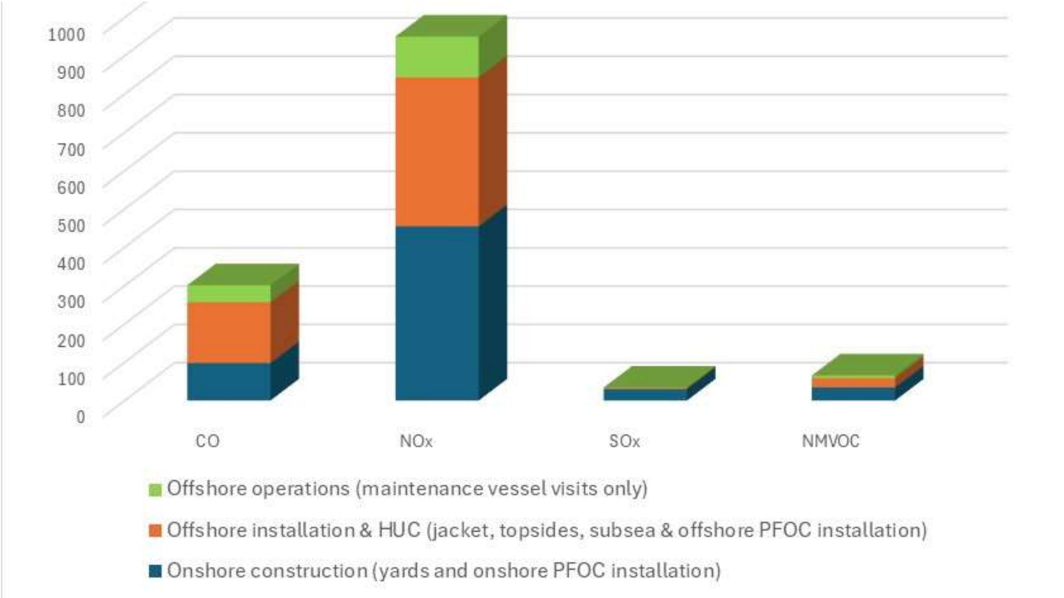

Figure 12.2: SDC project non GHG emissions per project phase (tonnes)

12.6.1 Cumulative impact between separate SDC project impacts

Air screening has been completed for emissions to atmosphere during SDC onshore construction and commissioning activities at the construction yards, and during onshore PFOC installation. No exceedance of the assessment criteria (derived from national and international standards / guidelines) is predicted at receptors in the vicinity yards or the PFOC installation route. Contour plots illustrating the dispersion profile of nitrogen dioxide (considered most significant pollutant in terms of health impacts) showed that NO_2 plumes are localised to each site, and due to the distance between the yards and the onshore PFOC installation route at Sangachal Terminal, no cumulative impacts on receptors (onshore community) are anticipated.

Emissions associated with vessels that will be used throughout all SDC project phases will rapidly disperse in the offshore environment with no cumulative impacts anticipated.

Emissions during platform operation are small-scale due to the lack of combustion plant (see Figure 12.2). As SDC will be powered by electricity from the shore, no generators will be present on the platform. Non-GHG emissions during operations phase are generated by the maintenance vessel and maintenance activities only.

12.6.2 Cumulative impact with other projects

As ACE and SD2 construction and installation activities are complete, non-GHG emissions from operations phase only are considered here.

Modelling conducted as part of the ACE ESIA (AECOM, 2019) found that NO_x emissions from simultaneous operation of both the ACE and SDB platforms resulted in an increase in NO_x concentrations at onshore receptors of less than 0.1 µg/m^3. The study concluded that during routine operations, NO_x emissions are predicted to disperse rapidly and the increase in long term and short term NO_x concentrations due to ACE and SD2 offshore operations are likely to be indiscernible from background levels at all onshore receptors.

As NO_x emissions from offshore operation of the SDC facilities (total of 53 tonnes) are significantly smaller than the operational emissions from SD2 and ACE[3] due to the lack of combustion plant on the platform, no cumulative impacts on onshore receptors are anticipated.

12.7 Atmosphere: Transboundary impacts associated with non-greenhouse gas atmospheric emissions

The potential for transboundary impacts associated with non GHG emissions are dependent on the environmental / health effects associated with the pollutant, residence time (i.e. atmospheric lifetime) and the expected dispersion characteristics of the pollutant in the atmosphere in addition to the location of potential receptors.

The most significant pollutant in terms of health impacts is NO_2. Modelling of onshore NO_2 emissions from the yards, and onshore PFOC installation, show only localised effects with no potential for transboundary impacts.

Offshore NOx emissions from platform operation are not anticipated due to the lack of combustion plant on the platform. NOx emissions associated with vessels that will be used throughout all SDC project phases will rapidly disperse in the offshore environment with transboundary impacts not anticipated.

12.8 Atmosphere: Cumulative and transboundary impacts associated with greenhouse gas atmospheric emissions

Greenhouse gas (GHG) emissions will be generated from each SDC project phase due to:

- operation of combustion plant (during construction and installation)
- operation of vessels (during construction and installation and to a lesser extent during operation)
- operation of helicopters (crew transfer during offshore construction and installation)

[3] ACE project NOx emissions for offshore operations estimated at 32,055 tonnes.

- fugitive emissions and maintenance venting (during offshore operation).

GHG emissions are inherently cumulative, as all emissions have the same impact on the same ultimate receptor. The impact is climate change, or global warming, caused by the radiative forcing effects of GHGs in the atmosphere. The affected receptor is the global climate (hence it is also a transboundary issue) and all the ecosystems and biomes that depend on it.

Climate scientists predict impacts based on global emission scenarios – the balance of GHGs emitted and absorbed (fixed or stored) over a defined period – and the resultant changes in levels of GHG concentrations in the atmosphere. It is impracticable to attribute a particular impact to a particular emission. Global efforts to mitigate climate change are primarily based on reducing net emissions of GHGs on a burden-sharing basis among nations.

The Republic of Azerbaijan actively participates in the implementation of the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol, and the Paris Agreement. In addition, the 2024 UN Climate Change Conference (UNFCCC COP 29) was held in November 2024 in Baku, Azerbaijan.

In October 2023, Azerbaijan submitted its revised Nationally Determined Contribution (NDC) and committed to a 40% reduction in GHG emissions by 2050, compared to 1990 levels, conditional on international support (Republic of Azerbaijan, 2023).

12.8.1 Cumulative impact between separate SDC project impacts

The concept of emission 'scopes' is defined by the GHG Protocol (2004), as follows:

- Scope 1 emissions are those that occur directly from sources owned or controlled by a defined entity.
- Scope 2 emissions are those that occur due to the import of energy (electricity or heat) to that entity. These occur at the place where that energy is generated, e.g., a power station. They are therefore termed indirect emissions.

Expected GHG emissions from SDC project activities (which include carbon dioxide and methane) are presented in Chapter 5 of this ESIA for all phases of the SDC project.

Scope 1 SDC project emissions

In terms of Scope 1 emissions (see Figure 12.3), platform and subsea offshore installation and HUC activities are the largest proportion of the GHG emissions (66%), this is mainly due to the limited direct GHG emissions generated during SDC operations phase. Total SDC project Scope 1 emissions are estimated at 147 ktonnes CO_2 equivalent (114 ktonnes CO_2 equivalent for construction phase, and 33 ktonnes CO_2 equivalent operations phase).

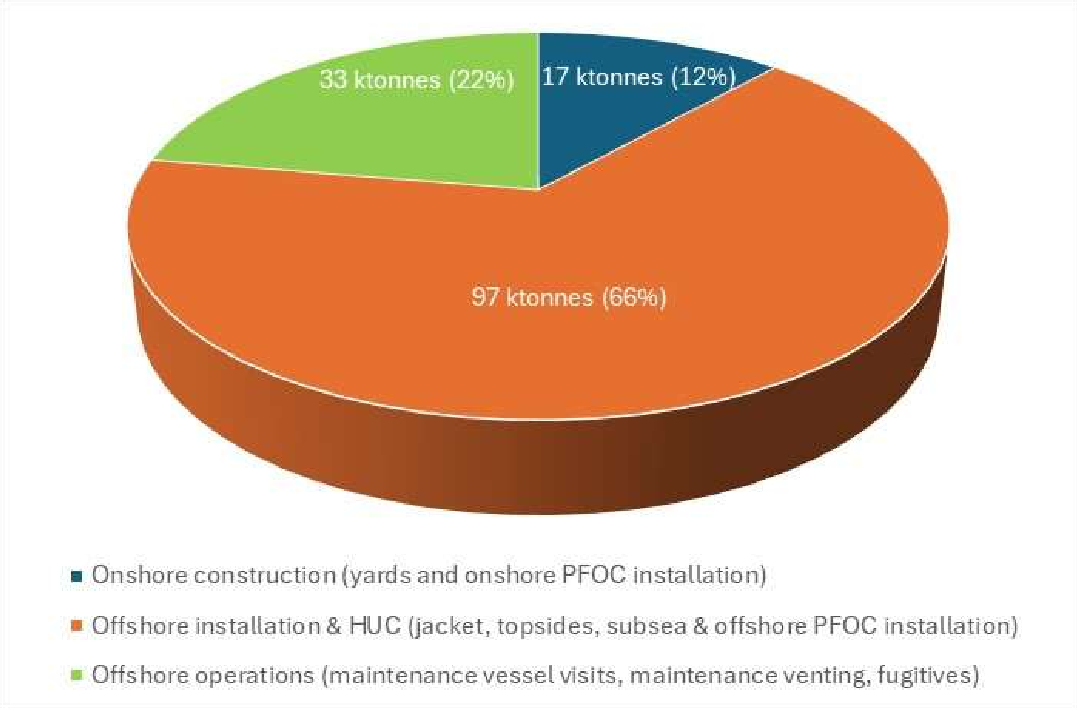

Figure 12.3: SDC project Scope 1 GHG emissions generated for each project phase (ktonnes CO_2 equivalent)

Scope 2 SDC project emissions

The electrical power demand of the SDC platform during operations phase will be met by utilising existing overhead lines feeding Sangachal Terminal from the national grid operated by Azerenergy, with a PFOC out to the platform. The Scope 2 emissions associated with this import of electricity are provided in Chapter 5: Table 5.22 (Chapter 5). Total SDC project Scope 2 emissions are estimated at 2,387 ktonnes CO_2 equivalent throughout the project lifetime.

Total SDC project operational GHG emissions

The total of SDC Scope 1 and 2 operational GHG emissions is 2,420 ktonnes CO_2 equivalent (33 ktonnes CO_2 equivalent Scope 1 operations phase, and 2,387 ktonnes CO_2 equivalent Scope 2 operations phase). Figure 12.4 presents the average annual SDC GHG emissions during the operations phase, compared to the annual bp Azerbaijan Operations GHG emission volumes for 2023. Figure 12.4 demonstrates that the SDC Project will contribute approximately 3% of the annual operational GHG emissions from bp's activities in Azerbaijan (based on GHG emissions data from 2023).

