Environmental Impact Assessment (EIA) for the drilling of the Aypara-1 well in the Ashrafi-Dan Ulduzu-Aypara (ADUA) Exploration area, Azerbaijan

May 2019

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Acronyms

ACE	Azeri Central East
ACG	Azeri Chirag and Deep Water Guneshli
ADUA	Ashrafi-Dan Ulduzu-Aypara
AHT	Anchor Handler Vessels
ALARP	As Low As Reasonably Practicable
BOD	Biological Oxygen Demand
BOEM	Bureau of Ocean Energy Management
BOP	Blow-out Preventor
BTC	Baku-Tbilisi-Ceyhan
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
BWM Convention	International Convention for the Control and Management of Ships' Ballast Water and Sediments
BWMP	Ballast Water Management Plan
CASPAR	Azerbaijan Caspian Shipping Company
CASPECO	Creation of Special protected Areas for the Caspian Seal
CEP	Caspian Environment Programme
CIPCO	Caspian International Petroleum Company
ES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COP	Conference of the Parties
CSCAP	Caspian Seal Conservation Action Plan
CSIR	Council for Scientific and Industrial Research
CSL	Caspian Sea Level
CST	Centre of Social Technologies
dB	decibels
DCENR	Department of Communications, Climate Action and Environment
DDT	Dichlorodiphenyltrichloroethane
E	Evaporation
ECMWF	European Centre for Medium-Range Weather Forecasts
EEA	European Environment Agency
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessments
EMP	Environmental Management Plan
EN	Endangered

ENP	European Neighborhood Policy
ERM	Environmental Resource Management
ERP	Emergency Response Plan
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FCV	Fast Crew Vessel
GHG	Greenhouse Gas
HFC	Hydrofluorocarbons
HR	High Resolution
HSE	Health, Safety and Environment
HSES	Health, Safety, Environmental and Security
IAGC	International Association of Geophysical Contractors
IBA	Important Bird Areas
IFC	International Finance Corporation
IMO	International Maritime Organization
IOGP	International Association of Oil and Gas Producers
IPIECA	Global oil and gas industry association for environmental and social issues
ISPPC	International Sewage Pollution Prevention Certificate
IUCN	International Union for Conservation of Nature
IUU	Overfishing, and illegal, unreported and unregulated fishing
JNCC	Joint Nature Conservation Committee
KBA	Key Biodiversity Areas
LTD	Limited Company
MARPOL	International Convention for the Prevention of Pollution from Ships
MENR	Ministry of Ecology and Natural Resources
MES	Ministry of Emergency Situations
MGO	Marine Gasoil
MMO	Marine Mammal Observers
MODU	Mobile Offshore Drilling Unit
MPA	Marine Protected Area
MSDS	Material Safety Data Sheets
NA	Not Available
NAVAREA	Geographic areas in which various governments are responsible for navigation and weather warnings
NGO	Non-Governmental Organisations

NOAA	National Oceanic and Atmospheric Administration
NTM	Notice to Mariners
O&G	Oil & Gas
OSCP	Oil Spill Contingency Plan
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
OW	Otariidae
P	Precipitation
PAH	Polycyclic Aromatic Hydrocarbons
PCAD	Population Consequences of Acoustic Disturbance
PCB	Polychlorinated Biphenyl
PER	Precipitation – Evaporation + Runoff
PFC	Perfluorocarbons
PLONOR	Pose Little or No Risk
POPs	Persistent organic pollutants
PPE	Personal Protective Equipment
PSA	Production Sharing Agreement
PSV	Platform Supply Vessels
PTS	Permanent Threshold Shift
PW	Phocidae
R	Runoff
RSA	Risk Service Agreement
SEE	State Ecological Expertise
SEL	Sound Exposure Level
SOBM	Synthetic Oil based Mud
SOCAR	State Oil Company of the Republic of Azerbaijan
SOPEP	Shipboard Oil Pollution Emergency Plan
SSPA	Seal Special Protected Area
SSS	Side Scan Sonar
SW	Sea water
SWAP	Shallow Water Absheron Peninsula
TBD	To be defined
TEU	Twenty-foot equivalent unit
TPH	Total Petroleum Hydrocarbons
TTS	temporary threshold shift
UN	United Nations

UNCLOS	The United Nations Convention on the Law of the Sea
UNECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VOCs	Volatile organic compounds
VSP	Vertical Seismic Profile
WBM	Water based mud
WMP	Waste Management Plan

Executive Summary

This document presents the results of the Environmental Impact Assessment ("EIA") undertaken for the Aypara-1 well drilling program (“the Project”), proposed by Statoil Azerbaijan in the Ashrafi-Dan Ulduzu-Aypara (ADUA) exploration area in Azerbaijan. This document has been prepared by the international sustainability consultancy *Environmental Resources Management Iberia S.A.* ("ERM") in collaboration with the Azeri company CST (Centre of Social Technologies) Synergetics.

The president of Azerbaijan’s state oil company SOCAR and Statoil Azerbaijan (part of the Equinor group) signed a Production Sharing Agreement (PSA) for the Ashrafi-Dan Ulduzu-Aypara (ADUA) exploration area on the 30th of May 2018. The ADUA exploration area is located around 50 kilometres east of Baku, around 14 kilometers to the east of Azerbaijan mainland (Absheron peninsula), and approximately 7 kilometers to the east of Pirallahi Island and Chilov Island in water depths varying between 20 and 225 meters.

As per the PSA, Statoil Azerbaijan will be the operator of the exploration activity and thus responsible for the planning and execution of the drilling program, which will comprise the drilling of a single exploratory well.

The Aypara-1 well is expected to spud in Q1 2020. Drilling of the well is expected to last around 60-90 days and has been designed as a standard vertical well. It will be drilled with a semi-submersible mobile offshore drilling unit (MODU) rated for operations in water depths around 140 m.

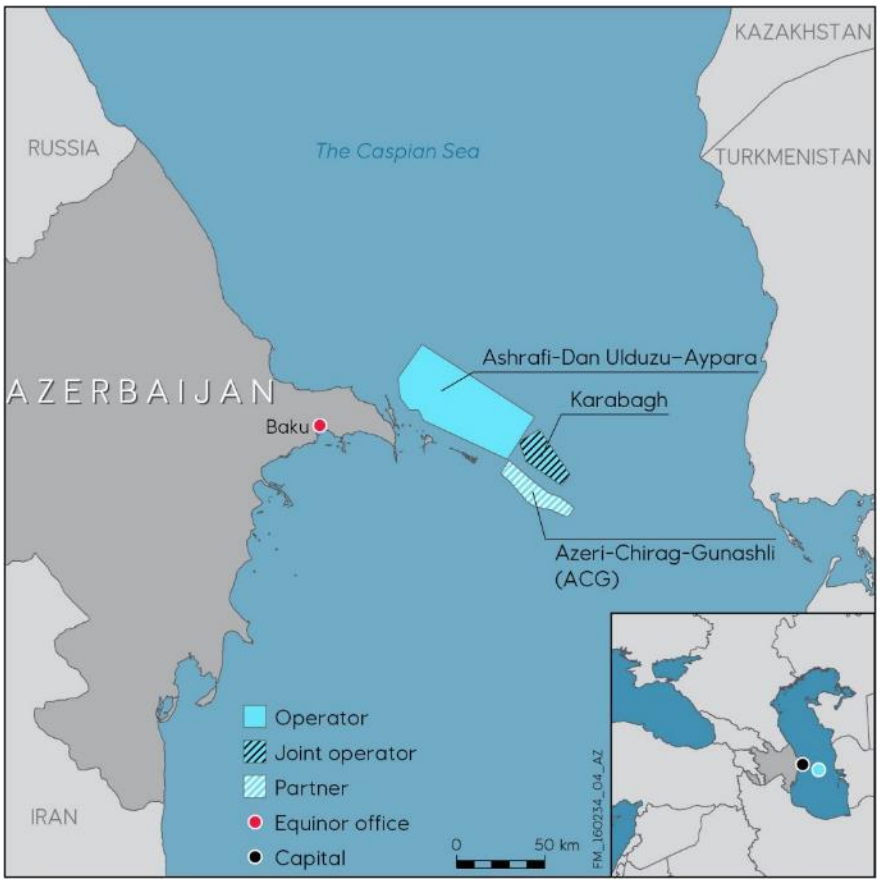


Figure 0.1: Location of ADUA exploration area in Azerbaijan (Statoil Azerbaijan, 2018)

Regulatory Framework

In Azerbaijan, the Ministry of Ecology and Natural Resources (MENR) is the Central state authority overseeing the environmental protection by controlling the implementation of the environmental protection rules and the adherence to the regulations and standards. The MENR is responsible for the review and approval of the EIA report.

The drilling Project will be carried out taking into account a number of legal and practice guidelines. These will be taken into account from early stages of the project planning and cover the entire project life-cycle. They can be organized as follows:

- National legislation and policy.
- International conventions and agreements.

- Guidelines and requirements set in the production sharing agreement (PSA) signed between the Ministry of Energy and the Project proponent.
- International standards.

Key regulations, legislation, as well as international conventions and standards relevant to the Project, are summarized in Table 0.1.

Table 0.1: Key National Environmental Laws (ERM and Synergetics, 2018)

Subject	Title
General	Law of Azerbaijan Republic on the Protection of the Environment No. 678- IQ.
	Law of Azerbaijan Republic on Ecological Safety No. 677-IQ.
	Law of the Azerbaijan Republic "On environmental impact assessment" of June 12, 2018
	Law of the Azerbaijan Republic "On hydrometeorological activity" № 485-IQ
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic "On approval of the Regulation on the rules of state monitoring of the environment and natural resources" No. 90 of July 1, 2004
Ecosystems	Law of the Azerbaijan Republic on Specially Protected Natural Territories and Objects No. 840-IQ.
	Law of the Azerbaijan Republic "On the protection of green belts" № 957-ICQ
	Law of the Azerbaijan Republic «On fisheries» № 457- İQ
	Law of Azerbaijan Republic on Fauna No. 675-IQ.
Water	Water Code of Azerbaijan Republic (approved by Law No. 418-IQ).
	Rules for Protection of Surface Waters from Waste Water Pollution, State Committee of Ecology Decree No. 1.
Air	Law of Azerbaijan Republic on Air Protection No. 109-IIQ.
	Methodology to Define Facilities' Hazards Categories Subject to Hazardous Substance Emissions Levels and Need to Develop Projects' Maximum Permissible Emissions.
	Decree of the President of the Azerbaijan Republic "On approval of norms of vibration and noise pollution having a negative impact on the environment and human health" No. 381
Waste	Law of Azerbaijan Republic on Industrial and Domestic Waste No. 514-IQ.
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic "On approval of the rules of hazardous waste storage " No. 228
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic "On approval of the procedure for certification of hazardous waste" No. 41
Subsurface	Law of the Azerbaijan Republic on Subsurface Resources No. 439-IQ.
Information	Law of the Azerbaijan Republic on Access to Environmental Information No. 270-IIQ.
Liability	Law on Mandatory Insurances.
Permitting	Law of Azerbaijan "On licenses and permits" № 176-VQ
International	Stockholm Convention on Persistent Organic Pollutants

Subject	Title
Conventions	International Convention for the Prevention of Pollution from Ships/ Vessel (MARPOL), 1973 as amended by the protocol, 1978
	International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990.
	Bern Convention
	Basel Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposals
	Kyoto Protocol, 1997
	UN Convention on Biological Diversity, 1992
	Convention for the Protection of the Archaeological Heritage of Europe
	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
	UN Convention on the Protection of the Ozone Layer (Vienna Convention)
	Montreal Protocol on Substances that Deplete the Ozone Layer, 1987
	United Nations Framework Convention on Climate Change, 1992
Regional Conventions	Convention on the legal status of the Caspian Sea
	Tehran-Caspian FrameworkConvention
	Convention for the Protection of the Marine Environment of the Caspian Sea
	Convention on the Transboundary Effects of Industrial Accidents*
	Protocol on Water and Health*
	Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention)*
	UNECE Geneva Convention on Long-range Transboundary Air Pollution*
	UN Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposals
	International Carriage of Dangerous Goods by Road*
	Aarhus Convention
	Espoo Convention

Project Description

The Aypara-1 well is expected to spud in Q1 2020. As part of the project definition alternatives were considered to ensure that (1) environmental and social performance was taken into account together with (2) technical and economic feasibility and (3) the presence of the resource that the drilling is aiming at investigating.

Key aspects in the proposed drilling include:

- **Drilling unit**: a semi-submersible mobile offshore drilling unit (MODU) rated for operations in water depths sufficient for operation in ADUA area will be used to drill the well.
- **Drilling technique**: a conventional drilling method will be used.
- **Well information**: Preliminary design for the proposed exploratory well is as follows.

Table 0.2 Aypara-1 Exploration well - Preliminary Design (Equinor, 2018)

Casing Size (in)	Depth of Shoe (m below RKB)	Section Length (m)
36”	312	153
20”	750	445
16” (contingency)	~1300	unknown
13 5/8”	1900	1150
11 3/4” liner (contingency)	~2500	unknown
9 7/8”	3164	1264
7” liner	3400	230

- **Drilling fluids and cuttings**: these control the well bore pressure, keep the bit and bottom hole assembly cool, lubricate the bit, reduce friction between the drill pipe and the hole, and inhibit reactive clays and transport cuttings out of the wellbore. Two different drilling fluids will be used: either Seawater/Hi-viscosity sweeps (SW) or Water Based Mud (WBM) for the top sections and Synthetic-Oil Based Mud (SOBM) for the lower sections.
- **Blow-out prevention (BOP)**: the MODU will have one BOP rated for 689 bar working pressure.
- **Vertical seismic profile (VSP)**: after drilling the well, a VSP will be conducted using geophones inside the wellbore. The seismic images produced will have greater detail than those obtained during the previous surface seismic surveys.
- **Well abandonment**: when all drilling, coring and logging activities are finalized the well will be permanently or temporarily abandoned in accordance with local regulations.

- **Work force**: The rig will operate 24 hours-per-day and will be staffed by about 120 personnel plus 30 personnel for the supply vessels. The full contingent of personnel engaged by Equinor, including shore staff, will be more than 200 people during the drilling activities.
- **Logistics base**: A shore base facility is planned to be located within the Qaradag area and will be the main hub for logistic support activities for the Project. The Project is planning to use existing storage areas and facilities in Qaradag area and thus avoiding construction of new infrastructure.
- **Water supply**: drilling will require about 2,000 tons of freshwater, while some 20-40 tonnes per day will be needed by the base facility. Drinking/potable water will be bottled water transported by the supply vessel to the rig. The average support vessel potable water consumption is estimated at 2 m^3 a day each.
- **Fuel supply**: the average usage, for a 60-day well, is estimated to be about 4,020 tonnes of MGO fuel. Fuel will be purchased locally and supplied to the drillship by the supply vessels.
- **Discharges of drilling fluids and rock cuttings**: the SOBM and cuttings of the lower sections will be sent to a locally approved vendor for treatment and landfill. Should SW be used for the top section, this mud type and cuttings will be discharged on the sea bed: about 1,200 m^3 of SW mud and about 310 m^3 of cuttings. These will be discharged during 15 days horizontally on the seabed with a 36" discharge pipe. In case WBM is used (same volume of mud and of expected cuttings as SW) the cuttings will be sent to a locally approved vendor for treatment and landfill and WBM will be recovered through a "riserless mud recovery" (RMR) system.
- **Discharges of liquid fluids**: it is assumed that one person generates 100 L/day of sanitary wastewater (from toilet facilities) and 220 L/day of domestic wastewater ("gray water" from showers, sinks, laundries, and galleys, as well as from safety shower and eye-wash stations). All liquid waste from all areas of the deck, and all run off from the drill floor, mud tanks and mud mixing and handling area, and all bilges and machinery spaces shall be contained and treated/disposed as required (i.e. oil/water separator; sent to shore).
- **Discharges of solid wastes**: activities aboard the rig will generate various wastes streams that include domestic waste, maintenance products, packaging waste, scrap metal, and empty chemical drums. These will be sorted, transported to shore and disposed according to the Waste Management Plan
- **Chemical wastes**: Material Safety Data Sheets (MSDS) datasheets will be available for all chemicals. All chemicals will be handled, stored and used in strict accordance with laws and regulations and the MSDS of each product. Relevant hazardous materials/waste will be included in the Waste Management Plan.
- **Air emissions**: will result from internal combustion engines used in the power generation systems, both in the rig and in supply and crew vessels.

Description of the Environmental and Social Baseline

Geographical setting

The Caspian Sea is the largest closed water basin in the world with an average depth of 207m, while the deepest area reaches 1,025 m, and is characterized by its regular changes in sea level. Azerbaijan has 850 km of shorelines. The Caspian Sea can be divided into three parts according to physical and geographical features, bottom relief and morphological features of shorelines: Northern Caspian Sea, Middle Caspian Sea and Southern Caspian Sea. The ADUA exploration area is located within the Southern Caspian Sea,

Meteorological Conditions

Climate condition of the ADUA exploration area is distinguished with moderate winter and hot summer months. Mean annual temperatures in the Project area range between 12 and 14°C. The lowest temperatures are expected in January (3-5°C) and the highest in August (35°C).

Average annual rainfall is estimated between 170-230 mm and there are approximately 30-40 days of rain a year on average.

The ADUA area is prone to north winds, being these more prevalent in summer, and average speed is 8.5-9.4 m/sec. Gusty winds mainly blow from north, sometimes reaching 40 m/sec and mainly occur in September.

Hydrological features

The Caspian Sea is the largest closed water basin in the world with an average depth of 207m, while the deepest area reaches 1,025 m, and is characterized by its regular changes in sea level with a fluctuation value estimated within the 15m range during the last 3,000 years. Since 1995 a slow rate of decline has occurred from the 26,7 m below open oceanic levels measured at that moment.

The ADUA exploration area is located within a relatively shallow subsea plateau that gently slopes offshore from the coast to a distance of approximately 70 km offshore. Water depth ranges between 20 to 225 m, with some limited areas reaching 10m. Aypara-1 well site is located in an area of 140 m depth.

Water temperature in the Caspian Sea presents large latitudinal changes showing differences of up to 10ºC between the north and south areas. Mean sea water surface temperatures within ADUA exploration area vary from 5ºC in winter to 25ºC in summer.

Similarly, salinity is highly influenced by the influx of fresh waters from rivers resulting in an increase of salinity from the north to the south east of the Caspian Sea. Results of the 2018/2017 surveys in ADUA exploration area and the near-by Karabakh field showed that salinity levels in the Project area varied between 11.04 and 12.39 ppt, being relatively higher in lower layers.

Water circulation in the Caspian Sea is mainly formed by wind-drift currents along the western shore from Northern Caspian to the South. These flows move to the Absheron Peninsula, where they divide into two arms. The stronger arm passes the peninsula and enters the southern part before returning north. The second arm moves to the east from Absheron Peninsula and enters the southern shores joining with the main arm. The joined flow results in a cyclic water circulation in the Northern Caspian Sea. Typical current speed value in the Caspian Sea varies in the range from 15-20 cm/sec, whereas this value can reach up to 100cm/sec in certain areas. Current measurements in the ADUA exploration area in 2018 revealed speeds varying between 30 and 230 cm/sec.

The greatest waves in the Caspian are found around Absheron Peninsula and may reach heights of 7,5 - 8,0 m, and during extreme storms 9-10 m. The waves in the ADUA area are mainly brought by north winds and are mainly short, with late extinction after wind drop.

Water and Sediment Quality

Water and sediments analysis carried out in the ADUA exploration area in 2018 have been considered to analyze water and sediment quality of the ADUA and its wider environment. Results reveal that concentrations in the water of metals, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH) and BTEX (Benzene, Toluene, Ethylbenzene and xylene) were below the minimum concentrations defined by the analytic methods.

Sediments are mainly formed by silt and sand with low amount of organic substances and high levels of TPH and also of PAH in certain locations, as was the case of metals such as copper (19.59 mg/kg), iron (18,133.71 mg/kg), nickel (31.38 mg/kg), lead (10.15 mg/kg), zinc (39.99 mg/kg), chromium (39.41 mg/kg), manganese (732.66 mg/kg), and barium (1426.60 mg/kg).

Biological Environment

The Caspian Sea is relatively poor in terms of biodiversity compared to other large water bodies. However, because of its isolation, the Caspian Sea includes a high number of endemisms. In total, it is calculated that the Caspian Sea includes around 500 plant and 854 animal species, 79 of which are vertebrate species. Among these vertebrate

species it includes a total of 5 species of sturgeon and the Caspian seal. The most relevant elements in the area of interest are the following:

- **Fishes:** The Sturgeons are the most remarkable group of fishes from the Caspian Sea. Four species are found in the region: *Acipenser gueldenstaedtii* (Russian Sturgeon), *Acipenser nudiventris* (Ship Sturgeon), *Acipenser persicus* (Persian Sturgeon) and *Acipenser stellatus* (Stellate Sturgeon). All four species found in the area are anadromous (i.e. they spend most of their life at sea but migrate into river systems for reproduction) and based on the IUCN Red List all are considered as Critically Endangered (CE).

- **Mammals:** The Caspian seal (*Pusa caspica*) is a species belonging to real seals family and is the only marine mammal inhabiting in the Caspian Sea. The species is currently classified as an Endangered (EN). A total population size of about 104,000 was estimated in 2005, though a reduction of 3 to 4% occurs every year. In spring a significant number of seals (up to 500) rests on the islands of the Absheron peninsula (i.e. Malaya Plita, Bolshaya Plita, Podplitochny, Dardanella, Baklaniy, the Southern Spit and Urunos island, a part of Chilov island), though the amount of seal estimated in nearshore waters in April and May can be of up to 5,000-10,000 individuals. The most sensitive period for seals in the ADUA exploration area is expected to be between April-May and November, where they are either resting or migrating through the area, thus outside of the prospective drilling activity schedule.

- **Seabirds**: The west coast of the Caspian Sea constitutes a migration corridor for many bird species. Migrating species tend to concentrate in a narrow piece of land along the Absheron Peninsula, where the Absheron National Park is located., being the Common Starling (*Sturnus vulgaris*) the most frequently observed species.

- **Protected and other designated areas:** The ADUA exploration area is located relatively far from any protected or designated area, and the closest protected area, the Absheron National Park, which is located some 22.7 km to the west from the ADUA exploration area boundaries. Figure 0.2 shows the location of the protected areas compared to the ADUA exploration area. Currently there are marine reserves in Azerbaijan.

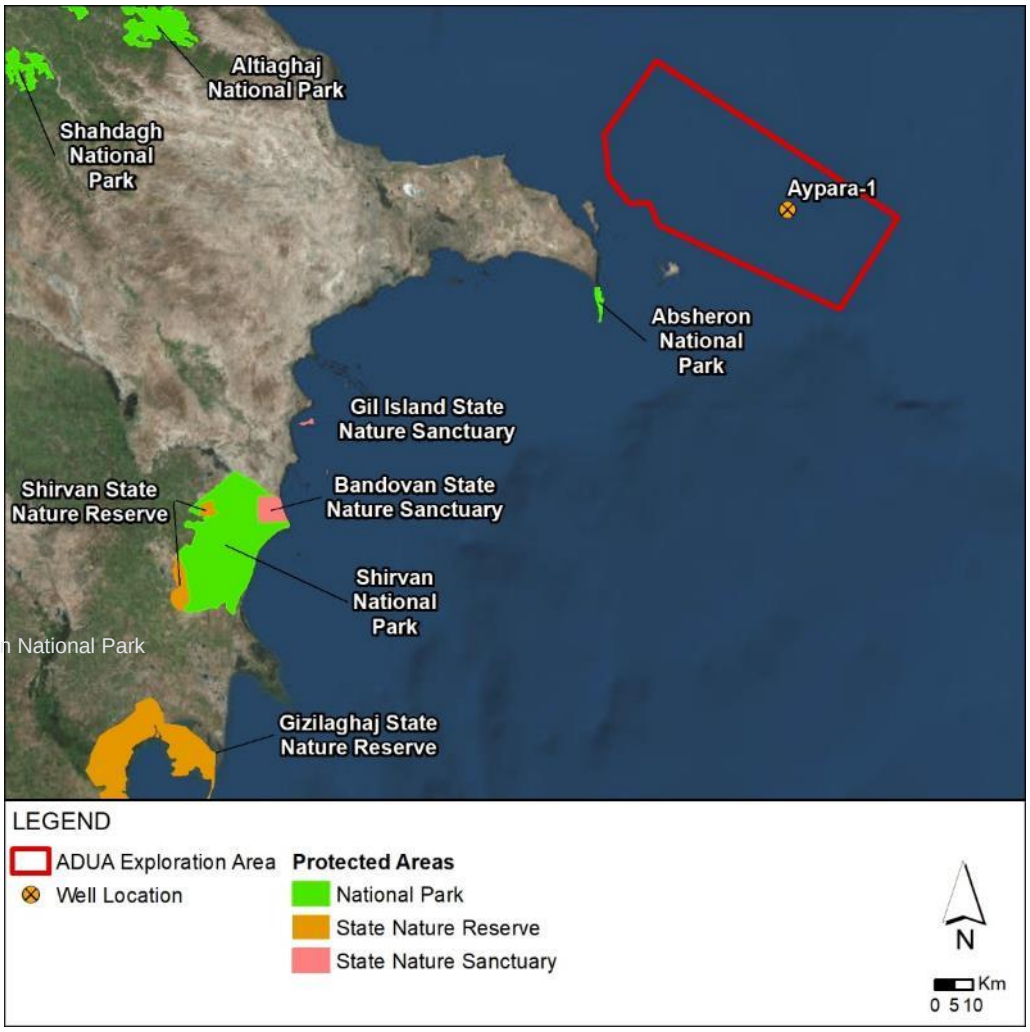


Figure 0.2: Protected Areas in Azerbaijan and ADUA exploration area (ERM, 2018)

Socioeconomic Environment

- **Fisheries**: In Azerbaijan there are some 22 species of fish species with commercial value. The most important species belong to the Acipenseridae, Clupeidae and Cyprinidae families although the large majority of the catches are composed by the species of the Clupeidae family. Fisheries have been traditionally an important commercial activity in Azerbaijan. However, during the last few decades the relevance of this sector has been reduced due to a number of environmental problems, including the appearance of the Comb Jelly, leading to a significant reduction in catches.

- **Maritime Transport**: Maritime transport plays a significant role in the economic development and prosperity of Azerbaijan, Baku being the largest port in the Caspian Sea. Shipping activity in the region combines different types of users from fishing boats to offshore O&G vessels, commercial trade and ferry services/passenger. The ADUA exploration area lies within some of the main marine traffic routes in the region.

- **O&G:** Oil and Gas industry is currently the most important economic resource and activity in the Caspian Sea and particularly in the Azerbaijan waters. At present, the majority of oil produced in the Azerbaijan Republic (70-95%) is received from the subsea fields.

Impact Assessment and Mitigation

Impact significance categories for potential environmental and social impact are illustrated in Table 0.3 below.

Table 0.3: Significance Criteria for Impacts (ERM, 2018)

Impact Significance	Definition
Negligible	When a receptor will not be affected in any way by a particular activity or the predicted effect is deemed “imperceptible”.
Minor	When an effect will be experienced but the impact magnitude is sufficiently small and well within accepted standard, and/or the receptor is of low sensitivity
Moderate	An impact within accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor to a level that might be just short of breaching the legal limit
Major	An impact where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive receptors. An aim of the EIA is to get to a position where the project does not have any major impacts, certainly not ones that would endure into the long-term or extend over a large area.

Table 0.4 presents a summary of the significance of residual impact (that is, after the implementation of the mitigation measures), based on the assessment of the activities associated with the Aypara-1 well drilling in ADUA exploration area.

Table 0.4: Evaluation of the Significance of Potential Environmental Impacts associated with the Aypara-1 well drilling activities (Routine Activities) (ERM, 2018)

Receptor	Project activity	Impact Description	Residual impact
Air Quality and Climate Change	Routine MODU operation, and support vessels	Potential reduction in localised air quality and contribution to greenhouse gases	**Negligible**
Seawater Quality	Routine and operational discharges during the project (i.e. black and grey water, bilge water, ballast, etc.). Drilling and installation of well infrastructure, including the discharge of cuttings and muds	Potential localized reduction in water quality, including increased turbidity and BOD Potential introduction of alien invasive species from ballast water discharges	**Negligible**
Seabed and Benthic communities	Drilling and installation of well infrastructure, including the discharge and deposition of cuttings and muds Vertical Seismic Profile activities.	Generation of noise emissions Loss of seabed, habitats and benthic fauna in the direct footprint of the well and where cuttings and cement are deposited Potential localized and short term increase in total suspended solids (TSS) in the water column and near the seabed Impacts on sediment quality and benthic organisms from contaminants contained in WBM directly discharged to seabed and SBM coated in cuttings discharged from the MODU	**Negligible** (Underwater sound) **Negligible** (Seabed discharges)
Plankton	Routine and operational discharges during the project (organic liquid/solid discharges)	Potential localised increase in organic matter and reduction in water quality	**Negligible**

Receptor	Project activity	Impact Description	Residual impact
Fish	Routine operation of MODU and support vessels. Vertical Seismic Profile activities.	Impacts due to the generation of noise emissions Secondary impacts due to changes in water quality	**Negligible**
Marine Mammals	Physical presence of the MODU and support vessels, including their movements Operation of MODU and support vessels Vertical Seismic Profile activities.	Disturbance from the presence of Project vessels; Potential collision risk with Project vessels; Impacts due to the generation of underwater noise emissions Secondary impacts due to changes in water quality	**Negligible to Minor** (physical presence, risk of collision and noise generated by VSP) **Negligible** (secondary impacts due to changes in seawater quality)
Seabirds	Operation of Project vessels	Disturbance from the presence and movements of Project vessels/helicopter, including lighting. Secondary impacts due to changes in water quality	**Negligible**
Protected areas	Operation of Project Vessels (including helicopters)	Disturbance to sensitive coastal areas from onshore activities	**Negligible**
Navigation, Traffic and Sea user	Project vessels movements	Impacts to maritime traffic Increase of collision risk	**Minor**
Fisheries	Physical presence and operation of Project vessels Vertical seismic profile activities	Impacts due to the presence of MODU and associated exclusion area for fisheries Impacts due to the generation of underwater sound emissions Secondary impacts due to changes in water quality	**Negligible** (presence of Project vessels) **Negligible** (impacts from underwater sound and from water quality changes)
Birds, marine mammals, coastal habitats, fish	Crude Oil / Diesel Spill	Affection to multiple receptors, including effects such as increased mortality, loss of habitats, contaminated fish and associated reduction in food and economic resources, etc.	**Tolerable if As Low As Reasonably Practical or 'ALARP'**

Receptor	Project activity	Impact Description	Residual impact
stocks and fisheries			

Conclusions on key identified impacts are summarized as follows:

- Impacts from noise emissions, physical presence and collision risk on marine mammals (Minor significance): The largest potential impact on the environment from the drilling activities is derived from the noise produced by the seismic source (i.e. VSP operations) and the risk collision derived of the physical presence of the vessels. Main associated mitigation measures include the implementation of soft start or ramp up procedures.
- Impacts from the presence and movements of project vessels on marine traffic and navigation (Minor significance): The project will notify relevant marine authorities about the development plans, timing and location of activities that together with the direct information through Notice to Mariners will ensure other marine users are aware of the activities. In addition, the implementation of a 500 m exclusion zone around the MODU will be enforced and supervised for the safety of the equipment and other users of the area. Given the short duration of the activities along with the static nature of the MODU, the residual impact from the physical presence of the seismic vessel and the presence of the safety awareness zone on the other sea users is considered to be Minor.
- Impacts from an Accidental Spillage (Tolerable if “ALARP”): A number of design measures will be introduced to reduce the risk of spill from operations such as leaks from on-board the MODU, releases of hydrocarbons from vessel collision and refueling etc. Design measures will also be introduced to reduce the risk of blow-out. An Oil Spill Contingency Plan (OSCP) and Emergency Response Plan (ERP) will also be in place to minimize the effects of an accidental oil spill by an effective and quick response. Regular maintenance activities and inspections as well as procedures for bunker transfer will contribute to reduce the likelihood of such an event.

Environmental Management Plan

In this EIA, no impacts were identified that could not be avoided or reduced to acceptable levels through the application of the proposed mitigation measures detailed in the impact assessment chapter and further described in the project´s Environmental Management Plan (EMP). The EMP will ensure that all the mitigation measures provided for in the EIA are implemented while the Project is carried out, in accordance with the commitments made by Statoil

Azerbaijan. The EMP is to be considered a dynamic document that may be continuously revised as part of an on-going environmental management and improvement process.

The objectives of the EMP are:

- Providing the mechanism to ensure compliance with Azeri legislation, Equinor Health, Safety, and Environment (HSE) policies, management system and procedures, international law and standards, and good Oil & Gas industry best practices;
- Providing the mechanism for ensuring that all proposed mitigation measures identified in the EIA to mitigate potentially adverse impacts are implemented;
- Providing a framework for mitigating impacts that may be unforeseen or unidentified;
- Evaluating effectiveness or inefficiency of these mitigation measures and, if required, modify them or include new mitigation/preventive measures; and
- Establishing a monitoring programme and record-keeping protocols so that pertinent additional information that was not available during the compilation of the EIA can be collected in order to provide quality assurance for the conclusions of the EIA.

In addition, the EMP serves as a set of contractual clauses and specifications that define the Contractor's environmental and social responsibilities at the tendering stage.

Based on the key identified impacts, specific management plans will be developed for the following environmental and social aspects:

- Waste management plan: establish waste streams, procedures for the storage, packaging and labelling of waste, including liquid and solid waste and hazardous and non-hazardous wastes, define transportation procedures and location for final disposal, and to define the responsibilities associated to waste management activities.
- Ballast Water Management Plan (BWMP): to assist in complying with measures intended to reduce the harmful effects on the marine environment that are spread through aquatic microorganisms transferred from one area to another through ballasting operations, while maintaining safety;
- Emergency Response Plan (ERP): to prepare for and respond quickly and safely to any incident within onshore and offshore operational sites, regardless of incident type and size;

- Oil Spill Contingency Plan (OSCP): will provide a detailed oil spill response and removal plan that addresses controlling, containing, and recovering an oil discharge in quantities that may be harmful to navigable waters or adjoining shorelines, by defining responsibilities and duties as well as capabilities and procedures;
- Shipboard Oil Pollution Emergency Plan (SOPEP): to assist personnel in dealing with unexpected discharge of oil, to set in motion the necessary actions to stop or minimize the discharge, and to mitigate its effects on the marine environment.

The EMP further establishes the procedures and responsibilities set forth to effectively implement all proposed actions, relevant information to be communicated and change management procedures when modifications of the EMP may be warranted.

1 Introduction

1.1 Background

The president of Azerbaijan's state oil company SOCAR and Statoil Azerbaijan (part of the Equinor group) signed a Production Sharing Agreement (PSA) for the Ashrafi, Dan Ulduzu, Aypara (ADUA) exploration area on the 30th of May 2018. The ADUA exploration area is located offshore and is around 50 kilometres east of Baku, around 14 kilometers to the east of Azerbaijan mainland (Absheron peninsula), and approximately 7 kilometers to the east of Pirallahi Island and Chilov Island .

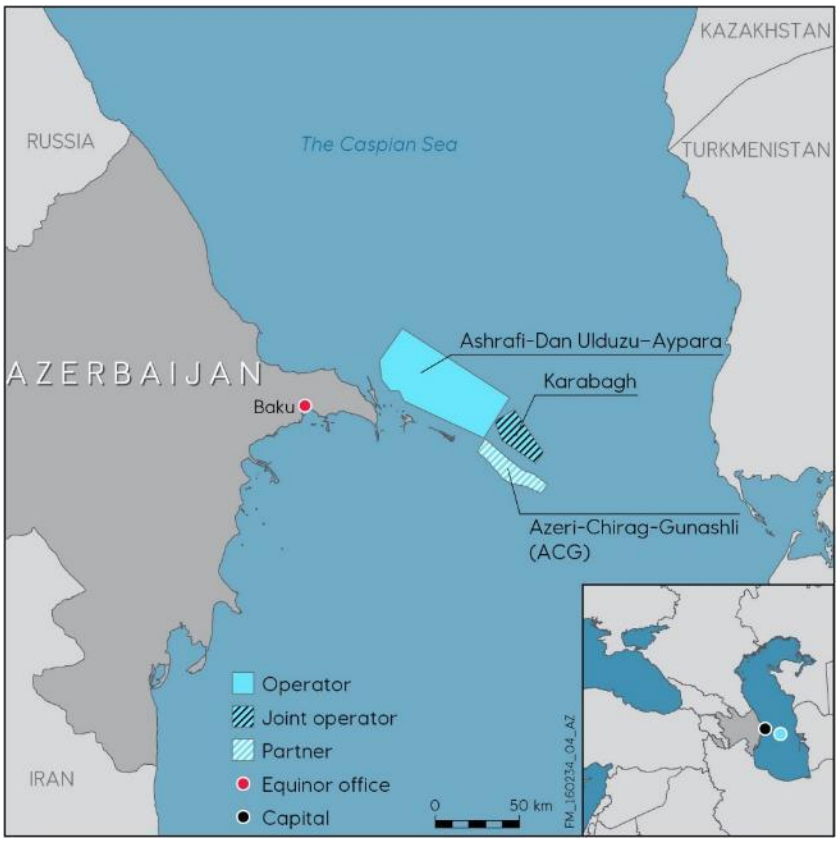


Figure 1.1: Location of ADUA exploration area and Karabakh oilfield in Azerbaijan (Statoil Azerbaijan, 2018)

As a first step, prior to the development of the ADUA field, an exploration well, named as Aypara-1, will have to be drilled. The objective of the exploration well will be to gain a better understanding of the potential resources in the field and the definition of the subsequent development (e.g. location of future appraisal and production wells).

As per the PSA, Statoil Azerbaijan will be the operator of these activities and thus responsible for the planning and execution of the exploration well Aypara-1.

1.2 The Project

The Aypara-1 well is located in the Caspian Sea (see detailed coordinates in Table 1.1), some 90 km east of Baku in a relatively central position within the Azeri–Chirag–Gunashli (ACG) structure. The Aypara is an undrilled structure with areal coverage of about 25 km^2 (Figure 1.2).