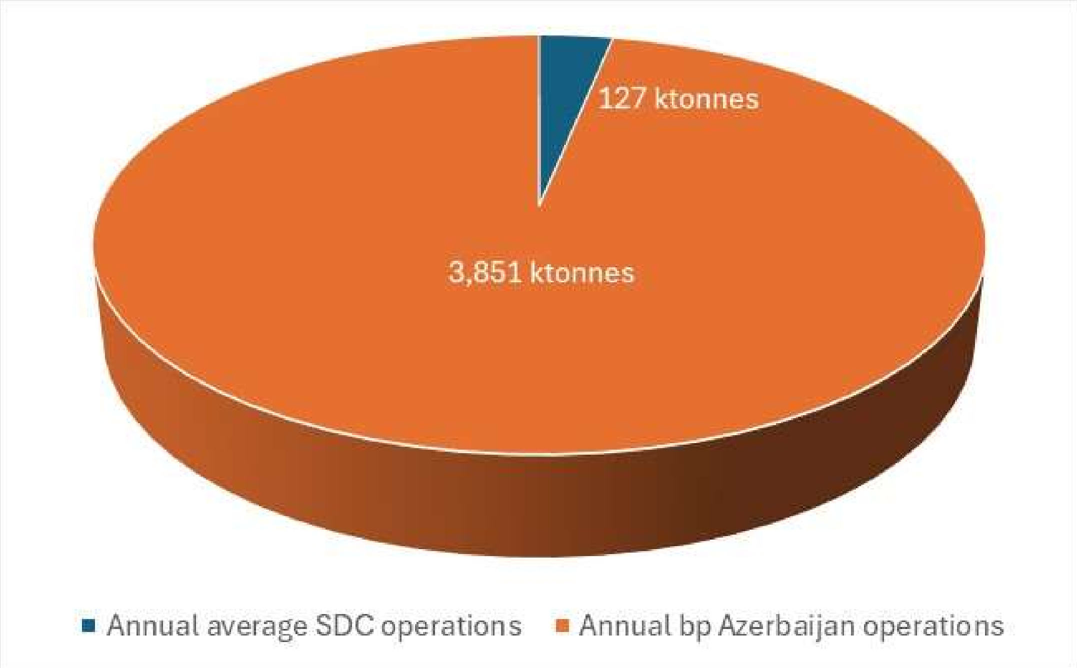

Figure 12.4: bp Azerbaijan annual operations GHG emissions (2023) and average annual SDC operations GHG emissions (forecast Scope 1 and 2) (ktonnes CO_2 equivalent)

The most recently published GHG emissions data for Azerbaijan estimated a total of 61.257 million tonnes of CO_2 equivalent were emitted in 2016, 79% of which was estimated to be generated by the energy sector (Republic of Azerbaijan, 2023). Total GHG emissions for 2030 were forecast to be approximately 76,800 kt assuming a business as usual case (MENR, 2021). As a proportion, the estimated GHG emissions for the SDC project for 2030 are expected to contribute only around 0.2% to the national total.

12.8.2 Conclusion

As described in Chapter 4, during optimise stage efforts were made to simplify the SDC platform and align the project with bp's Net Zero Aim 1, which envisages bp becoming net zero across its operations by 2050 or sooner. As a result operational Scope 1 GHG emissions are very low due to the fact that there is no power generation on the SDC platform, no firewater pumps, and no flare.

Scope 2 emissions need to be taken into account when considering cumulative GHG emission impacts. However, it should be noted that total operational GHG emissions from the SDC project (Scope 1 and Scope 2) are still considerably lower than those associated with bp's previous development projects, and only represent a very small percentage of Azerbaijan's national total.

There is a drive to reduce the carbon footprint of bp operations, and current regional projects such as bp's solar Sunrise project (see Section 12.2) and the Sangachal Terminal Electrification (STEL) project (which aims to electrify Sangachal Terminal and establish a framework to operate the terminal without direct or indirect CO_2 emissions) are all part of this drive (bp Exploration (Caspian Sea) Ltd, 2023c). The SDC project is aligned with bp's aims and has been designed to maximise synergies with the STEL project.

For both non GHG emissions and GHG emissions, monitoring and reporting procedures and documentation requirements for each SD and ACG project are included within BP Azerbaijan's Health, Safety, Security and Environment (HSSE) Policy. Once operational, the SDC project will implement a set of specific monitoring, management and reporting procedures based on and consistent with the procedures already in use on existing SD platforms.

12.9 Accidental Events

Accidental events are considered separately from routine and non-routine activities as they only arise as a result of a technical failure, human error or as a result of natural phenomena such as a seismic event. High operational performance and compliance with good industry practices will be maintained at all times by bp and their contractors. However, as with most projects of this nature, a low probability of an accidental event does exist.

Feasible accidental event scenarios for the SDC project have been identified and are limited to:

- project vessel collision with other marine users or Caspian seals
- release of chemicals / waste from a project vessel or SDC platform (e.g., transformer chemicals)
- hydrocarbon spills associated with project vessels (e.g. small spills resulting from refuelling, large spill of diesel resulting from a project vessel collision).

Due to the limited hydrocarbon inventory on the SDC platform, an accidental hydrocarbon release scenario from this facility is not considered. In addition there will be no condensate within the SDC infield pipelines.

12.9.1 Vessel collision

There is potential of a collision between SDC project vessels and other non-project related vessels during the construction and operational phases of the SDC project. However, it should be noted that no commercial shipping lanes cross the Shah Deniz Contract Area. The majority of shipping in the area consists of vessels servicing the existing SD platforms, using bp recommended routes, with crew that are familiar with the maritime and navigation safety measures outlined in Chapter 11: Section 11.2.5. The likelihood of a collision between vessels is therefore considered to be very low. However, in the event of a collision there is the potential for significant impacts on other marine users and infrastructure depending on the scale and nature of the collision.

Although unlikely, the potential for collision of a project vessels with a Caspian seal cannot be excluded and may cause injury or a lethal outcome. However, the Caspian seal is a highly mobile animal and will rapidly move away from any disturbance or sound and consequently the collision risk is considered to be extremely low. The project will comply with bp's internal environmental recommendations[4] which state that project vessels should immediately reduce speed and change course to avoid the imminent risk

[4] Group Recommended Practice 3.6-0001 Environmental and Social Recommendations for Projects.

of collision with a marine mammal, unless doing so poses an unacceptable risk in the opinion of the master of the vessel. Project vessels underway at night and during periods of low visibility will adhere to appropriate speed restrictions so as to minimise the potential risk of collision with marine species. Project vessels will not intentionally approach Caspian seals for the purposes of casual viewing, or feeding.

12.9.2 Release of chemicals / waste

Due to the nature of the SDC platform (it being an electrically powered Normally Unattended Installation) there will be little in the way of chemical storage on the facility and only small volumes of waste generated, with no permanent waste storage.

There will be four electrical transformers on the platform (2 x 40 MVA transformers containing approximately 15 m^3 of transformer fluid each, and 2 x 3.15 MVA transformers containing 2 m^3 of transformer fluid each). The transformer oil will be a synthetic ester. The transformers will be located in a kerbed area to provide secondary containment. Synthetic ester transformer oil is generally readily biodegradable in the marine environment and ecotoxicity testing of this product will be carried out prior to its use. Modelling of synthetic ester transformer fluid for bp's Shah Deniz Alpha Power (SDAP) project considered a release of 7 m^3. In this instance the discharge plume reached a 'no effect' concentration within 8 m of the discharge point.

All chemicals on the SDC platform, and on project vessels, will be labelled and stored appropriately in areas with secondary containment. Waste generated during the SDC project be managed in accordance with the existing AGT Region management plans and procedures.

The likelihood of an accidental release of chemicals or waste to the marine environment is considered to be very low, given the small volumes under consideration, and the control measures in place. In the unlikely event of loss of containment and release of hazardous substances overboard, the AGT Region spill reporting procedures described within Section 12.9.4 will be followed.

12.9.3 Hydrocarbon spills and releases

12.9.3.1 Spill of diesel

Small-scale spills of hydrocarbons are most likely to occur whilst refuelling / bunkering, or result from inadequate storage facilities. Spill volumes for this kind of unforeseen event are typically small, ranging from a few tens of litres of diesel, to the unlikely event of a decoupling of the fuel supply line (potentially up to 200 m^3).

In terms of a large-scale release, the most feasible scenario would be the loss of vessel diesel inventory to sea as a consequence of holing of a project vessel in a collision. However, these kinds of events are rare due to the navigational systems onboard and the environmental procedures in place on the survey vessels.

The Allianz Safety and Shipping Review found that ship collisions represented 12% of all shipping incidents in 2018, and that the likelihood of such an incident was extremely low (Allianz, 2024). The likelihood that such an incident would result in a loss of the vessel's fuel inventory is even lower, as a high-energy collision would be required to damage a vessel to such an extent that fuel tank integrity is compromised releasing its content into the sea. Fuel on vessels is typically stored in a series of small tanks which are double bottomed and connected by valves and it is unlikely that contents of all the tanks would be lost simultaneously in the event of a collision.

12.9.3.2 Fate of hydrocarbons in the marine environment

The key processes that govern the fate of hydrocarbons at sea are shown in Figure 12.5. When oil is released into the marine environment it undergoes a number of physical and chemical changes as a result of evaporation, dissolution, dispersion, emulsification, sedimentation, photo-oxidation and biodegradation processes, collectively known as weathering. These changes are dependent upon the type and volume of oil spilt and the prevailing weather and sea conditions.

Diesel fuel is a light, refined petroleum product and spreads very quickly to a thin film of rainbow and silver sheens when spilled on water. Evaporation and dispersion are the two main mechanisms that act to remove diesel type fuels from the sea surface, whilst oxidation and biodegradation break down hydrocarbons into basic elements over a longer time period. Diesel is readily dispersed into the water column when wind speeds reach 5 to 7 knots, or the sea state is approximately Force 2 Beaufort scale or higher. It is much lighter than water, therefore it is not possible for the diesel to sink and accumulate on the seabed as pooled or free oil. However, diesel may be physically mixed into the water column by wave action, forming small droplets that are carried and kept in suspension by the currents. Diesel dispersed in the water column can adhere to suspended sediments, which then settle out and are deposited on the seabed. This process is more likely to occur in near shore areas or river estuaries rather than in the open marine environment.

Compared to unrefined crude oils, diesel is not sticky or viscous. When stranded on the shoreline, diesel tends to penetrate porous sediments quickly whereas if it is deposited on hard surfaces, it will be quickly washed off by wave action.

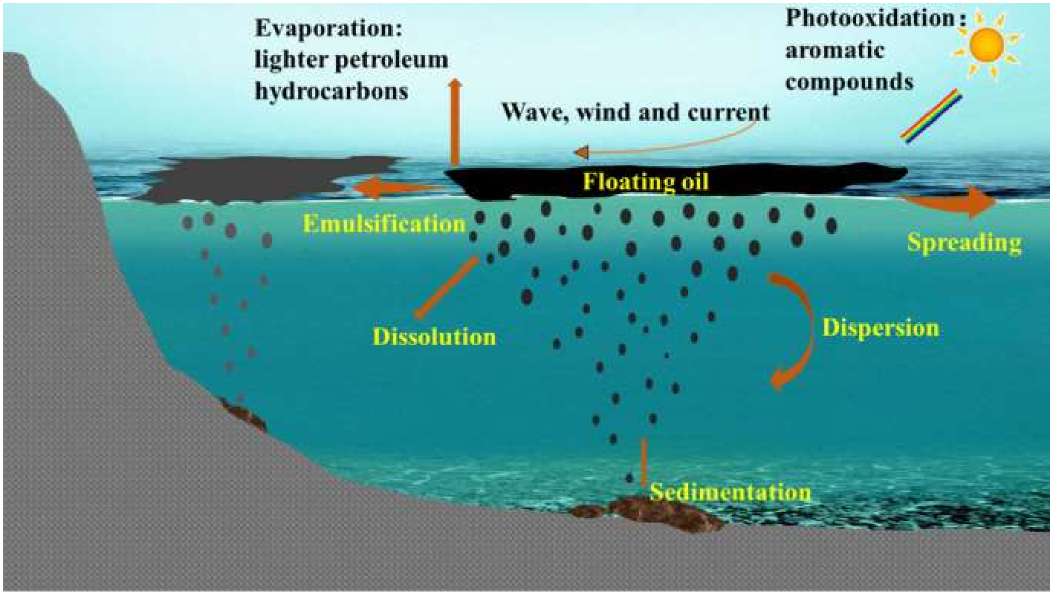

Figure 12.5: Weathering process acting on spilled hydrocarbons

Source: Wang et al., 2020

12.9.3.3 Spill modelling

A diesel spill scenario of 350 tonnes (approximately 400 m^3) was modelled in the Shah Deniz Contract Area as part of the SDX-NF1 drilling project (winter conditions modelled as considered worst-case scenario). The impact of the diesel was restricted to the vicinity of the release point (see Figure 12.6), with no shoreline impacts. After 16 hours 183 m^3 of the diesel had evaporated and 212 m^3 had dispersed (BMT Cordah, 2008).

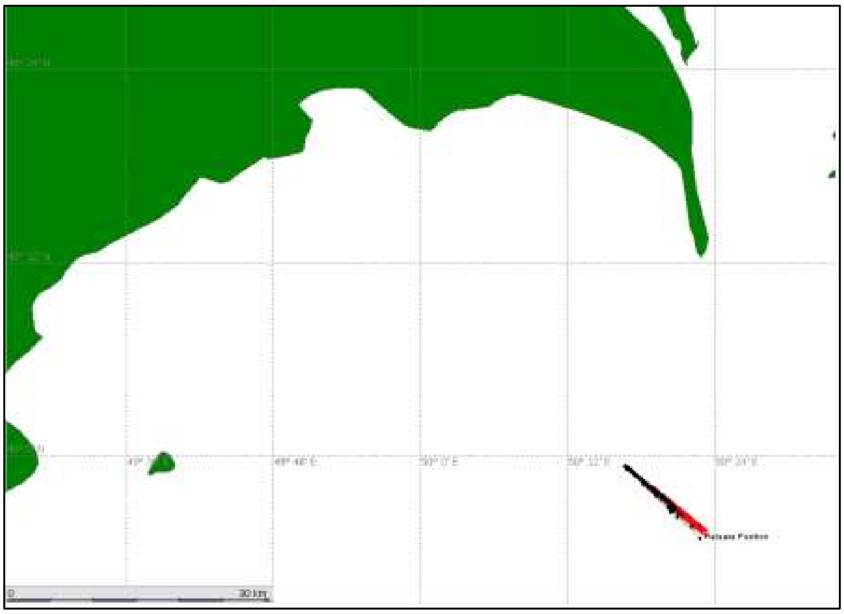

Figure 12.6: Trajectory modelling of an instantaneous release of diesel from loss of a diesel tank on a project vessel

Source: BMT Cordah, 2008

Similarly, a diesel spill scenario of 123 m^3 was modelled in the Shah Deniz Contract Area as part of the Shah Deniz 2 project.

The modelling indicated that the diesel fuel released would rapidly spread out to form a thin sheen on the sea surface. The area of sea surface covered by a film of diesel of 5 μm or thicker was approximately 13 km^2 in winter and 42 km^2 in summer, see Figure 12.7 and Figure 12.8. It should be noted that the figures do not represent the size of the slick, but is the maximum thickness that occurs at any one point during the simulation.

Over time the released diesel was lost from the sea surface by evaporation into the air or by natural dispersion into the water column and then biodegraded. Figure 12.9 presents the fate of the relative proportions of the diesel for both winter and summer conditions. The modelling showed that all of the diesel released would be removed from the sea surface by these processes within approximately 2 days in winter and 1.5 days in summer.

The concentrations of naturally dispersed diesel in the water column were shown to reach a maximum of around 1 ppm, which declined to less than 25 ppb dissolved in the water column within 48 hours under both summer and winter conditions (URS, 2013).

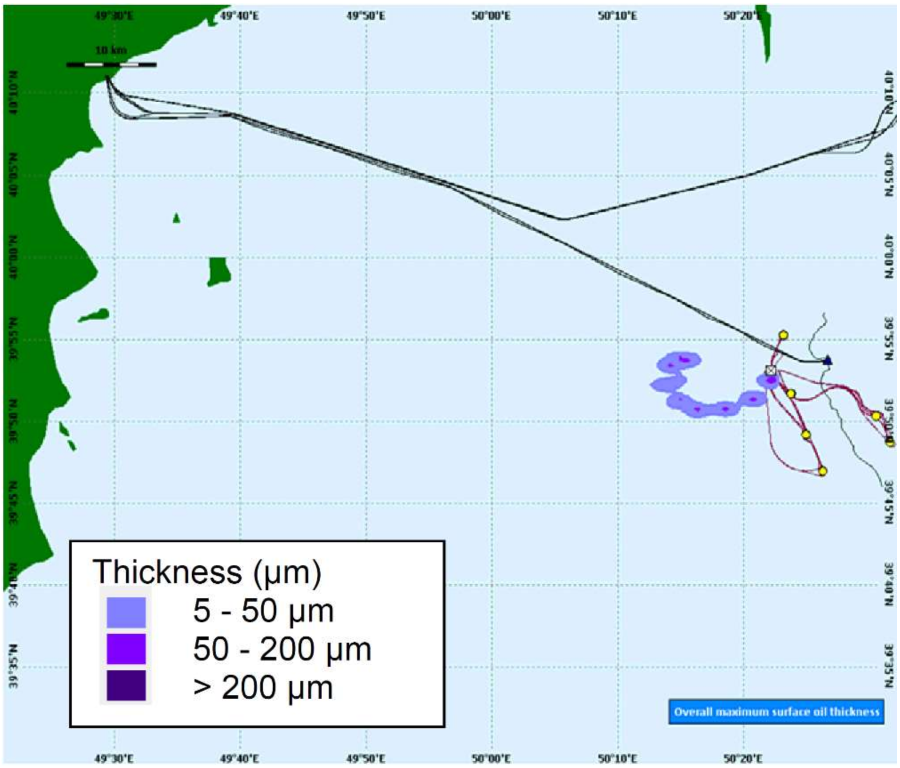

Figure 12.7: Maximum time-averaged thickness of diesel on the sea surface (winter)

Source: URS, 2013

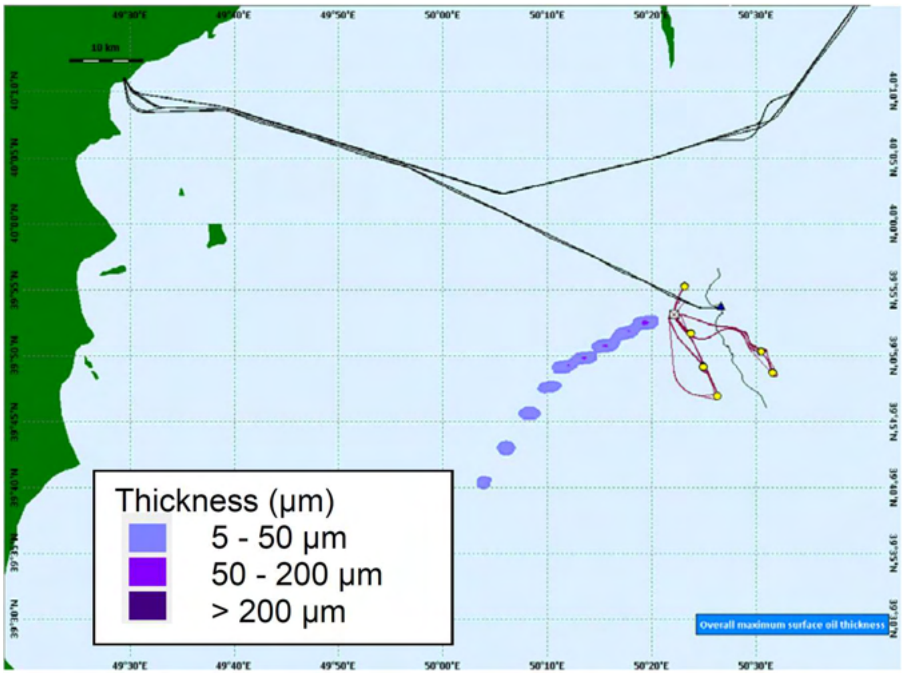

Figure 12.8: Maximum time-averages thickness of diesel on the sea surface (summer)

Source: URS, 2013

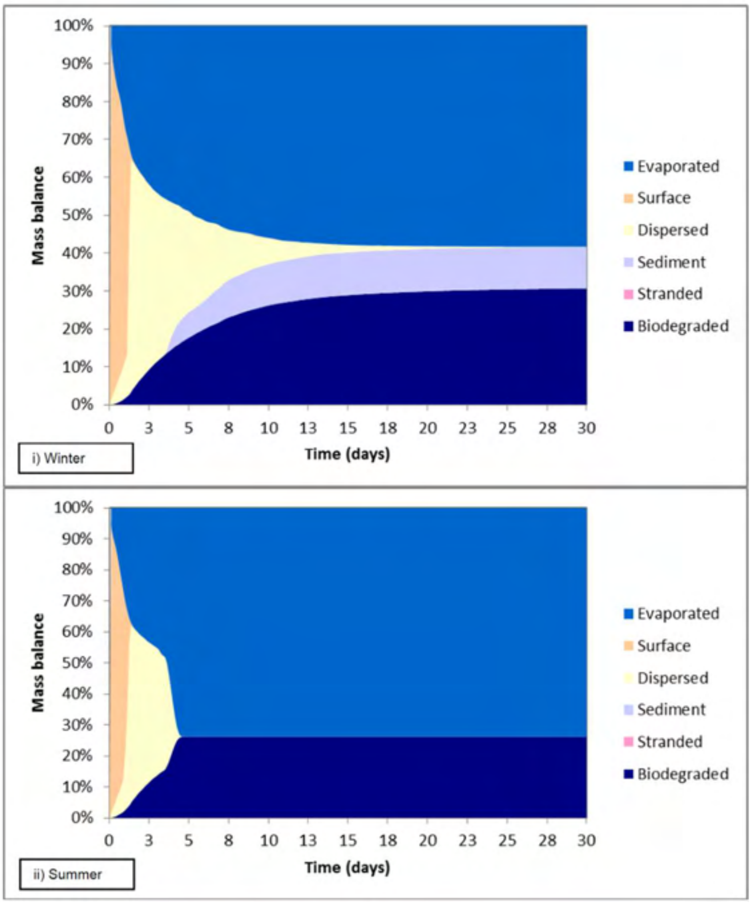

Figure 12.9: Fate of diesel released for i) winter and ii) summer conditions

Source: URS, 2013

12.9.3.4 Potential impact of a hydrocarbon release

Hydrocarbons have the potential to cause detrimental effects to water and sediment quality, marine flora and fauna, including plankton, benthic invertebrates, fish, birds and marine mammals that may come into contact with a spill. An impact on fisheries and an indirect impact on human health via the food chain is also possible, depending on the scale of the spill and its proximity to fishing grounds. The vulnerability of marine and coastal receptors to hydrocarbon spills is summarised in Table 12.1.