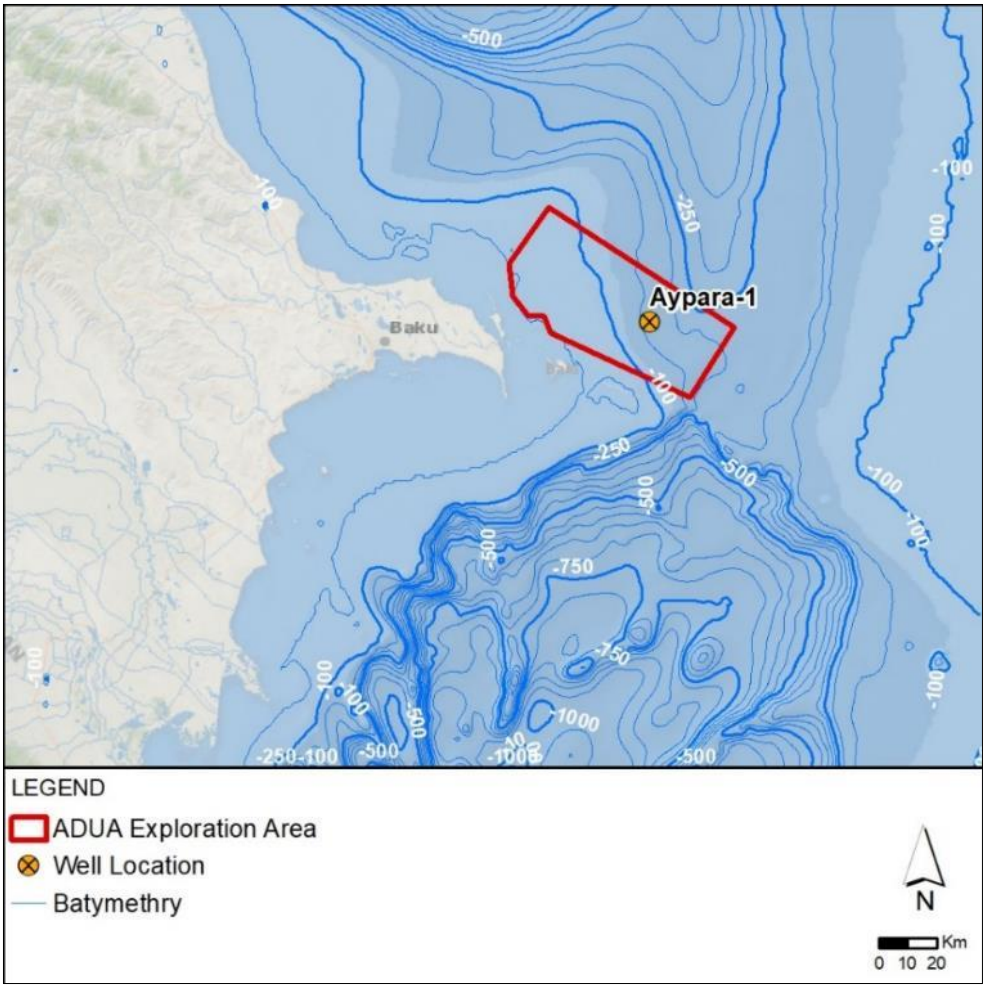


Figure 1.2: Location of Azerbaijan Ashrafi-Dan Ulduzu-Aypara exploration area and Aypara-1 well (ERM, 2018)

Table 1.1: Proposed well coordinates (Statoil Azerbaijan, 2018)

Well Name	*Proposed Coordinates*	
	Latitude	*Longitude*
Aypara-1	40° 27' 46.88" N	50° 57' 17.96"E

The Aypara-1 well is expected to spud in Q1 2020. Drilling of the well is expected to last around 60-90 days and has been designed as a standard vertical well. It will be drilled with a semi-submersible mobile offshore drilling unit (MODU) rated for operations in water depths around 140 m.

1.3 Purpose of this report

This Environmental Impact Assessment (EIA) report covers the activities required for the offshore drilling of the exploration well. This EIA report has been prepared in compliance with legal requirements in Azerbaijan, the conditions set in the PSA and international good practice.

The objective of the EIA is to support the design and management of activities related to the Aypara-1 drilling activities. The overall objectives of this EIA can be summarized as follows:

- Establish and describe the baseline of existing environmental conditions in the offshore exploration area;
- Assess the potential impacts of the Project and to propose management tools and approaches using internationally accepted standards;
- Support the proposed activity, including the project design, operation and decommissioning to be aligned and be compatible with internationally accepted environmental management practices;
- Demonstrate that the Project complies with current Azerbaijan legislation, Equinor's HSES policies, standards and expectations, and relevant international standards.

1.4 Presentation of the Project Proponent

Equinor[1], formerly Statoil, is an international energy company in charge of developing oil, gas, wind and solar energy around the world. Statoil Azerbaijan (part of the Equinor group) has been a partner in Azerbaijan's industrial and economic transition since 1992. Together with the national oil company SOCAR and other international companies,

[1] In May 2018, Statoil's Annual General Meeting voted to change the company name to Equinor to better reflect our evolution and identity as a company. The name Equinor is formed by combining "equi", the starting point for words like equal, equality and equilibrium, and "nor", signalling a company proud of its Norwegian origin.

they have worked both industrially and socially to build Azerbaijan's thriving oil and gas market to realise its full potential.

Today Equinor has an interest in the Azeri-Chirag-Gunashli (ACG) oil field, as well as the Baku-Tbilisi-Ceyhan (BTC) pipeline—which runs from the Azerbaijan capital of Baku to the south Turkish port of Ceyhan on the Mediterranean. In September 2017, the 30-year Production Sharing Agreement (PSA) for Azeri Chirag and Deep Water Gunashli (ACG) oil field that was signed in September 1994 was extended for another 25 years, until the end of 2049.

Equinor has a 7.27% interest in the extended ACG PSA and has an 8.71% interest in the BTC project. The BTC pipeline passes Azerbaijan, Georgia and Turkey, connecting the Caspian with the Mediterranean Sea. Baku-Tbilisi-Ceyhan (BTC) oil export pipeline is the main export route for the ACG oil.

1.5 Presentation of the consultancy in charge of the EIA

1.5.1 ERM

The EIA document has been developed by Environmental Resources Management Iberia S.A, which is part of the ERM Group. ERM is an international sustainability consultancy company employing approximately 5,000 people in more than 160 offices across the world.

ERM operates exclusively in the sustainability, environmental, social and health, risks and safety fields and the vast majority of its clients are private industrial clients or public sector clients of an industrial nature.

ERM has extensive experience in Projects in offshore environments in several geographic locations around the world, covering numerous sectors, such as oil and gas, mining and power. The company has an extensive proven track record in delivering Impact Assessments for offshore drilling operations worldwide.

ERM has significant experience in Azerbaijan and in the Caspian Sea in the O&G sector, including almost all Caspian countries.

1.5.2 Synergetics

CST (Centre of Social Technologies) Synergetics is an Azeri company that specializes in the development of research, consulting and training services for environmental and socio-economic projects carried out by different

local and international organizations and has been delivering quality consulting services to clients in different fields of social and environmental development projects since 1998.

CST has completed more than 59 projects which have been funded by different foreign and international organizations as well as major O&G companies and Consultancies, and government institutes of Azerbaijan Republic plans and programs.

The interdisciplinary team of CST Synergetics includes 45 employees, of which 7 are permanent staff. CST is supported by a network of independent consultants with expertise in multiple fields, including environmental and social evaluation and analysis.

1.6 Scope of the Drilling Campaign EIA

The purpose of the EIA is to provide information to regulators, the public and other stakeholders to aid the decision-making process. The main objectives of the EIA are to identify, reduce and effectively manage potential negative impacts and to maximize positive impacts. Specifically, the following objectives can be mentioned:

- Integrate environmental and socio-economic considerations into the drilling campaign design and implementation;
- Ensure that environmental and socio-economic impacts are identified and assessed, and appropriate preventive and mitigation measures proposed;
- Define the appropriate environmental and socio-economic performance standards for planning and implementation;
- Identify and establish the applicable legal, operator and PSA requirements and expectations; with due regard to environmental and socio-economic considerations.

1.7 Report Structure

The contents of the EIA have been organized following the contents presented in Table 1.2.

Table 1.2: Structure and content of the EIA (ERM, 2018)

Chapter	*Contents*
Executive Summary	Provides a summary of the EIA.
Acronyms	A list of the acronyms used in the EIA.

Chapter	*Contents*
• **Introduction**	Provides a general introduction to the drilling campaign EIA, including objectives and EIA structure.
• **Legal Framework**	Outlines the main regulations and legal framework applicable to the project in Azerbaijan. The chapter includes national legislation as well as international standards of reference (which Azerbaijan is a signatory) and key international standards of application to the project.
• **Project Description**	This chapter provides a technical description of the drilling campaign activities proposed by Statoil Azerbaijan including operations, location, timings and resources required.
• **Environmental Baseline**	This chapter provides a description of the environmental features of the Ashrafi-Dan Ulduzu-Aypara (ADUA) exploration area.
• **Impact Assessment**	A description of the methodology used for the EIA and assessment of the potential impacts (from routine and accidental events, and cumulative impacts) from the planned drilling activities of the Aypara-1 well, including mitigation and monitoring.
• **Environmental Management Plan (EMP)**	This chapter provides a description of how the mitigation measures identified in Impact Assessment Chapter will be incorporated into the Project design and subsequently implemented throughout the duration of the exploratory drilling programme.
References	Lists of references and sources used along the EIA.

2 Regulatory Framework

2.1 Introduction

This chapter outlines the main regulations and legal framework applicable to the project in Azerbaijan. This chapter also includes international standards of reference (which Azerbaijan is a signatory) as well as key international standards of application to the project.

The chapter is organized in six sections as follows:

1. National authorities regulating environmental issues;
2. Production sharing agreement (PSA);

3. National environmental legislation and policy;
4. Segment and Regional standards[2].
5. International and regional conventions and agreements ratified by the Azerbaijan government and of relevance for this project;
6. International petroleum industry standards and practices.

This chapter also sets out the responsibilities of relevant regulatory agencies in relation to environmental regulation.

2.2 National Authorities

The Azerbaijan government is responsible for environmental protection in Azerbaijan. Central state authority overseeing the environmental protection is the Ministry of Ecology and Natural Resources (MENR). The MENR is authorized to control the implementation of the environmental protection rules, adherence to the regulations and standards. In addition, the MENR is responsible for the review and approval of the EIA report, which are part of the agreements under the PSA that is signed with the corresponding contractors for O&G exploration and production.

State Land and Cartography Committee oversees the regulation of use of soils, while the registration of immovable property, including the land owners is performed by the State Service for Registration of Real Estate.

Ministry of Emergency Situations (MES) is the responsible organization in management of unexpected natural and industrial accidents. MES is also a state authority controlling the implementation of safety regulations in the construction, mining works and industry.

The Ministry of Health is a state authority overseeing sanitary and epidemiological situation within the country. The Ministry also regulates the health and safety in the production sites.

Ministry of Energy is the regulator for oil and gas sector in the country and is in charge of issuing the agreements and contracts for exploration, exploitation, production, processing, storage, transportation, distribution and use of energy materials and products, including oil and natural gas. In addition, it is entitled for the preparation and negotiation of Production Sharing Agreements (PSAs). In this context the State Oil Company of the Republic of Azerbaijan (SOCAR), dependant from the Ministry of Energy plays a key role in the preparation of the PSAs and defining the conditions applicable.

[2] Taking into account the gradual trend of integration of Azerbaijan national environmental legislation to that of EU directives, at this stage the inclusion of segment and regional standards, though not mandatory, are recommended.

The **State Oil Company of the Republic of Azerbaijan (SOCAR)** is the party to the PSA representing the Republic of Azerbaijan. Hence, the obligations that Statoil Azerbaijan has undertaken in the PSA are effectively owed to SOCAR.

2.3 Production Sharing Agreement (PSA)

Production sharing agreements (PSAs) are the contractual vehicle between the Ministry of Energy and the Contractors engaged in the exploration or development activities. As part of these contracts the Ministry of Energy includes guidance on relevant aspects such as the environmental protection and safety, environmental standards and practices and commitments for operations planned.

The PSA establishes the legal regime for implementation of the Petroleum Operations envisaged in the ADUA exploration area in the Azerbaijan sector of the Caspian Sea (in this case 2D-3D seismic and exploration drilling). The PSA was signed by Statoil Azerbaijan as Contractor and SOCAR in Baku on 30th May 2018, and was later ratified by Parliament in Azerbaijan (Milli Majlis) on 29th June 2018. The drilling activities will be managed by Statoil Azerbaijan as the Contractor under the PSA.

The detailed conditions can vary from contract to contract and are negotiated with the corresponding contractor. Nevertheless, unless specific conditions apply, the same principles are applicable to all contracts (i.e. Article 26 of the PSA on Environmental Protection and Safety, and Appendix 9 Environmental Standards and Practices). These can be summarized as follows:

General Environmental and safety requirements:

- Good International Petroleum Industry Practice with their implementation in exploration and production operations in other parts of the world and (ii) existing Azerbaijan safety and environmental legislation.
- Implementation of integrated management systems (covering all health, safety and environmental aspects of the activities carried out).
- Good emergency preparedness including definition of possible scenarios, response plan, coordination with relevant agencies and having the required technical capabilities and means.
- Environmental Protection Strategy shall typically include: (1) an environmental management system; (2) environmental risk assessment; (3) baseline and impact assessment studies, (4) environmental monitoring, (5) emergency response plans, and (6) an environmental work programme.

The environmental work programme to be pursued during Petroleum Operations pursuant to Article 26 of the PSA, in regards to exploration drilling activities, requires the development of an environmental impact assessment for drilling operations.

2.4 National Environmental legislation

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 proposed drilling activities 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 framework for national environmental legislation in Azerbaijan is provided by the Law on the Protection of the Environment (1999), which addresses the following issues:

- The rights and responsibilities of the State, the citizens, public associations and local authorities;
- The use of natural resources;
- Monitoring, standardisation and certification;
- Economic regulation of environmental protection;
- State Ecological Expertise (SEE);
- Ecological requirements for economic activities;
- Education, scientific research, statistics and information;
- Ecological emergencies and ecological disaster zones;
- Control of environmental protection;
- Ecological auditing;
- Responsibility for the violation of environmental legislation; and
- International cooperation.

According to Article 54.2 of the Law on Protection of the Environment, EIAs are subject to SEE, which means that the environmental authority (MENR) is responsible for the review and approval of EIA reports submitted by operators. The Law establishes the basis for the SEE procedure, which can be seen as a “stand-alone” check of compliance of the proposed project with the relevant environmental standards (e.g. for pollution levels, discharges and noise). In addition, the law determines that projects cannot be implemented without a positive SEE resolution.

The SEE approach requires state authorities to formally verify all submitted developments for their potential environmental impacts. Current internationally recognized practice emphasizes a proportionate, consultative and publicly accountable approach to assessing impacts.

According to the Law "On EIA "of 12.06.2018 (approved by the Decree of the President of the Azerbaijan Republic, №193, from 13.07.2018), the EIA documentation is developed in accordance with: 1) the requirements of the EIA law, 2) the laws of the Azerbaijan Republic "On environmental protection",3) "On environmental safety " and 3) other legal acts in the field of environmental protection. The list of activities for which EIA is required is given in Appendix 1 of this Law. According to this Appendix (paragraph 1), the EIA is required for projects related to the prospecting, exploration, development and production of hydrocarbon reserves.

The environmental impact assessment shall identify, describe and assess, as appropriate, in the light of each individual case, the direct and indirect impact of the proposed activity on the following factors:

- atmospheric air;
- surface and ground water;
- bottom surface of basins;
- natural and artificial landscapes;
- soil cover and subsoil;
- fauna and flora;
- state of ecosystems and biodiversity;
- environmentally sensitive areas;
- public health;
- socio-economic sphere (employment, education, health, road transport and other infrastructure); cultural heritage;
- climate change

The environmental impact assessment documentation (report) shall contain at least the following information:

- description, objectives and stages of the planned activities, types of environmental impacts and methods of environmental risk assessment;
- legal and regulatory framework used in the development of the EIA document;
- prospects of socio-economic development of the territory for the implementation of the planned activity;
- assessment of the current environmental status and sensitivity of the proposed activity area;
- forecast of changes and outcomes of the environmental impact of the planned activity and assessment of their scope;

- description of physical characteristics and requirements of land use during the construction and operation stages; description of the main characteristics of technological processes, assessment of the types and quantities of expected waste and emissions (water, air and soil pollution, subsurface pollution, noise, vibration, thermal and radioactive radiation, etc.) resulting from the planned activities;
- comparison of the main alternatives considered (including the option of abandonment of the planned activity) and indication of the main reasons for the choice of an alternative, taking into account the environmental impact;
- description of the current state of those elements of the environment that are likely to be significantly affected by the planned activity, including population, flora, fauna, soil, subsoil, water, air, climatic factors, material values, including architectural and archaeological heritage, landscape and the relationship between the above factors, with the necessary detailing to establish the basic (initial) state of the environment in the area of the planned activity;
- description of the possible types and effects of environmental impacts of the proposed activity and assessment of their scope. The description should include direct effects and any indirect, secondary, cumulative, short-term, medium-term and long-term, permanent and temporary, positive and negative impacts of the planned activity;
- description of the methods used for the environmental impact assessment;
- description of the measures provided for the prevention, reduction and, where possible, elimination of significant adverse environmental impacts;
- description of measures for prevention and elimination of consequences of the possible extraordinary and emergency situations;
- environmental management plan for all stages of the planned activities;
- environmental monitoring plan;
- plan of site rehabilitation after the expiry of the period of operation of the facility;
- information on public hearings and discussions;
- if the planned activity is related to the use of the earth's interior, the information on geological and hydrogeological justifications should be attached to the EIA document;
- justification of the need for implementation or non – implementation of post – project analysis and in the case of the need for its implementation, the definition of indicators and time frames.

Table 2.1 provides a summary of the key national environmental laws.

Table 2.1: Key National Environmental Laws (ERM and Synergetics, 2018)

Subject	Title	Date	Description / Relevance to Aypara-1 Drilling EIA
General	Law of Azerbaijan Republic on the Protection of the Environment No. 678- IQ.	08/06/1999 (last amendment 30/09/20140)	Establishes the main environmental protection principles and the rights and obligations of the State, public associations and citizens regarding environmental protection (described above).
	Law of Azerbaijan Republic on Ecological Safety No. 677-IQ.	08/06/1999 (last amendment 01/02/2013)	One of two keystone laws of the country's environmental legislation (along with the *Law on the Protection of the Environment*). 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.
	Law of the Azerbaijan Republic "On environmental impact assessment" of June 12, 2018	Approved by the Decree of the President of Azerbaijan Republic dated 13/07/2018, № 193	The purpose of this law is to create a legal basis for the functioning of the environmental impact assessment mechanism and/or strategic assessment of projects or planned activities (specified in Appendix 1 of the Law) to ensure the prevention or reduction of negative impacts on the environment and public health at the earliest stages. In accordance with the provisions of this Law, the environmental impact assessment is carried out based on the following principles: an integrated environmental, social and economic assessment of the impact of the proposed activity on the environment and human health; ensuring the integrity, transparency and reliability of information about the environmental safety of the proposed activity; the preservation of ecological balance and biodiversity; not to exceed the impacts of the proposed activity on the environment to acceptable standards; forecasting of possible environmental consequences and assessment of the level of environmental risks; ensuring transparency in the EIA, informing the public and taking into account public opinion.
	Law of the Azerbaijan Republic "On hydrometeorological activity" № 485-IQ	17/04/1998 (last amendment 03/04/18)	Defines the legal basis for conducting observations, investigations and works of active impact on atmospheric processes, development, use and protection of information on hydrometeorology and monitoring of the natural environment in the Azerbaijan Republic.

Subject	Title	Date	Description / Relevance to Aypara-1 Drilling EIA
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic "On approval of the Regulation on the rules of state monitoring of the environment and natural resources" No. 90 of July 1, 2004	01.07.2004	Regulates the rules of state monitoring of the environment and natural resources. The state monitoring system for the environment and natural resources is divided into: monitoring of atmospheric air; monitoring of water bodies; monitoring of land; monitoring of mineral resources; monitoring of biological resources; monitoring of atmospheric precipitation (rain, snow); monitoring of radioactivity; monitoring of harmful physical effects on the environment; monitoring of waste; sanitary and epidemiological monitoring.
Ecosystems	Law of the Azerbaijan Republic on Specially Protected Natural Territories and Objects No. 840-IQ.	24/03/2000 (last amendment 06/03/2015)	Determines the legal basis for protected natural areas and objects in Azerbaijan.
	Law of the Azerbaijan Republic "On the protection of green belts" № 957-ICQ	02/05/2014	Regulates relations in connection with the protection of green belts in the Azerbaijan Republic and defines the rights and obligations of the state, municipalities, legal entities and individuals in this area.
	Law of the Azerbaijan Republic «On fisheries» № 457- İQ	27/03/1998 (last amendment 28/10/2014)	Defines the legal basis for the organization and management of fisheries, the increase of fish stocks, their use and protection in the Azerbaijan Republic.
	Law of Azerbaijan Republic on Fauna No. 675-IQ.	04/06/1999 (last amendment 06/03/2015)	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.
	Forest Code of the Azerbaijan Republic (approved by Law No. 424-IQ).	30/12/1997 (last amendment 14/02/2017)	Defines the legal basis for the regulation of forest relations, use of forests, their protection, conservation, reproduction, improvement of ecological and resource potential of forests in the territory of the Azerbaijan Republic.

Subject	Title	Date	Description / Relevance to Aypara-1 Drilling EIA
	Law of the Azerbaijan Republic on Protection of Public Health No. 360-IQ.	26/06/1997 (last amendment 02/02/2015)	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.
Water	Water Code of Azerbaijan Republic (approved by Law No. 418-IQ).	26/12/1997 (last amendment 06/03/2015)	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 Azerbaijan Republic. "On the safety of hydraulic structures "	27/12/2002 (last amendment 18/12/2015)	Regulates the relations related to ensuring the safety of hydraulic structures during their design, construction, operation, reconstruction, restoration, conservation and liquidation, establishes the duties of public authorities, owners of facilities and operators.
	Rules of Referral of Specially Protected Water Objects to Individual Categories, Cabinet of Ministers Decree No. 77.	01/05/2000 (last amendment 10/05/2012)	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.

Subject	Title	Date	Description / Relevance to Aypara-1 Drilling EIA
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 organizations (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.	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.
	Decree of the President of the Azerbaijan Republic "On approval of norms of vibration and noise pollution having a negative impact on the environment and human health" No. 381	15/02/2011	This decree approved the "Norms of vibration and noise pollution, which have a negative impact on the environment and human health."

Subject	Title	Date	Description / Relevance to Aypara-1 Drilling EIA
Waste	Law of Azerbaijan Republic on Industrial and Domestic Waste No. 514-IQ.	30/06/1998 (last amendment 12/06/2012)	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 minimization 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.
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic “On approval of the rules of hazardous waste storage" No. 228	14/06/2016	Approves the rules of storage of hazardous industrial waste.
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic “On approval of the procedure for certification of hazardous waste” No. 41	31/03/2003	Approves the procedure for certification of hazardous industrial waste.
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic "On the order of inventory of hazardous waste generated in the production process" No. 13	25/01/2008	Approves the procedure for inventory of hazardous waste generated in the production process.

Subject	Title	Date	Description / Relevance to Aypara-1 Drilling EIA
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic "On approval of the State strategy of hazardous waste management in Azerbaijan" № 117	21/08/2004	Approves the State strategy for hazardous waste management in Azerbaijan.
	Resolution of the Cabinet of Ministers of the Azerbaijan Republic "On the procedure of transportation of hazardous waste by road " № 167	25/07/2008	Approves the procedure for transportation of hazardous waste by road transport.
Subsurface	Law of the Azerbaijan Republic on Subsurface Resources No. 439-IQ.	13/02/1998 (last amendment 25/12/2007)	Regulates the exploitation, rational use, safety and protection of subsurface resources and the Azerbaijani sector of the 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 Access to Environmental Information No. 270-IIQ.	12/03/2002 (last amendment 20/10/2006)	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 Azeri Law.
	Law of the Azerbaijan Republic "On environmental education and public education" No. 401-IIQ.	10/12/2012	Establishes the legal, economic and organizational framework of state policy related to environmental education and public education and regulates relations in this area.
Liability	Law on Mandatory Insurances.	24/06/2011	Identifies requirements for the mandatory insurance of civil liability for damage caused to life, health, property and the environment resulting from accidental environmental pollution.

Subject	Title	Date	Description / Relevance to Aypara-1 Drilling EIA
Permitting	Law of Azerbaijan "On licenses and permits" № 176-VQ	15/03/2016 (last amendment 25/04/2017)	This Law establishes the legal, economic and organizational regulation of the system of licenses and permits in connection with the implementation of business activities (except in the field of financial markets) in Azerbaijan Republic. According to Appendix 1 of the Law, activities related to the disposal and neutralization of hazardous waste are subject to licensing in the manner prescribed by this law.

2.4.1 National EIA Guidance

Guidance on the EIA process in Azerbaijan is provided in the Handbook for the Environmental Impact Assessment Process in Azerbaijan (1996). The Handbook introduces the main principles of the 'western'- type EIA process and details:

- The EIA process, i.e. the sequence of events and the roles and responsibilities of applicants and Government institutions;
- The purpose and scope of the EIA document;
- Public participation in the process;
- Environmental review decision (following its submission to the MENR, the EIA document is reviewed for up to three months by an expert panel); and
- The appeal process.

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

A summary of the guidance provided in the Handbook is given in Table 2.2.

Table 2.2: Summary of Guidance on the EIA Process in Azerbaijan (ERM and Synergetics, 2018)

Screening	The operator is required to submit an Application (containing basic information on the proposal) to MENR to determine whether an EIA is required.
Scoping	Requirement for a Scoping Meeting to be attended by the operator, experts and concerned members of the public, and aimed at reaching a consensus on the scope of the EIA.
Project Description	Full description of technological process and analysis of what is being proposed in terms of planning, pre-feasibility, construction and operation.
Environmental Studies	Requirement to describe fully the baseline environment at the site and elsewhere, if likely to be affected by the proposal. The environment must be described in terms of its various components – physical, ecological and social.
Consideration of Alternatives	Comparison of the main alternatives considered (including the option of abandonment of a planned activity) and indication of the main reasons for the choice of an alternative taking into account the environmental impact.

Impact Assessment and Mitigation	Requirement to identify all impacts (direct and indirect, onsite and offsite, acute and chronic, one-off and cumulative, transient and irreversible). Each impact must be evaluated according to its significance and severity and mitigation measures provided to avoid, reduce, or compensate for these impacts.
Public Participation	Requirement to inform the affected public about the planned activities twice: when the application is submitted to the MENR for the preliminary assessment and during the EIA process. The operator is expected to involve the affected public in discussions on the proposal.
Monitoring	The operator is responsible for continuous compliance with the conditions of the EIA approval through a monitoring programme. The MENR undertakes inspections of the implementation of activities in order to verify the accuracy and reliability of the operator's monitoring data. The operator is responsible for notifying the MENR and taking necessary measures in case the monitoring reveals inconsistencies with the conditions of the EIA approval.

2.5 Segment and regional Standards

2.5.1 European Union

EU relations with Azerbaijan are governed primarily by the EU-Azerbaijan Partnership and Cooperation Agreement (PCA) and the European Neighbourhood Policy (ENP).

The PCA entered into force in 1999. Under Article 43:

"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[3]. 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[4].

[3] Mammadov, A. & Apruzzi, F. (2004) Support for the Implementation of the Partnership Cooperation Agreement between EU- Azerbaijan. Scoreboard Report on Environment and Utilisation of Natural Resources. Report prepared for TACIS

[4] SOFRECO (undated) Support for the Implementation of the PCA between EU-Azerbaijan, Draft Programme of legal Approximation.

Following the enlargement of the European Union, the EU launched the ENP and Azerbaijan became part of this policy in 2004. The current National Indicative Programme for implementing the ENP[5] includes 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; and
- Development of sectoral environmental plans (waste and water management, air pollution, etc.).

2.5.2 Environment for Europe

Environment for Europe[6] is a partnership of member states, including Azerbaijan, and other organisations within the UNECE region. Under the auspices of the Environment for Europe a series of ministerial conferences on the environment have been held that have resulted in the establishment of the UNECE conventions described in *Section 2.6.*

2.6 International and Regional Environmental Conventions

Conventions, agreements, contracts on use of nature and environmental protection ratified by the Azerbaijan Republic are an integral part of the national environmental legislation. Each law of the Azerbaijan Republic has a special chapter or article stating that should international contracts provide for regulations that are different from the national legislation, the regulations of the international instruments shall prevail.

The state and central execution authority shall be appointed by the Resolution of the President of Azerbaijan Republic to address the issues arising from International Conventions. These authorities shall cooperate with the corresponding international organizations in regards to the Conventions, and shall perform the activities pursuant to the decrees of the Cabinet of Ministers of the Azerbaijan Republic, to address issues related to the implementation of the conventions in the country.

Resolution of issues arising from the execution of the responsibilities stipulated in the conventions is, in general, assigned to the concerned executive authorities.

[5] European Commission, 2007. European Neighbourhood and Partnership Instrument, Azerbaijan National Indicative

[6] United Nations Economic Commission for Europe UNECE (2008) Environment for Europe. Available at: http://www.unece.org/env/efe/welcome.html Accessed August 2015

The list of international and regional legislative environmental acts accepted by the Azerbaijan Republic are included in Table 2.3 and Table 2.4.

Table 2.3 Summary of International Conventions (ERM and Synergetics, 2018)

Convention	Purpose	Status
Stockholm Convention on Persistent Organic Pollutants	Reduction in releases of dioxins, furans, hexachlorobenzene and PCBs with the aim of minimization or elimination.	**Acceded in 2004.**
International Convention for the Prevention of Pollution from Ships/ Vessel (MARPOL), 1973 as amended by the protocol, 1978	The legislation giving effect to MARPOL 73/78 in Azerbaijan is the Protection of the Sea (Prevention of Pollution from Ships) Act 1983. Preventing and minimizing pollution of the marine environment from ships - both accidental pollution and that from routine operations.	**Acceded in 2004.**
International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990.	Seeks to develop further measures to prevent pollution from ships.	**Acceded in 2004.**
Bern Convention	Conservation of wild flora and fauna and their natural habitats.	**In force since 2002.**
Basel Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposals	Seeks to control and reduce transboundary movements of hazardous wastes, minimize the hazardous wastes generated, ensure environmentally sound waste management and recovery practices and assist developing countries in improving waste management systems.	**Ratified in 2001.**
Kyoto Protocol, 1997	Follow on from the Framework Convention on Climate Change.	**Acceded in 2000.**
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.	**Party to the Convention in 2000.**
Convention for the Protection of the Archaeological Heritage of Europe	Requires each state party to support archaeological research financially and promote archaeology, using public or private funding.	**Ratified in 2000.**
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Controls trade in selected species of plant and animals.	**In force since 1999.**

Convention	Purpose	Status
UN Convention on the Protection of the Ozone Layer (Vienna Convention)	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	**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.	**Acceded in 1996.**
United Nations Framework Convention on Climate Change, 1992	Seeks to stabilize 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.	**Acceded in 1992. Not formally required to meet specific targets.**

Table 2.4: Summary of Regional Conventions (ERM and Synergetics, 2018)

Convention	Purpose	Status
Convention on the legal status of the Caspian Sea	Treaty signed at the Fifth Caspian Summit in Aktau, Kazakhstan, on 12 August 2018 by the presidents of Russia, Kazakhstan, Azerbaijan, Iran and Turkmenistan. The dispute began after the dissolution of the Soviet Union in 1991, as the Soviet Union (and subsequently Russia) and Iran were respecting mutual 1921 and 1940 treaties. However, according to Azerbaijan, Kazakhstan and Turkmenistan, these treaties did not address the exploitation of the seabed, thus a new UNCLOS treaty was found to be necessary.	**Signed August 12, 2018**
Tehran-Caspian FrameworkConvention	Ratified by all five littoral states and entered into force in 2006. Requires member states to take a number of generic measures to control pollution of the Caspian Sea. Three protocols have been adopted and therefore form the basis for national legislation and regulations. One protocol, namely Environment Impact Assessment in a Transboundary Context has been drafted and has not been yet adopted. Convention is ratified and the following protocols have been adopted: • The Protocol Concerning Regional Preparedness, Response and Co- operation in Combating Oil Pollution Incidents ("Aktau Protocol") (August 2011); • The Protocol for the Protection of the Caspian Sea against Pollution from Land-based Sources and Activities ("Moscow Protocol") (December 2012); and • The Protocol for the Conservation of Biological Diversity ("Ashgabat Protocol") (May 2014).	**Signed November 2003 and entered into force on August 2006.**

Convention	Purpose	Status
Convention for the Protection of the Marine Environment of the Caspian Sea	The Convention protects the biological resources of the Caspian Sea and, at the same time, defines the following tasks for Littoral States with regard to the Pollutions: • Development of the national systems and emergency actions plans for contingencies with objective of fight against pollution; • Assurance of the information exchange and dissemination of information; • Urgent operational measures; • Establishment of the joint interest zone; • Reporting based on the pollution results; • Availability of the emergency action plans for vessels, offshore units, sea ports and oil rigs; • Mutual assistance in case of pollution; • Meeting the expenses for assistance; • Assurance environmental safety in the marine navigation.	**Ratified in 2006**
Convention on the Transboundary Effects of Industrial Accidents*	To prevent industrial accidents that may have transboundary effects and to prepare for and respond to such events.	**Acceded in 2004.**
Protocol on Water and Health*	To protect human health and well-being by better water management and by preventing, controlling and reducing water-related diseases.	**Acceded in 2003.**
Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention)*	To prevent, control or reduce transboundary impact resulting from the pollution of transboundary waters by human activity.	**Acceded in 2002.**
UNECE Geneva Convention on Long-range Transboundary Air Pollution*	Provides a framework for controlling and reducing transboundary air pollution. (NOTE: Has been extended by eight protocols, none of which have been ratified by Azerbaijan).	**In force since 2002.**
UN Convention on Control of Transboundary Movements of Hazardous Wastes and their Disposals	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.	**Ratified in 2001.**

Convention	Purpose	Status
International Carriage of Dangerous Goods by Road*	Provides requirements for the packaging and labelling of dangerous goods and the construction, equipment and operations of transportation vehicles. Annexes provide detailed technical requirements.	**In force since 2000.**
Aarhus Convention*	To guarantee the rights of access to information, public participation in decision-making and access to justice in environmental matters.	**Acceded in 2000.**
Espoo Convention*	To promote environmentally sound and sustainable development through the application of ESIA, especially as a preventive measure against transboundary environmental degradation (Note: Azerbaijan has not signed related protocol on Strategic Environmental Assessment.)	**Acceded in 1999.**

* Denotes UNECE agreement; 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.

2.7 International Petroleum Industry Standards and Practices

The exploration drilling related activities are required to comply with national legislation "to the extent that such laws and regulations are no more stringent than those set out in Environmental Standards" (Art. 26.4*)*; described in Part II of Appendix 9 of the ADUA PSA. The safety and environmental protection standards shall be developed by the Contractor jointly with MENR and "shall take account of the specific environmental characteristics of the Caspian Sea and draw, as appropriate, on (i) international Petroleum industry standards and experience with their implementation in exploration and production operations in other parts of the world and (ii) existing Azerbaijan safety and environmental legislation". Consideration of relevant international industry standards is therefore an important element in determining the applicability of national legislation or otherwise. Industry standards including those of:

- The International Association of Oil and Gas Producers (IOGP).
- The global oil and gas industry association for environmental and social issues (IPIECA) and
- The International Association of Drilling Contractors (IADC).

1. The Joint Nature Conservation Committee (JNCC) 2017 Guidelines for minimising the risk of injury to marine mammals from geophysical surveys.
2.

3 Project description

This section describes Project components at a level of detail sufficient to estimate and characterize environmental and social impacts potentially related to Project activities. The section begins with an overview of the Project location, schedule and contingency. Section 3.1 describes the drilling process, Section 3.33.2 is the description of the drilling project and Section 3.3 outlines proposed activities that support the implementation of the exploratory drilling program. Section 3.4 describes the discharges and effluents estimated to be generated by the project and Section 3.5 is about HSE requirements.

3.1 Project overview

Equinor and SOCAR propose to undertake the drilling of the Aypara-1 well, an exploration well on the Aypara structure (see Figure 3.1 and Table 3.1 below), in the Ashrafi- Dan Ulduzu- Aypara (ADUA) exploration area.

The Aypara prospect is a northwest-southeast elongated structure, in the Caspian Sea, about 25km to the northwest of the Azeri–Chirag–Gunashli (ACG) field, 90km from Baku**.**

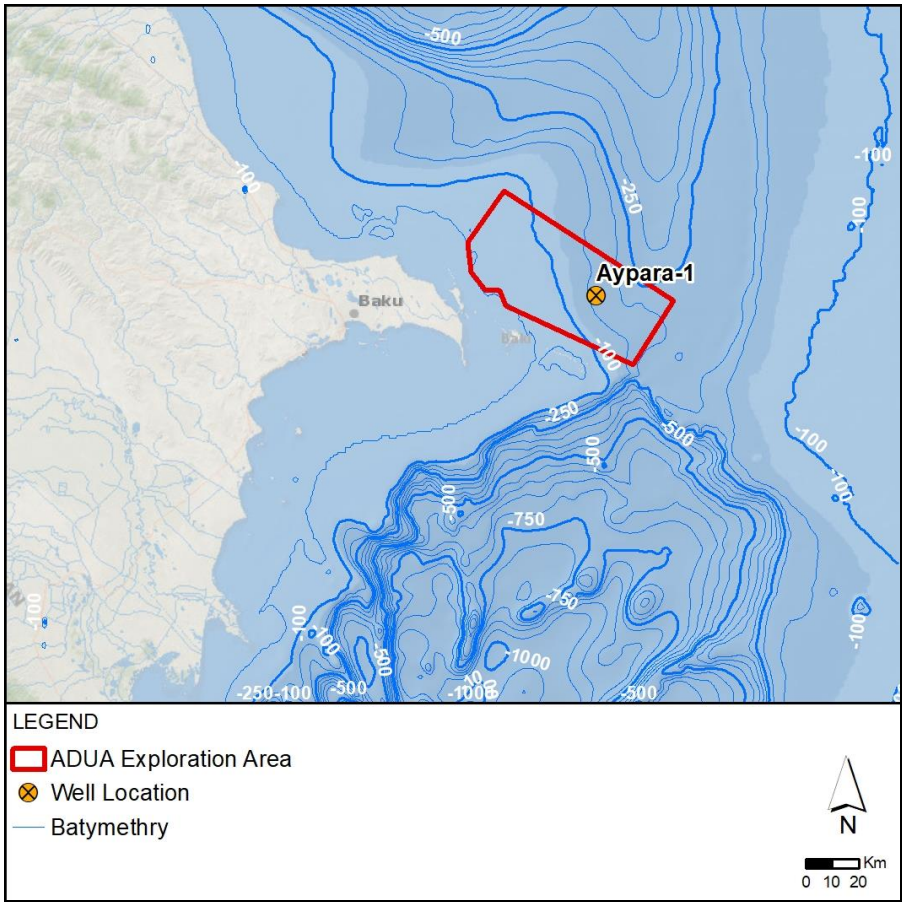


Figure 3.1: Location of Aypara structure in Azerbaijan (ERM, 2018)

Table 3.1: Proposed well coordinates (Equinor, 2019)

Well Name	Proposed Coordinates		Well Depth
	Latitude	Longitude	
Aypara-1	40° 27' 46.88" N	50° 57' 17.96"E	140m

Notes: Datum: ST_Pulkovo1942_UTM39N_P2200038_T1808

3.1.1 Project Schedule

The Aypara-1 well is expected to spud in Q1 2020. The drilling of the exploration well is expected to last between 60 to 90 days. Tentative dates and timings are provided in Table 3.2, below.

Table 3.2: Project schedule

Well	Type	Start	End	Time (days)[1]
Aypara-1	Exploration	Q1 2020	Q1/Q2 2020	60-90

[1] Number of days depend on scope of well (coring, and data sampling program among other factors)

3.1.2 Alternatives

When considering alternatives for a drilling project such as the Aypara-1 Exploration well, multiple elements can be evaluated and refined to avoid and minimize impacts from the planning and design phase. That is, project alternatives are not just limited to the specific coordinates of the well but to a range of solutions or approaches for a number of technical, environmental and socioeconomic aspects. Because of this, the alternatives adopted need to be evaluated on a case by case basis to ensure that (1) environmental and social performance are taken into account together with (2) technical and economic feasibility as well as (3) the presence of the resource that the drilling is aiming at investigating.

In this particular case the definition of the following aspects/criteria have been taken into account:

- **Location**: the well site has been selected taking into account the presence of the geological resource. The objective for the chosen well location is to prove hydrocarbon in the primary targets identified by Equinor.

- **Environment**: because the well is located far from any protected or designated area, no constraints were identified within the ADUA area.

- **Drilling equipment** (criteria used to select the MODU): The main criteria for selecting drilling equipment is the ability to safely operate at the water depth at well location (140m approximately). In this case, a semi-submersible rig has been selected as a Jack-up rig cannot operate at this depth.

- **Well design and safety considerations**: For robustness in the design, the casing selection and depths are based on offset wells and pore pressure prediction. The main design will include a 36" conductor, a 26" surface casing, a 13 5/8" intermediate casing along with a 9 7/8" casing string and a 7" liner. For contingency purposes, a 16" and 11 ¾" liners will be available. A schematic of the well design can be found in Figure 3.4.

- **Mud selection**: The selection of the muds has been performed taking into account current good practice in the industry. In this specific case seawater/sweeps (SW) or a water based mud (WBM) system could be used for the top hole drilling. After the drilling of top holes, a Blow out preventer (BOP) and Riser are installed, and Synthetic-Oil Based Mud (SOBM) will be used. Key for the detailed formulation of the muds will be the selection of chemicals with a low toxicity. In the event that new drilling fluids are used during drilling operations, drilling fluid toxicity will be tested under Caspian Specific Ecotoxicity tests or similar procedures.

- **Waste management options (transportation, storage and disposal):** To comply with National requirements and practices, Equinor plans to skip and ship the non-water-based cuttings to shore for treatment and disposal. The water-based cuttings and mud is planned to be discharged to sea but following the criteria established to allow such discharge.

3.2 Description of the Drilling Process

For the purpose of this assessment, the Project will be described by the following main components:

- Drilling Unit;
- Drilling Technique;
- Well Information;
- Drilling Fluids and cuttings;
- Blowout Prevention;

- Vertical Seismic Profile
- Well abandonment; and
- Workforce.

The offshore oil and gas industry is one of the key sectors in the country and therefore there are multiple service providers and shore-based facilities already established in Azerbaijan.

At the time of EIA preparation, no details about the contractors are available. However, the selection will be based on their capacity to already operate in the country and therefore no base construction activities are expected. Therefore, the magnitude of the operations required on land will be minimal when compared to the activities to be carried out offshore or when compared to the onshore activities for drilling projects where onshore facilities are not available or need relevant upgrading.

3.2.1 Drilling Unit

A semi-submersible mobile offshore drilling unit (MODU) rated for operations in water depths sufficient for operation in the ADUA area will be used to drill the well (Figure 3.2). Table 3.3 provides the specification of a typical drilling unit. These specifications are provided for context, but details will vary depending on the specific unit finally involved in the well-drilling programme.

Figure 3.2: Type of MODU to be used (MarineTraffic, 2018).

Table 3.3: **General Specification of the rig involved in the well-drilling program (Equinor, 2019)**

Size			
Main deck Width	60.6m	**Pipe deck area**	398m^2
Main deck Length	65.8m	**Riser deck area**	140m^2
Main deck Depth	2.3m	**Main deck storage area**	535m^2
Storage/Accommodation Capacity			
Water Capacity (drilling)	1,962m^3	**Total mud capacity**	More than 240m^3
Water capacity (potable)	207m^3	**Accommodation capacity (berths)**	120
Fuel Capacity (diesel)	1,112m^3	**Tubular handling capacity**	
Oil Capacity (fuel)		**Maximum tubular length**	
Barite / Bentonite storage capacity	144m^3 (3 tanks)	**Sack storage capacity**	6,000 units
Cement storage capacity	144m^3 (3 tanks)		
Technical specifications			
Maximum speed	N/A	**Fuel usage during drilling**	20m^3/day
Power generation	4 x 3648hp diesel generators	**Fuel usage during transit**	N/A
Relevant Drilling Properties			
Maximum water depth	475m	**Maximum Drilling depth**	7620m
Minimum water depth	45m		

*Details on specifications may be subject to changes once the specific rig is selected.

In the drilling unit, a number of pre-screened third-party companies will be responsible for different operations, as described in Table 3.4. These companies are yet to be selected. Nevertheless, all contractors working for Equinor on this Project will be required to comply with Azeri legislation and relevant Equinor requirements, thus supporting the implementation of the mitigation measures proposed herein. Compliance with national regulations and adherence to corporate risk management procedures by third parties is standard contractual requirements within Equinor.

Service Companies working for Equinor will be prequalified on the merits of their health, safety and environmental record to be included in the bidders list and ultimately invited to tender. This prequalification is done to ensure that the companies can comply with HSE requirements in the contract. Regular HSE follow-up towards the companies are conducted throughout the contract period.

Table 3.4: **Main operations to be undertaken by third party companies (Equinor, 2019)**

Main 3rd Party Operations
ROV
Mud logging
Cement equipment
Drilling fluids
Cuttings handling
Directional drilling
MWD
Casing Running

Before drilling, a geo-hazard study covering the proposed location area will be conducted (activities subject to a separate environmental report) to confirm the suitability of the chosen location. Upon positioning at the drilling location, the MODU will first conduct a short seabed survey using a Remotely Operated Vehicle (ROV) to obtain seabed images and confirm lack of obstacles or structures that may affect operations. The selected drilling rig is designed for operations in actual water depths. It is equipped with a complete set of rescue and safety equipment, including but not limited to:

- Two lifeboats capable of evacuating 120 people;
- Five life rafts capable of evacuating 125 people;
- Life jackets, total 267, equal to 120% above the maximum number of people on-board;
- H_2S gas detectors;
- A complete fire and gas detection/combat system, with alarms, affected area panels, separated water pump system, fire water rings, and others;
- HC gas detectors; and
- Emergency Shutdown System (EDS).

3.2.2 Drilling Technique

A conventional drilling method will be used, and it will include a drill bit attached to a bottom hole assembly consisting of downhole motors and/or rotary steerable system along with measurements while drilling tools, which will be connected to a surface top drive system via drill pipes. Drilling cuttings will be displaced to seabed or returned to

surface depending on if seawater or a WBM system is used for top hole drilling. For all SOBM drilling, all cutting will be returned to surface.

3.2.3 Well Information

The location of the Aypara-1 well is shown in Figure 3.3 (coordinates can be found in Table 3 1). The Aypara-1 well will have a robust and proven well design. The current plan (preliminary design) for hole sections and casings are described in Table 3.5, and illustrated in Figure 3.4.

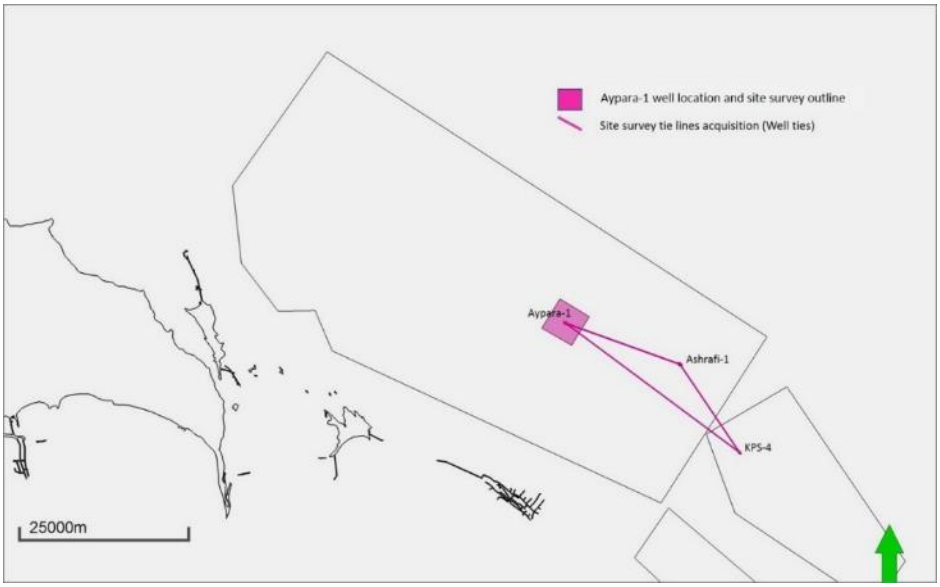


Figure 3.3: Aypara-1 exploration well – planned well location (Equinor, 2019)

The proposed well location will enable an evaluation of the potential reservoirs on the Aypara structure, based on the analysis of seismic survey already available in the area. Minor adjustments of the location may be needed if the ROV-survey (prior to spud) identifies any seabed features. There will be two potential locations for the main well (one primary and a contingency) in case ROV observations prior to spud identifies any other hazard not encountered during the shallow hazard study. The contingency location will also be used if drilling problems that could potentially affect the integrity of the well.

The selected well design, drilling procedures and well locations are meant to minimize risks.

Table 3.5: Aypara-1 Exploration well - Preliminary Design (Equinor, 2019)

Casing Size (in)	Depth of Shoe (m below RKB)	Section Length (m)
36”	312	153
20”	750	445
16” (contingency)	~1300	unknown
13 5/8”	1900	1150
11 3/4” liner (contingency)	~2500	unknown
9 7/8”	3164	1264
7” liner	3400	230

Some of the minimum required rig specifications associated to the related wellheads are presented in Table 3.6 and the schematic representation of the well in Figure 3.4.

Table 3.6: Minimum required rig specifications for wellheads (Equinor, 2019)

Property	Rig Required compliance
EWT (Expected Wellhead Temperature)	100˚C
MSWP (Maximum Shut-in Wellhead Pressure)	547 Bar
DRWCP (Design Rig Well Control Pressure)	670 Bar

Well: Aypara-1
Field: Exploration UTM 39
Rig: <Rig Name>

WELL SCHEMATIC
Mainbore - 6" TD

All depths refer to RKB.
RKB-MSL = 22 m
15/11/2018

HOLE SIZE	HOLE TVD MD	CASING/LINER SIZE	CASING/LINER TYPE / RAD. MARKERS	CENTRALIZERS	LOT / FIT [SG]	TOC/TOL TVD	TOC/TOL MD	CSG. SHOE TVD	CSG. SHOE MD	Max PP [SG]	Min FG [SG]	Fluid [SG]
SB	162											
42"	315 315	36"	Interval: 162 m - 312 m Type: 553lb/ft, X-56, Viper 3ST Drift: 31.22"		N/A	Seabed	Seabed	312	312	0.90	0.90	SW+PAD 1.20
26"	760 760	20"	Interval: 315 m - 750 m Type: 133lb/ft, N80, Tenaris ER Drift: 18.543"		FIT	Seabed or 643	Seabed or 643	750	750	1.00	1.32	SW+ PAD 1.20 or KCL 1.20
17 1/2"	1910 1910	13 5/8"	Interval: 760 m - 1900 m Type: 88.2lb/ft, SM125 ,Vam SLIJ-II Drift: 12.25"		LOT	1400 1850	1400 1850	1900	1900	1.23	1.63	OBM 1.28
12 1/4"	3174 3174	9 7/8"	Interval: 1910 m - 3164 m Type: 62.8lb/ft, SM125, Vam SLIJ-II Drift: 8.5" Note: Tie-back string		LOT	2337 3114	2337 3114	3164	3164	1.30	1.86	OBM 1.34
8 1/2"	3410 3410	7"	Interval: 3174 m - 3400 m Type: 32lb/ft, P-110, Vam Top HC Drift: 6.008"		LOT	3170	3170	3400	3400	1.45	1.99	OBM 1.49
6"	3900 3900	OH	Interval: 3410 m - 3900 m					3900	3900	1.76	2.04	OBM 1.80

RKB

Figure 3.4: Well schematic (Equinor, 2019)

3.2.4 Drilling Fluids and Cuttings

Drilling fluids are a fundamental part of the drilling process. The main functions of the drilling fluid are to control well bore pressure, keep the bit and bottom hole assembly cooled, lubricate the bit, reduce friction between the drill pipe and the hole, inhibit reactive clays (prevent clay swelling and hole degradation) and transport cuttings out of the wellbore. Drilling fluids include various mixtures and are known as drill mud. Bentonite and other clays and/or polymers are the basic constituents of drill mud; they are mixed with fluids to the desired viscosity.

The compositions of the drilling fluids are determined at an early stage of the well planning. Various kinds of additives and chemicals are required and need verification. The most commonly used drilling fluids are Water Based Mud (WBM), Oil Based Mud (OBM), and Synthetic-Oil Based Mud (SOBM). The type of drilling fluid used is dependent on the geological properties in the area of the drill site.

Two drilling fluid systems will be used for this project: SW/WBM and SOBM.

- SW/WBM will be used for drilling the upper sections of the well, riser-less or with a riser mud return system (approximately 588m)
- SOBM will be used after the BOP and Riser have been installed. An overview for the hole sections, type of mud and predicted mud volumes is provided in Table 3.7.

Table 3.7: Types of muds to be used per hole section (Equinor, 2019)

Bore Diameter (Open holes)	Well Interval between Sections (m)	Mud Type	Fluid Volumes (m^3)
42'', 26''	162-750	SW/WBM	1,200
17 ½", 12 ¼", 8 ½", 6"	750-3,900	SOBM	1,300

An illustrative list of the chemicals usually used for each mud is presented in Table 3.8 and Table 3.9.

Table 3.8: Estimates of principle drilling chemicals for WBM (Equinor, 2019)

Function	Total Usage (MT)	Discharge (MT)
Water based drilling fluid		
pH control	0.9	0
Viscosity	49.0	0
Weight	200.0	0
Salt (inhibition)	21.0	0
Alkalinity	0.4	0
Viscosity/ Filter loss	1.2	0
pH puffer/ Ca++ treatment	1.0	0
Filter loss	10.0	0
O2 remover	1.5	0
Biocide	1.5	0

Table 3.9: Estimates of principle drilling chemicals for SOBM (Equinor, 2019)

Function	Total Usage (MT)	Discharge (MT)
SOBM drilling fluid		
Base Oil	583	0
Emulgator A	33	0
Emulgator B	4	0
Alkalinity	14	0
Viscosity	34	0
Salt (Inhibition)	62	0
Filter loss	19	0
Weight	583	0
LCM	19	0

The proposed rig is equipped with a mud management system that includes mixing, circulating, solids control and storage systems. Mud pumps, storage tanks, mud hopper, degassers and shale shakers will be available on-board. The densities of the muds and cuttings are presented in

Table 3.10 while

Table 3.11 provides information on the volumes.

Table 3.10: Drilling mud and cuttings densities (Equinor, 2019)

Product	Density (kg/m^3)
Cuttings	2,380 – 2,600
WBM	1,030-1,300
SOBM	1,280-1,800

Table 3.11: Drilling muds and cuttings volumes (Equinor, 2019)

Option 1 (SW 0-750m)

Casing Depth	Estimated Interval Drilling Time Days	Cuttings Volume (m^3)	Discharge Depth	Mud Type	Total Volume Cuttings + mud (m^3)	Total Discharge to Cuttings + mud (m^3)
750m RKB	10	310	Seabed	SW	1,230	1,230
3,900m RKB	50-80	322	'Zero' discharge	SOBM	1,622	0

Option 2 (SW 0-315m / WBM 315-750m)

Casing Depth	Estimated Interval Drilling Time Days	Cuttings Volume (m^3)	Discharge Depth	Mud Type	Total Volume Cuttings + mud (m^3)	Total Discharge of Cuttings + mud (m^3)
315m RKB	2	133	Seabed	SW	643	643
750m RKB	8	177	Surface	WBM	857	857
3,900m RKB	50-80	322	'Zero' discharge	SOBM	1,622	0

The rig is designed with appropriate sloped bottom tanks for the mud storage, with drain and suction at the lowest point. It will be possible to run all mud pumps simultaneously and continuously while drilling. There will also be a system for surface mud circulation, which will include two surface mud tanks.

SOBM cuttings will be treated and disposed onshore. A project supply vessel will be used to transfer SOBM cuttings skips to shore base. The appointed Waste Management contractor (to be decided) will transfer the SOBM cuttings from the base by truck to its waste management facility. Refer to Section 3.4.1 for details on the management and disposal of effluents and wastes. Overall, a total of 1,300m^3 of SOBM is estimated to be used, 205m^3 is estimated to be sent to shore as mud adhered on cuttings. The remaining 1095 m^3 SOBM will be sent to shore for reuse.

3.2.5 Blow-out Preventer (BOP)

The MODU will have one Blow-out Preventer (BOP) rated for 689 bar. Although the project well is not expected to encounter any zones of abnormal pressure, the BOP will be rated for well pressures in excess of those expected to

be encountered in the well. In an emergency, the BOP can be controlled from the drill floor. BOP tests are conducted during the operations at regular intervals.

The rig is equipped with a Shaffer BOP that is built according to requirements from the American Petroleum Institute (API) when rig was built. The properties of the BOP are provided in Table 3.12.

Table 3.12: Main properties of BOP to be used for the Project (Equinor, 2019)

Property	Description
Bore size	18 ¾"
Working Pressure	689 bar
Nº of rams	4
Nº of annulars	2
Nº of surface accumulators	28+40
Accumulators working pressure	207 bar
Control fluid tank capacity	400 L
Antifreeze fluid tank capacity	0

The BOP storage area will have sufficient access platforms or other means to access the BOP and its parts where maintenance may be required without climbing on the BOP stack.

3.2.6 Vertical Seismic Profile

After drilling the well, a Vertical Seismic Profile (VSP) will be conducted using geophones inside the wellbore. This additional assessment produces seismic images with greater detail than those obtained during the previous surface seismic surveys. The VSP may require up to 200 activations of the air gun as the sonde is pulled up the well bore. The duration of the whole survey is typically from 12 to 18 hours.

The tool consists of geophones that detect seismic waves from the air gun source suspended in the sea from the drilling rig. Its purpose is to tie the original seismic information to the real depth information obtained after drilling. Unlike the 2D or 3D seismic exploration methodology, the sonde is a singular source and not an array.

A 'soft start' approach will be also implemented before VSP operations to protect marine fauna from high-energy air gun sounds.

3.2.7 Well Testing

No well testing activities are planned for the Aypara-1 well.

3.2.8 Well Abandonment

When all drilling, and logging activities are finalized, the well will be permanently abandoned according to Equinor and country regulations. Materials used for abandonment operations include cement and chemical additives.

The majority of the chemicals to be used will be left in the hole cement plug barriers. Also, the cement behind the casing/liners will act as a barrier. During the 36” conductor and 20” surface casing cement jobs, the cement will be displaced back to the sea floor. The cement materials are presented in Table 3.13. Wellhead assemblies and associated equipment constructed entirely of high-grade steel will remain on the sea floor, with the wellhead assembly extending approximately 3m above the seabed.

Table 3.13: Functions of Cement materials (Equinor, 2019)

Product	Function
Cement	Cement
Defoamer	Reduce foam in slurry
Dispersant	Viscosity control
Accelerator	Reduce setting time
Silica	Strength Retrogression
Dispersant	Anti-Settling
Retarder	Retarder
Fluid Loss	Fluid Loss
Spacer	Spacer
GAS control	GAS control

Product	Function
LCM	Tracer/lost circulation

3.2.9 Workforce

The rig will operate 24 hours-per-day and will be staffed by about 120 personnel plus 30 personnel for the supply vessels. The full contingent of personnel engaged by Equinor, including shore staff, will be more than 200 people during the drilling activities. These are mainly local/regional/national labourers plus a few expatriate specialists. All workers, and those of contractors, will be provided with health and safety training and personal protective equipment (PPE), from their respective companies, suitable for the types of activities in which they participate.

3.3 Support project components

As previously discussed, the main project components for drilling exploration wells includes a drilling rig, an onshore base for infrastructure and support services, and supply and support vessels which are discussed in more detail in the following subsections.

3.3.1 Shore base, Infrastructure and Support Services

A shore base facility is planned to be located within the Qaradag area, the largest Oil and Gas industrial area in Baku/Azerbaijan serving activities in the Caspian Sea. This shore base will be the main hub for logistic support activities for the Project. The Project is planning to use existing storage areas and facilities in Qaradag area and then avoiding construction of new infrastructure. Limited work related to site preparation and installation of a mud mixing station/plant will be required to ensure optimal accessibility and handling activities.

In addition, it is foreseen that there will be a need for the storage of well construction materials and material handling for offshore support that comprises:

- Quay and marshalling area;
- Warehouse;
- Sheltered area for storage of various chemicals; and
- Open area for:
  - Pipe storage equipped with pipe racks for drilling tubular material storage and treatment/cleaning;
  - Temporary storage area for containers, equipment and waste units (skips and bags).

Quayside operations will include the transfer to/from the vessels of bulk (barite, bentonite and cement), mud (oil based or water based depending on drilling requirements), food supply, fuel, water addition to items used in the drilling like pipes/casing, and in return solid and liquid waste fractions and other items returned from the rig to shore.

Figure 3.5: Supply Bases in Qaradag industrial area (Equinor, 2019)

3.3.2 Vessels

Platform Supply Vessels (PSV)

For the duration of the drilling operations (estimated to be between 60 to 90 days), the drilling rig will be supported by Platform Supply Vessels (PSV's), which are vessels designed to carry a variety of equipment, cargo and bulk. These vessels will supply the drilling rig frequently (most likely once a day) with material needed for the drilling like drilling muds, cement and casing, drill pipe and tubing etc. They will also remove waste from the rig that must be appropriately disposed of on land. The number of supply vessels has not yet been defined but is likely to be two. Figure 3.6 depicts a typical supply vessel.

Anchor Handler Vessels (AHT)

Most likely it will be used 3 (three) Anchor handler vessel for towing the drilling rig to the well location. This vessel will have the same design as the PSV described above and can be used as supply vessels in the drilling operation. This vessel will also perform the mooring of the drilling rig on the field location and be demobilized when the work has been done. Normally operation time are estimated to 5 days. These vessels will also be used for demobilization of the drilling rig after completed drilling operation. Figure 3.6 depicts a typical Anchor Handler Vessels.

Fast Crew Vessel (FCV)

Transport of personnel can be done either directly by helicopter from the airport in Baku directly to the rig or by transport from the airport in Baku to the Port by vehicles/bus and then by a Fast Crew Vessel from the Port to the rig. Transport by vessel will be used, but helicopter will be used as back-up solution. Vessel for personal transport regarding crew change to the drilling rig will be performed with a Catamaran designed fast Crew Vessel. The vessel will make 3 trips per week, with departure and arrival from Port Baku. Such vessel is the same that other operators are using in the Caspian Sea. Figure 3.6 depicts a Fast Crew Vessel to be used in Caspian Sea

Standby vessel

A standby vessel (or a supply vessel in dual mode – supply and standby) will also be available to support the drilling operations during an emergency, including oil containment/recovery and rescue to supply any specialised equipment necessary in case of an emergency and be able to carry out firefighting. The standby vessel will also be used to patrol the area to ensure that other vessels adhere to the 500m safety zone around the drilling rig.

Crew on vessels

The number of personnel on the supply vessels will vary based on vessel size and the types of activities they support and is typically around 15-18 crew members. All workers will be provided with health and safety training and Personal Protective Equipment (PPE) suitable for the types of activities, in compliance with the Standards of Training, Certification and Watchkeeping (STCW) Convention.

Table 3.14: General Characteristics of Supply Vessels

Description	Size
Overall Length	80 meters
Maximum Draft	6,5 meters
Gross Tonnage	3,500 metric tons
Deck Space	600 – 900 square meters
Complement	15-18 persons per vessel


Figure 3.6: From left to right, Platform supply vessel, Anchor handler vessel, Fast crew vessel (Equinor, 2019)

3.3.3 Helicopter

Helicopter support will only be used for ad-hoc crew transferring and Medivac Operations from the Baku airport to the rig. The main crew transport will be performed with a vessel. Equinor has estimated use of helicopter from 5-10 trips during exploration drilling phase. The rig will have an offshore helicopter landing pad with refueling capabilities to support this activity, see Figure 3.7 below as an example. In the event of an emergency, helicopter support will also be used for medical evacuation.

Figure 3.7: Medivac/Personnel transport helicopter and Typical Offshore Helideck

3.3.4 Water supply

Drilling a well will need fresh water for mixing the WBM and potable water and estimates based on previous experience indicates that up to 2,000 tons of freshwater could be used. The rig will have water storage tanks and will normally be equipped with water makers that produces much of the freshwater needed on the rig.

A certain volume of fresh water will be transported by the supply vessels to the rig based on needs and a certain volume of freshwater will be used at the supply base as needed (for mixing WBM etc). The volume of water consumed at the supply base will need to be further estimated but could potentially add up to some 20-40 tons per day. Potable water will be required for personnel stationed at the onshore base as well as on the drill rig and support vessels. Drinking water offshore will be bottled water transported by the supply vessel. The average support vessel potable water consumption is estimated at 2 m^3 a day each. Water transfer to/from the vessels will be done at the quayside.

The onshore base facility is connected to the municipal water source. Water transfer to/from the vessels will be done at the quayside.

Table 3.15: Water distribution systems on MODU (Equinor, 2019)

Seawater system (deck)					
Nº of pumps	2	Pump capacity (each)	305 Sm^3/h	Design pressure	10 bar
Potable water					
Nº of Tanks	1	Tanks volume (each)	206 m^3	Total storage capacity	206 m^3

3.3.5 Fuel supply

The daily consumption of marine gasoil (MGO) estimated for the campaign is approximately 15 tons/day for each of the two supply boats, 12 tons/day for the three-crew boat and around 25 tons/day from drilling rig (depending on the operation stage and weather). The average usage, for a 90-day well, is therefore approximately 6030 tons of MGO fuel. Fuel will be purchased locally and supplied to the rig by the supply vessels.

3.3.6 Other services

The operators of the respective vessels, including the rig, will determine their own food selection, quantities, and sources with support from the shore base (coordinate local purchases, etc.). Fresh products will most likely be purchased locally.

A Medivac plan will be established for personnel on rig and in the base. An emergency response plan will be established, and appropriate personnel will be contracted to supply these services, following agreed emergency response procedures.

3.4 Discharges and Emissions

3.4.1 Drilling Fluids and Rock Cuttings

Section 3.2.3 and Section 3.2.4 summarize the well design and some calculation on the volumes and quantiles of muds/raw materials and cuttings.

The mud system for the 42" top hole section is envisaged to be a seawater high viscosity (hi-vis) sweeps (SW); whilst for the 26" section is undecided at time of report writing. Either a seawater with high viscosity (hi-vis) sweeps (SW) or a water-based mud (WBM) system will be used. The seawater and hi-vis sweep would be discharged on the seabed, while the WBM mud system would aim for 100% returns back to the surface with the use of a riserless mud recovery (RMR) system; Equinor will favour the use of the latter to reuse WBM. Around 1,200-1,500 m^3 of either system (SW only or SW/WBM combination respectively) will be used and approximately 310 m^3 of cuttings could be discharged to the seabed in the case of SW or 133 m^3 at seabed and 177 m^3 from the surface in case the SW/WBM combination is used (

Table 3.11), where the rig shall be at a water depth of approx. 144m.

For the remaining hole sections (i.e. 17 ½", 12 ¼", 8 ½" and 6") SOBM will be used. For these sections, all cuttings and fluids will return to the drilling rig with zero discharge to environment. SOBM and cuttings (205m^3 approximately) will be sent onshore for treatment and disposal in accordance with national legislation and international best practice.

There will be on-board mud treatment equipment, with two degassers of 5m^3 of capacity each, as well as six shakers. The degasser capacity will be able to handle expected mud-flow during planned operations. The drilling fluid system will be enclosed with active ventilation in fluid tanks. There will be 3 x 1176 kW mud pumps, operating at 463-bar pressure, with an output total/maximum capacity of 200m^3/hr.

Because SOBM is considered hazardous, all areas for treatment, transportation and storage of cuttings will have appropriate "hazardous area" classification. There will be a mud laboratory with proper ventilation.

There will be a non-hazardous drain system for clean areas, a non-hazardous drain system for polluted areas and a hazardous drain system for polluted areas. It will be possible to connect all drain buffer tanks to the oil separation system, which will be able to clean the solution to below 15 ppm of oil content.

The final list of constituents and additives of the WBM to be used in the project are not available at the time of writing this report (see Section 3.2.4 for a general description on types of components/additives). However, the additives most commonly used include Bentonite, Guar Gum and Barite. All of these are included in the OSPAR´s PLONOR list, which considers that products included in the list Pose Little or No Risk (PLONOR) to the environment (the OSPAR standards are among the most well known in the offshore industry and are very often used outside the North-East Atlantic by many operators). Other commonly used components include Caustic Soda and Xantam Gums, which are categorized as the least hazardous components by the OSPAR HOCNS (Category E, which considers toxicity for the element at concentrations above 1,000 mg/l).

Prior to the drilling activity taking place, the drilling fluid service provider will have the obligation to provide the Material Safety Data Sheet (MSDS) for all additives to Equinor, which will be used for both drilling fluid systems. These sheets will provide all information about the product in matter of chemicals, chemical compounds, toxicity, acidity and any other relevant information.

3.4.2 Sanitary and Domestic Wastes

3.4.2.1 Liquid Wastes

The amount of wastewater generated and discharged from the drilling rig depends on the number of persons on board (POB). It is assumed that one person generates 100L/day of sanitary wastewater (from toilet facilities) and 220L/day of domestic wastewater ("gray water" from showers, sinks, laundries, and galleys, as well as from safety shower and eye-wash stations). The rig owner will describe all liquid waste from all areas of the deck, and all run off from the drill floor, mud tanks and mud mixing and handling area, and all bilges and machinery spaces shall be contained and treated as required (i.e. oil/water separator).

There will be a non-hazardous drain system for clean areas, a non-hazardous drain system for polluted areas and a hazardous drain system for polluted areas.

It will be possible to connect all drain buffer tanks to the oil separation system, which will be able to clean the solution to below 15ppm of oil content. All areas where spills can occur directly to sea will be fitted with a closed boundary. The height of the boundary will be sufficient to prevent the fluid from spilling over the edge due to rig movement.

All discharges to the sea will be in accordance with the MARPOL discharge requirements and the national legislation. Any waste that cannot be discharged to sea (with or without treatment) will be contained and shipped onshore for further treatment and/or appropriate disposal.

3.4.2.2 Solid Wastes

Activities aboard the rig will generate various wastes streams that include maintenance products (e.g., lube oil and other greases), packaging waste (e.g., paper, card, wood, sacks, drums and grease/paint cans), scrap metal, and empty chemical drums. These will be sorted, transported to shore and disposed according to the Equinor's drilling campaign-specific Waste Management Plan. Any spilled materials will be collected and disposed of through appropriate channels. Quantities of waste generated by the rig will vary depending on depth, geology and drilling duration.

The domestic waste produced by the rig and other vessels will include the usual organic and kitchen waste, and solid wastes (e.g., scrap wood, paper, packaging, etc.). As above, all will be sorted and removed to shore for

disposal, in accordance with the drilling rig's and Equinor's Waste Management Plan, national legislation and international best practices.

3.4.2.3 Chemical Waste

All chemicals are registered with data sheets and HSE classifications. Material Safety Data Sheets (MSDS) datasheets are available for all chemicals. Any hazardous chemical wastes are to be accompanied by their corresponding MSDS. Chemicals are stored separately in tightly sealed containers/drums, which are labelled clearly with the type of hazard. Waste is then collected by the Waste Management Contractor, analyzed, and transported to final disposal.

All chemicals will be handled, stored and used in strict accordance with laws and regulations and the MSDS of each product. Relevant hazardous materials/waste will be included in the Waste Management Plan.

The chemicals involved in the drilling operation will be assessed environmentally according to specific regulation, OSPAR-recommendations and Equinor's governing documents. Based on documentation provided by the suppliers, environmental hazard and risk will be assessed individually for each product where inherent properties together with application area are considered. For chemicals known to cause environmental harm, substitution shall be investigated. Equinor cooperates closely with suppliers and contractors and aims for the best solution where both HSE and technical performance are considered. Equinor will always consider chemical usage from a holistic perspective where key elements are green chemistry, low discharge, reduced waste and re-cycling.

The products involved in the drilling operation will be assessed for occupational and safety risk. Hazard and risk assessment are based on safety data sheets provided by the suppliers. If chemicals known to represent any potential risk; Equinor, together with suppliers will look for replacements or take mitigating efforts to ensure acceptable risk.

3.4.2.4 Air Emissions

The Project will generate atmospheric air emissions throughout the drilling program. This section discusses air emissions related to propulsion and power generation onboard the rig and fuel combustion from support vessels.

Drilling operations are expected to last approximately 60-90 days for the proposed well. During drilling activities, emissions will result from internal combustion engines used in the power generation systems. It is assumed that an emergency engine is also onboard. High-pressure pumps and compressors on most drilling units are electrically

driven. Thus, during normal operations, the primary source of air emissions will be from diesel-fuelled generators and engines onboard the MODU rig.

In addition to the MODU, one Personal transfer vessel and two supply vessels with internal combustion engines will contribute to air emissions. It has been assumed that for each trip, the supply vessels' engines will operate continuously, 20 hours per day at sea and 4 hours per day manoeuvring. It is also assumed the crew boat will undertake five roundtrips per week. Table 3.16 lists air emissions sources, estimated hours of operation, and type of fuel to be used.

Table 3.16: Air Emission Sources and Operating Data for the Exploratory Drilling Program (Equinor, 2019)

Unit Type	Source	Fuel Type	Assumed Operating Time
MODU	Four (4) 2642 kW Generators	Diesel	24 hours / day
MODU	One (1) 1350kW Emergency Generator	Diesel	16 hours /week
Vessel –Type 1	One (1) 2000 kW Engine	Diesel	14 hrs. / trip, 5 trips per week
Vessel – Type 2	Two (2) 2,730 kW Engines	Diesel	24 hrs. / day, 5 trips per week

Table 3.17: **Estimated Air Emissions for the Duration of the Appraisal well (Equinor 2019)**

Types of Pollutants	Drilling Rig Combustion Sources (ton)	Support Vessels (ton)	Total Estimated Emissions (ton)
NO_X	30	45	75
CO_2	3,800	5,700	9,500

4 Environmental and Social Baseline

4.1 Introduction

4.1.1 Project Study Area and regional setting

This baseline chapter focuses on the environmental features of the Ashrafi-Dan Ulduzu-Aypara (ADUA) exploration area. The ADUA exploration area is located about 50km east of Baku (Figure 4.1). The present chapter combines data specific to the ADUA exploration area and general descriptions of the regional setting and local setting depending on the availability of data (i.e. Caspian Sea and Middle Caspian area) for context. Additionally, specific socioeconomic characteristics such as fisheries and maritime/O&G activities in the area have also been described.

Figure 4.1: ADUA exploration area and Aypara-1 well location (ERM, 2018)

4.1.2 Sources of information

This baseline has been prepared combining publicly available information, scientific literature and data collected as part of previous studies in the wider ADUA area, in particular the Karabakh EIA prepared by Equinor in April 2018. This EIA included specific data obtained by SOCAR through a number of marine surveys (the Karabakh field is adjacent to the ADUA exploration area, towards southeast; Figure 4.2). Additionally, SOCAR undertook a marine survey in the ADUA exploration area 6-11th June 2018.

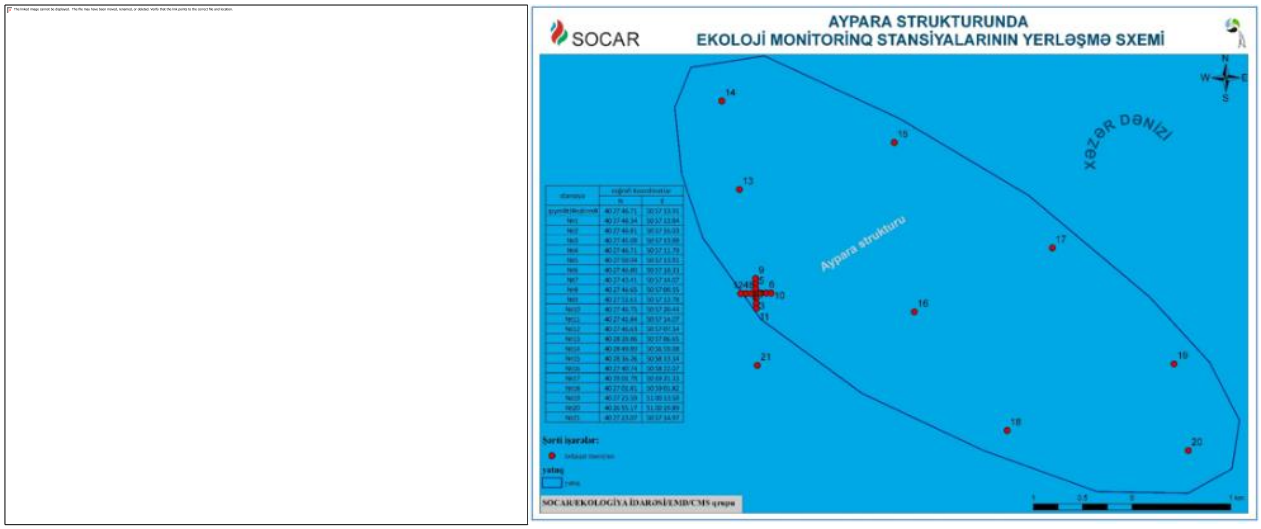


Figure 4.2: Location of Karabakh field in relation to ADUA exploration area (left) and SOCAR 2018 sampling scheme of the Aypara structure (right) (Statoil Azerbaijan, 2018; SOCAR, 2018).

Both surveys developed by SOCAR comprised water column physical properties measurements on the surface, middle column and near the seabed; as well as sediments and biological analyses. Similar measurements were undertaken in 1996 in the Karabakh field within the framework of the CIPCO studies in 1996-1999 (Environment and Resource Technology LTD, 1996). The SOCAR 2017 and 2018 results are also compared with the 1996 data to determine any water quality changes over the past 20 years.

4.2 Physical Environment

This section presents the geological, meteorological and climate conditions, hydrological regime, currents, water column chemistry and environment pollution assessments of the ADUA exploration area and its surroundings.

4.2.1 Geographical setting

The Caspian Sea is the largest closed water basin in the world and, contains about 45% of the water in all the world's enclosed water bodies. Its meridional length is 1,200 km, middle length 325 km, area – 392,000 km^2, water volume – 79,000 km^3, and average depth - 207m, while the deepest area reaches 1,025 m (Mekhtiyev and Buniat-Zade, 1980). The most important hydrographical feature of the Caspian Sea is considered to be its regular changes in level; the main reason of changes in the sea level is the changes in the water balance components (Nicholls, 2013). More than 130 rivers flow into this sea, among them Volga River is the first and the most important because of its discharging regime (most of the water balance in the Caspian (80%) is gained from rivers, 85% of which is the water brought by the Volga River), and Kura River is in the second place (Kosarev, 2005).

The Caspian Sea can be divided into three parts according to physical and geographical features, bottom relief and morphological features of shorelines: Northern Caspian Sea, Middle Caspian Sea and Southern Caspian Sea. The Caspian Sea has both sea (large size, hydrometeorological properties, chemical composition of water, etc.) and lake features (no direct contact with oceans).