Table 12.1: Vulnerability of marine and coastal receptors to hydrocarbon spills

Receptor	Vulnerability to hydrocarbon spills
Plankton	• Abundance of phytoplankton may increase after a hydrocarbon spill due to increased nutrient availability, while zooplankton, fish larvae and eggs may suffer increased mortality due to toxicity in the water column, and therefore can affect the food chain of other fish species. • Although localised mortality is likely, the overall effect on plankton communities is not statistically significant and generally short-term. Following a spill, plankton biomass may fall, however, after a few weeks, population often returns to baseline levels as a result of high reproductive rates and redistribution of species from outside the affected area.

Receptor	Vulnerability to hydrocarbon spills
Benthic invertebrates	• Effects on the benthos include acute toxicity and organic enrichment. Offshore impacts are typically minimal, and influenced by water depth and local hydrography. Sub-tidal regions generally have lower hydrocarbon concentrations after a spill than inter-tidal regions as often the hydrocarbon is carried and spread at the sea surface. Recovery times are variable, and for light hydrocarbons are generally in the region of a few months to a few years. • Impacts can include rapid mortality of sensitive species such as crustaceans and amphipods; a period of reduced species population and abundance; a period of altered community structure with increased abundance of opportunistic species.
Seagrass beds	Hydrocarbon spills may affect seagrass beds either by direct smothering, or by the toxic effects of the water soluble fraction of oil. Petroleum products can damage seagrass ecosystems in a variety of ways, including: • Direct mortality of organisms due to smothering leading to reduced growth rates, blackened leaves and mortality • Direct mortality due to asphyxiation or poisoning • Photosynthetic stress • Indirect mortality due to the death of food sources or the destruction or removal of habitat • Destruction of juveniles using seagrass beds as a nursery ground • Incorporation of sub-lethal amounts of petroleum fractions into body tissues, potentially lowering tolerance to other stresses.
Fish	• Evidence suggests that fish are able to detect and avoid hydrocarbon-contaminated waters. This avoidance may cause disruption to migration or spawning patterns. • Hydrocarbon exposure in fish can lead to mortality or sub-lethal impacts on growth, physiology, behaviour and lowered disease resistance. • Fish populations are more sensitive to hydrocarbon pollution in shallow waters than in deep waters, with hydrocarbon concentrations being typically higher in the upper column. • Fish may ingest large amounts of hydrocarbons through their gills. Fish that have been exposed to hydrocarbons may suffer from changes in heart and respiratory rate, enlarged livers, reduced growth, fin erosion and a variety of effects at biochemical and cellular levels. Hydrocarbon toxicity can also affect reproductive capacity negatively and/or result in deformed fry. • Fish eggs and larvae are more vulnerable to hydrocarbon pollution than adults. In many fish species, these stages float to the surface where contact with spilt hydrocarbons is more likely. However, as most fish species have extensive spawning grounds and produce large numbers of eggs, there is unlikely to be any effect on numbers in the adult populations. Stocks may be at risk from a spill if it is large and coincides with spawning periods. • Longer term impacts of a hydrocarbon spill have shown genetic damage, physical deformities, reduced abundance and growth, and compromised survival of some life stages.

Receptor	Vulnerability to hydrocarbon spills
Seals	• Seals are very vulnerable to hydrocarbon pollution because they spend much of their time on or near the surface of the water. They need to surface to breathe, and regularly haul out onto beaches. During the course of a hydrocarbon pollution incident, they are at risk both when surfacing and when hauling out. • Seals may be damaged through the ingestion of food contaminated by hydrocarbons or the inhalation of hydrocarbon droplets and vapours. Oil, especially light oils and hydrocarbon vapours, will attack exposed sensitive tissues. These include mucous membranes that surround the eyes and line the oral cavity, respiratory surfaces, anal and urogenital orifices. This can cause corneal abrasions, conjunctivitis and ulcers. Consumption of contaminated prey can lead to the accumulation of hydrocarbons in tissues and organs.
Birds	• The spilled hydrocarbon can penetrate the plumage of sea birds, reducing its insulating ability, and making them more vulnerable to temperature fluctuations and much less buoyant in the water. This can lead to death from hypothermia or drowning. • In their efforts to clean themselves from hydrocarbon, birds may inhale or ingest the hydrocarbon. As hydrocarbons are toxic, this may result in serious injuries / health effects such as pneumonia, congested lungs, intestinal or lung haemorrhage, liver and kidney damage. • Hydrocarbons may also affect reproductive success as hydrocarbons from feathers of a bird that is laying on eggs may pass through the pores in the eggshells and either kill the embryos or lead to malformations.
Fisheries	• Fish exposed to hydrocarbons may become tainted, defined as giving the product a petroleum taste or smell. Commercial fish species rarely become tainted in open deep waters, as they are able to avoid the affected area. However, major spills can result in loss of fishing days and exclusion zones and bans on certain species lasting for a whole season may be enforced.

Sources: NOAA, 2024; IPIECA, 1997; ITOPF, 2011

Plankton

The spill modelling indicates that for a diesel release the concentrations of diesel in the water column above the 58 ppb threshold[5] are limited in extent from the point of release and not expected to persist for longer than 2 days. The exposure of plankton (excluding fish larvae) to toxic levels of hydrocarbons from a possible spill is expected to be short term and localised based on the modelling results.

Plankton (particularly zooplankton, fish larvae and eggs) are likely to suffer high levels of mortality through exposure to hydrocarbons. However, plankton already experience very high levels of natural mortality, predominantly the result of predation. Plankton are generally short-lived, rapidly reproducing often releasing very high numbers of eggs

[5] Research completed by Statoil (2006) and Det Norsk Veritas (2008) resulted in the development of species sensitivity dose-response curves to assess the impact to organisms from different water column hydrocarbon concentrations. A 5th percentile LC50 1 for total hydrocarbon concentrations was found to be 58 ppb. This value of 58 ppb is used within the modelling as the lower threshold for potential acute toxicological responses and concentrations below this threshold are not reported from OSCAR.

and/or larvae and are also widely distributed, so that recovery, even from significantly detrimental impacts, can be relatively short (weeks or months) (ITOPF, 2011).

During the peak period of phytoplankton production (spring and autumn) the biomass exposed to a hydrocarbon spill would increase resulting in reduced growth levels and mortality. However, this is not expected to be significant in comparison to the total production level over the long term. Zooplankton may also suffer mortality as a result of a hydrocarbon spill, but the large number of early life stages produced and short reproductive cycles, will act as a buffer for recruitment from areas outside the spill affected region. Thus, plankton concentrations are expected to return to baseline levels after a relatively short period of time. As a result, the overall impact on the plankton communities is not considered to be significant.

Benthic invertebrates

As detailed in Chapter 6: Sections 6.6.3 and 6.7.1, the benthic community throughout the SD Contract Area and at the proposed SDC platform location is not expected to support any species of conservation significance. Nevertheless, benthic communities do play an important role in supporting critical functions of the local ecosystem, particularly as prey items for other species, including fish such as sturgeon. There are a number of taxa that are important prey e.g. amphipod crustaceans, which are known to be sensitive to hydrocarbons.

As shown in Figure 12.9, a release of diesel associated with the SDC project is predicted to result in none of the spilled diesel ending up in sediments in the summer simulations and just over 10% in the winter simulations, thus benthic environments are less likely to suffer the impacts of a surface hydrocarbon spill.

Potential impacts to the benthic invertebrates can include: (i) rapid mortality of sensitive species such as crustaceans, amphipods, and bivalves; (ii) a period of reduced species population and abundance and (iii) a period of altered community structure with increased abundance of opportunistic species.

Given the water depths in the vicinity of the SDC platform (approximately 85 m), it is unlikely to be a spill in this area would give rise to highly significant effects to benthic invertebrates from a surface spill of diesel, particularly as the diesel will rapidly evaporate and disperse in the water column.

Considering the low probability of diesel beaching or reaching the seabed, the limited area being affected by spilt hydrocarbon and medium term recovery rates, the overall impact to low sensitivity benthic invertebrates is expected to be low. There is potential for changes to the community structure due to the increased abundance of opportunistic species.

Seagrass beds

Coastal seagrass beds are present in Sangachal Bay and potentially along other areas of the coastline between Sangachal and Baku (see Section 6: Section 6.5.2). Based on the spill modelling, a diesel release in the vicinity of the SD Contract Area (where most of the project vessel activities will take place) would not reach the shoreline, therefore coastal seagrass beds would not be affected. A vessel collision in Sangachal Bay during PFOC installation is highly unlikely due to the marine exclusion zones in place around the vessel construction spread and the short installation period.

Fish

As discussed in Chapter 6: Section 6.6.5.3, the key locations for fish species in the southern Caspian are within the shallow water shelf areas. Maximum concentrations of fish are typically found at depths of up to 75 m for the majority of the year but it is common for Caspian fish species to migrate to warmer waters for overwintering and migrate to nutrient rich shallow areas of the north Caspian or river deltas in the spring / summer for spawning and feeding. The coastal region is important for non-migratory species as it provides breeding and nursery habitat for a number of species during spring, summer and autumn. Pelagic species such as kilka are likely to be found in the waters of the southern Caspian year round, while migration of sturgeon, shad and mullet takes place along the coast in water depths up to 100 m.

The potential impacts of hydrocarbon releases on fish include physical damage (e.g. through oiling of gills) and toxic effects (e.g. due to uptake of volatile toxic components). Fish have the ability to detect hydrocarbons in water through olfactory (smell) or gustatory (taste) systems and tend to avoid contaminated areas. Depending on the time of year that a spill was to occur, different groups of fish species may be affected. It can be assumed therefore that the majority of adult fish would avoid the area of a spill, although in very shallow waters fish may be more restricted between the seabed and the hydrocarbons on the sea surface. Spill avoidance behaviour can disrupt migration routes for some fish species. This has the potential to impact the migration of species of sturgeon and shad and semi migratory species such kilka and mullet. Where mortalities have been recorded they have generally been associated with significant spills in storm conditions when mixing increases the presence of oil compounds in the water column. Juveniles and larvae are more vulnerable to oil spills as they have limited ability to move away from the contaminated zone, which may have implications for the reproduction of these species. It should be noted that protected sturgeon species do not spawn within Azerbaijani waters but will be migrating in spring and summer and may be feeding during summer in coastal waters up to 100 m water depth.

Oil spill modelling indicates that diesel concentrations in the water column that have the potential to cause toxic effects on fish are non-persistent, with a large proportion of the diesel evaporating within two days of the release. Although adult fish have the ability to move away from affected areas, juveniles and larvae are less mobile. The limited area impacted by a diesel spill modelled and the short duration of contamination means there will likely be insignificant impacts to fish populations in the short to long-term.

Seals

If Caspian seals are within the area of a spill, or if the spill affects any resting or haul out sites, there could be irreversible impacts from a hydrocarbon spill through coating, inhalation and ingestion.

As discussed within Chapter 6: Section 6.6.5.4 seals may be present in the SD Contract Area at any time of year but with an increased likelihood during the spring and autumn migration, and during the summer months. The scientific opinion is that seals are showing signs of adaptation to anthropogenic disturbances. It is understood that, following increased disturbances within the Dagestan coastal area of Russia (including reported mass poaching), seals tended to avoid coastal areas during the autumn and spring migrations and use routes located away from the coast. Thus, the latest research has shown it is not possible to assume the seals will always follow the previously defined migratory paths close to the east and west coastline and may travel through the centre of the Caspian (including through the SD Contract Area). Recent research indicates that a significant proportion of seals remain to feed in the central Caspian (to the north and south of the Absheron Peninsula) throughout summer and autumn.

With regard to a release of diesel in the Shah Deniz Contract Area, the spill modelling indicates that surface diesel thicknesses will be greatest near the spill location, dispersing and thinning out with distance and time. The duration of diesel remaining on the sea surface in most areas is not predicted to exceed two days and it is not predicted that any of the spilled diesel will reach the shoreline. Therefore, any exposure of seals to spilled diesel is likely to be limited.

The Caspian seal is listed on the IUCN Red List as 'Endangered' and is under pressure from various natural and anthropogenic stressors. Seals are known to be highly sensitive to oiling and are most vulnerable during the breeding season (December to February) and feeding periods (May to November). Therefore, even small-medium scale exposure to toxic effects of diesel, within sensitive areas for seals, could result in a potentially significant impact.

Birds, protected areas and sites of ornithological importance

As discussed in Chapter 6: Section 6.4.3.2 there are a number of Protected Areas (IUCN Categories II and IV), Important Bird Areas (IBAs), and Key Biodiversity Areas (KBAs) located along the coastline of Azerbaijan. The Caspian region supports a high diversity of bird species, with a large number of endemic and protected species present.

There are some key periods of higher sensitivity. Ducks and coots overwinter from December to February and the presence of migratory species peaks in March and November. The IBAs are key habitats for these groups of birds, particularly for nesting and breeding. The bird nesting season begins at the end of April / beginning May and continues until mid-July. Limited information is available regarding the offshore distribution and abundance of birds in the southern Caspian. Surveys conducted in winter 1995 and spring 1996 in an area close to Oily Rocks recorded mainly herring gulls and little gulls on the water surface, with small numbers of ducks and divers (AIOC, 1995).

Based on the spill modelling, a diesel release in the vicinity of the SD Contract Area (where most of the project vessel activities will take place) would not reach the shoreline. It is considered that the impact to offshore birds would be minor due to the relatively low numbers and species present. A release of diesel from a project vessel in the SD Contract Area is not expected to reach the shore and therefore has a low probability of impacting the shallower coastal areas important to birds.

Fisheries and other marine users

Social receptors such as commercial fisheries, recreational fisheries, and coastal tourism could be exposed to the risk from an accidental hydrocarbon spill.

Chapter 7: Section 7.7.2 describes how commercial fishing is not routinely undertaken within the SD Contract Area. The closest offshore commercial fishing is carried out on the shallow water banks of Andreyev and Kornilov-Pavlov that are relatively remote from the Contract Area (see Figure 7.4). Recreational fishing is restricted to within 2 miles of coast and recreational activities such as swimming and water sports are also focused on the shoreline. As described above, modelling of a diesel spill in the SD Contract Area indicates that water column exposure to diesel concentrations exceeding 25 ppb is not expected to exceed two days. Furthermore, the diesel is not predicted to reach the shoreline.

The impact on fisheries would reflect the impact on fish and the presence of juvenile stages at the time of a spill as they are more susceptible to relatively low levels of oil within the water column and are less likely to be able to move away. Any impact on juvenile stages could impact short to medium term recruitment to future stocks. Despite the susceptibility of fish larvae and juveniles to relatively low concentrations of hydrocarbons in the water column, adult free swimming fish and wild stocks of commercially important species are likely to detect and avoid hydrocarbon contaminated areas. Following a spillage, the reproductive success of unaffected fish, as well as the influx of larvae from unaffected areas should lead to the recovery of stock numbers. Given that many marine species produce vast numbers of eggs that are widely distributed by sea currents this means that species can recover from small mortality events relatively quickly.

If there are signs of fish oil tainting or contamination, in the event of a hydrocarbon spill, any resultant imposed authority restrictions on fishing activities could result in detrimental financial impact upon local fisheries.

Summary of hydrocarbon spill impacts

Considering the spill modelling, a release of diesel from a vessel in the Shah Deniz Contract Area (where most of the SDC project vessel activities will take place) will have a limited impact on the marine environment as it will only persist in the environment for a short period and the diesel will not reach the coastal area or shoreline.

12.9.4 Spill prevention and response planning

12.9.4.1 Oil spill contingency planning – Azerbaijan offshore

The AGT Region Offshore Facilities Oil Spill Contingency Plan (OSCP) provides guidance and actions to be taken during a hydrocarbon spill incident and includes platforms, subsea pipelines and marine vessels. It is valid for spills that may occur during the commissioning, operation, and decommissioning of the systems.

The OSCP is designed to:

- establish procedures to control a release or the threat of a release, that may arise during offshore operations and associated facilities
- establish procedures to facilitate transition of response operations from a Tier 1 incident to a Tier 2/3 incident (see Table 12.2)
- minimise the movement of a hydrocarbon spill from the source by timely containment
- minimise the environmental impact of an oil spill by timely response
- maximise the effectiveness of the recovery response through the selection of both the appropriate equipment and techniques to be employed
- maximise the effectiveness of the response through trained and competent operational teams.

bp's response strategy is based on an in-depth risk assessment of bp's offshore activities, analysis of potential spill movements, environmental sensitivities, and the optimum type and location of response resources. bp supplements its dedicated resources with specialist spill response contractors.

Under the AGT Region spill procedures, spill incidents are categorised according to the level of resource required to respond to them. bp has adopted the internationally recognised tiered system as shown in Table 12.2.

Table 12.2: Oil spill response tiers

Tier 1	Small operational spills that can be handled immediately by onsite personnel. In most cases, the response would be to clean up using on site resources.
Tier 2	Spills that require additional local (in-country) resources and manpower that are not available on the site that the spill occurs. The site response team would carry out cleanup, aided by the dedicated Tier 2 oil spill contractor.
Tier 3	Very large, possibly ongoing spills, which require additional resources from outside the country of spill origin and are likely to impact the community for an extended period and may arouse national or international media interest. Such spills are very rare. All available spill contractors (from within and outside Azerbaijan) would carry out the physical response, with extensive support from the bp Incident Management Team and the Business Support Team.

bp has contracted an independent oil spill response contractor in Azerbaijan to provide a response to a Tier 2 oil spill incident originating from bp's offshore operations. bp also has Tier 2 oil spill response capability in Georgia and Turkey and these resources may be accessed for larger spills in Azerbaijan.

Oil Spill Response (Ltd) (OSRL) is a Tier 3 responder who has bases in both the UK and Singapore and will provide Tier 3 services to bp in the event of a major release and/or highly sensitive Tier 2 incident. In addition to the supply of equipment, they can also provide response technicians and supervisors.

bp will also coordinate with local emergency services and government agencies in Azerbaijan, both prior to, and during oil spill incidents, and additional resources are available from the Ministry of Emergency Situations (MES). The OSCP describes how bp will utilise these resources to protect the environment in which it resides.

It should be noted that credible spill scenarios associated with the SDC project would only warrant a Tier 1, or at the most Tier 2 response.

12.9.4.2 Reporting

Under the AGT Region spill reporting procedures, all accidental and non-authorised releases (liquids, gases or solids), including releases exceeding approved limits or specified conditions during all phases of the SDC project, will be internally reported and investigated. Existing external notification requirements, agreed with the Ministry of Ecology and Natural Resources (MENR), during the operation phase of the SDC project are:

- for liquid releases to the environment exceeding a volume of 50 litres, notification will be made to the MENR within 24 hours after the incident verbally and within 72 hours in the written form
- if the release to the environment is less than 50 litres, then information about the release will be included into the bp AGT Region Report on Unplanned Releases and sent to the MENR on a monthly basis.

It will be the responsibility of the main construction and installation contractors to report any spills that occur at the sites where they are undertaking SDC project related activities, or from vessels used for SDC project related activities, to the MENR.

A Protocol "On Agreeing the Main Principles of Cooperation for Regulation of Unplanned Material Releases" signed between bp and MENR in December 2012 defines an approved release as "a release that is permitted by the applicable PSA, MENR permitted and / or approved documents including ESIA, EIA, Technical Note, Technical Letter, individual discharge request letters to MENR, or any other written agreement with the MENR". Unapproved releases are those that do not fall into this definition.

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CHAPTER 13: Environmental and Social Management

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TABLES

FIGURES

13 ENVIRONMENTAL AND SOCIAL MANAGEMENT

13.1 Introduction

Under the Shah Deniz (SD) Production Sharing Agreement (PSA), bp as operator is responsible for the environmental and social management of all SD activities, to ensure that project commitments are implemented, and conform to applicable environmental and social legal, regulatory and corporate requirements. This chapter provides an overview of the system that will be used to manage the environmental and social issues associated with the SDC project.

13.1.1 Overview of AGT Region Operating Management System

The bp Azerbaijan Georgia Turkey (AGT) Region manages bp's operations in Azerbaijan and has an established Operating Management System (OMS). The OMS is a structured set of processes designed to keep operations safe, compliant and reliable. This system forms the structured framework to the Health, Safety, Security and Environment (HSSE) performance of the organisation for which there are six key stages, as set out in Figure 13.1:

- intent
- risk assessment and prioritisation
- planning and controls
- implementation and operation
- measurement, evaluation and corrective action
- management review and improvement.

The environmental portion of the AGT Region OMS for operations is aligned with 'ISO 14001 Environmental Management Systems', the leading international standard on environmental management.

In line with the six stages within the OMS, bp apply the following principles of environmental and social protection:

- **Plan** - prior assessment of potential environmental and social impact
- **Do** - implementing design and mitigation measures that seek to avoid, reduce or minimise potential impact
- **Check** - monitoring performance and the efficacy of the mitigation measures that are implemented
- **Act** - auditing and tracking the implementation of corrective actions.

Section 13.3 highlights how these principles will be applied to the SDC project.