There are five countries on the Caspian shores: the Republic of Azerbaijan, the Kazakhstan Republic, the Islamic Republic of Iran, the Russian Federation and the Republic of Turkmenistan (Figure 4.3). The shoreline boundaries between the countries are as follows: Azerbaijan – 850 km, Kazakhstan – 2,350 km, Iran – 900 km, Russia – 1,000 km, Turkmenistan – 1,200 km. There are 50 islands in the Caspian Sea with a total area of 2,000 km^2.

Note: Approximate ADUA exploration area shown in red outline

Figure 4.3: Geographic setting of the Caspian Sea, including major river networks (Spangler, 2018)

4.2.2 Meteorological conditions

The climate of the Caspian Sea mainly depends on its geographical condition, overall circulation of the atmosphere, shore features, sea depth, impact of surrounding dry areas (i.e. Aral-Caspian lowland in the east, Caucasian Mountains in the west) and water exchange between various areas of the sea (Heydar Aliyev Foundation, 2018).

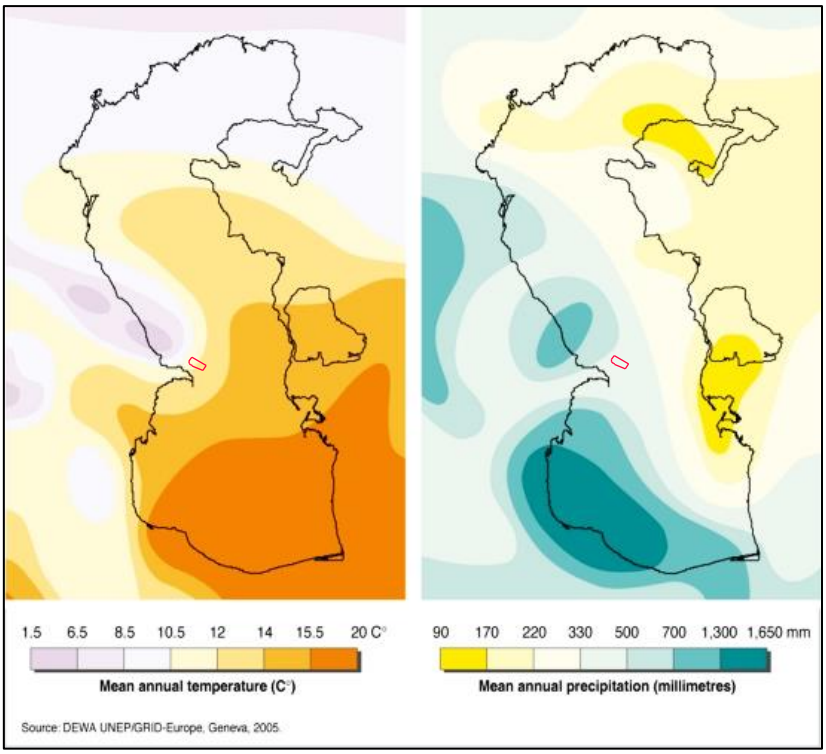
Lower latitude conditions a higher temperature of the air, which, in in turn, allows accumulation of the heat in the seawater. In winter, the cold Arctic air from the north and from mountainous areas of Iran enters the sea area. These two high-pressure air masses collide creating cyclonic air period in the middle of the sea. Moreover, the cyclones from Mediterranean and Black Seas also affect the Caspian Sea climate. In spring, the Siberian anti-cyclone and

Mediterranean cyclone start moving towards east and northeast. As a result, synoptic processes and air currents change frequently (Heydar Aliyev Foundation, 2018).

4.2.2.1 Air temperature, precipitation and humidity

The average annual air temperature above the Caspian Sea changes from 10ºC in the north to 17ºC in the south. (Figure 4.4). The monthly average air temperature in January is -5 - 10°C in the north and near the east coast of the Middle Caspian and is -1 - 5°C in Makhachkala area. The coldest month above the southwestern and central areas of the sea is February. Increase of temperature from March to July occurs uniformly. From the middle of March the temperature of air over eastern and western parts of the sea becomes lower than the temperature over land; in the central deep-water areas of the sea and in the southwest this occurs in April. The largest range of monthly average air temperatures in deep-water areas of the Middle Caspian is 20,5 - 22°C, of the South Caspian it is 18 - 20°C. Above the remaining part of the South Caspian this range also does not exceed 20°C and increases up to 22°C only around the Absheron and Cheleken Peninsulas (Casp Info, 2018).

The amount of precipitation on the Caspian coast depends on the interaction of different air masses with relief of the coast. Distribution of precipitation above water area is extremely uneven. It oscillates from 210 mm (Neft Dashlari) to 1250 mm (Lenkoran zone) of precipitation per year on the southwestern coast (southern Caspian). To the north of Absheron Peninsula, the amount of precipitation is of 400-430 mm. The eastern Caspian coast is distinguished by its dryness, and thus precipitation maximums do not exceed 10-20 mm (Casp Info, 2018).



Note: Approximate ADUA exploration area shown in red outline

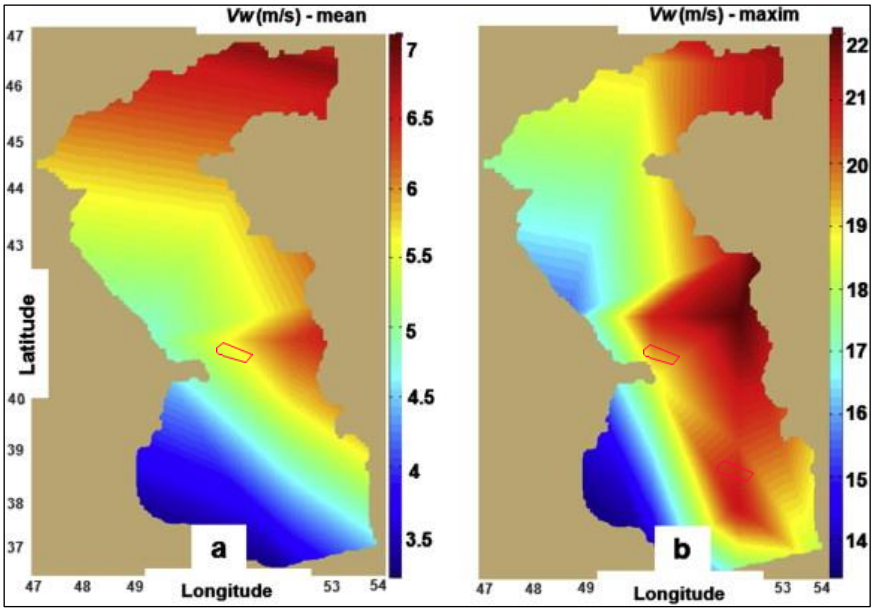
Figure 4.4: Mean annual temperature/precipitation in the Caspian Sea region (UNEP/Grid Arendal, 2007)

The humidity of the air above the Caspian Sea increases from south to north at high sea and from east to west along the shoreline; it also increases towards the high sea. The humidity does not vary markedly during the cold season, reaching 80-87% on western coast and 75-80% on eastern coast. In the high sea it decreases from 90% at the central parts of the Middle Caspian to 85% at the center of the South Caspian area.

4.2.2.2 Winds

Direction and strength of winds over the Caspian are determined by three factors: atmospheric circulation, sea temperature and coastal relief. Despite significant physiographic dissimilarities, the Caspian coastal and offshore areas may be divided into regions with relatively stable regime of a wind direction. General regularity of the wind direction regime is such that the winds of northern (i.e. northwest, north, and northeast) and southeastern directions dominate above the sea the most part of a year. Northern winds make up on average 41% each year; moreover their probability in the summer is higher (48,7%). All eastern winds make up on average 35,9% per year, and are more often observed in winter (41,3%).

The average wind speed over the sea is 5,7 m/sec. The greatest average speeds are observed in the middle part of the sea and are on average 6-7 m/sec per year. Their values may reach 8-9 m/sec in the Absheron Peninsula, with maximum wind speed being able to reach 40 m/sec. During the cold season (i.e. December-February), when the intensity of atmospheric circulation above Middle and South Caspian increases, the average wind speeds may reach 7-7,5 m/sec. The average wind speeds are sizably lower in the South Caspian, in the central areas being 4-5 m/sec, eastern coast 3,5-4 m/sec, southeast 2,5-3 m/sec. Low speeds (2,2-3 m/sec) are observed along the south-western coast (Figure 4.5).



Note: Approximate ADUA exploration area shown in red outline

Figure 4.5: Spatial distributions of the wind speed (at 80 m) in the Caspian Sea based on the ECMWF data for the time interval January 2001–December 2011 (Rusu and Onea, 2013)

4.2.2.3 Specific meteorological conditions in the ADUA area

Specific climate conditions of the ADUA exploration area are not known since no primary climatic data have been collected in that area as part of this EIA. However, given the proximity of the ADUA exploration area with the Karabakh field, the climatic conditions provided in the Karabakh KPS-4 well EIA (Equinor, 2018) are considered valid also for the ADUA exploration area and are described below.

- **Air Temperature**: moderate winter and hot summer months. Average annual temperature is 12.2°C. The lowest temperatures are expected in January (3-5°C) and the highest in August (35°C). In winter, the temperatures and wind direction in the area often change and strong gusts are observed. Summer is usually accompanied with hot dry weather.
- **Humidity**: it is around 50-70% in October-March and 70-80% in April-September.
- **Precipitation**: they happen mainly in winter and spring with 25-30% frequency. The rainiest month is November and the least precipitations (2.6 mm) occur in summer. Annual amount of precipitations is 170-230 mm and there are approximately 30-40 days of rain a year on average.

- **Visibility**: it depends on the amount of precipitations and dust in the area. The longest visibility distance is 12-15 km with 30% frequency in September - April and 30-40% frequency in May-September.
- **Winds**: this part of the Caspian Sea is subject to north winds. Their frequency is about 43%, which mostly happens in winter and summer months and average speed is 8.5-9.4 m/sec. Gusty winds mainly blow from north, sometimes reaching 40 m/sec and mainly occur in September.

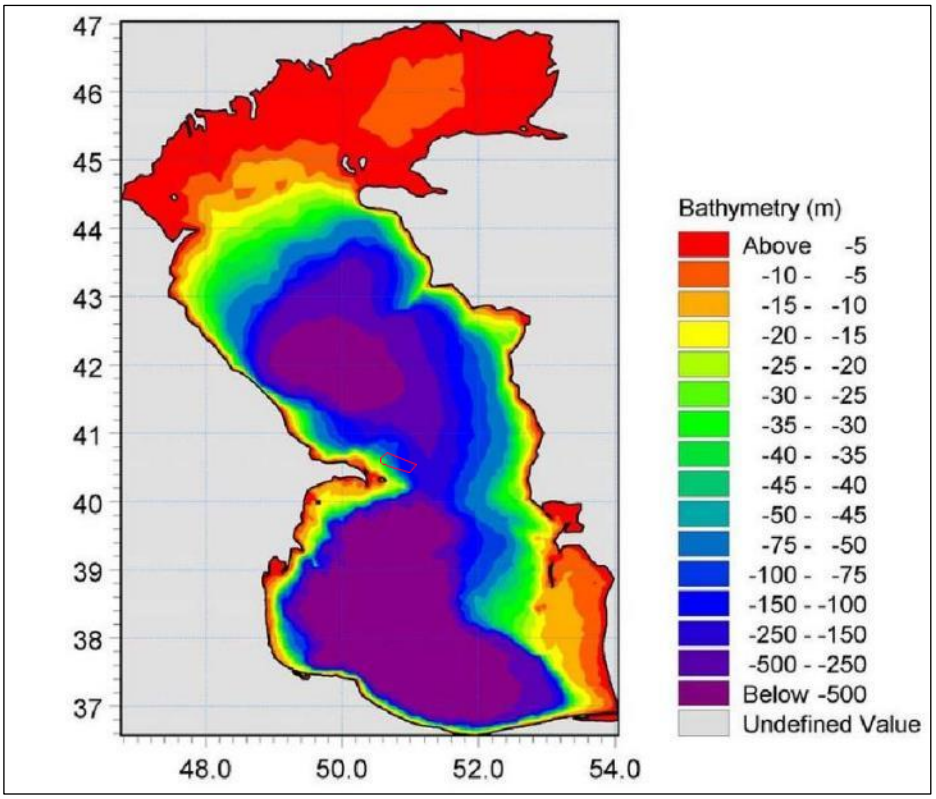
Table 4.1: Frequency of wind origins in the Aypara area in % (SOCAR, 2018)

North	North-east	East	South-east	South	South-west	West	North-west
43	11	5	6	17	12	3	3

4.2.3 Hydrological features of the Caspian Sea

4.2.3.1 Bathymetry

The Caspian sea consists of three distinct basins, each characterized by different features. The northern basin (91,942 km^2) is actually a shallow expanse of water, which never reaches a depth of more than 25 m and is less than 5 m deep over two-thirds of its area. It accounts for nearly a quarter of the total surface area of the sea but only 0.5 percent of the volume. The central and southern basins are deep depressions. The central basin, with a surface area of 137,812 km^2, a maximum depth of 788 m, and an average depth of 192 m, contains 33.9 percent of the total volume of water; the southern basin, with a surface area of 148,646 km^2, a maximum depth of 1,025 m and an average depth of 345 m, contains 65.6 percent of the volume (Schmitt, 2012). General bathymetry of the Caspian sea is shown in Figure 4.6.



Note: Approximate ADUA exploration area shown in red outline

Figure 4.6: Caspian Sea bathymetric map (Allahdadi et al. 2004)

The Absheron Ridge, which separates the Central and Southern Basins, is a narrow section of relatively shallow water (between 50 to 300m deep) which extends from Absheron Peninsula to the Khazar Peninsula on the east coast of Turkmenistan. The ADUA exploration area is located within the Middle Basin, within a relatively shallow subsea plateau that gently slopes offshore from the coast to a distance of approximately 70 km offshore. Water depth ranges between 20 to 225 m, with some limited areas reaching 10 m (Figure 4.7). The area where the Aypara-1 well is envisaged to be drilled is of approximately 140 m deep.

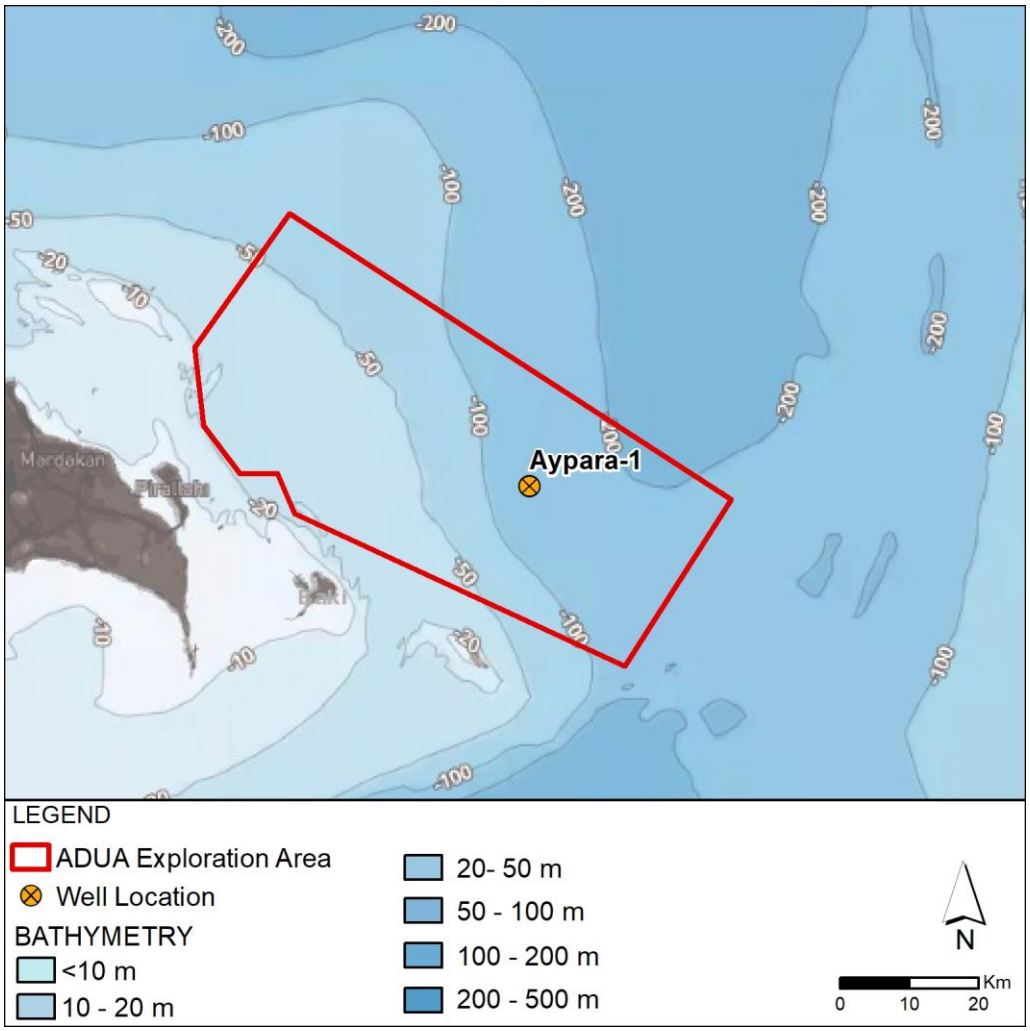


Figure 4.7: ADUA exploration area bathymetric map (ERM, 2018)

4.2.3.2 Sea level

One of the profound features distinguishing Caspian Sea from other large inland basins is the fact of its sea level significant fluctuation. Caspian Sea level fluctuation value is estimated within the 15 m range during the last 3,000 years based on paleo-geographic, archaeological and historical evidences (Heydar Aliyev Foundation, 2018).

The considerable drop in the Caspian Sea Level (CSL) began in 1930. Prior to that the observed water level had been more constant, fluctuating around -26 m for about eight decades. In 1929, the water level stood at 26.1 m

below open oceanic levels. This level dropped rapidly by around 1.6 m and reached -27.7 m by 1940. After that the Caspian's sea level continued to decline but at a slower rate, falling by around 1.4 m within 37 years and reaching -29.1 m by 1977. After 1977, the sea level began to rise such that a water level of about -26.7 was recorded in 1995 showing an increase of 2.6 m over the period 1977 to 1995. Since 1995, a slow rate of decline has occurred (Firoozfar et al. 2012). Chen et al. (2017) conducted a climate model-predicted precipitation (P), evaporation (E), and observed river runoff (R) to reconstruct long-term CSL changes for 1979–2015 and show that PER (P-E + R) flux predictions agree very well with observed CSL changes. They observed rapid CSL increase (about 12.74 cm/yr) and significant drop (~−6.72 cm/yr) during the periods 1979–1995 and 1996–2015 are well accounted for by the integrated PER flux predictions; showing that increased evaporation rates over the Caspian Sea play a dominant role in reversing the increasing trend in CSL during the past 37 years; with an actual long-term decline in CSL expected to continue into the foreseeable future, under global warming scenarios(Figure 4.8).

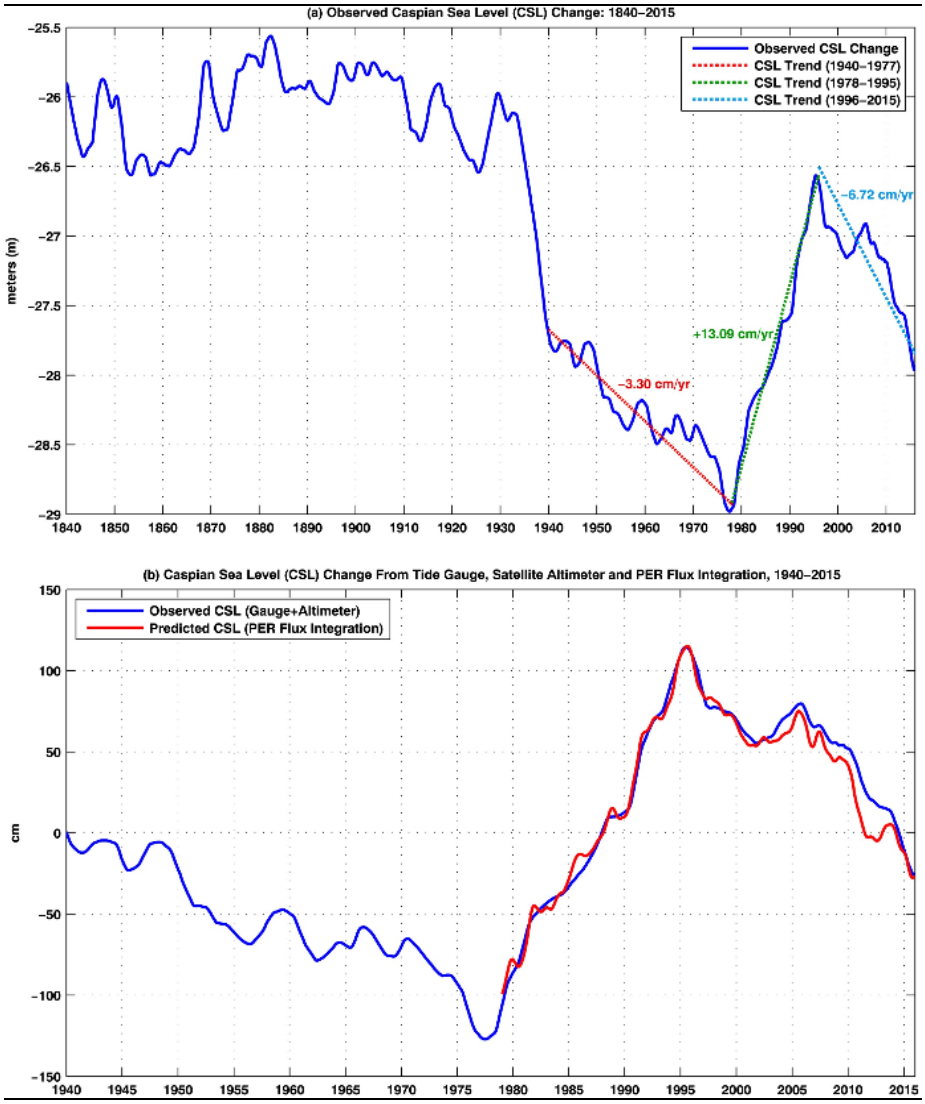


Figure 4.8: Caspian Sea level fluctuations 1840-2015 (Chen et al, 2017)

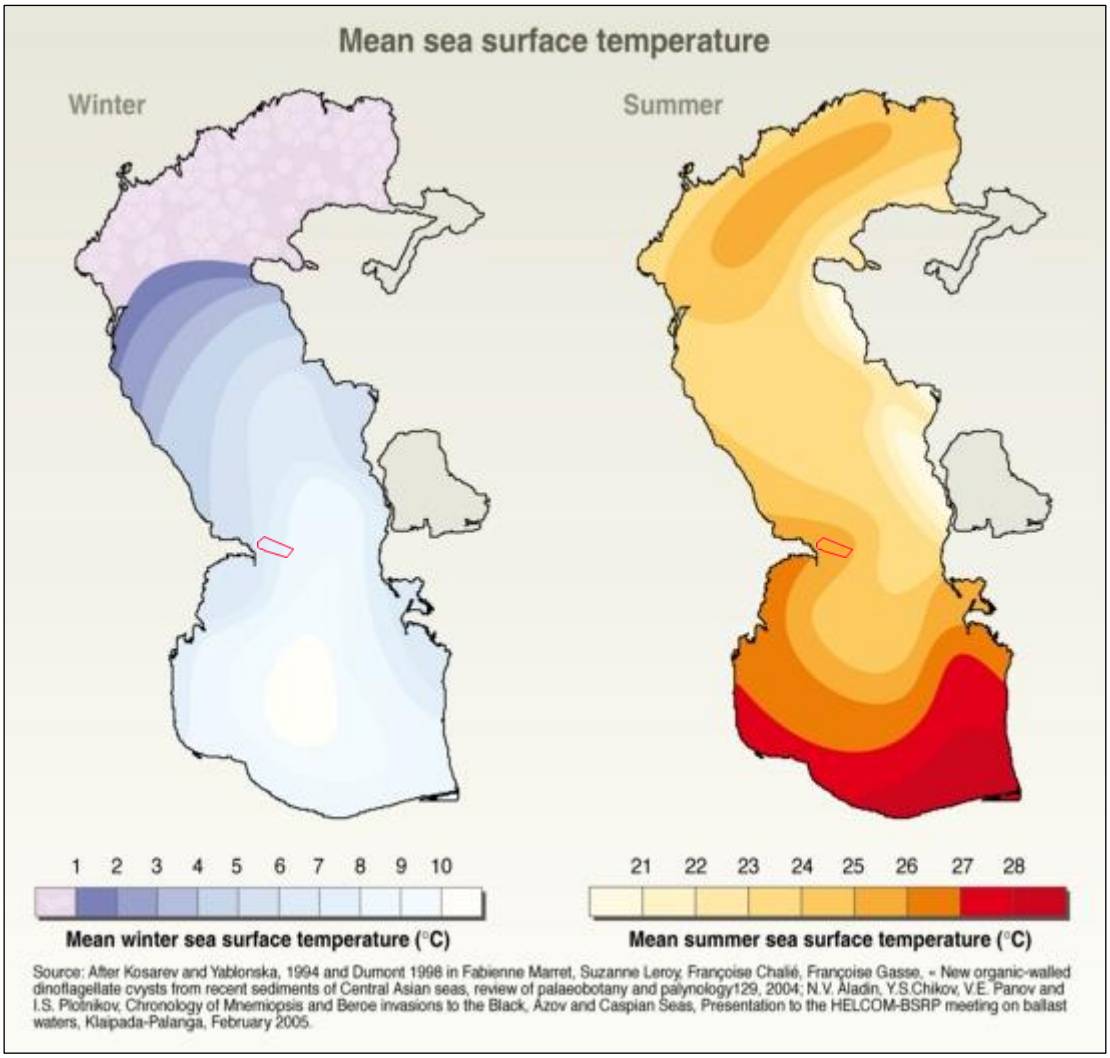
4.2.3.3 Sea surface temperature (SST)

Due to the considerable extent of the Caspian sea along the meridian, the water temperature is subject to large latitudinal changes, most distinctly expressed in the winter period, when the sea temperature changes from 0-0,5ºC in the north to 10-11ºC in the south (Figure 4.9), a difference of nearly 10ºC. This difference decreases to 1-2ºC in

the summer; where water temperature in the north is of 24-25ºC, whilst in the south 25-26ºC. The temperature along the east coast is 1-2ºC lower than on the west coast.

The most general characteristic of seawater temperature is the distribution of the annual average temperature. These values reflect the influence of the Caspian Sea on the climate of the adjoining land, though it is more smoothed with regard to separate seasons. This smoothness is reflected in the form of annual average isotherms. Far from the coast the accumulation of water heating in degrees changes from 11ºC in the areas adjoining the Caspian near steppes to 18ºC on south-eastern tip of the sea. The greatest influence on the form of isotherms is the drain of the rivers: Volga, Terek, Kura, and also prevailing winds. The influence of cold deep waters getting to the surface is greatest in the eastern half of the Caspian.

Annual average differences of water temperature on the surface of up to 20ºC are observed in the northern areas. This is also observed near the east coasts of the South Caspian, but depends on intensive warming up in summer and cooling down of shoals in winter. It is characteristic for central parts of the South Caspian that water temperature changes the least during the year, which corresponds to minor seasonal climatic distinctions. The annual difference of surface temperature decreases to 14-15ºC near western and eastern coasts of the Middle Caspian in upwelling areas.



Note: Approximate ADUA exploration area shown in red outline

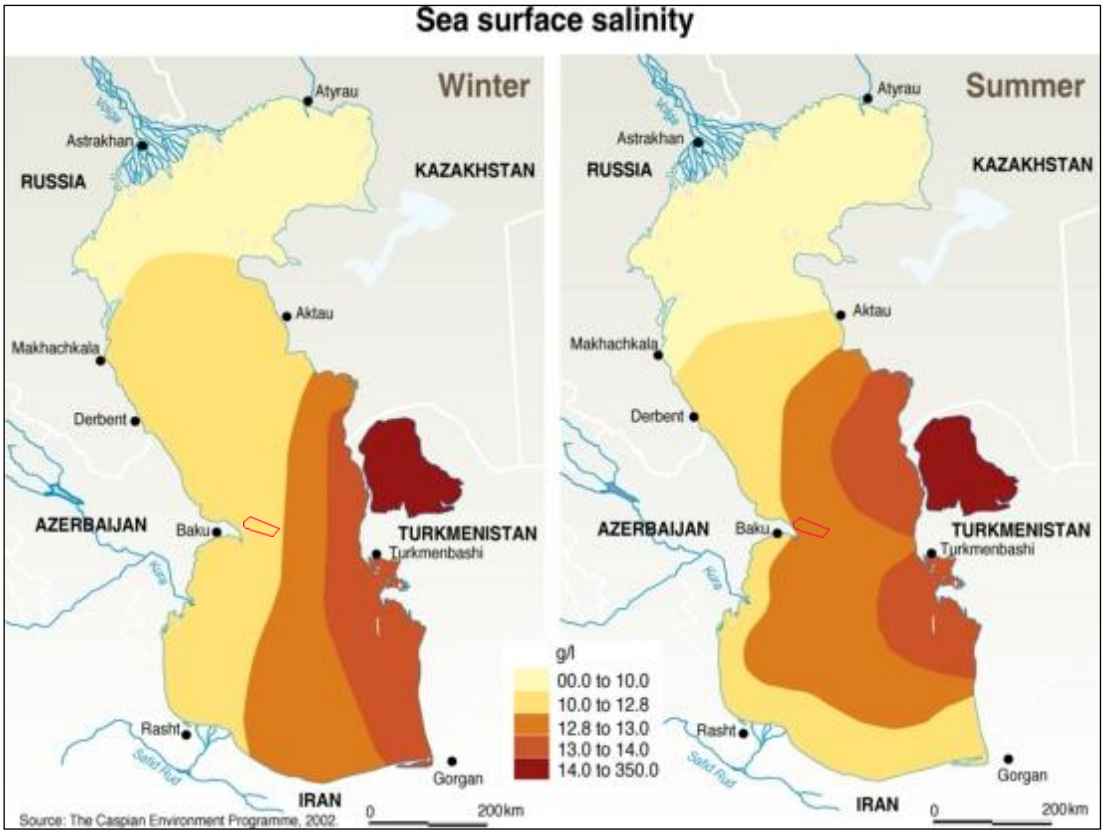
Figure 4.9: Sea surface temperature in the Caspian Sea (UNEP/Grid Arendal, 2007)

4.2.3.4 Salinity

The salinity of Caspian Sea changes from the north to the south within a range of 1,0 to 13,5 parts per thousand (ppt). This difference is especially marked in the northern Caspian, being less obvious in other areas distinguished by relative homohalinity. The 12,8 ppt bending around the peninsula forms a ledge as more salty water masses move towards the east. This phenomenon is explained by the fresh water influence from rivers draining into the western coast of the Middle Caspian, which is allocated by branches of Main Caspian flow of cyclonic and

anticyclonic directions. Practically all the remaining surface waters beyond the 12,9 ppt isohaline is defined by salinity of 13,0-14,0 ppt, due to an almost complete absence of a hydrographic network in the south-east Caspian.

The common increase of the salinity happening in the northern areas is observed in the whole area of the sea in winter months. In other parts of the sea extremes do take place. Like in the Gara-Bogas-Gol Gulf, where the salinity of the water can reach up to 300 ppt.



Note: Approximate ADUA exploration area shown in red outline.

Figure 4.10: Sea surface salinity in the Caspian Sea (UNEP/Grid Arendal, 2007)

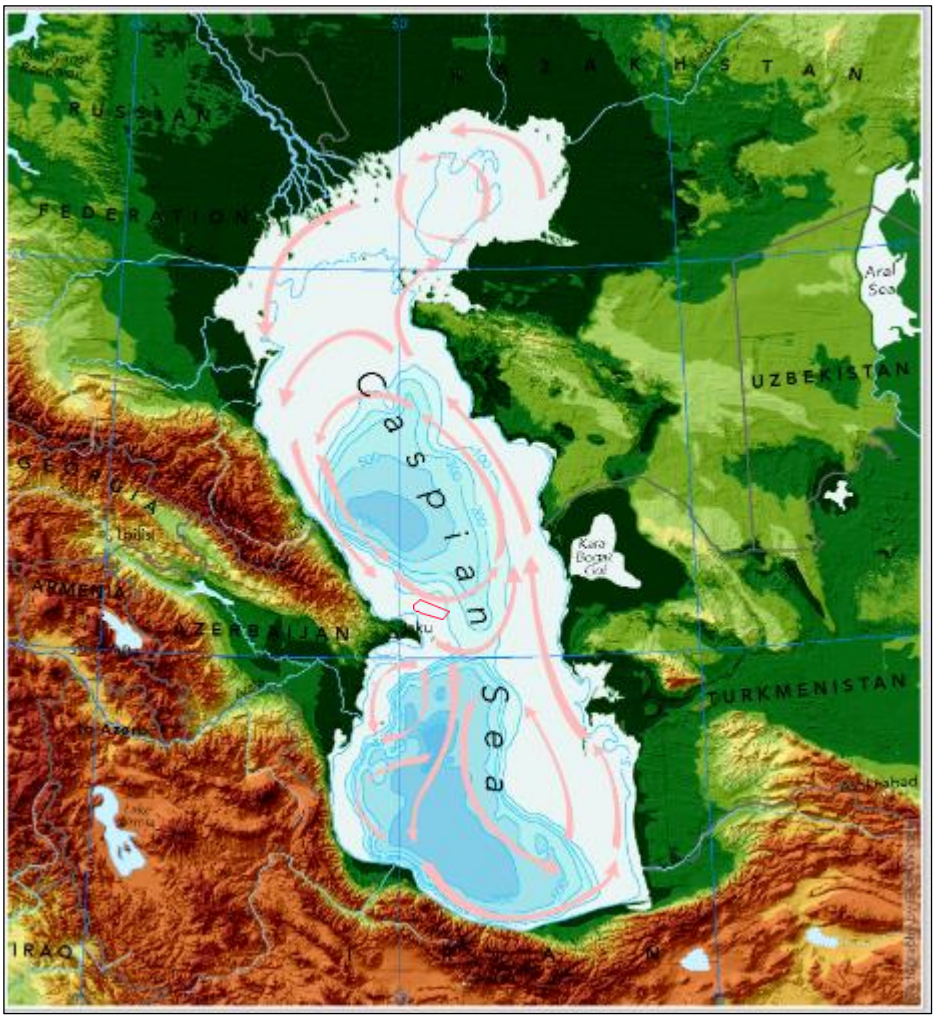
4.2.3.5 Sea Currents

General water circulation in the Caspian Sea is the result of long-term hydrometeorological conditions. In order of importance the causes of the circulation in Caspian waters are (Casp Info, 2018):

- wind conditions;
- bottom relief;
- shape of the coastal line;
- differences in water temperature and
- drain of rivers flowing into the Caspian, especially of the Volga river.

In general, north winds are dominant all year round generating wind-drift currents along the western shore from Northern Caspian to the South. These flows move to the Absheron Peninsula, where they divide into two arms. The stronger arm passes the peninsula and enters the southern part, then moves along the shores of the Southern Caspian and turns left returning back to the Central and Northern Caspian. The second arm moves to the east from Absheron Peninsula and enters the southern shores joining with the main arm. This joined flow enters Mangishlag Peninsula and turns west, thus creating cyclic water circulation in the Northern Caspian (Figure 4.11). There are also local anti-cyclone currents between Absheron Peninsula and Kura River mouth in the southern part of the sea.

Typical current speed value in the Caspian Sea varies in the range from 15-20 cm/sec, whereas this value reaches 100cm/sec in between Chilov Island and Neft Dashlary oilfield (Heydar Aliyev Foundation, 2018). The fastest currents in the North Caspian Sea are the Northeast and Southwest (25 cm/s) currents, while the Northwest and Southeast currents are the slowest (13 cm/s). Direction of winds and currents in the eastern part of the Central Caspian coincide. Wind velocity and, respectively, the current speed increases along the shore from south to north. The south currents (velocity up to 10 cm/sec) dominate around Baku archipelago in the Southern Caspian. The maximum current velocity in this area was 40-50 cm/sec. The south currents dominate along the eastern shores of the South Caspian in April - September. The current velocity is 15-30 cm/sec in moderate wind and 50-60 cm/sec in strong winds. Recurrence frequency of currents with up to 10 cm/sec velocity may reach 60%.



Note: Approximate ADUA exploration area shown in red outline

Figure 4.11: Main surface currents of the Caspian Sea (EEA, 2008)

The results of the Aypara field current measures carried out in 2018 (Table 4.2) suggest that in this part of the Caspian currents vary between 30 and 230 cm/sec. Southeast mid-currents dominate over the western shores of the Central Caspian. Within Absheron Peninsula, the strong north-west winds create the currents from the shore to the east due to the impact of the shore, while in open sea the currents flow towards north-west. With exception of south winds between Chilov Island and Neft Dashlari, all other winds create stable southbound currents and their velocity changes between 60-70 cm/sec and sometimes between 150-160 cm/sec (SOCAR, 2018).

Table 4.2: identified trends in sea currents in the Aypara area (SOCAR, 2018)

S / S	St. No.	measuring depth	Current speed, cm / sec. Error (± 2)	current direction Error (± 2)	
				Bearing (º)	Bearing
1		surface	31	30-70	NE
2	1	average	33	30-70	NE
3		deep	38	30-70	NE
4		surface	43	30-70	NE
5	20	average	30	30-70	NE
6		deep	45	30-70	NE
7		surface	41	30-70	NE
8	2	average	44	30-70	NE
9		deep	55	30-70	NE
10		surface	48	30-70	NE
11	22	average	42	30-70	NE
12		deep	40	30-70	NE
16		surface	62	150-190	SESW
17	9	average	49	150-190	SESW
18		deep	83	150-190	SESW
19		surface	28	150-190	SESW
20	10	average	31	150-190	SESW
21		deep	56	190-230	SW
22		surface	40	190-230	SW
23	21	average	63	190-230	SW
24		deep	71	190-230	SW

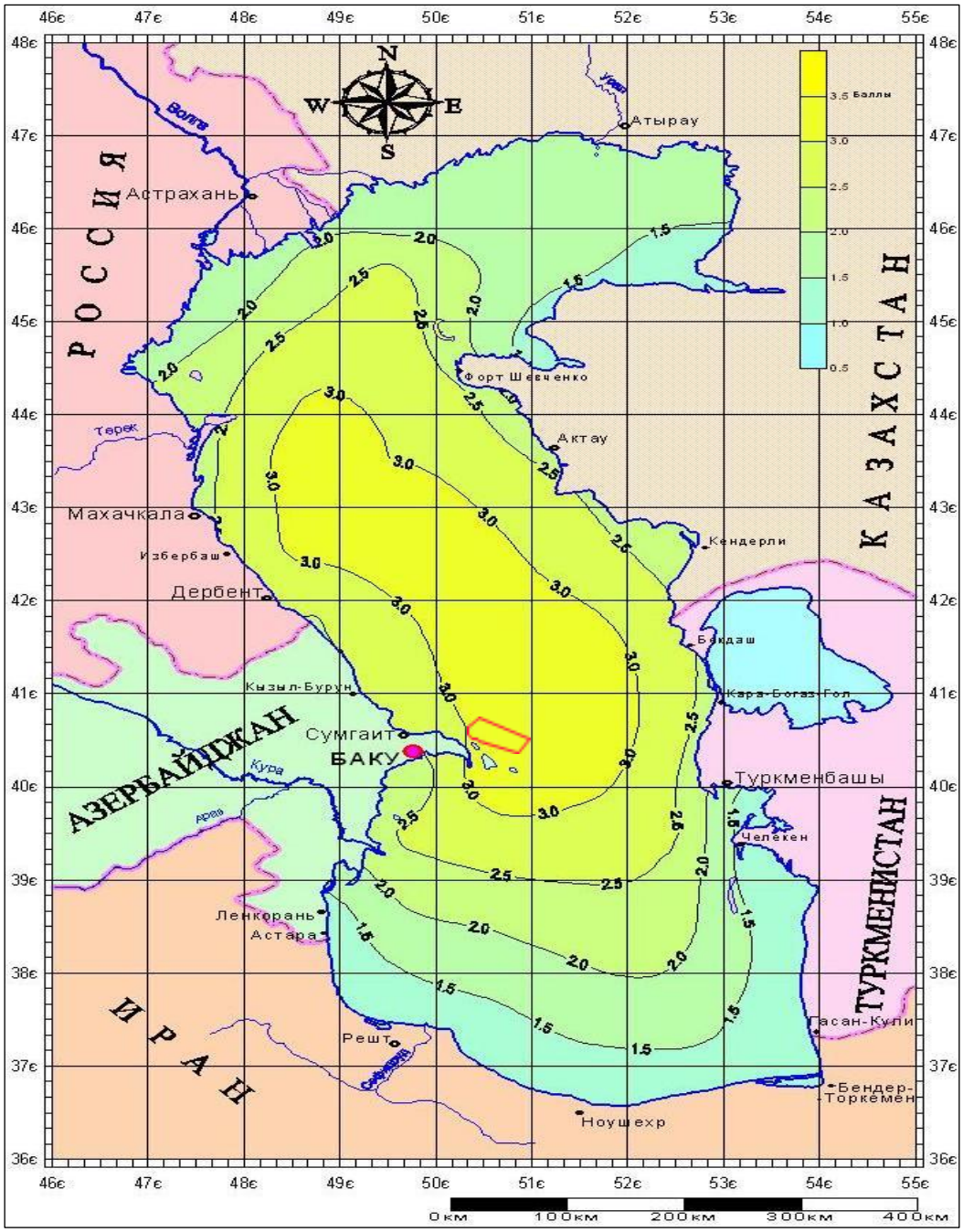
4.2.3.6 Waves

Characteristics of waves in various areas of Caspian Sea strongly differ from each other. The main characteristics of the waves in the Northern Caspian sea are: height - 3m, the period - 10 sec., length - 85m. Wave regime in the southeastern and eastern directions has the largest repeatability in the western part of the Northern Caspian Sea (Figure 4.12). In the northeastern area of the sea the repeatability is biggest in western and eastern directions (Casp Info, 2018).

Wave regime in various areas of Middle and South Caspian is characterized by northern winds, where greatest heights are 2-3 m in the coastal zone of Makhachkala - Derbent region, and are 4-6 m in the offshore section of this area. The average periods and lengths of waves are accordingly 4 sec and 16 m at the coast, 5-7 sec and 20-25 m far from the coast; with wave size increasing from north to south (Casp Info, 2018).

The greatest wave heights are found around Absheron Peninsula. During severe northwestern storms (> 25 m/sec) waves may reach heights of 7,5 - 8,0 m, and during extreme storms 9-10 m. Eastern winds with a speed of 5-9 m/sec cause wave heights up to 1 m. Winds with speeds of 10-15m/sec cause waves of up to 2 m in height. The period of the waves is increased to 3,0 - 4,7 sec (Casp Info, 2018).

With eastern winds of 16 - 20 m/sec, waves may reach heights of 3-3,5 m with a period of 6 sec. The whole southern Caspian Sea has a weak standard wave regime (0,5-1 m) due to the southeastern winds. Strong waves develop in case of northern and western winds on the east coast near the Cheleken region. The height of waves does not exceed 1 m in case of moderate and strong northwest winds (from 5 up to 15 m/sec) in the eastern area of the South Caspian. Storms of 16-20 m/sec may cause waves of 2-3 m, and heavy storms (21-25 m/sec) waves of 3 - 4 m (Casp Info, 2018).



Note: Approximate ADUA exploration area shown in red outline

Figure 4.12: Annual wave regime the Caspian Sea (Casp Info, 2018)

Similarly to what has been described for the meteorological conditions, in the absence of primary data specifically for the ADUA area, the hydrological regime of Karabakh field are considered applicable to the ADUA area given the proximity between these two. The waves in the ADUA area are mainly brought by north winds and are mainly short, with late extinction after wind drop. Waves influence the wind regime. Wind direction changes are described *in* Table 4.3.

Table 4.3: Wave height frequency and average wind directions in the Aypara field (SOCAR, 2018)

Wave height	Throughout the year	Directions							
		N	NE	E	SE	S	SW	W	NW
0,1-0,5	69,7	26,9	55,2	81,7	81,2	83,5	61,3	86,4	81,2
0,6-1,0	19,6	27,7	33,4	16,5	14,3	15,4	30,2	9,7	9
1,1-1,5	5,3	16,5	6,6	1,8	4	1	3,3	3,9	5,2
1,6-2,0	2,8	11,5	3,5	-	0,3	0,1	5	-	2
2,1-2,5	1,4	8,6	1	-	0	-	0,15	-	1,8
2,6-3,0	0,6	4	0,1	-	-	-	0,05	-	0,8
3,1-3,5	0,3	2,6	0,2	-	-	-	.	-	-
3,6-4,0	0,18	1,4	-	-	-	-	-	-	-
4,1-4,5	0,07	0,5	-	_	-	-	-	-	-
4,6-5,0	0,03	0,17	-	-	-	-	-	-	-
5,1-5,5	0,02	0,13	-	-	-	-	_	-	-

4.2.3.7 Water transparency

The transparency of Caspian waters increases from the north to the south (Figure 4.13). The North Caspian Sea has by a small transparency (0,5-1,0 m), which is explained by a big inflow of river waters, containing rich organic and inorganic suspensions, a highly biological productivity of waters and small depths.

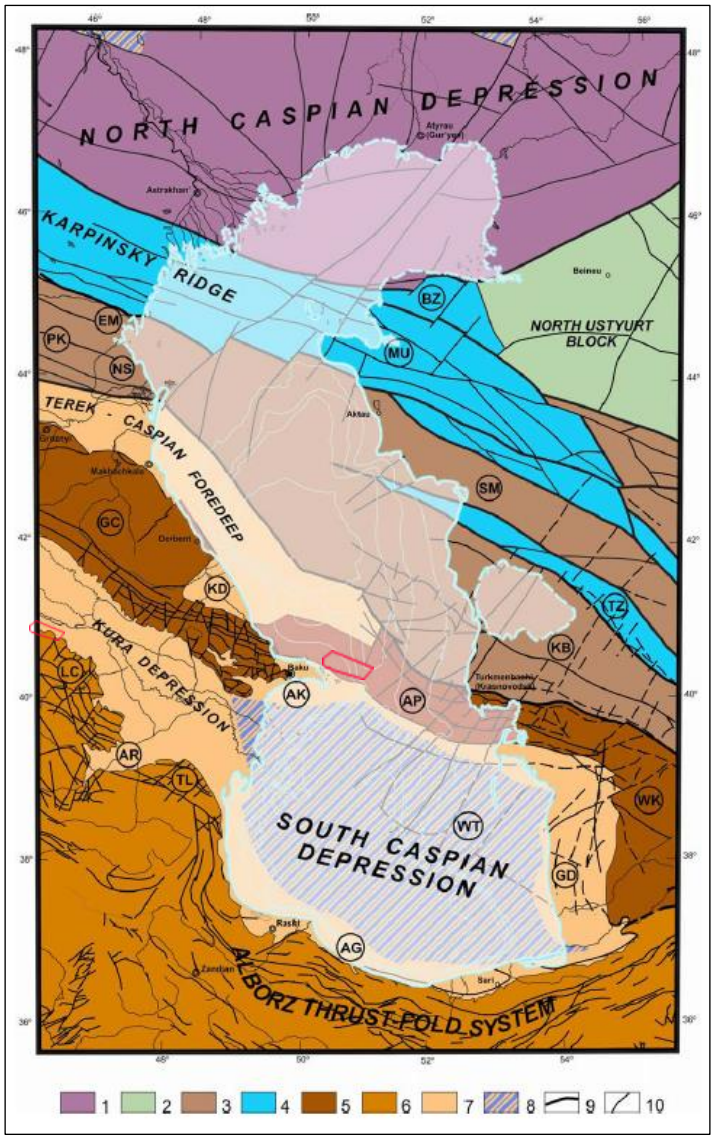
The transparency is not the same in various areas of Middle and South Caspian and increases in deep water. The transparency is about 10-15 m in the central part of the sea almost in all seasons of year, and the maximal value (21 m) was observed in South Caspian.

Note: Approximate ADUA exploration area shown in red outline

Figure 4.13: Water transparency in the Caspian Sea (National Academy of Science, 2010)

4.2.3.8 Geology and Sediments

Various geological structures participated in the formation of the Caspian depression: the Russian Paleozoic platform, Epihercynian Turan platform and Alpine-Himalayan orogenic zone. As a result, the Caspian Sea was separated by three almost independent depressions: the Northern Caspian, the Middle Caspian and the Southern Caspian, which differ in depth, morphological features, geological structure and occupied area. They are separated by sub-latitudinal, underwater risings (Mangyshlak and Absheron). The Middle Caspian Basin is separated from the South Caspian Basin by the Absheron – Balkhash zone of uplifts, which bridge the fold systems of the Greater Caucasus and Kopeh Dagh. It consists of two chains of brachyanticlines, the western of which is located immediately north of the Absheron Peninsula. Eastwards from the seashore there is a poorly traceable arch expression of the structure up to Eocene-Miocene deposits. Cretaceous strata occur here at a depth of approximately 2 km and are locally overlain by Pliocene sediments. This area represents a submerging continuation of the Greater Caucasus axial zone. The latter submerges sharply further eastward with simultaneous increase in the thickness of the lower Pliocene hydrocarbon productive sequence (Russian Academy of Sciences, 2005).



Basement of platform areas (1 – 4): (1) Early Precambrian, (2) Baikalian, (3) Hercynian, (4) Early Cimmerian; Alpine fold – thrust systems (5, 6): (5) Greater Caucasus and Kopeh Dagh, (6) Lesser Caucasus, Talesh, Alborz; (7) Foredeeps and depressions; (8) Depressions with oceanic-type crust; (9) Tectonic lineaments corresponding to boundaries of large structures; (10) other important lineaments. Main structures (letters in circles): (Bz) Buzachi arch, (MU) Mangyshlak – Central Ustyurt, (SM) South Mangyshlak – Ustyurt system of troughs, (TZ) Tuarkyr zone, (KB) Middle Caspian Karabogaz anteclise, (EM) East Manych trough, (PK) Kuma system of uplifts, (NS) Nogai scarp, (GC) Greater Caucasus fold system, (KD) Kusary – Divichi trough, (AP) Apsheron Balkhan zone, (WK) West Kopeh Dagh zone, (LC) Lesser Caucasus fold system, (AR) Lower Araks trough, (TL) Talesh zone, (AG) Alborz – Gorgan foredeep, (WT) West Turkmen trough, (GD) Gograndagh – Okarem zone.

Note: Approximate ADUA exploration area shown in red outline

Figure 4.14: Main structural elements of the Caspian Sea region (Russian Academy of Sciences, 2005)

Regional Geology

Geological data have been obtained from exploration and appraisal wells drilled in the South Caspian Basin and at the Absheron Sill. Seismic interpretation and mapping based on acquired (in 1995-1999) and reprocessed 2D and 3D seismic indicates that the area north of the Naft Dashlari-Chilov Adasi trend is covered by thick Cenozoic sediments.

The Pleistocene aged Absheron Formation is underlain by the Pliocene aged Productive Series sediments. The Absheron Formation comprise grey to green claystones and marls interbedded with minor channelised bodies of siltstones and sandstones.

The Pliocene sequence is characterised by the deposition of fluvial deltaic sandstones and shales of Paleo Volga in a lacustrine basin. Laterally continues sand and shale layers were deposited in a low gradient ramp like delta under great influence of rapid fluctuations of lake level (driven by climate change). The Pliocene interval is characterized by fast deposition and rapid subsidence of the basin. Approximately 8km of sediment was deposited in the South Caspian Basin during five to six million years in Pliocene time. The Pliocene interval is thinning toward the north (Absheron Sill) and progressively onlaps onto an upper Miocene or older unconformity surface across the central Caspian region.

The youngest formation of the Productive Series (Akchagyl Formation) mainly consist of claystone and represents the last connection period between the Caspian Basin and open sea. Below the Akchagyl Formation are the deposits of Surakhany, Sabunchi, Balakhany, Fasila, NKG, NKP, Kirmaky, PK and Kalin Formations.
The older units (Miocene to Paleocene) are poorly known in the offshore area. Only few exploration wells have been drilled down to Cretaceous and limited data is available from these old deep targeted wells.

Tectonic Setting

The South Caspian Basin is bounded by the Alborz Mountains in the south, the Kopet Dagh Mountains in the east and the Azeri Kura Basin in the west. The northern boundary of the South Caspian Basin is the Apsheron Sill, a

large structural high that stretches across the Caspian Sea from Turkmenistan to the Greater Caucasus Mountains in Azerbaijan.

The Apsheron Sill marks the boundary of the thick sedimentary package found in the South Caspian Basin and separates the South Caspian Basin from the Central Caspian Basin. At shallow levels, the Apsheron Sill is composed of large anticlines that form giant hydrocarbon fields found in Azerbaijan and Turkmenistan. To the north of the Apsheron Sill, there is a small foreland basin (thick isochore) that is called the Apsheron Depression.
The regional tectonic is controlled by the collision between the Arabian and Eurasian plates during late Cenozoic. This north-south converge between the Arabian and Eurasian plates resulted in a large variation in structural styles and kinematics.

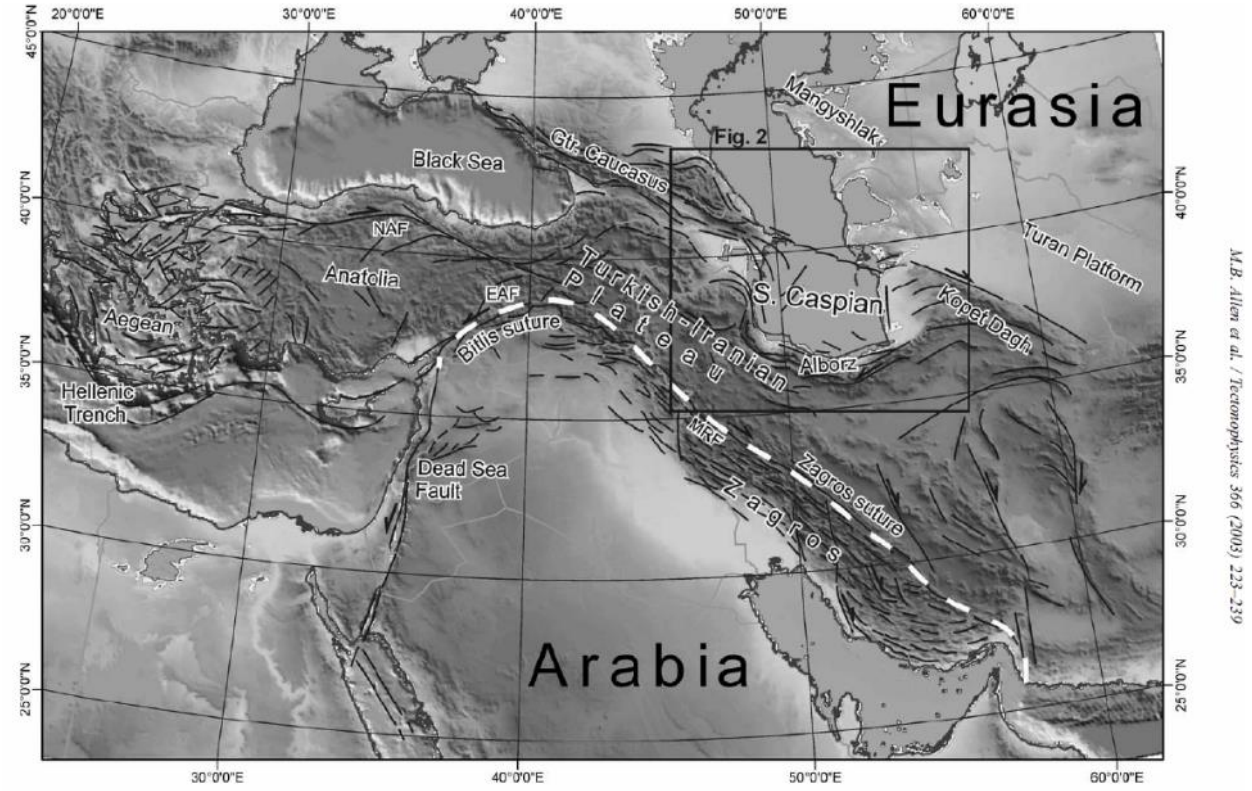


Figure 4.15: Topography and regional structure of the Arabia-Eurasia collision. Principal fault zones and fold trends are highlighted. Elevated regions are principally between the Zagros and the northern side of the Greater Caucasus-Kopet Dagh range. The Arabia-Eurasia convergence has been largely accommodated by crustal shortening in the area between these range fronts. EAF = East Anatolian Fault; MRF= Main Recent Fault; NAF =North Anatolian Fault. (Allen et al 2003)

The basin architecture in the South Caspian Basin is characterized by long wavelength box folds. The folds are detached from the basement by the thick mid-Tertiary Maykop interval. These folds formed during late Pliocene (Akchagyl Formation) and are marked by thickness changes across the folds. In Akchagyl to recent times, the sediments imply deposition during structural growth. Some of the folds within the South Caspian Basin are underlain by basement structures. The Maykop acts as the decollement zone for the box folds.

The northern margin of the South Caspian Basin is marked by the transition towards the Apsheron Sill. The sill trend is interpreted to have developed during Early Cenozoic as the offshore continuation of the Greater Caucasus Mountains. Evidence of structural inversion along faults parallel to the ACG trend suggests that these faults may represent reactivation of earlier normal faults that relate to the formation of the early Cenozoic South Caspian Basin.

The main compressional events occurred during the Late Miocene forming the Greater Caucasus fold and thrust belt and the formation of the folds within the South Caspian during the Pliocene-Pleistocene. Both folding events are linked to the Arabian-Eurasian collision.

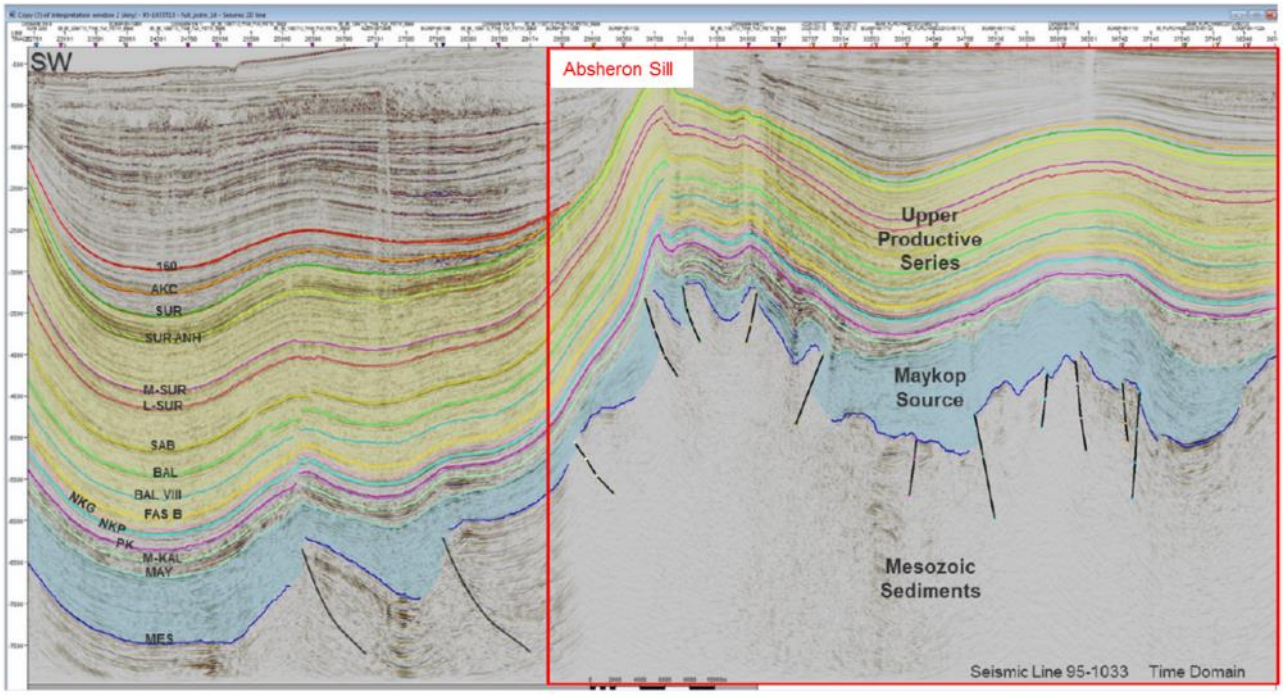


Figure 4.16: South Caspian Basin cross-section. SW-NE cross section across the northern margin of the South Caspian Basin showing the long wavelength folds in the Productive Series. The basement high is the Apsheron Sill that marks the northernmost boundary of the South Caspian Basin.

Seismicity

The regional tectonic of the Caspian region is controlled by the collision between the Arabian and Eurasian plates. The convergent collision between the Arabian and Eurasia continental plates led to the subduction of the Tethys oceanic plate, which lay between the Eurasia plate to the north and the Arabian plate to the south. The convergent plate movements are associated with relatively high levels of seismic activity and earthquakes around the rigid South Caspian Basin.

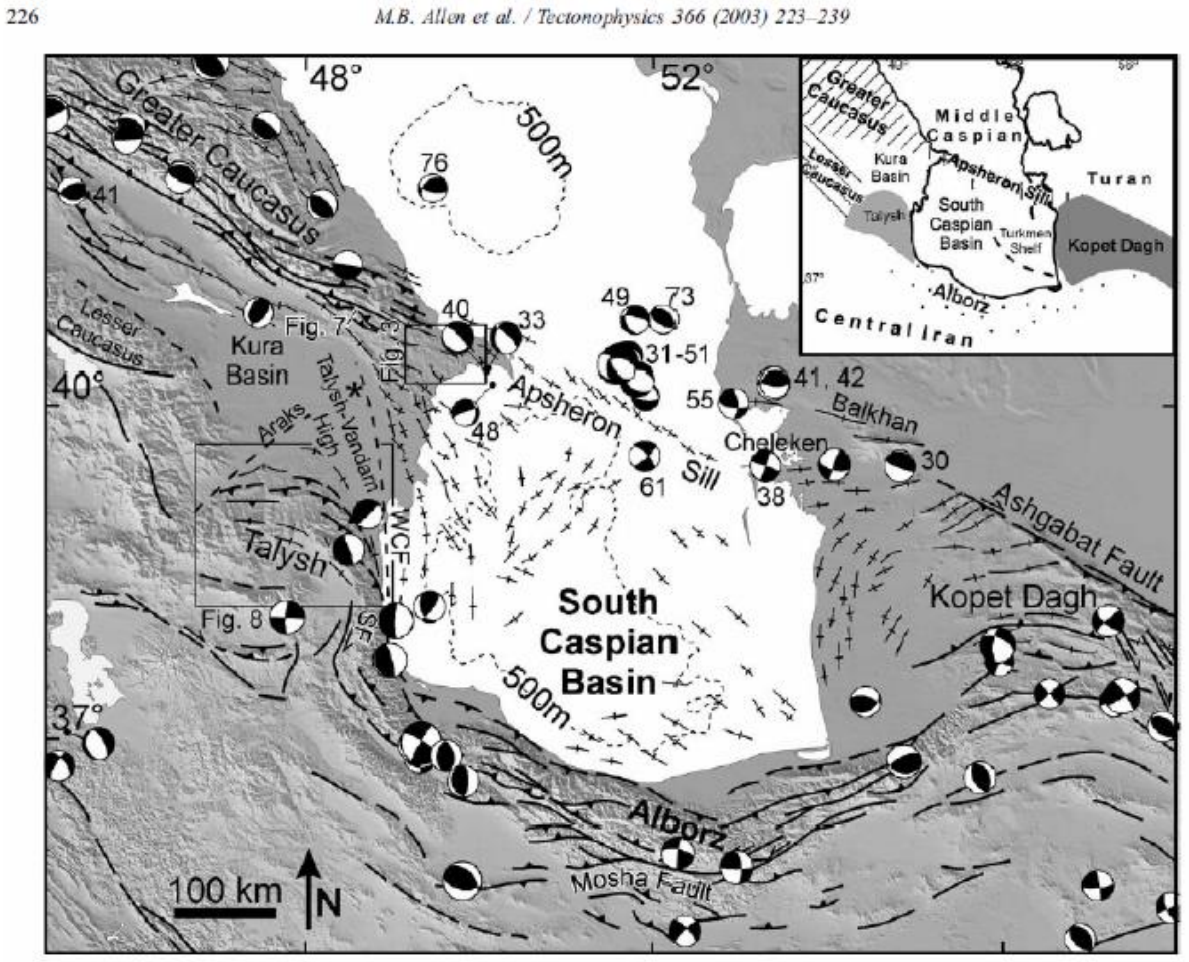


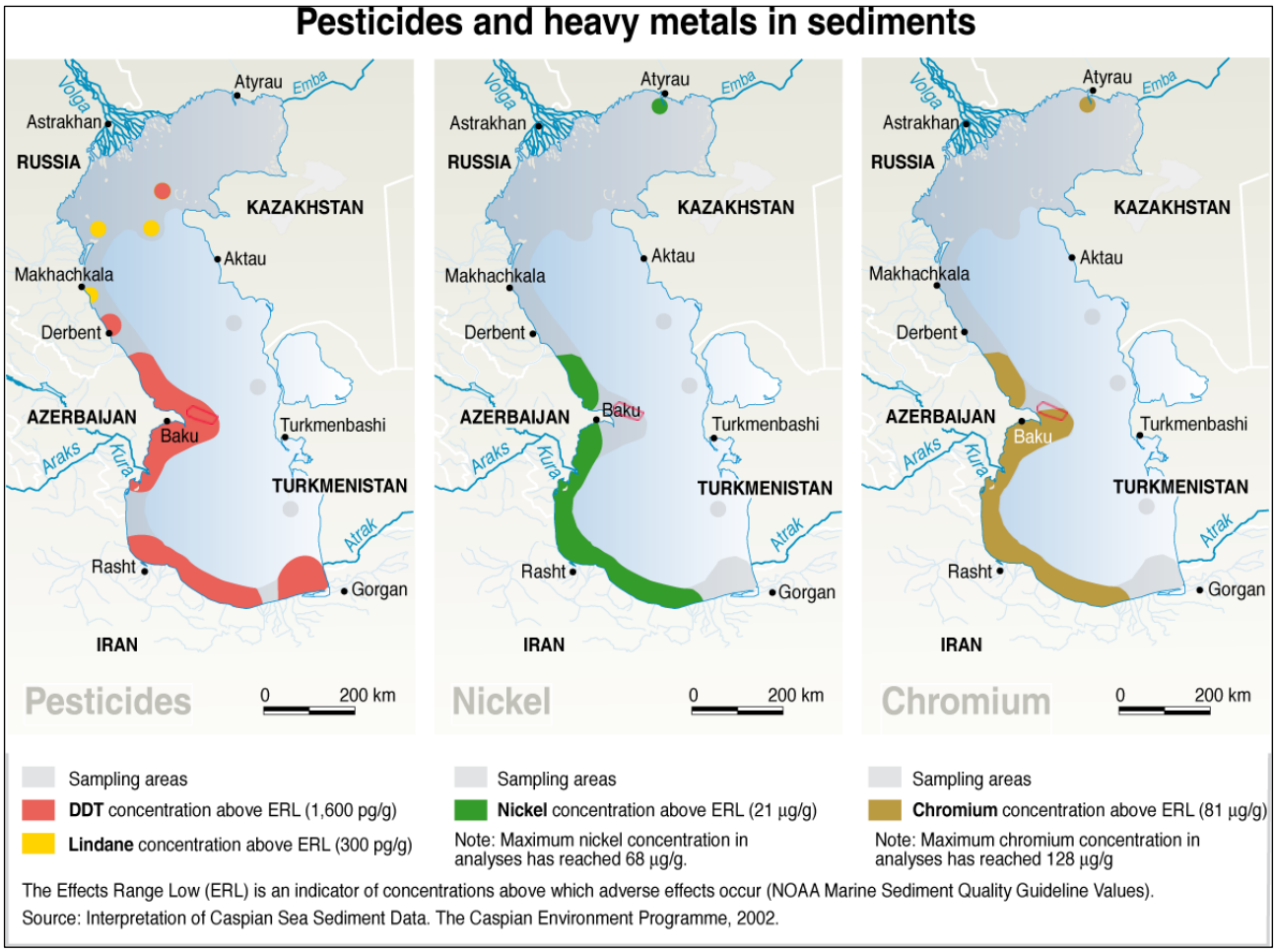
Figure 4.17: Structure and seismicity of the South Caspian region. Modified after Jackson et al. (2002). Centroid depths are only shown for earthquakes deeper than 30 km. SF = Sangevar Fault; WCF=West

Caspian Fault. The South Caspian Basin is characterized by thin skinned deformation and is surrounded by compressional thick-skinned fold and thrust belts. (Allen et al., 2003).

Current neotectonic (more recent) tensions are leading to convergent movements between the plates. The Absheron Sill is located to the north of the main deep fault that is associated with several reverse and thrust faults. Figure 3 shows the location of earthquakes deeper than 30 km. Five earthquakes with a magnitude greater than 6.0 on the Richter scale have occurred in Azerbaijan since 1842 with the most recent, measuring 6.5, on 25th November 2000 with an epicenter 30km northeast of Baku.

Sediments

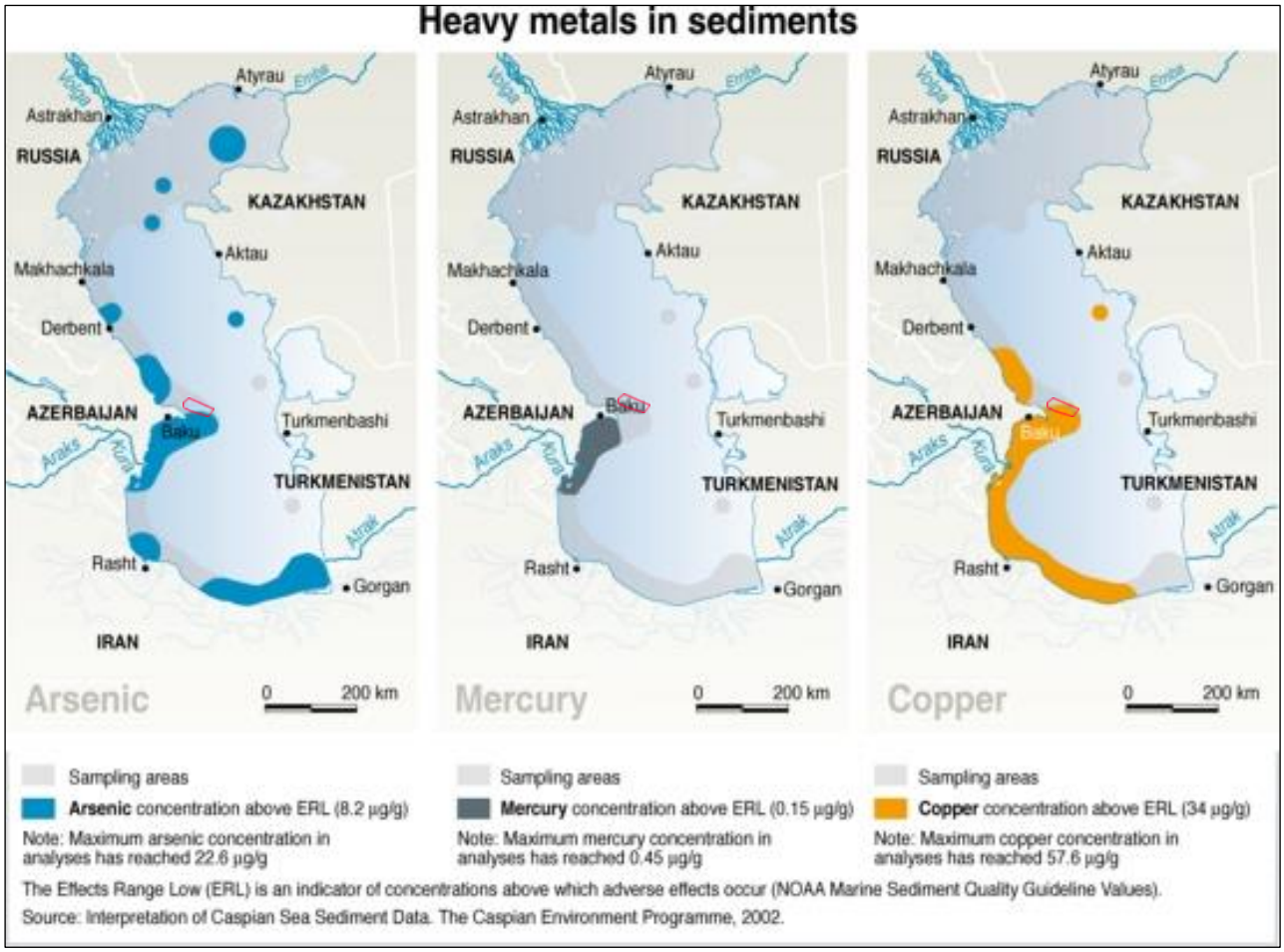
Sampled sediments in the Caspian Sea (Figure 4.18) showed that the accumulation is at its worst in the south and southwestern shores of this inland sea, off the shores of Iran and Azerbaijan. Sampled pollutants presented in this map are pesticides (persistent organic pollutants Lindane and DDT - POPs), and the heavy metals Chromium and Nickel (CEP, 2002).



Note: Approximate ADUA exploration area shown in red outline

Figure 4.18: Pollutants in sediments of the Caspian Sea (pesticides, nickel and chromium) (CEP, 2002)

Other parameters (Figure 4.19) showed that arsenic is spread out at multiple locations, but primarily on the southern and southwest shores of the Sea, on the shores of Iran and Azerbaijan - where also Copper is accumulated in the sediments. Mercury is concentrated on the Absheron Peninsula of Azerbaijan (CEP, 2002).



Note: Approximate ADUA exploration area shown in red outline

Figure 4.19: Heavy metals in sediments of the Caspian Sea (Arsenic, Mercury and Copper) (CEP, 2002)

4.2.4 Specific water column and sediment analysis in the Aypara area

Water column physical properties were measured for the ADUA area in June 2018 and the near-by Karabakh field in 2017 on the surface, middle column and seabed. Measurements in the Aypara area where made in areas where depths ranged between 139 to 150m; the main results are summarized in the sub-sections below. Similar measures were performed in 1996 in the Karabakh field in 1996 within the framework of the CIPCO studies in 1996-1999 (Environment and Resource Technology LTD-1996). The 2017-2018 results are also compared with the 1996 to pinpoint any water analysis changes over the past 20 years.

4.2.4.1 Physical parameters analysis

Temperatures in the upper layers of the samples varied between 17.5 and 19.3ºC in the Aypara area; whilst in Karabakh it varied between 18.4 and 19.6ºC, in both cases they were more almost two times lower in middle layers (9.1 to 10.3ºC Aypara; 8.0 to 8.9ºC Karabakh) and lower layers (7.8 to 9.4ºC Aypara; 6.7 to 8.7ºC Karabakh). This indicates the existence of a thermocline, (i.e. sharp decline of temperature) in the area. This was also recorded in previous surveys and seem to occur in the layers below 60 m (SOCAR 2017-2018). Salinity changed between 11.04 and 12.39% and was higher in lower layers. The pH was fairly similar in all samples (8.83 - 9.10).

Results of the 1996 monitoring where found to be comparable with the 2017/2018 surveys.

4.2.4.2 Analysis of biogenic substances in water samples

The 2017/2018 surveys included sampling of Nitrates NO_3^-, Nitrites NO_2^-, Ammonium NH_4^+, and Orthophosphates PO_4^{3-} which are the main source of food for phytoplankton and therefore a good ecological indicator.

The amount the nitrate ions during the 2018 survey where highest in two samples collected in two separate stations (1.233 and 1.194 mg/l); whereas in the Karabakh 2017 survey it was the highest in two samples collected in the middle layer (2.466 and 2.326 mg/l); in both cases levels where similar throughout the remaining sampling points, though Aypara samples where comparably lower (i.e. 1.01-1.233 mg/l Aypara versus 1.024-1.664 mg/l Karabakh).

The amount of nitrites was comparably higher in the Karabakh samples; with the highest found in the upper level (0.022 -0.027 mg/l) and in some stations on the bottom level (0.018-0.021 mg/l) and were fairly similar in other stations (0.01-0.016 mg/l); in the Aypara area, none of the samples where beyond the analytical threshold of 0.0015 mg/l.

The amount of orthophosphates was similar across all stations in Aypara (0.02 -0.049 mg/l) and Karabakh (0.039-0.059 mg/l) surveys. The amount of ammonium in both surveys was lower than the minimum defining level of analytical method in most stations (<0.0058 mg/l), with both maximum and minimum values being found in the upper levels.

The 1996 monitoring campaign highlighted an increase in nitrates towards the deeper areas, which was not the case in in the 2017/2018 surveys. Nitrites and phosphate levels were lower in 1996 than in 2017/2018.

4.2.4.3 Analysis of hydrocarbons in water samples

The 2017/2018 surveys included the analysis of hydrocarbon concentrations. Based on the results obtained from the sampling, the concentration of total hydrocarbons (TPH) in the Karabakh survey was lower than minimum level defined by the analytic method (<0.05 mg/l); whereas in the Aypara area TPH values for four stations where higher, with a range of 0.09-1.48 mg/l). Similarly, n-alkaline levels where relatively higher in the Aypara survey (0.005-0.023mg/l) in comparison to Karabakh survey where it was below detection limits (n-alkane <0.001 mg/l). On the other hand, the concentration of polycyclic aromatic hydrocarbons (PAH) was lower than the minimum defining limit of the analytic method (PAH < 2 µg /l) on both surveys.

Concentrations of BTEX (Benzene, Toluene, Ethylbenzene and xylene), of poly-aromatic hydrocarbons (PAH) and of n-alkaline in water samples were lower than the minimum concentrations defined by the analytic methods.

Overall, the levels of total hydrocarbons obtained during the 2017/2018 monitoring are equivalent to the ones obtained in 1996.

4.2.4.4 Analysis of heavy metals in water samples

The concentration of heavy metals (Cd, Cu, Fe, Ni, Pb, Zn, Cr, Mn, Ba) in water samples collected during the 2017/2018 monitoring campaigns in Karabakh/Aypara where lower than the standards permissible for waters important for fishing industry, except for the concentrations of mercury (Hg) and Arsenic (As) which were slightly higher. Overall the amounts of heavy metals where similar to indicators from other fields in the Caspian Sea.