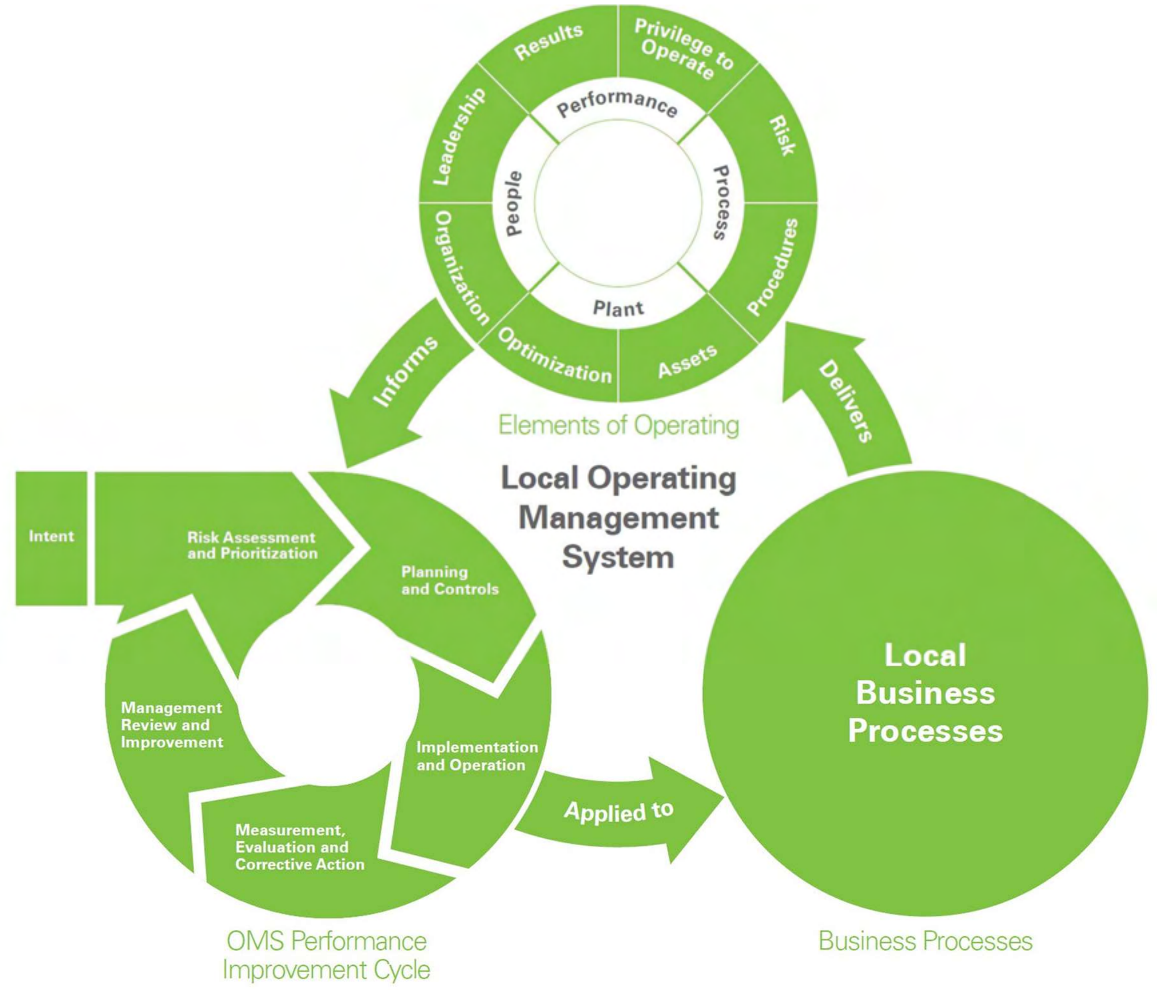

Figure 13.1: AGT Region OMS framework

13.2 Project Construction Phase Roles and Responsibilities

13.2.1 bp

bp is responsible for the detailed design, procurement, construction and operation of the SDC project and has appointed design contractors to undertake the detailed design. In due course, bp will contract construction contractors to manage the various elements of the construction work scope.

bp will monitor and audit the technical, environmental and social performance of its contractors throughout the construction phase. The contractors will be responsible for the management of their staff (to the extent that reflects staffing at the site).

An SDC project Construction Phase Environmental and Social Management System (ESMS) will be developed by bp and will include the following:

- a Commitments Register listing all the commitments within this ESIA that are to be implemented during the construction phase (and operations phase)
- a register of legislation applicable to the SDC project
- Environmental and Social Management and Monitoring Plan (ESMMP) which will be prepared, reviewed and updated as needed as part of a process of continuous improvement

- a schedule of monitoring, inspection and audit of environmental performance that includes checking that the main construction and installation contractors are meeting the expectations set out in the ESMMP
- an action tracking system to monitor the findings of inspections and audits that do not conform to the ESMMP and the implementation of corrective actions.

13.2.2 Main construction and installation contractors

The main construction and installation contractors for the jacket, topside, subsea facilities and onshore section of the PFOC will be expected to conform fully to the relevant aspects of the bp SDC project Construction Phase ESMS for which they are responsible.

The main construction and installation contractors will be required to develop and implement their own Construction Phase ESMS, specific to the SDC project, that is consistent with the bp SDC project Construction Phase ESMS. The main construction and installation contractors' ESMS will include a set of environmental and social management plans and procedures that will address contract requirements, including ESIA commitments.

13.3 Construction Phase ESMS

13.3.1 Introduction

The bp SDC project Construction Phase ESMS will form the framework for managing social and environmental issues throughout construction, hook up and commissioning (HUC) and start up (i.e. all activities prior to the operations phase) of the SDC project facilities and will be aligned with the requirements of the ISO 14001 standard. Once operational, the AGT Region management systems will apply to SDC.

The bp SDC project Construction Phase ESMS will demonstrate how the project will deliver the SDC project ESIA commitments and review the environmental and social performance of the SDC project at the construction phase. Special consideration will be given to the following:

- practical training and raising the environmental and social awareness of personnel
- supervision and monitoring of environmental and social issues in the field
- continuous improvement of environmental and social performance throughout the SDC project.

13.3.2 Implementation of construction phase ESMS

13.3.2.1 bp's environmental and social management and monitoring plan (ESMMP)

An ESMMP will be developed by bp to demonstrate how environmental and social mitigations and management measures discussed in this ESIA will be managed throughout the duration of the Project. The ESMMP will detail:

- conformance requirements
- roles and responsibilities of bp and the main construction and installation contractors
- the main activities that will be undertaken

- the actions needed to avoid and / or mitigate environmental and social impacts and to put the commitments in the ESIA into effect
- the assurance process that will be adopted to monitor and report environmental and social performance including inspection, audit and monitoring programs such as chemical inventory and storage.

The ESMMP will be a live document that will be regularly reviewed and revised as the project proceeds, based on outputs and activities.

To support the ESMMP a number of topic-specific management plans will also be developed. Table 13.1 lists the specific management plans that have been identified as being applicable to the SDC project. These plans will be finalised during mobilisation of the main construction and installation contractors.

Table 13.1: Topic-specific environmental and social plans under the overarching SDC project ESMMP

Title of plan	Issues covered
Pollution Prevention Management and Monitoring Plan	• energy efficiency (vehicle and equipment selection, maintenance) • emissions management (i.e. vehicle, equipment and generator emissions) • wastewater management • sewage treatment and disposal, including sewage plant monitoring • chemical selection and management, and hazardous materials management • spill response and notification procedure • monitoring and reporting
Waste Management and Monitoring Plan	• waste hierarchy (i.e. reduction at source, reuse, recycling, energy recovery, responsible disposal) and green procurement • identification and classification of waste • waste register • waste handling (i.e. collection, segregation and containers, storage, treatment, transport and documentation, disposal) • monitoring and reporting
Pipeline Pre-commissioning Discharge Management and Monitoring Plan	• schedule of discharge events • chemical selection and dosage process • cleaning and pre-commissioning procedures • monitoring and reporting
Community Engagement and Nuisance Management and Monitoring Plan	• grievance mechanism • nuisance management and monitoring • community interaction (i.e. prior notification of activities that affect the community e.g. noisy activities, traffic restrictions etc.) • monitoring and reporting

Title of plan	Issues covered
Traffic and Transportation Management Plan	• driver management training • onsite vehicle movements • offsite vehicle movements and the prohibition on off-road driving • risk assessment for the transport of oversized and heavy loads.
Restoration and Landscape Management and Monitoring Plan (onshore section of PFOC)	• topsoil and subsoil management (during onshore cable installation works and subsequent reinstatement) • site restoration • spoil management • monitoring and reporting
Ecological and Wildlife Management and Monitoring Plan (onshore section of PFOC)	• pre-construction ecological surveys and wildlife inspections (prior to onshore cable installation works) • habitat and species protection during construction (i.e. translocation, traffic restrictions, code of conduct) • monitoring and reporting
Archaeology and Cultural Heritage Management and Monitoring Plan (onshore section of PFOC)	• the protection of known archaeological resources (i.e. their location, legal status, protective buffers) • watching brief procedure for all ground breaking activities • archaeological chance finds procedure • monitoring and reporting
Stakeholder Engagement Plan	• stakeholder identification • stakeholder engagement programme
Employee Relations Management and Monitoring Plan	• training and skill development activities • grievance mechanism • demanning • monitoring and reporting

13.3.2.2 Main construction and installation contractor management plans

The main construction and installation contractors, as part of their ESMS, will be required to develop their own environmental and social management plans and procedures that are in line with the requirements of bp's ESMMP and submit them to bp for approval before construction begins.

13.3.2.3 Training

Training is fundamental to the successful delivery of environmental and social aspects of the SDC project. The SDC project construction activity will be of relatively short duration, so establishing key environmental and social requirements at the outset is important to the provision of effective training. The main training elements required are:

- management briefings
- induction training for bp, the main construction and installation contractors and their sub-contractor staff
- toolbox talks and awareness programmes during construction.

Management briefings

An environmental and social training session will provide the bp project management team with an overview of the bp SDC project Construction Phase ESMS and a common understanding of roles, responsibilities and applicable standards prior to the construction contracts being awarded.

Following award of contract, a second environmental and social training session will seek to ensure the bp project management team and the main construction and installation contractors' senior personnel adopt a coordinated approach to implementing bp requirements, and to affirm bp's commitment to good environmental performance and the establishment of sound community relations. Further briefings and awareness sessions will then be provided to the teams as required.

Induction training

All SDC project construction staff will receive HSE induction which will include environmental and social aspects and will explain the key requirements to everyone on site.

Toolbox talks

In addition to toolbox talks delivered by the main construction and installation contractors as part of skills training, sessions to raise awareness will be held for the following environmental and social issues:

- waste management, minimisation and handling (including identification of waste types, segregation, and waste transfer documentation)
- refuelling
- hazardous materials management / handling
- spill prevention.

13.3.2.4 Monitoring, inspections reporting and audits

The bp SDC project Construction Phase ESMS will identify key indicators that will be used to measure environmental and social performance.

bp's procedures and plans, and the main construction and installation contractors' procedures and plans, will be used to collect and regularly report monitoring data to bp, including the following:

- data (e.g. waste volumes, types and disposal; complaints received and resolved)
- activities carried out (e.g. surveys, meetings with communities, site inspections and findings)
- status of non-conformances identified during inspections
- environmental and social issues arising in the course of the works
- site observations and reports, from inspections and incidents such as spill events.

bp and the main construction and installation contractors will conduct audits to track progress and performance in implementing the Construction Phase ESMS, and the effectiveness of the mitigation measures implemented in avoiding environmental and social impacts. The schedule of these audits will be determined after the contract has been awarded, but the aim will be to audit all elements of the Construction Phase ESMS.

The frequency of auditing for individual commitments will be reviewed regularly and adjusted as necessary to take account of audit findings. bp will also carry out spot check audits of any issues that are of environmental and social concern.

13.3.2.5 Corrective action

The inspection and audit processes described in Section 13.3.2.4 will be documented and feedback will be formally submitted to contractors. Contractors will be notified about any actions arising from the inspections and audits. Both bp and the main construction and installation contractors will develop and maintain action-tracking systems to monitor close-out actions and the effectiveness of actions taken in response to findings.

bp will track the implementation of corrective actions and will update the relevant teams including the Project Manager on non-conformances that require follow-up actions.

13.4 Operations Phase EMS

Prior to commencement of SDC operations, a transition plan will be developed to support the movement of SDC from the construction to the operations phase. This will include integration of SDC into the scope of the AGT Region wide EMS and its existing processes. A full ESIA Commitments Register (covering both the construction and operations phase) will be handed over from projects to operations at this stage.

The operations commitments included within this ESIA will be implemented through the existing environmental and social management and monitoring plans and procedures relevant to SD offshore operations, updated to incorporate SDC operations. In addition, the existing AGT Region Emergency Response Plan (ERP) and Offshore Facilities Oil Spill Contingency Plan (OSCP) will be reviewed and amended to incorporate the new offshore SDC facilities.

13.5 Environmental Monitoring Programme (EMP)

Offshore marine monitoring has been conducted as part of the SD Contract Area development since 1998, with the primary focus being the benthic environment as sediments and their associated biological communities are widely considered to be the source of the most reliable indicators of ecological status and impact. Periodic water quality sampling has also been carried out.

A marine environmental baseline survey was undertaken at the proposed SDC platform location in August 2023, the results of which are presented in Chapter 6: Section 6.7.