4.2.4.5 Sediment analysis

Seabed sediments where collected along 21 sampling sites in the Aypara area, the main conclusions where:

- Presence of Modern Caspian Deposits, containing clayey sand, sandstones and seashell, and clay in the deepest parts.
- The granular composition of the sediment samples mainly consisted of silt and sand.
- The amount of organic substances was relatively low and, in general, similar in all sampling locations (between 3.60% and 9.27%).
- The carbonate content of seabed deposits was 15.98% throughout the field but variable according to sampled stations (from more than no higher than 20% across all stations).
- The average value of total phosphorus in sampled stations was 0.059 kg/g.

- The total nitrogen varies significantly in different stations (between 0.001 g/kg and 0.006 g/kg), with an average value of 0.0032 g/kg.
- In terms of hydrocarbon concentrations in bottom sediment samples, TPH concentrations were high in all stations, the amount of PAH was above standards in five 5 out of 25 stations, the amount of n-alkanes was higher than standards in most of the stations, and the BTEX amount in most of the stations was below the defining limit of the analytic method (<1 µg /kg).
- In terms of heavy metals in bottom sediment samples, the following average concentrations were recorded (these being very similar to those of the Karabakh area): arsenic (15.21 mg/kg), cadmium (0.15 mg/kg), copper (19.59 mg/kg), iron (18,133.71 mg/kg), nickel (31.38 mg/kg), lead (10.15 mg/kg), zinc (39.99 mg/kg), mercury (0.022 mg/kg), chromium (39.41 mg/kg), manganese (732.66 mg/kg), and barium (1426.60 mg/kg).

These results are somehow comparable to the results obtained by CIPCO in 1996, main differences between the amount of iron and lead which were relatively lower in 2017/2018 than in 1996.

4.3 Biological Environment

4.3.1 Introduction

The Caspian Sea is relatively poor in terms of biodiversity compared to other large water bodies. However, because of its isolation, the Caspian Sea includes a high number of endemic species (i.e. species that occur only in the Caspian Sea). In total, it is calculated that the Caspian Sea includes around 500 plants and 854 animal species, 79 of which are vertebrate species. Among harvested fish species, there are seven species and subspecies of sturgeons, Caspian salmon, bream, chub, Shamai, Omul and the Caspian eel. In addition, the Caspian Sea includes the Caspian seal (*Pusa caspica*).

As for the physical environment, no biodiversity surveys were conducted specifically on the ADUA exploration area as part of this study therefore the section is based on literature information and from primary data collected as part of other near-by projects, in particular the Karabakh field survey carried out in 2017.

4.3.2 Plankton

4.3.2.1 Phytoplankton

Production characteristics of the Caspian Sea are determined by receipt allochthonous organic matter, mainly, with river runoffs and eolian precipitation; autochthonous organic matter, i.e. production of organic matter by

phytoplankton and higher water plants, development of bacterial biomass and destruction of organic matter in water and ground (Aladin et al. 2006).

The phytoplankton of the Northern Caspian is different from that of the Middle and Southern Caspian with typical features of estuarine plankton, impoverished by marine elements. The phytoplankton of the Northern Caspian in 1986-1994 consisted of 230 species, the Middle and Southern 82 and 83 species, respectively. Currently, specific composition of plankton microalgae only of the Northern Caspian includes more than 400 species (Cyanophyta - 90, Chrysophyta - 1, Bacillariophyta - 149, Pyrrophyta - 58 Euglenophyta - 7, Chlorophyta - 138). However, despite of this diversity, only a few species are predominating. A marine diatom, *Rhizosolenia calcar-avis* makes the basic part of the phytoplankton of the Middle and Southern Caspian. At present, its amount remains the same in the Middle Caspian, but has highly increased in general. In the Middle Caspian, in the 90's, the eastern region was the richest by the number of phytoplankton species and their population. (Aladin et al. 2006).

The phytoplankton of the southern Caspian at the coast of Azerbaijan is represented by 171 species. A leading role belongs to diatoms, which are widespread all over this part of the sea and have the most diverse species composition (75 species of 22 genera). By specific diversity, the genus Chaetoceros - 16 species, varieties and forms is distinguished, of these 3 are endemics of the Caspian Sea. The second by the number of species is the genus Thalassiosira consisting of 11 species, varieties and forms, of which 5 are endemics. On the third place there is the genus Coscinodiscus - 8 species, varieties and forms, ensued by genera Melosira and Nitzschia – up to 6 species, varieties and forms. Of the genus Coscinodiscus, the species *N. jonesianus* and *N. granii* are the most widespread. It is necessary to note the marine genus Rhizosolenia with 3 species. Such species, as Actinocyclus, Sceletonema, Thalassionema though they are represented by a small number of forms, however their representatives are widely distributed in the Caspian and play an important role in the life of the sea. In the coastal zone, in the vicinity of islands of the Baku archipelago, a special role belongs to benthic-plankton and benthic species, abundantly developing in plankton - Grammatophora, Achnantes, Campylodiscus, etc (Aladin et al. 2006).

During the SOCAR marine campaigns carried out in the Aypara and Karabakh Fields, in addition to physical and chemical parameters samples of plankton were taken. Given the proximity of the Karabakh field with the Aypara area, their results are compared.

In terms of phytoplankton, the following taxa were surveyed in Aypara and Karabakh fields:

Phytoplankton Class	Karabakh 2017	Aypara 2018
Cyanophyta.	4 types blue-green algae	7 types blue-green algae

Bacillariophyta.	10 diatoms	11 diatoms
Dinophyta:.	4 diatoms	4 diatoms
Chlorophyta:	2 types of green algae	2 types of green algae

The most abundant species in phytoplankton was Bacillariophyta (50% Karabak; 46% Aypara). Cyanophyta and Dinophyta accounted for a 20% of the species in Karabak and 29 and 17% respectively in Aypara. Chlorophyta accounted for 10% of the species in Karabakh and 8% in Aypara.

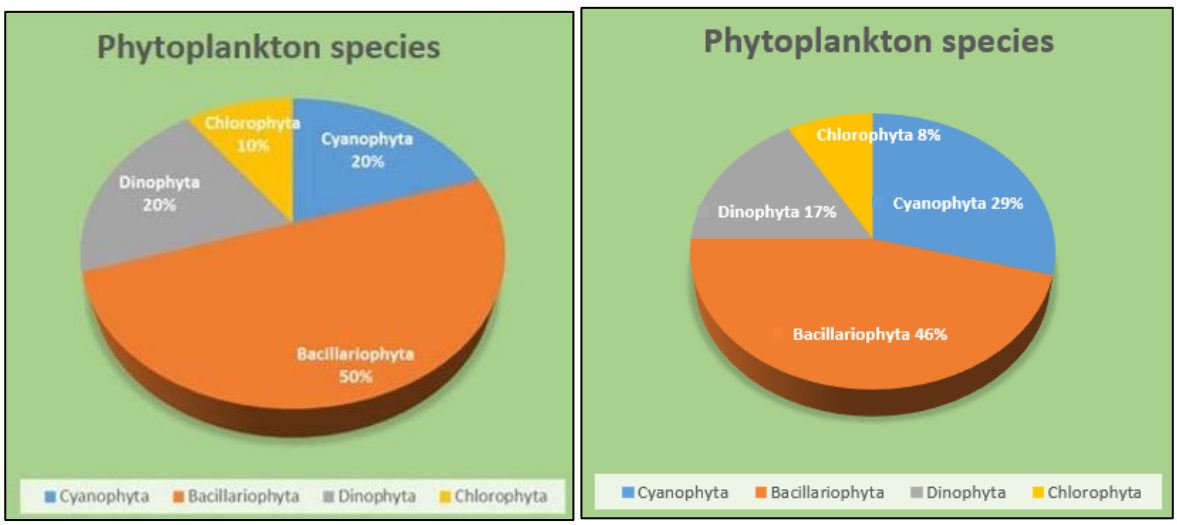


Figure 4.20: Phytoplankton species composition diagram in Karabakh (left) and Aypara (right) surveys (SOCAR, 2017 and 2018)

Rhizosolenia calcar-avis (Shults) was the most abundant by number and by weight among the Bacillariophyta composition on both surveys; same situation with *Anabaenopsis tanganyikae* (Müller) which was the most abundant among the Cianophyta species. In the Karabakh area *Prorosentrum cordata* (Ostf) was the most abundant among the Dynophyta species; whereas *Exuviaella cordata* was the most abundant in the Aypara area. *Binuclearia lauterbornii* (P-L) was the most abundant among the Chlorophyta species on both areas.

Overall, the distribution density and biomass of phytoplankton in the studied areas was conform to the known information from literature; with an average phytoplankton biomass of 293.8 mg/m^3.

4.3.2.2 Zooplankton

Zooplankton of the Caspian Sea includes classes Infusoria, Coelenterata, Rotatoria, Annelida, Mollusca, as well as fish eggs and tadpoles. Zooplankton is the main food source for fish. There are 315 species of zooplankton in the Caspian Sea, including 135 species of infusorias, 2 species of coelenterates, 67 species of rotifers, 54 species of cladoceras, 32 species of copepods, 1 species of ostracods, 6 species of mysids, 5 species of cumaceas, 6 species of amphipod, 1 species of isopods, and 1 species of water fleas.

73 out of the infusoria plankton species of the Caspian Sea live in the North Caspian, 112 in the Central Caspian and 108 in the Southern Caspian. Rotatori mainly live in fresh water areas, i.e. where Volga and Kura Rivers flow to the sea, cladoceras play an important role in the zooplankton of the Caspian Sea. They can be observed in the North Caspian Sea and the Volga River delta. There are several sub-species of copepods in the Caspian Sea (6 Calanoida species, 17 Cyclopoida species, 9 Harpacticoida species). Most numerous species are *Limnocalanus* spp. Mizids, amphipoda and other invertebrate are also important in the Caspian plankton.

Representative species of zooplankton in coastal shallow zone of the Middle and Southern Caspian are *Calanipeda aquaedulcis, Acartia clausi, Heterocope caspia, Podonevadne camptonux*, and *P. angusta*. (Aladin et al. 2006). The presence of larvae of benthic organisms in mass is representative of vernal and summer plankton of coastal zone. Both in the Middle and Southern Caspian, more than 50 % of the total biomass of plankton is formed by the larvae of Balanus in spring, and by the larvae of Mollusca in summer (Bagirov, 1989).

The biomass of zooplankton increases in autumn near the coastal area, while the biomass in the central part of the sea is much lower. The trophic structure of the Caspian zooplankton is the following: Plant feeders are dominant in deep areas, the predators are more important in circular currents while the shallow zones are shared between plant feeders, predators and detritus eaters.

The zooplankton collected in the Karabakh and Aypara fields in October 2017 and June 2018 respectively included:

Zooplankton	**Karabakh 2017**	**Aypara 2018**
Cladosera	5 species	4 species
Copepoda	5 species	4 species
Ctenofora	1 species	1 species
Rotatori	0 species	1 species
Others	3 species	3 species

The majority of the zooplankton species were Copedoda and Cladocera (36% each in Karabakh, and 31% each in Aypara).

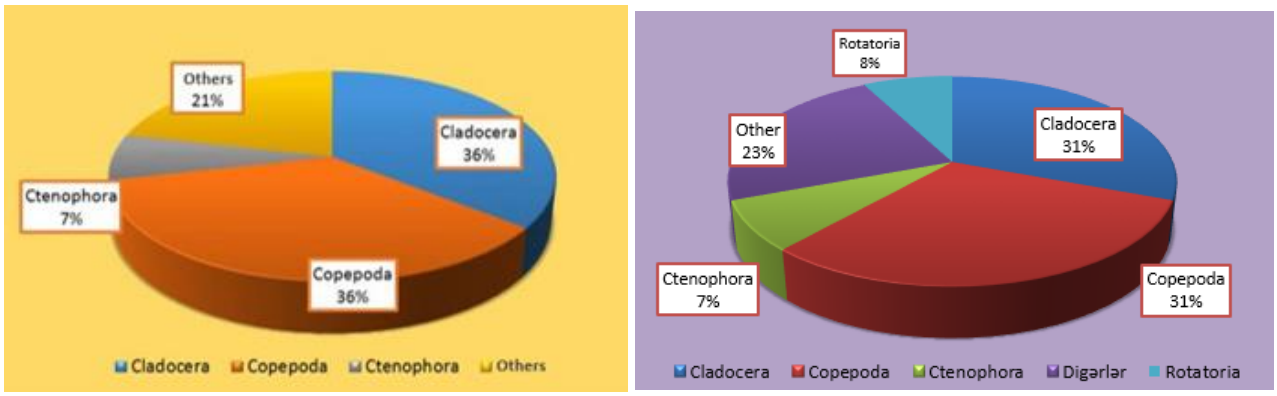
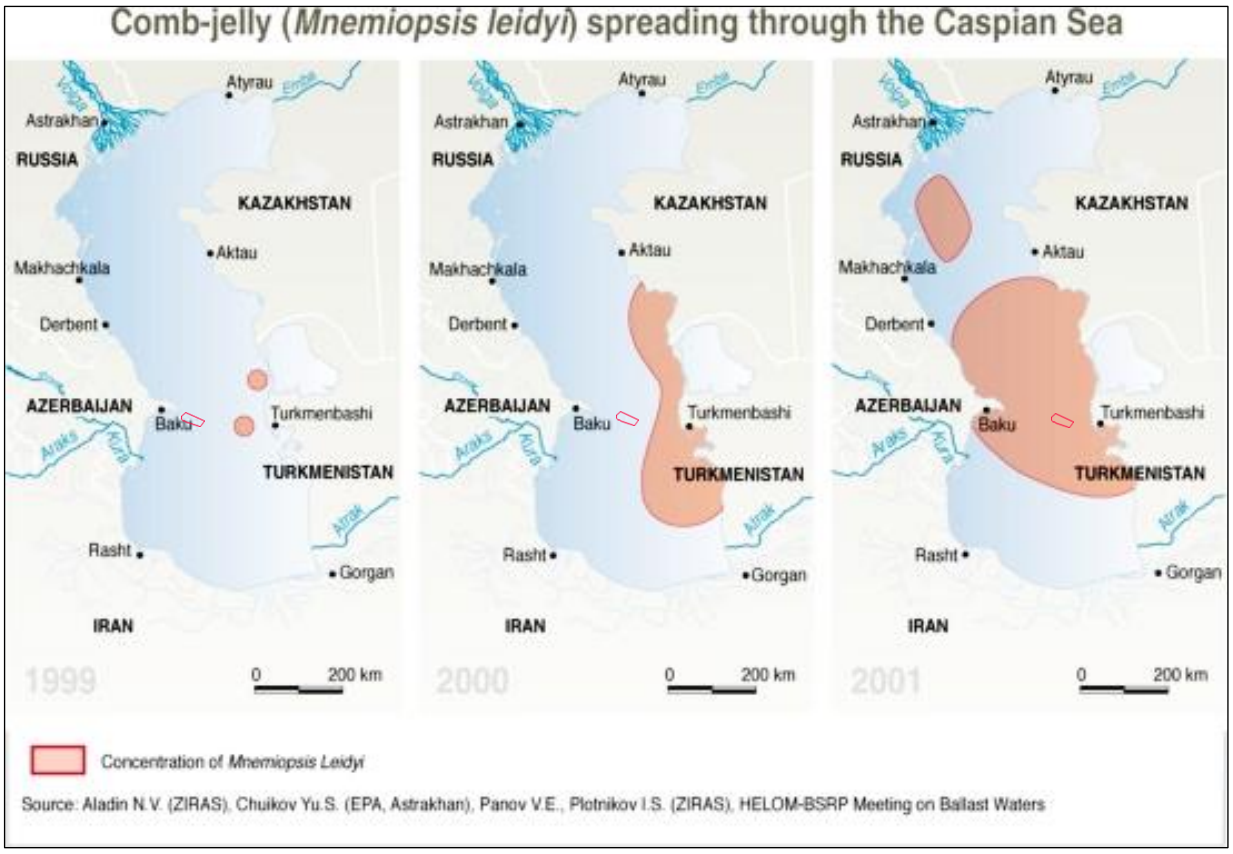


Figure 4.21: Zooplankton species composition diagram in Karabakh (left) and Aypara (right) surveys (SOCAR, 2017 and 2018)

In both surveys, *Acartia tonsa Dana* was the most abundant among the Copedoda species and *Evadne anonyx typica Sar* among Cladocera species. Cthenophora species consisted of comb jelly *Mnemiopsis leidyi (Agassis)*, which had invaded the Caspian in the year 1999 (Bilio and Niermann, 2004).

The plankton-feeding comb jelly *M. leidyi*, has diminished food reserves in the Caspian Sea, consuming large quantities of zooplankton, so that the situation is almost catastrophic for organisms which feed on zooplankton and throughout the food chain (BP, 2015). Roohi et al. (2008) documented changes in the Caspian Sea pelagic ecosystem after the introduction of this ctenophore species; they found that *Mnemiopsis leidyi* and zooplankton abundance where inversely related by season; with *M. leidyi* abundance was highest in summer and autumn, whereas zooplankton biomass was highest in spring and winter. In the period 2001–2006, following the invasion by *M. leidyi*, the dominance of the calanoid copepod *Acartia tonsa* was striking, whereas the abundance of other large copepods such as *Eurytemora minor* and *Eurytemora grimmi* decreased compared to 1996 (Hossieni et al. 1996) or completely disappeared. Among the cladocerans, only *Podon polyphemoides* seemed to have survived the invasion of *M. leidyi.*



Note: Approximate ADUA exploration area shown in red outline

Figure 4.22: Spread of comb jelly M. leidyi in the Caspian Sea (UNEP/Grid Arendal, 2007)

Other Zooplankton species also included Mollusca, Balanus and Copepoda larvae, which were dominant in terms of quantity and biomass.

The middle Caspian Sea is characterized by reduced phytoplankton productivity (Pautova et al, 2009), due to the change in dominant diatom species (now dominated by the coccolithophorid *Emiliania huxleyi* and the pennate diatom *Pseudo-nitzschia pseudodelicatissima*) and the increasing role of picoplankton in the primary production of the Caspian Sea ecosystem. This demonstrates that the stability of the pelagic ecosystem in the central Caspian Sea is currently limited. Furthermore, the relatively recent invasion by the comb jelly is thought to have played a major role in the modification of zooplankton distribution and abundance in the Caspian (Roohi et al. 2008), with changes in species composition of some zooplankton groups (e.g. a sharp decrease in the species number of Cladocera, one of the main prey of the comb jelly). A deficiency of phytoplankton results in poor feeding conditions

for micro-, meso- and macrozooplankton, and for ichthyoplankton. Phytoplankton, zooplankton and ichthyoplankton abundances in the survey area are thus expected to be relatively low.

4.3.3 Macrophytes

87 species of macrophytes, relating to 5 types, 8 classes, 17 orders, 24 families and 45 genera are known in the Caspian Sea. The quantitative ratio of types of algae is represented in the table. The most diverse with representatives of the family Cladophoraceae (11), and Characeae (11) Ulvaceae (10). The most diverse genus Enteromorpha - 9. The core of the Caspian algoflora is the green alga.

Review of historical data by Karayeva (2003) indicate seagrass beds were present along much of the coastline between Baku and Sangachal as well as in shallow waters surrounding the Shahdili Spit and the lagoons adjacent to Sahil. Data to confirm the presence and density of seagrass in the ADUA area is not available.

4.3.4 Macrozoobenthos

The main part of benthic organisms live on or in the seafloor (i.e. epi and endobenthos). These are usual representatives of periphyton (fouling); sponges (Demospongiae); pearlweed (Bryozoa); worms (Vermes); barnacles (Cirripedia); bivalves (Bivalvia), *Mytilaster*, *Dreissena*, Infusorias (Infusoria), and also nektobenthos (e.g. shrimps (Palaemonidae); opossum shrimps (Mysidacea)) and planktobenthos (e.g. copepods (Copepoda); cladocerans (Cladocera) and rotifers (Rotatoria)).

Factors defining geographical distribution of benthic fauna include:

- Salinity (especially for the Northern Caspian).
- Granulometry and related gas (dissolved oxygen) regime of benthic layer.
- Distribution and population of the major benthos consumers (e.g. benthos eating fishes).

In regards to salinity, 4 ecological groups are distinguished in the benthos of the Caspian Sea (Aladin & Plotnikov, 2004):

- Freshwater forms: freshwater gastropods (Gastropoda) and bivalves (Bivalvia), oligochaetas (Oligochaeta), larvae of chironomids (Chironomidae), spreading within estuaries with the salinity of 0-2 gr/l.
- Coastal and brackish forms: including freshwater by genesis invertebrates (Oligochaeta, Bryozoa, Chironomidae) and representatives of autochthonous Caspian fauna (e.g. higher crustaceans such as

ampharetids (Ampharetidae), molluscs *Hypanis vitrea*, *Dreissena polymorpha polymorpha* and crustacean *Pterocuma sowinskyi*). These forms live mainly under the salinity ranging from 0-2 up to 7 gr/l, some of them (higher crustaceans) are euryhaline and can live in a broad range of salinity and depths.

- Exlusively brackish forms: living under salinity from 3-5 to 10-11 gr/l. A mass development of relict Caspian molluscs is typical for this group, which habitat is limited to northern part of the Caspian Sea (*Didacna trigonoides*, *Hypanis angusticostata*, *Dreissena polymorpha andrusovi*, and also amphipods (Amphipoda) and Cumacea.
- Marine forms: includes invertebrates of Mediterranean origins and salt water forms of relict Caspian faunal complex (inhabit mainly in the Middle and Southern Caspian: *Didacna barbotdemarnyi, D. Longipes, Dreissena rostriformis*). Mass development of marine forms is observed under the salinity of above 8-10 gr/l.

At present, about 855 species and sub-species of invertebrate have been recorded in the seabed. 305 of them are infusoria, 52 are nematodes, 118 are molluscs, 74 are amphipods and 46 are hermit crabs. Coastal areas of the sea (0-50 m) have more variety of benthic animals than deep sea areas.–Maximum number of benthic species are recorded at a depth of 10-50 m, where *Mytilaster*, *Abra* and *Dreissena* snails dominate the biomass.

Due to the increased salinization of the Caspian Sea in the bays, its benthos has significantly changed, generating completely new biotic community. This phenomenon also includes the migration of organisms from semi-saline waters of the Azov and Black Seas via the Volga-Don Canal. Caspian fauna remained unchanged only in the Kazakhstan bay, where water salinity has not significantly changed.

Mirzoev and Alekperov (2017) studied composition and quantitative distribution of macrozoobenthos in deep zones of the Azerbaijan sector of the Caspian Sea in 2000 - 2012. They found 118 species of zoobenthos belonging to 10 taxonomic groups; among them, 57 species were first discovered in the deep zones. The maximum number of species was observed at depths of 200 - 300 m (118 species), and the minimum one was observed at depths of 900 - 1000 m (6 species).

Macrozoobenthos diversity surveyed in the Karabakh and Aypara fields in October 2017 and June 2018 respectively included:

Zoobenthos	**Karabakh 2017**	**Aypara 2018**
Crustacea	29 species	14 species
Annelida	8 species	8 species
Coelenterata	1 species	1 species
Mollusca	0 species	1 species

Other	1 species	2 species

The most abundant species inventoried in the benthos were Crustaceans (74% in Karabakh and 54% in Aypara), followed by Annelids (20% Karabakh, 31% Aypara).

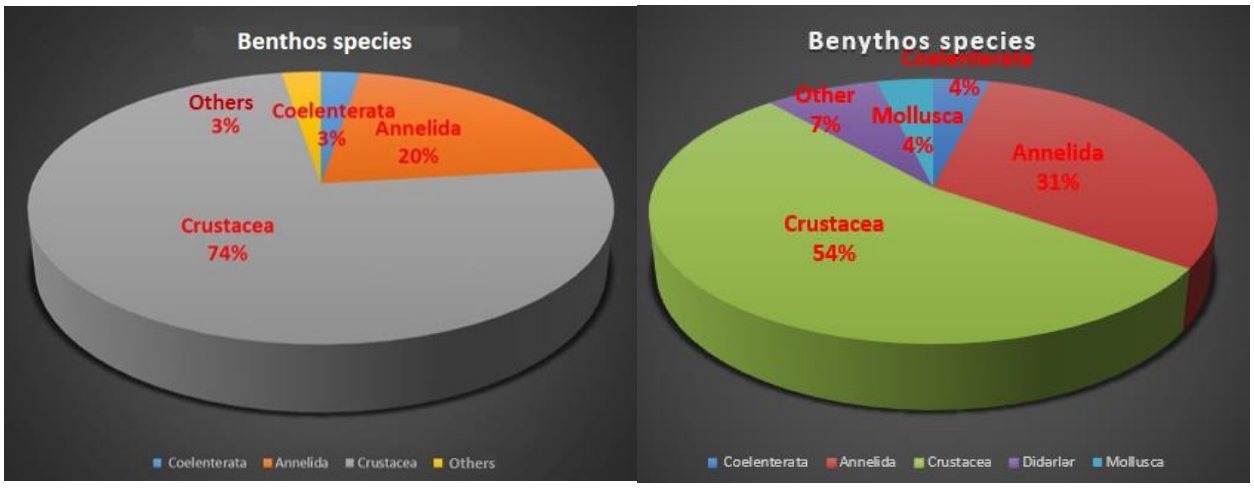


Figure 4.23: Benthos species composition diagram in Karabakh (left) and Aypara (right) surveys (SOCAR, 2017 and 2018)

In Karabakh area, the most abundant Crustacean species was *Gammarus pauxillus* and the most abundant Annelida species was *Stylodrilus cernosvitoviv*; whilst for Aypara it was Ostrocoda spp. and *Isochaetides michaelseni* respectively.

4.3.5 Fishes

The distinctive feature of the Caspian ichthyofauna is its high endemism, observed from the category of a genus up to the level of a subspecies. Early separation of the Caspian Sea from the World Ocean has ensured a high level of endemism of its ichthyofauna. According to Kazancheyev (1981), the number of endemics at the level of a genus make 8.2 %, species - 43.6 %, subspecies - 100%. In general, the Caspian is inhabited by 4 endemic genera, 31 endemic species and 45 endemic subspecies (Kazancheyev, 1981). The active speciation processes in the Caspian Sea are largely related to special hydrological conditions in geological past and present. Repeated transgressions of the sea, its salinization and desalinization promoted formation of new species and subspecies and as well as various biological and ecological forms and races (Aladin & Plotnikov, 2004).

According to Naseka & Bogutsaya (2009), indigenous fish fauna of the Caspian Sea basin (including drainages of rivers belonging to it) encompass 159 species and subspecies from 60–62 genera (four to six endemic) of 19 families. Ninety-nine species and subspecies (62%) may be considered endemic to the basin. The most numerous family is Cyprinidae (27 genera), followed by Gobiidae (12 genera). Other families where much less numerous (1–3 genera).

The fish species in the Caspian are typically divided into 4 different ecological groups based on criteria of physical habitats and the presence/absence of migrations between them:

- Marine fishes;
- Fluvial (river);
- anadromous; and
- semi-anadromous.

The sturgeons are the most remarkable group of fishes from the Caspian Sea. All four species are anadromous (i.e. they spend most of their life at sea but migrate into river systems for reproduction). These species are highly prized for their meat and unfertilized roe (caviar), traded both legally and illegally. The majority of global trade in caviar is wild-sourced, although trade in caviar from aquaculture operations is increasing. Their IUCN Red List status and population trend is shown Table 4.4 .

Table 4.4: Sturgeon species present in the Caspian Sea (IUCN, 2018)

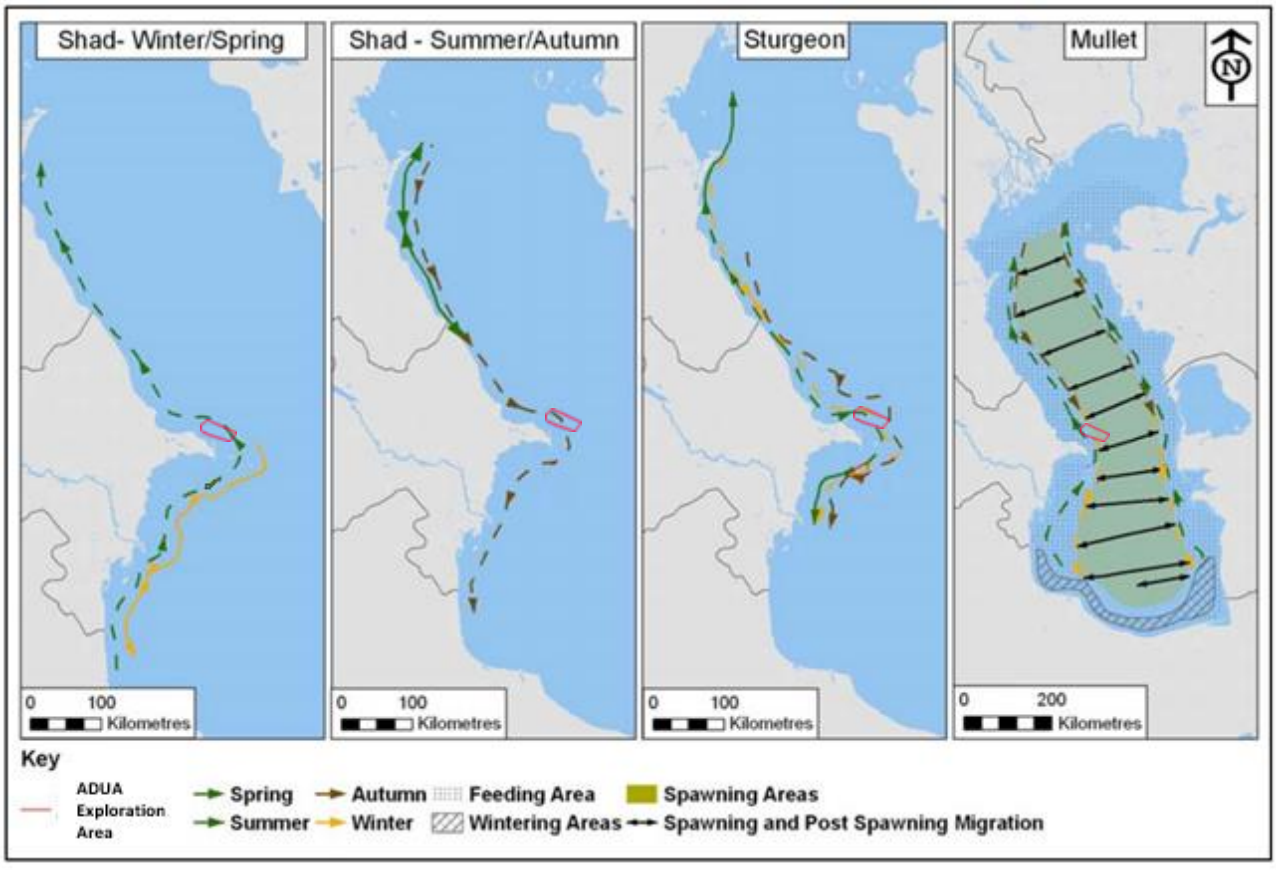
Scientifc name	Common name	Status	Population trend
Acipenser gueldenstaedtii	Russian Sturgeon	Critically Endangered	decreasing
Acipenser nudiventris	Ship Sturgeon	Critically Endangered	decreasing
Acipenser persicus	Persian Sturgeon	Critically Endangered	decreasing
Acipenser stellatus	Stellate Sturgeon	Critically Endangered	decreasing

As presented above all sturgeon species are Critically Endangered (CR) according to the IUCN red list. According to the Food and Agriculture Organization of the United Nations (FAO), there are numerous factors that underpin this situation.

- Overfishing, and illegal, unreported and unregulated (IUU) fishing;
- lack of fishery management;
- deteriorating environmental conditions; and

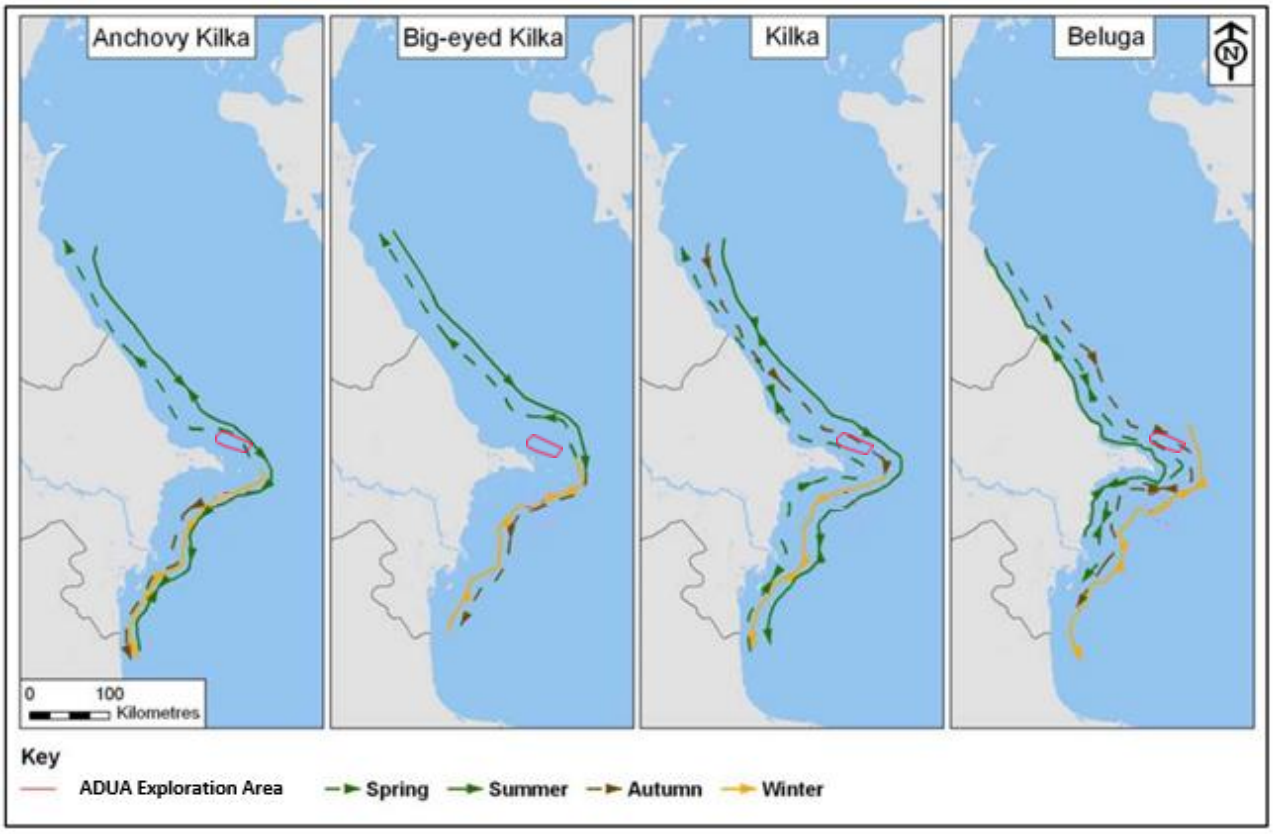
- the construction of several dams, which have prevented fish from migrating upstream to their natural spawning grounds.

Other species besides the sturgeon such as grey mullet, herring, anchovy kilka, big eyed kilka and beluga migrate across the Southern Caspian region during spring (March-April) and autumn (October-November). During the winter months these species are found wintering near the western shores and southern slopes of the Absheron sill (herring, anchovy and big-eyed kilka). The migration routes and spawning areas of fish species respective to the ADUA exploration area are shown in Figure 4.24.



Note: Approximate ADUA exploration area shown in red outline

Figure 4.24: Shad, Sturgeon and Mullet Migrations Routes (modified from BP, 2015)



Note: Approximate ADUA exploration area shown in red outline

Figure 4.25: Kilka and Beluga Migrations Routes (modified from BP, 2015)

4.3.6 Mammals

The Caspian seal (*Pusa caspica*) is a species belonging to the real seals family and is the only marine mammal known to be present in the Caspian Sea. It is endemic to the Caspian and is considered the smallest seal in the world.

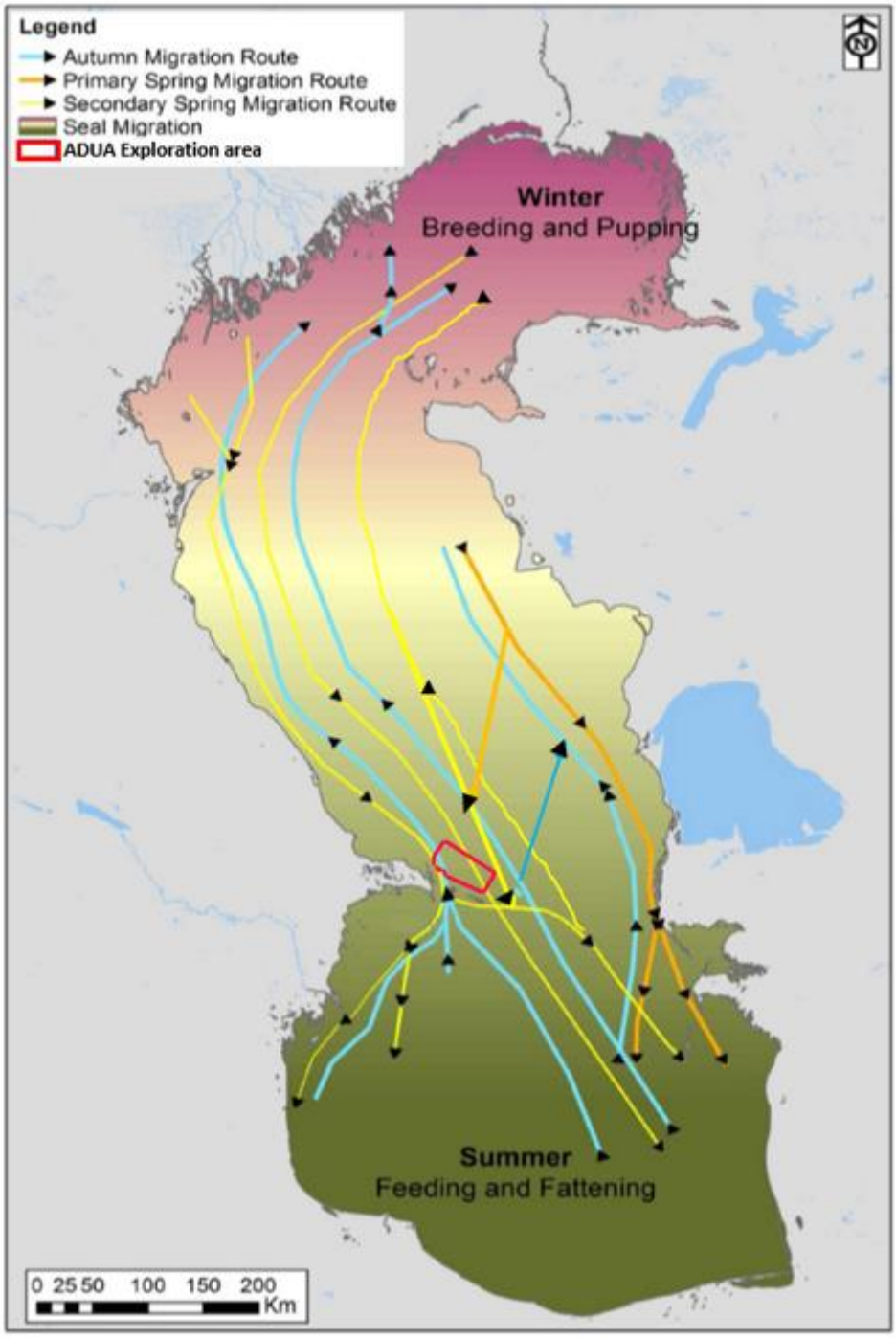
The species is currently classified as endangered (EN) by the IUCN red list (Goodman and Dmitrieva, 2016). According to the IUCN (2018), this is mainly due to the following factors: (1) the species population has faced a decline exceeding 70% over the last three generations; (2) the number of sites used by the species have been reduced (range reduction within the overall geographic range); (3) the current hunting levels are expected to certainly exceed sustainable harvest levels; and (4) there are multiple ongoing negative impacts on the habitat of the Caspian seal.