Due to the lack of significant discharge sources associated with the SDC facility (unattended facility, no drilling conducted, no discharge of produced water, cooling water, etc) project-specific post-installation and operational monitoring is not proposed. Shah Deniz regional environmental surveys will continue to be conducted approximately every 5 years to capture any contract area impacts.

13.6 Waste Management

Waste generated during the SDC project will be managed in accordance with existing bp AGT Region management plans and procedures. In addition, site specific Waste Management Plans will be prepared by the main construction and installation contractors for the jacket, topside, subsea facilities, and onshore section of the PFOC and reviewed by bp.

Waste streams will be segregated at source to support reuse and recycling, and to avoid contact between incompatible materials. The segregation requirements will be clearly indicated by the use of containers with clear signage denoting the waste types that are suitable for the containers provided. All waste generated offshore will be tracked and controlled through the use of Waste Transfer Notes (WTNs).

Workforce awareness and training will be undertaken, and the management of waste will take into account the:

- AGT Region Approved Waste Contractors List
- AGT Region Waste Streams Register
- AGT Region Waste Management Manual.

Waste disposal / treatment options will be assessed and adopted based upon the following guiding principles:

- internationally recognised best practice
- the waste hierarchy
- AGT Region Best Practicable Environmental Option (BPEO) assessments.

All new waste disposal routes will be routinely assessed prior to use and will be compliant with applicable local laws and regulations. Waste will only be routed to those waste disposal facilities that have been approved for use by the AGT Region.

This approach is intended to ensure that wastes are managed in the most sustainable way and in compliance with all applicable AGT Region standards and national legislation.

CHAPTER 14: Residual Impacts and Conclusions

CONTENTS

TABLES

14 RESIDUAL IMPACTS AND CONCLUSIONS

14.1 Introduction

This chapter summarises the residual impacts and conclusions of the Shah Deniz Compression (SDC) Project ESIA.

14.2 Residual Environmental Impacts

Environmental impacts have been assessed separately for the following phases:

- Construction, installation, hook-up and commissioning (HUC) phase – onshore construction and commissioning of facilities at construction yards; offshore platform installation and HUC; offshore infield pipeline and subsea infrastructure installation and commissioning; and PFOC installation (Chapter 9 of this ESIA).
- Operations phase - offshore operations; onshore operations (Sangachal Terminal); and electricity import (Chapter 10 of this ESIA).

14.2.1 Construction, installation and HUC

Table 14.1 summarises the outcome of the impact assessment for SDC project construction, installation and HUC activities.

Table 14.1: Summary of residual environmental impacts for SDC construction, installation and HUC

Receptor	Activity	Scoring		
		Magnitude of effect	Receptor sensitivity	Impact significance
Atmosphere	Emissions from construction yard plant and vehicles	2 - low	2 - low	4 – minor
	Emissions from onshore PFOC installation plant and vehicles	1 – very low	2 – low	2 – negligible
	Emissions from offshore installation and support vessels and helicopters	2 – low	1 – very low	2 – negligible
Terrestrial environment (noise)	Noise from construction yard plant and vehicles, and from commissioning activities (Bayil only)	2 - low	2 - low	4 – minor
	Noise from onshore PFOC installation plant and vehicles	2 – low	2 / 3 – low / medium	4 / 6 – minor / moderate
Marine environment	Infield pipeline and subsea infrastructure commissioning discharges	2 – low	2 - low	4 – minor
	Vessel operational discharges	1 – very low	2 - low	2 - negligible

Receptor	Activity	Scoring		
		Magnitude of effect	Receptor sensitivity	Impact significance
	Discharge of cement during grouting of piles	1 – very low	2 - low	2 - negligible
	Underwater sound from pin and skirt piling	3 - medium	3 - medium	9 – moderate
	Underwater sound from vessel movements	1 - low	3 - medium	3 – minor
Nearshore / coastal environment (ecology and coastal processes)	Construction of finger pier and nearshore PFOC installation works	2 – low	2 - low	4 – minor
Terrestrial environment (ecology)	Onshore PFOC installation	2 - low	3 - medium	6 – moderate
Terrestrial environment (soil and surface water)	Onshore PFOC installation	2 - low	2 - low	4 – minor
Terrestrial / nearshore environment (cultural heritage)	Onshore PFOC installation	2 – low	2 / 3 – low / medium	4 / 6 – minor / moderate

Air quality and noise screening assessments have been conducted for the construction yards, and along the onshore PFOC installation route. These studies demonstrate that potential impacts to onshore human receptors are considered to be negligible to minor. The exception to this is noise impacts from the PFOC landfall construction works which were ranked as minor / moderate. This is due to the close proximity of individual dwellings at the landfall, and rocky stone being present in the area of the beach where the cable route and cable transition pit will be excavated. As a result, construction activities at the landfall, in particular any rock breaking, will be scheduled for the hours of daylight where feasible to minimise noise impacts.

Following installation of the infield pipelines offshore in the SD Contact Area they will be cleaned, gauged and hydrotested. This involves the use of seawater containing preservation chemicals (to prevent corrosion and biological growth). Discharges to sea of treated seawater associated with these activities are anticipated to vary in volume between approximately 0.4 m^3 and 6,416 m^3. Dilution and dispersion modelling has been conducted for the worst case scenarios in terms of volume and flow rate (for flood, clean, gauge scenarios; and dewatering scenarios). Predicted no-effect concentrations were achieved at approximately 250 m from the discharge point (assuming that the chemicals are used up in providing protection to the pipeline and are discharged at 20% of the concentration applied). Under typical use and discharge conditions it is predicted that the plume will occupy a very small volume of the available water column at the discharge location and will rapidly achieve dilution of the hydrotest chemicals to below toxic concentrations (with discharge plumes indistinguishable from the ambient environment at 500 m from the discharge point). Impacts on the marine environment and ecological receptors have therefore been ranked as minor.

Monoethylene glycol (MEG) will be used to dehydrate and condition the new infield gas pipelines resulting in small-scale discharges to the environment ranging from approximately 20 to 130 m^3. MEG is a low toxicity, highly biodegradable substance that is classified as a “Pose Little or No Risk” (PLONOR) substance as defined by OSPAR. MEG is therefore not anticipated to cause a discernible impact on the marine environment or ecological receptors.

Hydraulic fluid (Castrol Transaqua HT2) will also be discharged during commissioning of the pigging loop module (PLM) control valves. Discharge volumes will be very limited ranging from approximately 0.4 to 0.6 m^3. Caspian specific ecotoxicity testing has been carried out on this product and the results indicated low toxicity across all samples tested. As a result Transaqua H2 discharge is not anticipated to cause a discernible impact on the marine environment or ecological receptors.

During SDC platform installation, cement could be discharged during grouting of the platform piles. The volume of cement required will be calculated prior to the start of the activity to minimise excess cement discharges to sea. A grout seal / packer will ensure that as much of the cement grout as possible is retained inside the pile sleeve annulus. The low toxicity of the grout (cement chemicals selected will be ‘Gold’ or ‘E’ category, or equivalent toxicity to those previously used), and the fact that cement is designed to set in the marine environment without widespread dispersion, indicates negligible impacts on ecological receptors.

The remaining discharges to sea from construction and installation vessels (treated sanitary waste, galley waste, deck wash water and ballast water) will be small in volume and do not contain components of high environmental concern. These discharges, which are monitored in accordance with existing procedures to ensure applicable project standards are met, will be rapidly diluted and are all assessed as having a negligible impact upon ecological receptors in the water column.

Underwater sound will result from pile driving activities as part of SDC platform installation, and from construction and installation vessel movements. Propagation modelling of underwater sound has been conducted to estimate distances at which various impacts on marine species may occur. For piling, the modelling results show that seals may experience permanent hearing damage within 1.2 km of the noise source if exposed to the sound for an hour under typical early spring oceanographic conditions (March period), and within 743 m of the noise source in late summer conditions (August period). Temporary hearing loss of seals from piling may occur within 18.6 km of the noise source (March) and 2.4 km (August) if exposed for an hour. For fish, sensitivity varies across species, for the most sensitive species mortality could occur within just 328 m of the noise source, and recoverably injury within 618 m of the noise source if exposed for an hour (with little differences in distances between March and August). It should be noted that the Caspian seal (IUCN Red List ‘Endangered’ and included in the Azerbaijan Red Book) is a highly intelligent animal that will rapidly move away from any disturbance or sound. The use of an acoustic deterrent device (ADD) prior to piling activities, and a piling soft-start / slow-start, will alert any seals present, allowing them to leave the area as soon as they detect elevated sound levels and reducing the risk of underwater sound injury. As a result underwater sound impacts from piling on ecological receptors have been ranked as moderate. For project vessel movements, underwater sound impact distances were considerably reduced (in comparison to piling), resulting in impacts on ecological receptors being ranked as minor.

In the nearshore zone, the PFOC between Sangachal Terminal and the SDC platform will be trenched out to the 12.5 m water depth contour (just beyond the shipping lane) to provide protection. In order to carry out PFOC installation in very shallow water it is anticipated that a temporary finger pier will be constructed, extending approximately 300 m into Sangachal Bay. Impacts related to these activities include physical habitat disturbance and smothering, increased turbidity, and changes to coastal processes from the presence of the pier. However, it should be noted that the receptors present in, and adjacent to, the nearshore PFOC installation corridor are common in local coastal waters; and Sangachal Bay is a shallow water environment that is regularly disturbed by wave action with biological communities that are adapted to periodic turbidity. As the finger pier will only stay in place for the duration of the nearshore cable installation works (approximately 6-12 months) the effects on littoral sediment fluxes and current flows are anticipated to be short-term and localised to the immediate surroundings of the structure. Based on the above, the impacts on ecological receptors and coastal processes have been ranked as minor.

In the onshore zone, the PFOC between Sangachal Terminal and the SDC platform will be trenched using open cut methods, and horizontal drilling at road / rail / pipeline crossings. This will require clearance works along the cable right of way (RoW). During these works the vegetation and surface soil will be removed and stored for later reinstatement of the corridor, in order to maintain the environmental characteristics of the area. Based on the temporary nature of the impacts, and the fact that the PFOC route will follow the existing route of the SD2 gas export pipelines, the magnitude of effect is anticipated to be low. However, the presence of spur-thighed tortoise (IUCN Red List 'Vulnerable' and included in the Azerbaijan Red Book) in the vicinity of the terminal, and cable installation on the eastern fringes of the wetland area to the south of the terminal, has resulted in a receptor sensitivity of medium and an impact significance of moderate. An Ecological and Wildlife Management and Monitoring Plan will be developed and implemented to manage the relocation of any fauna encountered within the areas affected by the cable lay works and will include measures to minimise impacts on the wetland area. Impacts on soil and surface water from the onshore PFOC installation is assessed as minor and no further mitigation is proposed.

The onshore and nearshore PFOC installation works have the potential to disturb unknown artefacts of cultural heritage importance, although the cable route will follow that of the existing SD2 gas export pipelines, which reduces the likelihood of a cultural find. In addition, excavation of the cable transition pit and cable trench at the landfall will require breaking through rocky stone, with potential vibration impacts on the sand cave protected state monument located approximately 300 m to the northwest. Prior to excavation activities at the landfall (and any associated rock breaking) a toolbox talk will be held with site personnel to raise awareness of the proximity of the sand cave, and visual inspection will be made of this feature prior to and during rock breaking activities to monitor any vibrational impacts. Due to the presence of the sand cave, and because the possibility of chance finds cannot be ruled out, the impact significance is ranked as minor / moderate. A watching brief, with representatives from the Institute of Archaeology and Anthropology will be maintained during PFOC groundworks.