According to the Seal Conservation Society (2011), seal population is currently reducing by at least 3–4% per year. A total population size of about 104,000 was estimated from the pup production figure of about 21,000 in 2005 (Härkönen et al. 2008). Main causes on seal death are hunting and fishing by-catch, as well as natural mortality, predation on pups by wolves and eagles, contamination of food-chain (especially DDT) and habitat loss. There is a Caspian Seal Conservation Action Plan (CSCAP) agreed in 2007 by all five Caspian countries, but the plan has yet to be implemented on the ground. The species is included in the second edition of the “Red Book” of the Azerbaijan Republic.

Figure 4.26: Caspian seals and colony (Arkive, 2018)

4.3.6.1 Caspian Seal Migration

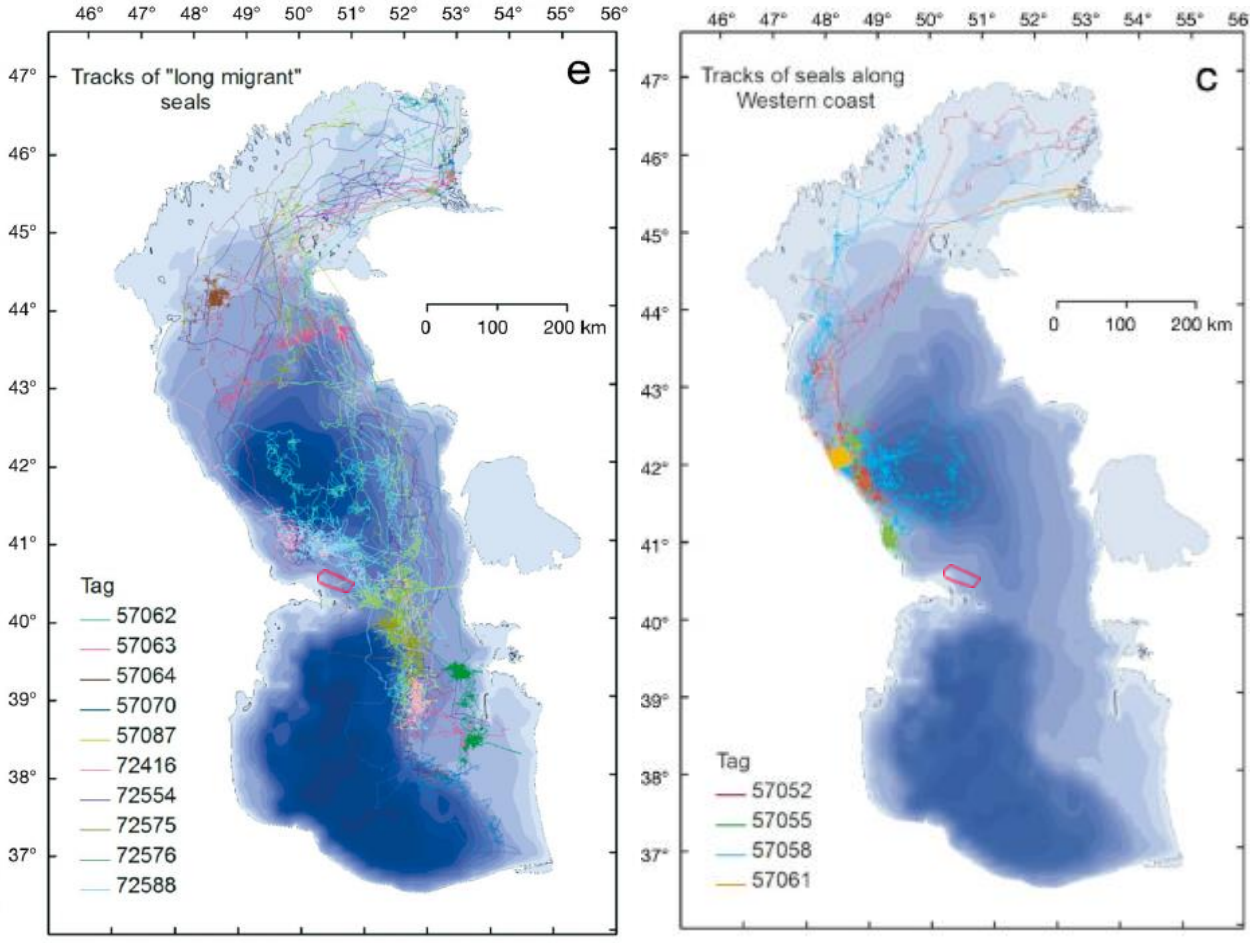
Seals live in all parts of the Caspian Sea, and mainly in the North. In winter they live on the ice of the North Caspian. In the summer time, seals migrate to the Middle and Southern Caspian for fattening although a portion of the herds remain in the Northern Caspian (some 10-15% of the population is thought to be non-migratory). Their pupping, mating and molting happens on ice *(*Figure 4.27*).*



Note: Approximate ADUA exploration area shown in red outline

Figure 4.27: Caspian seal migratory routes (modified from BP, 2015)

A recent exhaustive study of Caspian seal movement, based on deployments of tags on 75 individuals, spanning 4 consecutive years (2009 to 2012) supported the general historic understanding of population migration (Dmitrieva, 2016). However, the results revealed a high degree of individual variation in the timing, destination, and consistency of movement patterns, indicating that migratory movements are much more heterogeneous than previously thought *(*Figure 4.28*).* Nonetheless, the authors indicated that timings of spring and autumn movements derived from telemetry data correspond with bi annual peaks of strandings around the Absheron peninsula in Azerbaijan recorded from the 1970s to present (Wilson et al. 2014), suggesting that those peaks in mortality reflected local increases in seal density arising from seasonal migrations.



Note: Approximate ADUA exploration area shown in red outline

Figure 4.28: Movement patterns for Caspian seals tagged in April 2011 that moved to the Southern Caspian Sea (left) and tracked along the western coast (right) (Dmitrieva, 2016)

Overall seal distribution in the Caspian can be summarized as follows:

- In summer (June-August): adult seals tend to stay in areas of the middle and South Caspian.
- In autumn (October-November): seals start their migration towards the north where they will wait in the haul-out areas for the ice to form and breed.
- In winter (November-March): the majority of the seal population will be breeding and giving birth in the North Caspian.
- In Spring (April-May): the migration towards the south commences and seals start to appear in the middle and south Caspian shores.

Eybatov (2018) cites Dmitrieva et al. (2016) seal satellite tracking results, that Caspian seals not only migrate during springtime to the Middle and South Caspian through coastal corridors along the eastern and western coasts, but also through the central part of Caspian Sea (periodically shifting from east to west).

According to Eybatov (2015 and 2018) a part of the seal population (5,000-10,000 specimens) stays in the North Caspian. In spring, from April to June, until seals reach Iran, their abundance in Azerbaijan can reach up to 20,000 individuals. In spring a significant number of seals (up to 500) rests on the island of the Absheron peninsula (i.e. Malaya Plita, Bolshaya Plita, Podplitochny, Dardanella, Baklaniy, the Southern Spit and Urunos island, a part of Chilov island).

4.3.6.2 Caspian Seal Haul-out sites

In the past, Azerbaijan had multiple important haul-out areas in the Absheron Peninsula and other locations, south and north of the peninsula. These sites, however, seem to have been largely abandoned as the residential population of the species has effectively disappeared from the Azerbaijan coasts and only migrating individuals are expected to use these sites in their migration. The CASPECO project (Creation of Special protected Areas for the Caspian Seal) identified two offshore areas and 17 coastal sites as potential protected areas (i.e. Seal Special protected Areas or SSPAs), separated in three categories:

- Category 1. An established area of seal habitat currently used fully by seals.
- Category 2. An established area of seal habitat no longer used fully or regularly by seals, or used only by a few animals.

- Category 3. A known area of historical seal habitat not currently used at all by seals.

The relevant sites adjacent to the Absheron peninsula are:

Haul-out site "D" Cat. 1: Zhilhov Island and surrounding islands in Azerbaijan. The Zhilhov archipelago off the Absheron Peninsula in Azerbaijan was used by c. 500 seals in January 1996. 60 seals in July 2007, about 500 seals between October and December 2007 and 2008, and large groups of seals seen in the water at that time. Seal by-catch was reported in December 2007. These islands were also used by large numbers of seals (up to about 500) in the post-moult period of May–June in 2008 and 2009 (though not in 2007). There is anecdotal information from fishermen to suggest that large numbers of seals are most likely to be present when herring or kilka shoals are also present in the area.

Haul-out site "O" Cat. 3: Shakhova Kosa, Absheron Peninsula, Azerbaijan. This site was regularly used by more than 100 seals at a time, counted on surveys in January 1996, June 1997, 2000, and 2001, and March 2002. However, repeated surveys since autumn 2006 have found zero live seals or signs of seals there, with the exception of a record of a transient seal presence in the Shakhova area, apparently following a herring shoal, at the beginning of May 2009.

To date, the pilot SSPA plan has not proceeded further, since the programme has not had any government support.

Monitoring conducted on the coast of the Absheron peninsula and on the island of the Absheron and Baku archipelagos, showed that since 2005 there were no permanent rookeries. Temporary haul-out sites are only observed during the spring migration from the north to the south (from April till May) and during autumn migration from the south to the north (in October-December). And these temporary haul-out sites are only found on the Southern spit and Urunos on Chilov island, as well as on small islands between Pirallahi and Chilov islands (Malaya Plita, Bolshaya Plita, Podplitochny and Dardanella, Coltush, Baklaniy and so on). There are no haul out sites or rookeries on the Shakhova spit any more. (Eybatov and Rustamova, 2010).

4.3.6.3 Caspian Seal Presence in the Absheron peninsula

Based on the studies commissioned by BP for the Shallow Water Absheron Peninsula (SWAP) and Block D230 seismic Projects, findings from Eybatov (2015 and 2018) are highly relevant, considering the northeastern area of the SWAP/D230 are directly adjacent to the ADUA exploration area.

Table 4.5: Observations of Caspian Seal Presence and Activity During winter/spring season the Last 5 Years in the Vicinity of the Absheron Peninsula (Eybatov, 2015 and 2018)

Year	Winter season observations	Spring season observations
2010	In January and February no seals were observed on the islands; in December seals were observed on the Southern spit, Chilov island and Podplitochny (2-3 individuals at each site).	Seals appeared in the area Pirallahi island - Chilov island - Oil Rocks at the end of April. In this year unusual (diffuse) spring migration was observed. Seals arrived in small groups - 3-5 individuals in a group and distributed evenly in the aquatic area up to Oil Rocks. There were no seal accumulations at the island haul-out sites.
2011	Neither fishermen, no helicopter pilots did not see seals during this period.	Early migration, 1st April. Concentration of seals again is related to migration of herring. The first large shoal of seals (200 – 400 individuals) was registered on 1 April in the area of Southern spit and islands between Pirallahi island and Chilov (Malaya Plita, Bolshaya Plita, Podplitochny, Dardanella). According to fishermen, at that time mass migration of small herrings took place. At the end of April - beginning of May seals moved to the sea area between Chilov island and Shakhova spit. Small groups of seals were also observed by oilmen at Oil Rocks. The first seals appeared in the Iranian waters in the beginning of June.
2012	Individual seals on the Urunos, Southern spit and 2-3 individuals on Baklaniy island.	Helicopter pilots informed that seals came to the islands between Pirallahi and Chilov at the end of April, and disappeared one week later. In some places occasionally individual seals can be seen. Migration of seals was related to migration of kilka, then migration of Black sea roach (small kutum)

Year	Winter season observations	Spring season observations
		began, and only now - migration of gray mullet. Diffuse migration in the beginning of May.
2013	Small groups of seals (2-5 individuals) on Dardanella island, Malaya Plita and Podplitochny. One seal lies on the Southern spit of Chilov island.	Migration began in mid-April. Significant accumulations were observed westward from Chilov island. Large group of seals swam in waters of Lebyazhi island, which seals usually do not visit
2014	Individual seals (1-2) on the Southern spit, 2-3 seals on Urunos. Groups of seals - 1-3 animals swim between Chilov island and Oil Rocks.	1st April - early migration was observed. Namely, seals appeared in the Azerbaijan waters, in the area of Yalama seashore at the end of March. Usually one week prior to appearance on the islands of Absheron archipelago. In the recent years migration of seals in the first place was related to migration of shoals of herring. Fishermen complain that seals eat out fish in the nets.
2015	2-5 individuals on the Shahdili Spit and Urunose (Chilov island). Small groups of 2-3 individuals move between Chilov and Oil Rocks.	Mass spring migration in the area between Pirallahi and Chilov islands was observed on 19-20 April. The largest number of seals was observed near Baklaniy and Urunos islands
2016	No data	For the first time in many years there was no mass spring migration of seals. The ice melted earlier in the northern Caspian Sea and small groups of seals started migration to the southern regions in March. Aggregations of seals on the islands of the Absheron archipelago were observed in the spring. Fishermen also noted that there were no spring herring migrations in this region. Also on the north coast of the Absheron peninsula there were no seal

Year	Winter season observations	Spring season observations
		corpses washed up onto the coast, commonly observed here each year

Eybatov (2015) further indicated that the expected total amount of seals that may be found in the nearshore waters of the Islands of Absheron archipelago during spring (April and May) can be of up to 5,000-10,000 individuals. The backward migration towards the North usually occurs in November (autumn migration), and seal numbers are comparable to that of spring.

June to October is a period of active feeding. During the period seals will migrate through the Contract Area in small groups. The total number of seals in the Absheron archipelago islands would not exceed 300-500 specimens. Most of them (estimated at some 2-3 thousand individuals) would be found far away from the shore and in the deep water (3-70 km distance) (Eybatov, 2018).

On the other hand, the period of lowest abundance of seals is January to March; small groups (1-3 specimens) may be seen on the islands on the Absheron archipelago, with small groups of young seals also be found far from the shore in the deep water part of the Azerbaijani sector of the Caspian.

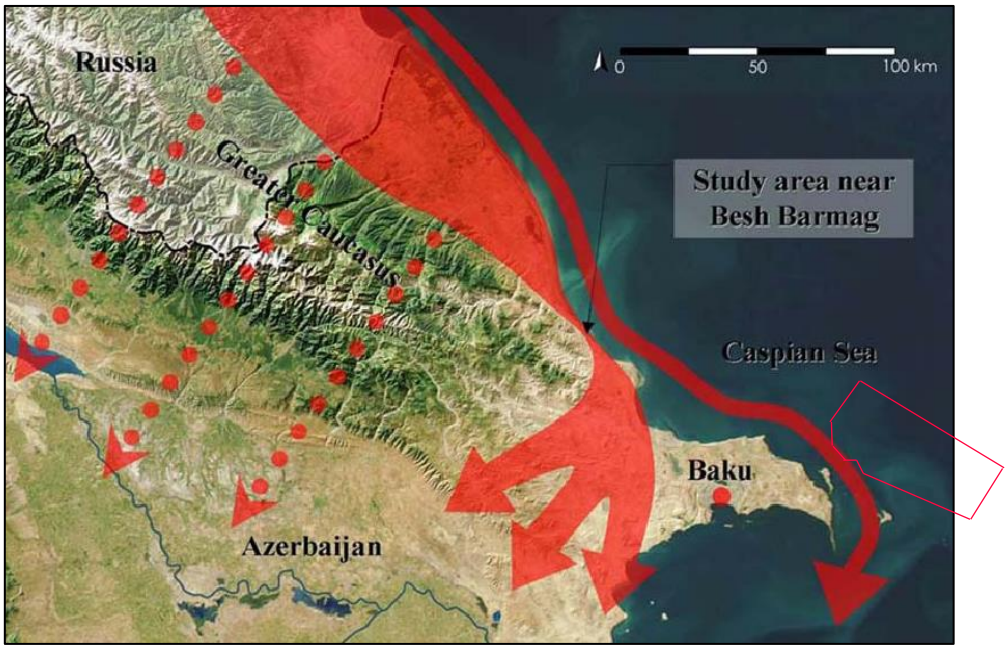
Based on the above, the most sensitive period for seals in the ADUA exploration area is expected to be between April-May and November as this is the period where seals may be most abundant in this part of the Caspian Sea coinciding with their spring and autumn migration respectively.

4.3.7 Seabirds

According to BirdLife International Azerbaijan includes some 300 migratory bird species, 31 seabird species and 124 waterbird species.

The west coast of the Caspian Sea constitutes a migration corridor for many bird species. Different species may follow slightly different routes along a wider corridor and use the landscape features differently. However, most species tend to travel close to the coastal areas and use specific areas (e.g. inland or coastal wetlands) as stopovers (for eating and resting) on their routes north or south. In Azerbaijan, the presence of the mountains of the Caucasus and the Caspian Sea create a natural bottleneck (ie *Besh Barmag bottleneck*) which forces many migrating species to concentrate in a narrow piece of land along the Absheron Peninsula, where the Absheron National Park is located. Heiss and Gauger (2011) indicated from observations during a one month survey in 2007 that the most common migrating species was the Common Starling (*Sturnus vulgaris*); noting that in general passerine migration was

restricted to the coastal plain, whilst along the coastline strong migration of terns, gulls and ducks was observed (Figure 4.29).



Note: Approximate ADUA exploration area shown in red outline

Figure 4.29: Important bird migration routes along the Caspian shore of Azerbaijan. Dotted line = weak migration route through the Greater Caucasus, broad line = main migration route through the lowland, narrow line = coastal waterbird migration route. (Heiss and Gauger, 2011)

The distance between the ADUA exploration area and the Chilov Island, on the East of the Absheron Peninsula is around 7 km, thus relatively far from the main route along the coast.

In general, even seabirds that can travel to offshore areas tend to stay relatively close to the shores because the best, most productive, feeding grounds are usually located on shallower areas (0-15 km approx.). Consequently, the ADUA exploration area, especially its westernmost part (closer to the coast) may be considered quite sensitive from an ornithological perspective. It is expected that birds would be found in small numbers as they cross the area, and in some cases may be attracted by vessels and offshore infrastructures such as platforms as these are often attracting fish as well. In addition, old oil platforms in the sea are considered to be important places for breeding of different species of birds (Birdlife, 2018a,b).

4.3.8 Sensitive marine habitats

Mud volcanoes and seepages at the Caspian Sea bottom have been known about for a long time. The largest number of mud volcanoes (more than 300) and the biggest ones are concentrated at the north-western edge of the South-Caspian Depression. The majority of South-Caspian Depression mud volcanoes are in the seepage stage of their lifecycle and discharge mud, water, gas and oil. Intensification of activity of the underwater volcanoes and seepages results in contamination of the sea surface by oil and mud patches (Mityagina and Lavrova, 2016). There are more than 170 mud volcanoes located within the Caspian Sea. The mud volcanoes are formed as a results of over pressure buildup in a thick mud dominated sequence (Maykop Formation), caused by rapid subsidence and deposition. The only currently known mud volcano at seabed is located to the northwest of Karabakh and south of Ashrafi structure, outside the 3D survey. The shallow seismic interpretation and mapping reveals the presence of a flowing mud features close to and at the seabed. The feature is characterized by very low seismic velocity and strong seismic amplitude dimming beneath. No other mud volcanoes have been seen on 2D seismic data covering the ADUA contract area.

4.3.9 Protected and other designated areas

The ADUA exploration area is located relatively far from any protected or designated area. Figure 4.30 shows the ADUA area and the closest protected area, the Absheron National Park, which is located some 22.7 km to the west from the ADUA exploration area boundaries.

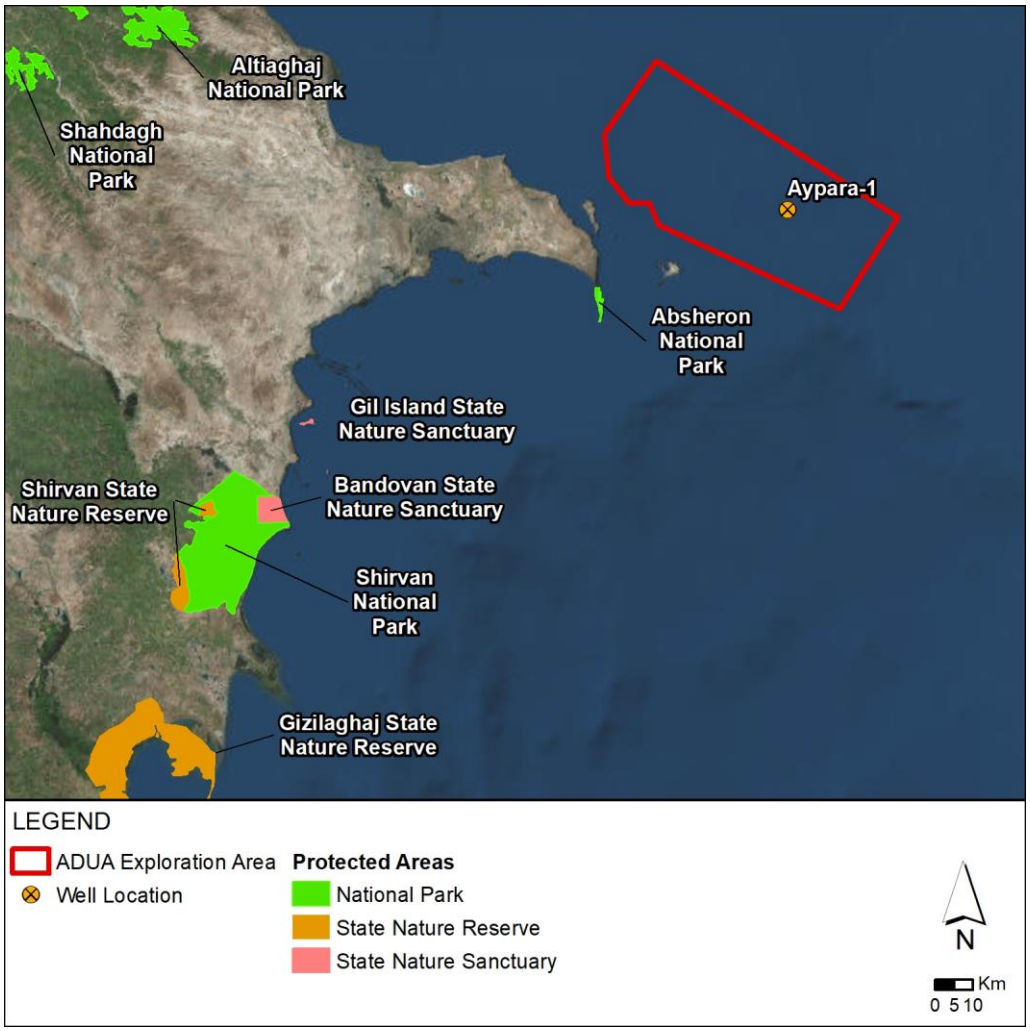


Figure 4.30: Protected Areas in Azerbaijan and ADUA exploration area (ERM, 2018)

The Absheron national park was established in 2005 for the protection and restoration of the number of migrant and wintering waterfowl-wader birds, as well as to protect Caspian seal rookeries (Heydar Aliyev Foundation, 2018).

Currently there are no marine reserves in Azerbaijan, however based on a recent news published by IUCN on 14th February 2018: "*Azerbaijan is upgrading and expanding the Gizilaghaj State Reserve to become a National Park and will include the first Marine Protected Area (MPA) in the Caspian Sea, the largest inland body of water on the planet. The new MPA will seek to protect six significant marine species on the brink of extinction, including the*

Beluga sturgeon and the Caspian salmon". This area, which is also designated as a Ramsar site, is located more than 200 km to the south-west of the ADUA exploration area.

In addition to the above, in Azerbaijan there are a number of internationally recognized areas designated by BirdLife International and IUCN designated as *Important Bird Areas* (IBA) and *Key Biodiversity Areas* (KBA) respectively (Figure 4.31). The closest IBA/KBA is the Absheron archipelago (north) and Pirallahi bay[7] located on the islands around the Absheron Peninsula, this is Chilov (or Jilov) and Pirallahy islands, as well as some small islands like Boyuk and Kichik Tava, Yal, Koltish, Gu, Garabatdag and a scores of small islands (Birdlife, 2018a).This IBA/KBA (and in particular the Chilov island) is located about 6.5 km to the southwest of the ADUA exploration area

Additonally Shahdidi Spit is at the easternmost edge of the peninsula. It is notable for passage and wintering Pelecaniformes and Ciconiiformes. At least 20,000 ducks and 40,000 *Fulica atra* migrate through the area. It is possible to find 100-200 individuals of Caspian seals in any season of the year (Birdlife, 2018b).

Breeding birds in this archipelago include *Tadorna ferruginea*, *Porphyrio porphyrio*, *Larus cachinnans*, *Sterna hirundo* and (unconfirmed) *S. sandvicensis*. It is a wintering area for 2,000-3,000 wildfowl, notably *Cygnus cygnus*, and also *Aythya fuligula*, *A. marila*, *A. ferina*, *Bucephala clangula* and *Fulica atra*. Species of global conservation concern that do not meet IBA criteria include *Circus macrourus* and *Phalacrocorax pygmeus*.

[7] http://datazone.birdlife.org/site/factsheet/absheron-archipelago-(north)-and-pirallahi-bay-iba-azerbaijan

Figure 4.31: Location of closest IBAs and KBAs to the ADUA exploration area (ERM, 2018)

4.4 Socioeconomic Environment

4.4.1 Fisheries

In Azerbaijan, there are some 22 species of fish species with commercial value. Table 4.6 lists these species and their families. The most important species in terms of fisheries belong to the Clupeidae family, followed by Acipenseridae and Cyprinidae (Salmanov et al, 2013).

Table 4.6: Species of commercial value in Azerbaijan (Salmanov et al., 2013)

Family	Scientific name	Common name
Acipenseridae	*Acipenser gueldenstaedtii*	Russian sturgeon
Acipenseridae	*Acipenser persicus*	Persian sturgeon
Acipenseridae	*Acipenser stellatus*	Stellate sturgeon
Acipenseridae	*Acipenser nudiventris*	Fringebarbel sturgeon
Acipenseridae	*Huso huso*	Beluga sturgeon
Clupeidae	*Clupeonella cultriventris*	Kilka
Cyprinidae	*Abramis brama*	Bream
Cyprinidae	*Cyrpinus carpio*	European carp /common carp
Cyprinidae	*Hypophthalmichthys molitrix*	Silver carp
Cyprinidae	*Ctenopharyngodon idella*	Grass carp
Cyprinidae	*Rutilus rutilus*	Roach
Cyprinidae	*Rutilus frisii*	Kutum
Cyprinidae	*Aspius aspius*	Asp
Cyprinidae	*Vimba vimba*	Vimba
Cyprinidae	*Chalcalburnus chalcoides*	Shemaya
Esocidae	*Esox Lucius*	Pike
Mugilidae	*Liza auratus*	Golden grey mullet
Mugilidae	*Liza saliens*	Leaping grey mullet
Persidae	*Sander lucioperca*	Pike-perch
Persidae	*Perca fluviatilis*	Perch
Salmonidae	*Salmo trutto caspiensis*	Caspian salmon
Siluridae	*Silurus glanis*	Wels catfish

Fisheries have been traditionally an important commercial activity in Azerbaijan. However, during the last few decades the relevance of this sector has been reduced due to a number of environmental problems, such as water pollution, introduction of alien species, overfishing, etc. This reduction in catches has been accompanied by a significant reduction in fishing fleets. With the appearance of the Comb Jelly (*Mnemiopsis leidyi*) in the Caspian Sea,

kilka reserves have dramatically reduced, with volumes of caught fish overall in the Caspian basin reduced from 271 thousand tonnes in 1999 to 54 thousand tonnes in 2003 (i.e. a 5-fold decline).

Table 4.7 shows the fishing fleet's composition over three years and shows that the vast majority of fishing boats belong to small artisanal boats (less than 6 m length) which are mainly used for Cyprinidae fishes, caught about 1.6–3.2 km off the coast.

Table 4.7: Fishery fleet composition in Azerbaijan (Source: FAO, 2013)

Fishery fleet composition												
Length	**< 6 m**			**24–30 m**			**45–60 m**			**> 60 m**		
Year	2007	2008	2009	2007	2008	2009	2007	2008	2009	2007	2008	2009
Number	563	624	633	34	28	22	4	4	2	1	-	-
Total waterway tonnage (tonnes)	-	-	-	3,112	2,596	2,082	2,890	2,890	1,545	1,115	-	-
Power kW)	-	-	-	4,945	4,109	3,515	3,408	3,408	1,704	852	-	-

At present, there are 5 heavy-tonnage vessels engaged in sprat fishing in the Azerbaijan sector of the Caspian Sea. Of these, 4 vessels are located in the south of Azerbaijan - in the Lankaran port, from there they sail and fish near the water border with Iran. The 5th vessel, owned by "Caspian Fish" (LTRV-50 "Shahriyar" vessel), berths near the Pirallahi Island, and sails from there. According to the fishing license, the vessel with a crew of 6 persons has an annual quota for sprat fishing in the amount of 25 tons. Fishing is carried out between the banks Korinov, Pavlov and Karagedov located approximately at a distance of 50-100 km to the south from the ADUA area. Fishing is carried out only at night using cone-shaped nets and electric lighting.

On the other hand, coastal small-scale fishery is carried out by fishing crews mainly using small-sized (up to 5 m long, 2 m wide) motor boats in the coastal zone of the Caspian Sea. Fishing is done on the basis of the license of MENR, which specifies the composition of the crew, areas of fishing, quotas on fishing, species of fish, the catching of which is permitted. As a rule, the small-scale fishing is carried out at a distance of 2-3 nautical miles. For catching mainly floating and plug-in (insertable) nets, fixed seines and nets in the form of traps are used. Plug-in nets and seines are mainly installed at a depth of 2-3 m, and nets at a depth of 5 -8 m. Fixed seines are installed at a depth of 1.5-2.5 m, start from the shore and have a length of not more than 1 km from the coast.

Detailed and reliable statistics on current artisanal and commercial fisheries distribution, seasonality, fishing grounds and catches are not available. However, a summary of seasonal changes in commercial and coastal small-scale fisheries in the Azerbaijan sector of the Caspian Sea:

- from December to February – due to adverse weather conditions, fishing intensity ranges from average to low levels. As a rule, during this period the fishing is carried out by commercial fishermen, who use 50% or less of their fleet;
- from March to April - due to the predominance of cloudy weather, the fish attracting method using electric lighting is most effective, for this reason this season is considered as a high demand season;
- from May to June is a season with low intensity when Clupeid fish migrate to the northern and southern Caspian Sea for spawning;
- from July to August - due to clear weather is a season with medium-low fishing indicators;
- from September to November - due to the predominance of overcast and cloudy weather, fish attracting method is most effective and thus a high demand season.

According to previous studies conducted at sea, some sturgeon species migrate along the routes indicated on the maps from March to April and again from September to November (see Section 4.3.5 on fish migrations). The expected presence of fishing boats in the ADUA exploration area in the spring (especially from February to April) is likely within a distance of 4-6 km from the shore. According to the Fish and Fishing Review Report from BP (2015), the most relevant areas for fishing near and to the south of Absheron Peninsula are in most cases within 0-50 km from the shores (see Figure 4.32). Nonetheless, fishing grounds can be located up to 70-80 km offshore. The closest known fishing ground is Oil rocks, located about 9 km south from the ADUA exploration area boundaries.

Figure 4.32: Areas of importance for the Fishing Industry (modified from BP, 2013)

Commercial fishing methods exclude trawling (the latter only performed for scientific purposes). Methods currently used include cone-shaped purse nets, centrifugal fish pumps and airlift.

Within the Caspian context the shallow northern part of the sea is of high importance as a region of reproduction of marine species, development on early stages of their life and a feeding ground of adult fishes (e.g. common sprat, Dolginka shad, Caspian shad and big-eyed shad). The Azerbaijan sector of the Caspian, the Cis-Kura region, Kyzyl-Agaj gulf and Lenkoran coast are important for fish species of the Southern Caspian and areas with water depths of

10-50 m with silty-sandy, sandy-silty and silty-shelly grounds are considered as the most populated with benthic fodder organisms.

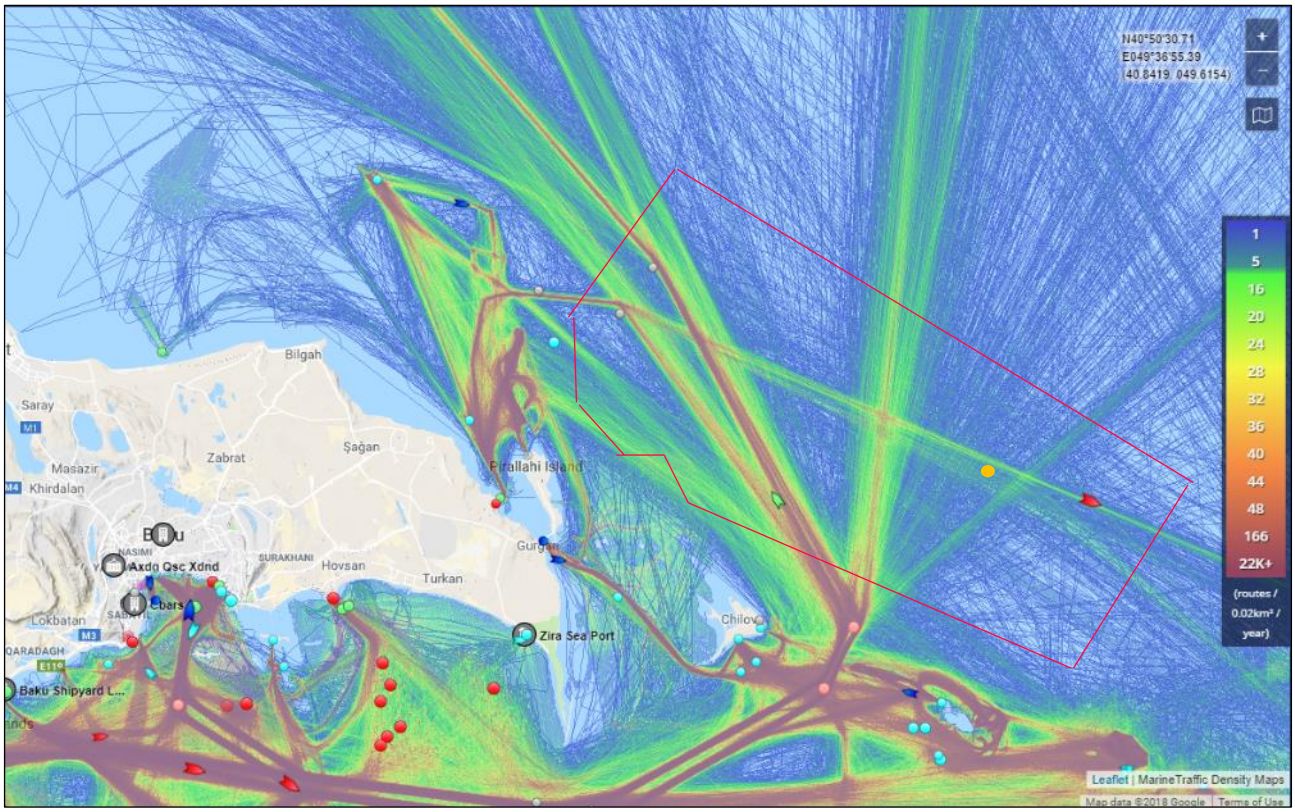
Wintering and feeding grounds of sturgeons on marine pastures at the depths of 10-40 m are located in the regions of western coast of the Middle and Southern Caspian. Therefore, the whole western coast of the Middle and Southern Caspian can be considered as a sensitive fish habitat.

Caspian sturgeon stocks have also suffered a very important reduction. Natural reproduction of sturgeons was dramatically reduced as a result of sturgeon habitat destruction and limited access to breeding grounds, which are located along rivers that have been largely modified and dammed.

4.4.2 Maritime Transport

Maritime transport plays a significant role in the economic development and prosperity of Azerbaijan. Azerbaijan has vast potential in maritime transport in the Caspian Sea. Baku has the largest seaport in the Caspian Sea. Azerbaijan's Caspian Sea Shipping Company is among the major ship owning companies in the Caspian basin and its main activity is cargo transportation, predominantly in oil and oil products, in the Caspian, Black, Mediterranean, and Marmara Seas. Until recently, Azerbaijan’s state-owned Caspian Shipping Company (CASPAR) had remained a monopolist in the maritime transportation on the Caspian Sea, though there is increasing competition (Azernews, 2015).

The Baku International Sea Trade Port ferry terminal in Alat, 40 miles south of Baku, was recently commissioned in 2014, while the Baku Sea Port was upgraded and was commissioned later the same year. The estimated transshipment volume for the new port complex is up to 10 million tons of cargo and 40,000 TEU containers at the first stage, up to 17 million tons of cargo and 150,000 TEU containers at the second stage, and up to 25 million tons of cargo, and 1 million TEU containers at the third stage of the project. In addition to the logistics center, a free economic zone is planned for this area in the future. Around 3.1 million metric tons of cargo was transported by ships during January-May 2015, according to the Statistics Committee. All cargo accounted for international operations. The volume of goods handled in Azerbaijani ports amounted to 4.2 million metric tons. Some 71.2 percent of cargo shipping fell to oil and oil products, while 28.8 percent on dry cargo. The volume of international transit cargo handled in the ports hit 94.5 percent. As of June 1, 2015, around 56,800 metric tons of import cargo left in the ports for transportation. A map showing maritime traffic density for years 2016-2017 show large density of ingoing-outgoing traffic, mostly related to nearby O&G fields (Figure 4.33).