Overall, the majority of SDC construction, installation and HUC residual impacts were assessed as negligible or minor. The only moderate impacts were: potential impacts on ecological receptors from piling underwater sound, and impacts on ecological receptors from the onshore PFOC installation works. Minor / moderate impacts were limited to potential noise impacts from PFOC installation at the landfall on human receptors, and potential impacts on cultural heritage in the event of a chance find during onshore PFOC installation and due to the proximity of the sand cave to the landfall site. It is considered that these impacts are minimised as far as practicable and necessary through the implementation of the existing control measures and mitigation measures.

14.2.2 Operations

The SDC platform is an electrically powered unmanned installation that has been simplified to minimise the offshore maintenance burden. As such sources of impact are very limited as there is no discharge of sanitary waste, galley waste, cooling water, produced water, or fire water / firefighting foam from the platform. In addition there is no flaring, no permanent closed drains, and no topside pigging facilities. Drilling activities will not be carried out from the platform, as it is purely for compression facilities only.

The activities / sources of impact remaining from operation of the SDC platform: fugitive emissions; small-scale venting during maintenance; open drains discharge of rainwater and wash down water; small-scale hydraulic fluid releases (Transaqua HT2) from PLM control valves during pigging activities; and periodic vessel maintenance visits have been scoped out of full assessment. Likewise use of existing processing and storage facilities at Sangachal Terminal, and electricity import from the Azerbaijan national grid, have also been scoped out of full assessment due to the limited environmental impacts.

14.3 Residual Socio-economic Impacts

The SDC project is predominantly an offshore development, with the majority of SDC project related activities taking place within the SD Contract Area. Onshore activities are limited to installation of the onshore section of the SDC PFOC from Sangachal Terminal to the landfall, and construction of the jacket, topsides and subsea infrastructure at onshore construction yards.

With reference to experience gained from previous SD and ACG projects, the following key socio-economic issues have been assessed (see Table 14.2):

- employment opportunities during the SDC construction and installation phase (including training and skills development provided to the workforce)
- demanning of the construction workforce after peak employment has been reached.

In addition, the following indirect socio-economic impacts have been discussed:

- procurement of goods and services by the main construction and installation contractors through internal supply chains (increased economic flow)
- potential social conflict from (perceived or actual) competition between individuals seeking jobs.

As potential indirect socio-economic impacts of the SDC project are outside of bp and their main construction contractors' control, and cannot be mitigated to any reasonable extent, the impact assessment provided for indirect impacts is qualitative in nature.

Table 14.2: Summary of residual socio-economic impacts for SDC project

Event/ Activity	Scoring		
	Magnitude of effect	Receptor sensitivity	Impact significance
Employment during SDC project construction and installation	0 - positive	4 – high	0 – positive
Demanning following SDC project construction and installation	2 - low	4 – high	8 - moderate

The socio-economic assessment considered that the national workforce to be employed during the SDC project construction phase is likely to peak at approximately 2,600 personnel in 2027. During the operational phase only a limited number of maintenance personnel will be employed by the project as the SDC platform is unmanned. Employment impacts are likely to be distributed within the local area with the majority of employees expected to be recruited from the Baku City economic region (which includes the Sabayil and Garadagh districts). It is anticipated that employment will not require establishment of workforce accommodation, or significant migration of populations to the construction areas.

Every effort will be made to re-hire workers who have demonstrated competence whilst working on previous oil and gas construction projects. Upon hiring workers, a gap analysis will be undertaken by the main construction and installation contractors between relevant competence criteria and the contractor's Training and Development Plan. Where gaps are identified training will be provided to bring each worker up to at least the minimum standards for the role expressed in the Training and Development Plan. It is expected that the employment generated by the SDC project will result in positive impacts to individuals and their households.

As the construction phase will generate temporary employment opportunities, planning for the conclusion of construction workforce contracts will be carefully considered from the start of the SDC project. Measures to mitigate this will include adequate staff communications between the main construction and installation contractors and their workforce which will inform the workforce of project progress and expected completion dates.

The overall socio-economic impacts of the SDC project, particularly from employment creation throughout the construction, installation and HUC phases were assessed as positive. The provision of training and skills development to the workforce, certificates to provide competence for certain types of professional positions, and adequate warning in advance of their position being made redundant, will reduce the impact of demanning to the extent possible. The residual impact is scored as moderate due to the high sensitivity of the receptor.

14.4 Cumulative, Transboundary and Accidental Events

14.4.1 Cumulative and transboundary impacts

Potential cumulative and transboundary impacts have been assessed taking into account the potential for intra-project impacts (interactions between separate SDC project-related impacts), as well as inter-project impacts that take into account other potentially significant projects where the associated impacts may overlap geographically or temporally with SDC project impacts.

Due to the uncertainties with regard to third-party marine projects in the vicinity of the Shah Deniz Contract Area, and the distance to bp's new Memorandum of Understanding (MoU) areas (Karabagh and Ashrafi-Dan Ulduzu Blocks), the cumulative assessment focuses on potential cumulative effects with known activities in the SD and ACG Contract Areas and at Sangachal Terminal (Sangachal Terminal Electrification project).

Cumulative impacts and transboundary effects were considered to be limited to the following:

Underwater sound – cumulative impacts

Long-term seismic acquisition programmes are planned in both the SD and ACG Contract Areas. While there is no bioaccumulation of sound in the marine environment, there is the potential for an additive effect if sounds from one activity coincide and overlap spatially and temporally with other concurrent activities. The main source of underwater sound from the SDC project is underwater piling which is anticipated to take a total of 10 days for the jacket pin piles around August 2026, and 20 days for the jacket skirt piles around March 2028. There is therefore the potential for cumulative underwater sound impacts if seismic survey activities (particularly in the Shah Deniz Contract Area) are carried out concurrently.

The exact timing of seismic survey activities in the SD and ACG Contract Areas are not currently known. As part of bp's simultaneous operations (SIMOPs) planning, seismic survey activities in the Shah Deniz Contract Area will not be conducted at the same time as the piling activities for the SDC project in order to mitigate the potential for underwater sound cumulative impacts on marine fauna.

Greenhouse gases (GHGs) – cumulative and transboundary impacts

GHG emissions are inherently cumulative, as all emissions have the same impact on the same ultimate receptor. The impact is climate change, or global warming, caused by the radiative forcing effects of GHGs in the atmosphere. The affected receptor is the global climate (hence it is also a transboundary issue) and all the ecosystems and biomes that depend on it.

SDC project operational Scope 1 and Scope 2 GHG emissions per year are estimated as 127 ktonnes CO_2 equivalent, which represents only approximately 3% of the annual operational GHG emissions from bp's activities in Azerbaijan.

During optimise stage efforts were made to simplify the SDC platform and align the project with bp's Net Zero Aim 1 (see Section N.5). As a result operational Scope 1 GHG emissions are very low due to the fact that there is no power generation on the SDC platform, no firewater pumps, and no flare. Scope 2 GHG emissions need to be taken into account when considering cumulative GHG emission impacts. The electrical power demand of the SDC platform during operations phase will be met by utilising existing overhead lines feeding Sangachal Terminal from the national grid operated by Azerenergy, with a PFOC out to the platform. However, it should be noted that total operational GHG emissions from the SDC project (Scope 1 and Scope 2) are still considerably lower than those associated with bp's previous development projects, and only represent a very small percentage of Azerbaijan's national GHG emissions total (approximately 0.2%).

There is a drive to reduce the carbon footprint of bp operations, and current regional projects such as bp's solar Sunrise project (a photovoltaic power facility in Azerbaijan), and the Sangachal Terminal Electrification (STEL) project (which aims to electrify Sangachal Terminal and establish a framework to operate the terminal without direct or indirect carbon dioxide emissions) are all part of this drive. The SDC project is aligned with bp's aims and has been designed to maximise synergies with the STEL project.

14.4.2 Accidental events

Due to the limited hydrocarbon inventory on the SDC platform, an accidental hydrocarbon release scenario from this facility is not considered. In addition there will be no condensate within the SDC infield pipelines.

Feasible accidental event scenarios for the SDC project are therefore limited to:

- release of chemicals / waste from a project vessel or the SDC platform (e.g., transformer chemicals)
- hydrocarbon spills associated with project vessels (e.g. small spills resulting from refuelling, larger spill of diesel resulting from a project vessel collision).

The transformers on the SDC platform will contain synthetic ester transformer fluid. The product selected will be readily biodegradable in the marine environment and ecotoxicity testing will be carried out prior to its use. The transformers will be located in a kerbed area to provide secondary containment. Modelling of synthetic ester transformer fluid for bp's Shah Deniz Alpha Power (SDAP) project considered a release of 7 m^3. In this instance the discharge plume reached a 'no effect' concentration within 8 m of the discharge point.

To support the assessment of project vessel accidental hydrocarbon spill impacts, diesel spill modelling of 400 m^3 and 123 m^3 releases in the SD Contract Area were reviewed. In both cases the impact of the diesel was restricted to the vicinity of the release point, with no shoreline impacts. The released diesel was lost from the sea surface by evaporation into the air, or by natural dispersion into the water column, within 2 days.

The AGT Offshore Facilities Oil Spill Contingency Plan (OSCP) provides guidance and actions to be taken during a hydrocarbon spill incident and includes drilling rigs, platforms, subsea pipelines and marine vessels. This document will be reviewed and amended to incorporate the new offshore SDC facilities.

14.5 Environmental and Social Management

Each phase of the SDC project will be subject to formal environmental and social management planning.

During construction, installation and HUC phase, bp will develop a Construction Phase Environmental and Social Management System (ESMS) that will include an Environmental and Social Management and Monitoring Plan (ESMMP) supported by additional topic-specific management plans, a Commitments Register listing all the commitments in this ESIA, and a register of environmental and social legislation applicable to the SDC project.

The main construction and installation contractors will be required to develop and implement their own Construction Phase ESMS, specific to the SDC project, that is consistent with the above. The main construction and installation contractors' ESMS will include a set of environmental and social management plans and procedures that will be submitted to bp for approval before construction begins.

At operations phase bp will manage the SDC facilities using an Operations Phase Environmental Management System (EMS) that is aligned with the requirements of ISO 14001, the leading international standard on environmental management. Prior to commencement of SDC operations, a transition plan will be developed to support the movement of SDC from the Construction Phase ESMS to the Operations Phase EMS.

The AGT Environmental Monitoring Programme (EMP) provides a consistent, long-term set of data, with the objective of developing an accurate picture of potential impacts on the surrounding environment, so that they can be managed and mitigated as effectively as possible. As part of this programme, a marine environmental baseline survey was undertaken at the proposed SDC platform location in August 2023. Due to the lack of significant discharge sources associated with the SDC facility (unmanned facility, no drilling conducted, no discharge of produced water, cooling water, etc) project-specific post-installation and operational monitoring is not proposed. Shah Deniz regional environmental surveys will continue to be conducted approximately every 5 years to capture any Contract Area impacts.

14.6 Conclusions

Activities associated with the SDC project have been assessed for all project phases. Residual environmental and socio-economic impacts identified have been of negligible, minor or moderate adverse significance, with positive impacts arising from employment, training and skills development and through procurement of goods and services.

The mitigation and monitoring associated with each impact have been presented and discussed, and it is concluded that these are sufficient to ensure the sound management of impacts throughout the duration of the SDC project. This conclusion is underpinned by the substantial experience acquired by bp, its partners, and its contractors in successfully executing previous projects in the SD and ACG Contract Areas over recent years.