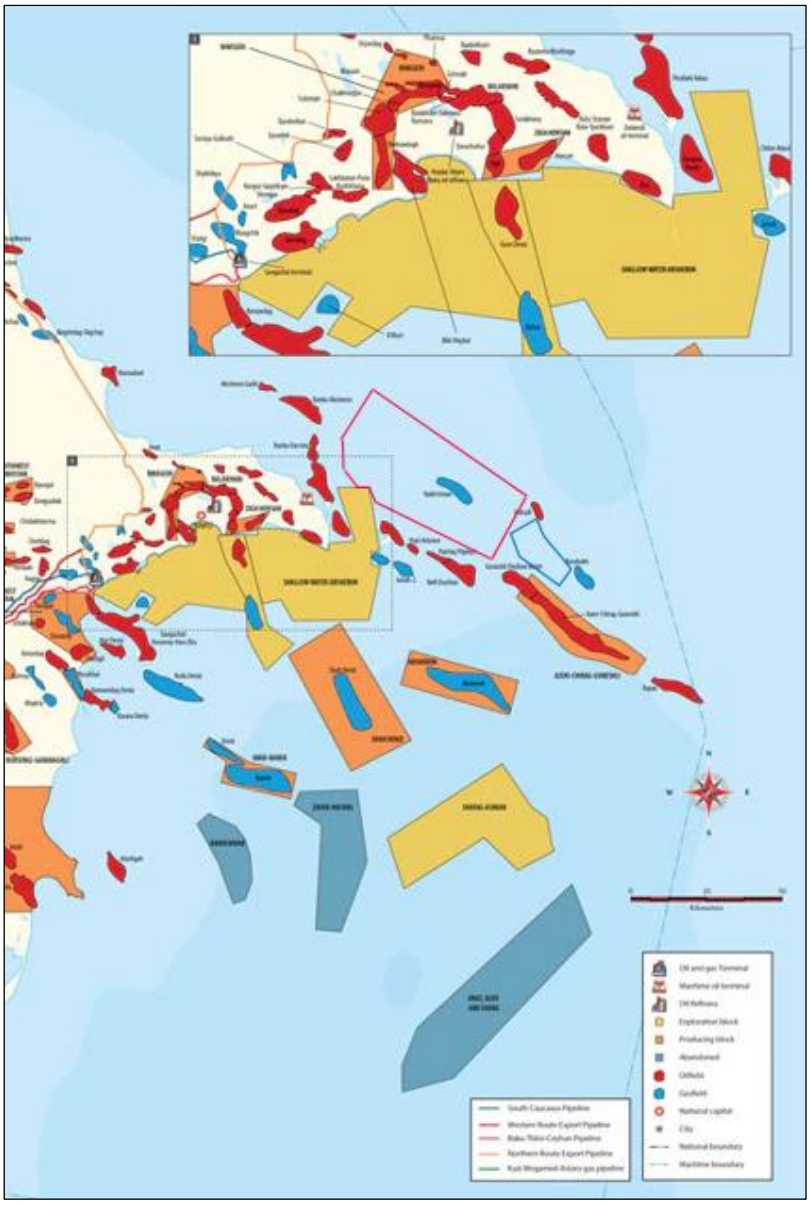


Note: Approximate ADUA exploration area shown in red outline and Aypara-1 well in orange circle.

Figure 4.33: Marine traffic density map (2016-2017) in the main Baku ports (Marine Traffic, 2018)

4.4.3 O&G Activities

Oil and Gas industry is currently the most important economic resource and activity in the Caspian Sea. At present, the majority of oil produced in the Azerbaijan Republic (70-95%) is received from the subsea fields. Geological exploration works in the region discovered a number of large oil and gas fields in the sea and adjacent areas. Thanks to its hydrocarbon potential, the Caspian Sea is the world second oil and gas source after the Persian Gulf. Recent map on O&G infrastructure and hydrocarbon blocks in the vicinity of the Absheron Peninsula is shown in Figure 4.34.



Note: Approximate ADUA exploration area and Karabakh field shown in red and blue outline respectively

Figure 4.34: O&G infrastructure and blocks in Azerbaijan (The Oil and Gas Year, 2016)

5 Impact assessment

5.1 Introduction

This chapter provides an assessment of potential impacts from the planned drilling activities of the Aypara-1 well in the ADUA exploration area to be undertaken by Equinor. The assessment considers how the Project has the potential to impact upon receptors in the physical, biological, and socio-economic environment[8] within the Project area.

5.2 Methodology

This section presents the methodology for assessment of the Project impacts.

The key stages in the impact assessment are as follows:

- identification of potential environmental and social receptors (baseline chapter);
- identification of the activities of the proposed drilling exploration programme with the potential to contribute to or cause impacts to environmental and social receptors;
- development of mitigation measures to be applied to reduce potential impacts; and
- assessment of the likely magnitude of the residual impact (depending on its intensity, its duration, its scale, etc.), and the sensitivity of the receiving environment to impacts, to determine its importance.

5.2.1 Impact Significance

Significance of potential impacts is obtained through a combination of the following:

- the predicted magnitude of an impact, taking into consideration all the mitigation measures; and
- the sensitivity of the receptor.

In addition to the impacts generated by routine activities, the impact of unforeseen or accidental events has also been assessed. In these cases, the probability of the event has also been considered.

[8] Only selected receptors have been considered in this EIA, mainly fisheries and shipping /O&G activities in the Project area.

5.2.1.1 Impact Magnitude

The magnitude describes the degree of change that impact is likely to bring to a component of the environment (receptor). The evaluation criteria are presented in Figure 5.1 below.

1. Nature of Impact

- **Negative** – an impact that is considered to represent an adverse change from the baseline
- **Positive** – an impact that is considered to represent an improvement to the baseline

2. Type of Impact

- **Direct** – impacts that result from a direct interaction between a planned project activity and the receiving environment.
- **Indirect** – impacts that result from other activities that are encouraged to happen as a consequence of the project
- **Cumulative** – impacts that act together with other to affect the same receptors as the project.

3. Frequency of the impact

Degree of disturbance experienced by the receiving environment.

4. Duration of Impact

- **Short-term**: impacts that are predicted to last only for an intermittent /occasional period of time.
- **Medium**-term: impacts that are limited in time, ceasing once the activity is over.
- **Long-term**: impacts that will continue over an extended period.
- **Permanent**: impacts that endure substantially beyond the project lifetime.

4. Extent of Impact

- **Local:** impacts that affect locally important environmental receptors or are restricted to a single habitat/biotope, a single (local) administrative area, a single community.
- **Regional:** impacts that affect regionally important environmental receptors or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystem.
- **National:** impacts that affect nationally important environmental receptors affect an area that is nationally important/protected or have macro-economic consequences.
- **International:** impacts that affect internationally important receptors such as areas protected by International Conventions.

- **Transboundary:** impacts that are experienced in one country as a result of activities in another.

Figure 5.1: Evaluation criteria

An assessment of the overall magnitude of an impact is provided by taking into account all the dimensions of the impact described above to determine whether an impact is of negligible, small, medium or large magnitude; examples can be found below.

Table 5.1: Magnitude Criteria for Environmental Impacts

Magnitude	Physical Receptors (e.g. air, water, sediments)	Biological receptors
Negligible	Immeasurable, undetectable or within the range of normal natural variation.	Immeasurable, undetectable or within the range of normal natural variation.
Small	Minimal disturbance. Slight change in water quality expected over a limited area with water quality returning to background levels within a few meters. Discharges are well within benchmark effluent discharge limits.	Affects a specific group of localized individuals within a population over a short time period (one generation or less), but does not affect other trophic levels or the population itself.
Medium	Localized and/or short-term disturbance of seabed. Temporary or localized change in water quality with water quality returning to background levels thereafter. Occasional exceedance of benchmark effluent discharge limits.	Affects a portion of a population and may bring about a change in abundance and/ or distribution over one or more generations, but does not threaten the integrity of that population or any population dependent on it.
Large	Widespread and/or long-term disturbance or permanent change to the seabed. Change in water quality over a large area that lasts over the course of several months with quality likely to cause secondary impacts on marine ecology. Routine exceedance of benchmark effluent discharge limits.	Affects an entire population or species in sufficient magnitude to cause a decline in abundance and/ or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations.

5.2.1.2 Receptor sensitivity

The significance of the impacts resulting from an impact of a given magnitude will depend on the sensitivity (terms and definitions of vulnerability and importance may also be used when defining sensitivity) of receptors to that impact, i.e. the extent to which the receptor will undergo a change – negative or positive – as a result of the Project (e.g. nature of the impact).

The quality or importance of a receptor will be judged taking into account, for example, national or international designation, its importance to the local or wider community, its ecosystem function or its economic value.

Table 5.2: Sensitivity Criteria for Environmental Receptors

Sensitivity	Physical Receptors (e.g. air, water, sediments)	Biological receptors
Low	Existing airshed/water/seabed quality is good and the ecological resources that it supports are not sensitive to disturbance.	Ecological receptors are abundant, common or widely distributed and are generally adaptable to changing environments Species are not endangered or protected.
Medium	Existing airshed/water/seabed quality shows some signs of stress and/ or supports ecological resources that could be sensitive to change in quality or physical disturbance (secondary ecological impacts are possible).	Some ecological receptors have low abundance, restricted ranges, are currently under pressure or are slow to adapt to changing environments. Species are valued locally / regionally and may be endemic, endangered or protected.
High	Airshed/water/seabed quality is already under stress and/ or the ecological resources it supports are very sensitive to change (secondary ecological impacts are likely).	Some ecological receptors in the area are rare or endemic, under significant pressure and / or highly sensitive to changing environments. Species are valued nationally /globally and are listed as endangered or protected.

5.2.1.3 Evaluation of significance

Magnitude and receptor sensitivity are looked at in combination to evaluate whether an impact is, or is not, significant and if so its degree of significance (defined in terms of Negligible, Minor, Moderate or Major). This principle is illustrated schematically in Table 5.3.

Table 5.3: Overall Significance Criteria for Impacts in the EIA

		Sensitivity Importance of the Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The definitions for the four categories of impact significances are the following.

- **Negligible impact** is where a receptor will not be affected in any way by a particular activity or the predicted effect is deemed “imperceptible”.
- **Minor impact** is where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity.
- **Moderate impact** is an impact within accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor up to a level that might be just short of breaching the legal limit.
- **Major impact** is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive receptors. An aim of EIA is to get to a position where the project does not have any major impacts, certainly not ones that would endure into the long-term or extend over a large area.

5.2.2 Developing Mitigation Measures

One of the key objectives of an EIA is to identify and define environmentally/socially acceptable, technically feasible and cost-effective mitigation measures. Mitigation measures are developed to reduce the significant negative impacts identified during the EIA process to a point where they have no adverse effects, and to create or enhance positive impacts such as environmental and social benefits.

Mitigation measures are often established through industry standards and may include the following.

- Changes to the design of the project during the design process (*e.g.* changing the development approach or selection of more energy efficient power generating equipment).
- Engineering controls and other physical measures applied (*e.g.* use of effluent treatment equipment or spill prevention technology).
- Operational plans and procedures (*e.g.* notification to other marine users, navigation safety plans or waste management plans).

In this context the term “mitigation measures” includes operational controls as well as management actions. Where a significant impact is identified, a hierarchy of options for mitigation is explored as follows.

Avoidance at source

Develop the project such that the characteristic causing an impact is eliminated at the design stage (elimination of waste materials flow, for example).

Reducing at source

Modify the design of the project or of operational procedures to reduce the impact. For example, measures used to process effluent and waste materials fall into this category – this is also the case of soft-start procedures when seismic survey phases begin.

Reducing at receptor level

If an impact cannot be reduced on site, measures can be implemented off site – this is the case for example with the use of a guard vessel to help to control the level of interference with fishing activities.

Repairing or correcting

Some impacts imply damage to a receptor that is unavoidable. Repair mainly involves restoration and re-establishment type measures.

Compensation in kind

When other mitigation methods are either not possible or are not entirely efficient, compensation can be adapted, to a certain extent, to losses

Figure 5.2: Mitigation hierarchy

To facilitate the comprehension of the report, mitigation measures are provided at the end of the impact assessment chapter in a tabular form, both for routine events (Table 5.6Table 5.6: Summary of Impacts and Mitigation measures for Routine events of the Aypara-1 well drilling

) and unforeseen events (Table 5.13*)*.

The proposed EIA process will undertake the assessment of potential impacts considering the inclusion of the mitigation measures. The final remaining “mitigated” impacts are termed “residual” impacts. Where significant residual impacts remain, monitoring may be necessary to investigate the effectiveness of the mitigation measures.

5.2.3 Uncertainty

The prediction methods used are mainly qualitative evaluations based, to the extent possible, on specific indicators such as timings, volumes of resources/effluents, etc. This approach allows a reasonable degree of accuracy in predicting changes to the existing baseline and making comparisons with relevant standards. Where assumptions have been made, the nature of any uncertainty that stems from the 'prediction' process is explained. If appropriate, a 'worst case' approach has been adopted with mitigation measures developed accordingly.

5.3 Impact identification

The first step in impact identification is to identify the various types of activities associated with the project, together with their associated emissions and discharges where appropriate. At a high level, the main sources of impact of an offshore drilling project are:

- physical disturbance;
- physical presence of vessels;
- emissions to the atmosphere;
- discharges to the sea;
- generation of wastes; and
- accidental events.

Accidental events can potentially lead to significant impacts, for example in the event of an oil spill. However, they are clearly not a part of the intended activity and their potential occurrence has a likelihood associated with it (see Section 5.8).

The impact identification matrix provided in Table 5.4 identifies and scopes the predicted interactions between Project activities and environmental/socio-economic receptors. Each marked cell on the impacts matrix represents a potential interaction between a project activity and an environmental/socioeconomic receptor (i.e., potential impact). The cells are marked by using an associated code (e.g., for Air Quality Impacts, A). Blanks in the matrix indicate no potentially significant impacts are expected.

The specific impacts presented in the sections below have been defined based on a receptor potentially being impacted by the activities. Grouping all the individual impacts (marked cells) in one single impact allows a comprehensive analysis of the project activities that would interact with each environmental and socioeconomic receptor, also considering potential synergistic processes.

In some cases, the impact, although scoped-in, is directly identified to be negligible, based in previous experiences and technical judgement. In these cases, a summarized impact assessment is presented. Standard mitigation measures, part of good industry practices, will suffice to avoid or mitigate these impacts.

For the remaining cases a detailed impact assessment is provided which includes the following impact subsections: (1) impact description; (2) mitigation measures; and (3) Impact descriptors and residual impact evaluation.

The impact identification and assessment process is somewhat mechanical in its application but presents a robust set of arguments. The result is a trail, which can be easily followed and ensures that all activities are assessed against all identifiable receptors/resources: environmental and socioeconomic.

The results of this process and the identification of mitigation measures are discussed in the text. The proposed preventive and mitigation measures will be implemented throughout the duration of the activities, so that impacts are kept within the final residual category.

Furthermore, an Environmental and Social Management Plan (ESMP; See Chapter 6) will be implemented to establish measures, such as good practices and specific work procedures, to prevent, avoid, eliminate, minimise, or eventually offset/compensate the predicted adverse impacts. This will include mitigation measures, along with monitoring, remediation, and follow up evaluation to ensure the effectiveness of the management plan

Table 5.4: Impact identification matrix

Sources of Potential impact			Air Quality and Climate Change	Sea water Quality	Bottom sediments	Marine Flora/Plankton	Benthic communities	Pelagic Fish and Invertebrates	Marine Mammals	Seabirds	Protected Areas	Navigation, traffic and sea users	Fisheries
Exploration Drilling Campaign Routine Events		Mobilization and demobilization of the MODU	A1						M1			NT1	FS1
		Physical presence of the MODU and support vessels						IL1	M1	IL1		NT1	FS1
		Operation of support vessels	A1					IL1		IL1		NT1	
		Operation of the drilling unit	A1									NT1	FS1
		Operation of the onshore facilities (supply base)									PA1		
		Performance of Vertical Seismic Profile (VSP) activities				P2	B2	F1	M2				FS2
		Waste generation and management including the production of wastewater discharges		W1		P1	FA1	FA1	FA1	FA1			
		Drill cuttings and muds discharges		W1	B1		B1						
	Accidental Events	Accidental hydrocarbon spillage/discharge	AE1	AE1	AE1	AE1	AE1	AE1	AE1	AE1	AE1	AE1	AE1

A1	*Impacts on air quality and climate change due to the release of air pollutants*	***M1***	*Impacts on marine mammals due to the presence and operation of the MODU and support vessels*
W1	*Impacts on seawater quality due to effluents and waste to the sea*	***M2***	*Impacts on marine mammals due to the generation of noise emissions during VSP activities*
P1	*Impacts on plankton due to the change of seawater quality due to effluents and waste to the sea*	***IL1***	*Impacts on fish/seabirds due to artificial lighting.*
B1	*Impacts on seabed and benthic communities due to the discharge of drill cuttings and muds*	***PA1***	*Impacts on protected coastal areas due to the support operation from coastal facilities*
P2	*Impacts on plankton derived from the generation of noise emissions during VSP activities*	***NT1***	*Impacts on Navigation, Traffic and Sea users*
B2	*Impacts on benthic communities derived from the generation of noise emissions during VSP activities*	***FS1***	*Impacts on Fisheries due to the presence and operation of the MODU and support vessels*
F1	*Impacts on fishes due to the generation of noise emissions during VSP activities*	***FS2***	*Impacts on Fisheries due to the generation of noise emissions during VSP activities*
FA1	*Impacts on marine fauna due to the change of seawater quality due to effluents and waste to the sea*	***AE***	*Impacts due to accidental events*

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5.4 Impacts to the Physical Environment

5.4.1 A1: Impacts on Air Quality and Climate Change

5.4.1.1 Impacts on air quality due to the release of air pollutants

The major sources of atmospheric emissions will result from the MODU, support vessel engines and power generation exhausts. Other emissions to air from point and non-point sources may occur throughout the Project (e.g. helicopter and incineration). However, these would be very small when compared, and would be managed via proper maintenance protocols. In addition, given that no well testing is planned, there will be no emissions from flaring.

The release of gaseous pollutants to the atmosphere has the potential to affect local air quality. However, the main source of emissions during drilling activities will be at about 50 km from the coastline given the location of the Aypara-1 well. Emissions will also be released by support vessels along the route between the port and the drilling area and as such will be of a diffuse nature, which will assist dispersion of pollutants and lessen potential impacts. On-board incineration of some waste materials may also generate occasional-limited emissions. The dispersion rate of atmospheric emissions is expected to be high, due to the project's offshore location and the fact that most sources are mobile.

Effects on air quality will be localised and temporary at the MODU/vessels location. In addition, background levels of pollutant concentrations are expected to be reached within tens of metres from the sources and are not expected to reach any onshore receptors.

In summary, no significant impacts to air quality from Project-related emissions are expected, given the extent of emissions from MODU/vessel engines and other power generation sources, the high level of dispersion that will occur in offshore locations from stationary/moving vessels and the absence of human receptors in the vicinity of the drilling area).

5.4.1.2 Mitigation measures

Project-embedded measures to limit atmospheric emissions during the Project operations will include:

- Advanced planning to ensure efficient operations;
- Appropriate maintenance policies and procedures of equipment and generators will be followed, and its implementation audited by an Equinor representative;
- Ensure MODU has valid Engine International Air Pollution Prevention Certificate in place (marine diesel engines >130kW).
- Regular monitoring of fuel consumption;
- Equipment will be switched off when not in use;
- Use of low-sulphur marine fuel (i.e. <0.4% S by weight), and
- Compliance with Tier II of revised MARPOL 73/78 Annex VI which sets limits on sulphur dioxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances.

Taking into consideration the implementation of Project mitigation measures and embedded controls inherent in the project design, together with the localised nature of emissions, the sensitivity of the offshore environment and the expected dispersion rate, the resulting residual impact on air quality is assessed as **Negligible**.

5.4.1.3 Impacts on climate change due to the release of air pollutants

Context

In September 2015, just before the 21st Conference of the Parties to be held in Paris (COP 21) of the United Nations Framework Convention on Climate Change (UNFCCC), Azerbaijan submitted its new climate action plan that included the country's Intended Nationally Determined Contribution (INDC) in relation to the fight against climate change. This action plan targets a 35% reduction in the level of greenhouse gas (GHG) emissions compared to 1990 base year as its contribution to the global climate change efforts, by 2030. In practical terms, the INDC aims a total annual emission of 25,666 tonnes of CO_2, compared to the 73,331 tonnes emitted in 1990.

With regards to the oil and gas sector specifically, the INDC included the following measures:

- application of new and modern environmental-friendly technologies in the oil and gas processing,
- production of fuel in line with EURO-5 standards in a new refinery complex by 2019 and strengthening the capacity of the staff;
- modernization of gas pipelines, gas distribution system and other measures to decrease losses up to 1% by 2020 and ensure the volume of reduction in compliance with international standards by 2050; and
- based on adopted strategy, accumulation of gases emitted to the atmosphere during oil-gas production, prevention of gas leakages during oil-gas processing and at distribution networks.

The analyses of impacts related to Project's greenhouse gas emissions are limited to the Project itself (a single exploration offshore exploration well) but not to GHG emissions related to future phases of oil exploitation (e.g. related to possible exploitation of resources, processing, distribution and consumption of products are not taken into account in this study as they are outside the scope of the current drilling EIA). GHG included in the assessment are those considered by the Kyoto Protocol, namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), fluorinated hydrocarbons (HFC -PFC - SF6).

Emissions related to the consumption of fossil energy for the operation of ships

As detailed in the Project Description (Chapter 3), air emissions sources, estimated hours of operation, and type of fuel to be used associated to the Project are the following:

- MODU, four 2642 kW generators, Diesel, 24h/day;
- MODU, one 1350 kW emergency generator, Diesel, 16h/week;
- Vessel – Type 1, one 2000 kW engine, Diesel, 14 h/trip, 5 trips per week
- Vessel – Type 2, two 2730 kW engines, Diesel, 24h/day, 5 trips per week

The total estimated air emissions during drilling activities are 75 tons of NOx (30 from drilling MODU combustion sources and 45 from support vessels) and 9500 tons of CO_2 (3800 from drilling MODU combustion sources and 5700 from support vessels).

According to the emission estimate provided before, the seismic acquisition activities will generate 9,500 tonnes of CO_2 in total. Compared to the country emissions target of 25.7 Mn tons/year of CO_2, the Project emissions of GHG represent approximately 0.03% of the overall emissions target, thus is considered to be **Negligible.**

5.4.1.4 Descriptors and residual impact

Impact descriptors for air quality and climate change impacts

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Small	Low	**Negligible**

Taking into consideration the implementation of Project mitigation measures and embedded controls inherent in the project design, together with the localized nature of emissions, the sensitivity of the offshore environment and the expected dispersion rate, the resulting residual impact on air quality and the potential for climate change is assessed as **negligible**.

5.4.2 W1: Impacts on seawater quality due to effluents and waste to the sea

Operational discharges may locally affect water quality and can be grouped into:

- Liquid wastes;
- Solid wastes (hazardous and non-hazardous) and

- Drilling fluids and rock cuttings

Liquid wastes

Liquid wastes include sanitary wastewater ('black water' from toilet facilities) and domestic wastewater ("grey water" from showers, sinks, laundries and galleys, as well as from safety shower and eye-wash stations). In some cases, grey water can include some solid or semi-solid food. These streams will introduce microorganisms, small quantities of nutrients, suspended solids, organic material with chemical and biological oxygen demand and residual chlorine from sewage treatment to well-mixed, well-oxygenated surface open waters.

As described in the Project Description, it is estimated that one person will generate 100 l/day of sanitary wastewater and 220 l/day of domestic wastewater. Since about 200 persons would be involved in the drilling activities (including onshore staff), the estimated daily volumes result to be 64,000 litres of wastewater a day, which corresponds to 64 m^3/day.

Liquid wastes also include drainage water from the drains and bilges of the MODU and auxiliary vessels (two supply vessels and one crew boat). Drainage is likely to become contaminated with low levels of hydrocarbons and other chemicals. Unmanaged discharge of this water to the sea represents a potential impact on local water quality. All oily waste water will be contained onboard and transported to shore for disposal. The amount of drainage water depends on the frequency of wash-downs and rainfall. In general, considering the drilling program duration (about 60-90 days), it is expected that the generated volume of drainage water will be small.

The last type of liquid waste considered are ballast waters. Ballast water is taken on-board to maintain safe operation and manoeuvring of vessels. Depending on where it is taken on-board, it may contain harmful microorganisms, marine organisms from other locations (potentially invasive species) and contaminated sediments in suspension. As the vessels use fuel and transport other fluids (i.e. drilling muds) they may be required to take on water during the Project, thus any ballasting operations will be logged. In addition, the Project will comply with IMO regulations and standards and guidelines for ballasting management based on the International Convention for the Control and Management of Ship's Ballast Waste and Sediments (BWM Convention).

All discharges of liquid wastes to the sea will be carried out in accordance with a Waste Management Plan and in full compliance with relevant national legislation, as well as MARPOL requirements and provisions specified in its Annex IV – Sewage. Moreover, liquid wastes that may be discharged are expected to dilute and disperse quickly in the offshore environment resulting only in a temporary and localised reduction of water quality.

Solid wastes

Solid wastes include maintenance products (e.g., lube oil and other greases), packaging waste (e.g., paper, card, wood, sacks, drums and grease/paint cans), scrap metal, and empty chemical drums. As described in the Project Description, any solid waste will be sorted, transported to shore and disposed according to the Waste Management Plan (although wastes that are appropriate to burn at sea may be incinerated e.g. food waste).

As described in the Project Description, any chemical waste will be managed according to the Waste Management Plan, including storage in sealed containers/drums with clear labelling and accompanied with copies of the relevant Material Safety Data Sheets (MSDS). Chemical wastes will be sorted, transported to shore and disposed according to the Waste Management Plan. Therefore, no impacts to water quality is expected from the generation of chemical wastes during project activities. The only potential negative impact is linked to accidental events, described in *Section 5.7*.

Drilling fluids and rock cuttings

The major waste product of a drilling operation is the generation of rock cuttings and drilling muds (or drilling fluids).

Cuttings are small fragments of inorganic material generated during drilling and are representative of the geological strata through which the well is being bored. During drilling, muds (drilling fluids) are used for several purposes (as weighting agents to control downhole pressure, to lubricate and cool the drill bit and to carry the cuttings to the surface for disposal). Consequently the cuttings become coated with drilling mud and require treatment to (a) recover as much mud as possible for reuse and (b) to clean the cuttings to a condition suitable for disposal.

Either a Seawater/Hi-viscosity sweeps (SW) or a combination of SW and Water-based muds (WBM) system will be used for drilling the top sections. As described in the Project Description, drill cuttings of the SW system will be discharged directly at the seafloor (140 m depth) with a 36" discharge pipe. It is estimated that about 133 m^3 (SW/WBM combined) or 310 m^3 (only SW) of cuttings will result from the top section drilling. It is also estimated that about 1,200 m^3 of SW or SW/WBM will be used during the drilling activities. The seawater and hi-vis sweep would be discharged on the seabed while the WBM mud system would have 100% returns back to the surface with the use of a riserless mud recovery (RMR) system.

There are two main potential environmental effects resulting from the deposition of the cuttings: chemical effects and physical effects, both of which would affect the water quality:

- Cuttings can have low levels of hydrocarbons and heavy metals,: some heavy metals are present in drilling muds as metal salts or organo-metallic compounds; others are trace contaminants/impurities in bentonite clay

(e.g. arsenic, mercury, cadmium, lead, nickel and zinc) or may be derived from the penetrated rock formation or drill pipe corrosion.

- Physical effects could occur because due to the discharge of cuttings on the seabed. Coarser material that will sink quite rapidly and have a short residence time in the water column. However, finer material that will have a longer residence time, increasing the total suspended solids (TSS) and subsequently the water turbidity. Typically, most of the material will deposit within a few hours of release. The remaining particles will reside in the water column for multiple days and will be transported further away from the MODU. The plume of turbidity is expected to stay close to the seafloor and is not expected to increase the amount of suspended solids in the water column.

SOBM (synthetic oil based mud) will be used after the Blow out preventer (BOP) and riser has been installed. As described in the Project Description, drilling cutting with SOBM will be recovered and sent back to the shore to a locally approved vendor for treatment and landfill. SOBM will also be taken back to shore and reused or managed in appropriate facilities. It is estimated that about 322 m^3 of cuttings will result from the drilling with SOBM. It is also estimated that about 1300 m^3 of SOBM will be used during drilling activities. Taking into account that no SOBM nor cuttings coated with SOBM will be deposited in the seabed, but recovered in the MODU and treated onshore, no effect is expected in the water quality as a result of the SOBM use in the drilling operations.

In addition to cutting discharges, leaching may also occur from the small quantities of overspill cement that may be released. However, cement chemicals will be risk assessed and used downhole, in alignment with OSPAR HOCNF standards.

5.4.2.1 Mitigation measures

- The vessels will be equipped with a sewage treatment unit compliant with MARPOL Annex IV regulations, with International Sewage Pollution Prevention Certificate (“ISPPC”);
- Liquid discharges will comply with MARPOL Annex IV and the Azerbaijani law;
- Limited quantities of water released during weekly testing of the fire water pumps, with no chemical dosing.
- Bilge and drainage oily wastewater will be contained onboard and transported to shore for disposal;
- Maintenance of an Oil Record book and a vessel’s logbook.
- All Ballasting activities will comply with the International Convention for the Control and Management of Ship’s Ballast Waste and Sediments (BWM Convention);
- Use and discharge of drill fluids and cuttings, completion fluid or cement products will be subject to a Chemical Management Plan.

- No discharge of SOBM or associated cuttings. SOBM and associated cuttings will be returned to shore for treatment and disposal.
- Components of water based drill fluids will be either categorized as Low Toxicity (based on OSPAR's OCNS) or listed as a Plonor product under OSPAR. Contractor will aim at minimizing the number and quantities of additives and will aim selecting additives with a good environmental behaviour.
- Barite used for WBM would follow the maximum allowable content of heavy metals (<1 mg/kg and cadmium <3 mg/kg dry weight).
- A mud recovery system will be available to reuse WBM as needed to minimize mud consumption (i.e. solids control equipment - shakers & centrifuge - will separate cuttings from the mud system and maximise recovery and re-use of drilling mud). Discharge to sea will be via a caisson at least 15 m below sea surface.
- Selection of a pipe dope that is heavy metal free to avoid introduction of heavy metals.
- Cooling water discharge location/depth will be selected to ensure that temperature 100 m from the discharge point will be no greater than 3ºC above ambient water temperature (IFC EHS Guidelines Oi l& Gas Development - Offshore).
- No chemicals injected into cooling water system. Concentrations of copper and aluminium in water will be below international Environmental Quality Standards (EQS) and national Maximum Permissible Concentration (MPC) levels.

5.4.2.2 Descriptors and residual impact

Impact descriptors for water quality

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Small	Low	**Negligible**

Taking into consideration the implementation of Project mitigation measures and embedded controls inherent in the project design, together with the localized nature of liquid/solid discharges, the sensitivity of the offshore environment and the expected dispersion rate, the resulting residual impact on water quality is assessed as **negligible**.

5.5 Impacts to the Biological Environment

5.5.1 P1: Impacts on plankton due to the change of seawater quality due to effluents and waste to the sea

The discharge of routine waste effluents from the MODU and support vessels may result in a temporal increase in organic matter in the surroundings of the MODU/vessels as well as along the sites traversed by them. Considering the maximum personnel requirements of 200 people and assuming an average daily production of 100 L/day/person of sanitary wastewater and 220 L/day of domestic wastewater (black and grey waters respectively), expected volumes of effluents should not exceed 30.4 m^3/day.

Considering these limited volumes, the constant movement of survey vessels throughout the survey area and the adherence to MARPOL requirements, an increase in organic matter is considered not significant as it is not expected to disrupt natural phytoplankton cycles in the area and will be limited to a temporary increase in plankton communities along a limited surface.

Regarding ballast waters, should any of the project vessels not be sourced locally and come from other marine areas, it could result in the introduction of invasive or alien species into the Caspian Sea. Alien species have the potential to create changes to ecosystem by modifying the trophic chain and even lead to the local extinction of certain species, presenting therefore a threat to biodiversity. To reduce this possibility, Statoil Azerbaijan and its contractors will adhere to IMO Guidelines for the Control and Management of Ship's Ballast Waste and Sediments (BWM Convention) which will be communicated to contractors supporting the Project as part of their contractual obligations.

With regards to the discharge of the cuttings and associated muds, those originated in the upper sections of the well (SW) will pose no threat to the planktonic communities as they will directly deposited in the seabed. The cuttings from the lower well sections (WBM) may result on a temporary increase of turbidity which could affect the photosynthesis of the phytoplankton. The discharge will be made, however at sufficient depth below sea surface, limiting the extent of this impact. WBM cuttings discharged to the sea from the MODU can be divided physically into two types:

- Coarser material that will sink quite rapidly and have a short residence time in the water column; and
- Finer material that will have a longer residence time in the water column, increasing the total suspended solids (TSS).

As a result, the discharge will pass down through the water column and gradually be dispersed depending on material size before settling on the seabed. Generally, most of the material, approximately 60%, is coarser and will deposit within a few hours of release. The remaining particles will reside in the water column for multiple days and be transported further away from the MODU. The latter will affect the water column by the increase in Total Suspended Solids (TSS) above background concentration that may lead to an increase in turbidity and consequently to a reduction of light penetration potentially affecting phytoplankton and primary productivity. Discharge to sea will be via a caisson at least 15 m below sea surface.

5.5.1.1 Descriptors and Residual impacts

Impact descriptors for plankton

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Small	Low	**Negligible**

Due to the embedded controls for the Project, including adherence to IMO guidelines, the impact of liquid discharges (including ballast water/WBM cuttings discharge) is predicted to be **Negligible**.

5.5.2 B1: Impacts on seabed and benthic communities due to the discharge of drill cuttings and muds

As per the Project design a zero discharge policy will apply where SOBM (riser connected) is to be used. For the top-hole sections that will employ SW/WBM, based on the principles set for the formulation of the SW/WBM mud it can be assessed that products disposed off will be non-toxic and thus no relevant chemical effects are expected on the benthic communities. Therefore, the impact assessment on seabed and benthic communities is focused in the resulting physical footprint.

Discharge of SW/WBM mud and associated cuttings and overspilled cement (the latter two from either the SW or SW/WBM system used) in the seabed will form a footprint on the seabed which will result in physical damage and habitat loss of benthic communities. Studies have shown that impacts from smothering can occur where the depth of cuttings is 1 mm or more (Bakke et al., 1986; Smith et al., 2006).

The sediment mounds around the well are the areas of most significant deposition, and smothering of seabed species will cause mortality in benthic species primarily through the clogging of respiratory and feeding apparatus.

Smothering by mud, cuttings and sediment are expected to impact sessile organisms, such as mollusc species, to a greater degree than mobile and burrowing species such as arthropods and annelids. However, it should be noted that recovery will be expected over time as the new sediment layers are recolonized.

The deposited SW/WBM mud and cuttings will also alter the particle size distribution in the sediment substrate and will physically alter the habitat (changes to sediment composition), possible influencing on how benthos re-colonises the affected area.

Additional footprint in the seabed due to the drilling activities will be:

i) the blowout preventer installed on the wellhead. At the conclusion of the drilling activities, the well will be abandoned but keeping a wellhead constructed of high-grade steel. The wellhead assembly will extend approximately 3 m above the seabed, with a diameter of 1 m.

ii) MODU anchoring will result in disturbance due to positioning of anchors and anchor chains. The displacement of sediment is not expected to 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 are likely to re-establish themselves once the anchors and chains have been removed.

The seabed sampling campaigns performed in 2017/2018 in the Karabagh and ADUA fields concluded that the seabed consisted primarily in silt and sand. Benthic species were more frequently recorded at the depth of 10 – 50 m. The benthic community described to be present in the Karabagh/ADUA fields were primarily crustaceans and annelids, none of which were protected. Given the location of the Aypara-1 well (i.e. comparable depth), the sensitivity of the seabed and benthic communities in the Aypara-1 well location is expected to be low.

The magnitude of the impact on the seabed and benthic communities is considered to be limited, given the following:

- Smothering by use of SW/WBM mud, cuttings and sediment are expected to impact sessile organisms, such as mollusc species, to a greater degree than mobile and burrowing species such as arthropods and annelids. Identified benthic communities in the near-by Karabagh/ADUA fields were mainly crustaceans (subphylum of arthropods) and annelids.
- Short-term duration of the discharge of cuttings, limited to 60-90 days maximum (approximate length of drilling activities).
- Footprint impact area will depend on factors such as currents, grain size, viscosity/density of cuttings, etc. Given the amount of associated cuttings (in terms of SW mud 133 m^3 or 310 m^3 directly at seabed or 177 m^3 from the surface in case of WBM) it is expected that footprint areas impacted around the well with a thickness cover greater than 1mm will be small (within a few hundred meter radius).
- Most of the turbidity will be temporal only, limited to a few hours of release.

- Recolonisation of any benthic fauna affected is expected to be rapid.

5.5.2.1 Mitigation measures

Although impacts are considered of small magnitude, the following mitigation measures are good industry practice and will be adopted by the Project:

- Use and discharge of drill fluids and cuttings, completion fluid or cement products will be subject to a Chemical Management Plan.
- No discharge of SOBM or associated cuttings. SOBM and associated cuttings will be returned to shore for treatment and disposal.
- Components of water based drill fluids will be either categorized as Low Toxicity (based on OSPAR's OCNS) or listed as a PLONOR product under OSPAR. Contractor will aim at minimizing the number and quantities of additives and will aim selecting additives with a good environmental behaviour. In the event that new drilling fluids are used during drilling operations, drilling fluid toxicity will be tested under Caspian Specific Ecotoxicity tests or similar procedures.
- Barite used for WBM will follow the maximum allowable content of heavy metals (< 1mg/kg and cadmium <3 mg/kg dry weight).
- A mud recovery system will be available to reuse WBM as needed to minimize mud consumption (i.e. solids control equipment - shakers & centrifuge - will separate cuttings from the mud system and maximise recovery and re-use of drilling mud). Discharge to sea will be via a caisson at least 15m below sea surface.
- WBM and cuttings will only be discharged after treating fluids to reach PSA specified chloride levels (<4 times ambient concentration of receiving waters).
- A pre-drill and post-drill environmental survey with a remote operated vehicle (ROV) will be carried out in the vicinity of the well site to show evolution of recovery.
- Hydraulic fluid used in BOP and function tests is biodegradable and has been formulated to meet CEFAS and OSPAR requirements. Only small volumes will be released at the seabed.

5.5.2.2 Descriptors and residual impact

Impact descriptors for seabed and benthic community impacts

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Small	Low	**Negligible**

Taking into consideration the implementation of Project mitigation measures and embedded controls inherent in the project design, together with the localized nature of cuttings/mud discharges, the sensitivity of the benthic communities and the limited dispersion rate, the resulting residual impact on seabed and benthic communities is assessed as **negligible**.

5.5.3 Underwater sound impacts on Marine Fauna

This section analyses underwater sound impacts generated by the Project. Sound-generating activities include the mobilization and operation of Project vessels, the drilling itself and those derived from the performance of the vertical seismic profile activity (VSP).

Table 5.5 shows sound sources and sound levels likely to be associated with Project activities. Since expected sound levels generated by Project activities are not available, the assessment is based on the expected sound levels generated by typical drilling project. This information forms the basis of the assessment of underwater sound impacts on receptors including fish and marine mammals (i.e. the Caspian Seal).

Table 5.5 Typical Underwater Sound Levels and Frequencies

Source	Noise Level (dB re 1µPa)	Noise Frequency (Hz)
	Ambient sound	
Calm Seas	60	-
Moderate waves/surf	102	100-700
	Project-related sound	
MODU	154 at 1 m from source	5
Supply vessels	170-180 at 1 m	10-100
Vertical Seismic Profile (VSP)	184.5- 196.5 at 4.5 m	0-150

Sound frequency is expressed in Hertz. Only the approximate range of peak frequencies is presented, frequencies outside this range are likely to exist but be lower in sound level.
Source: CEAA, 2004 and ERM (2018)

Environmental issues relating to VSP are focused on the potential effects on marine fauna from the sound waves associated with the seismic energy source. The pulses associated with VSP produce a steep-fronted detonation wave which is transformed into a high-intensity pressure wave (shock wave with an outward flow of energy in the

form of water movement). There is an instantaneous rise in maximum pressure followed by an exponential pressure decrease and drop in energy. The low-frequency signals created during VSP events propagate efficiently in the water, with little loss due to attenuation (i.e. due to absorption and scattering). Within a few meters of an airgun array, spherical spreading loss (the reduction in intensity caused by the spreading of waves into an ever increasing space) results in a loss of around 6 dB per doubling of distance. However, attenuation depends on propagation conditions. In good propagation conditions, the signal may be above the background level for more than 100 km; in poor propagation conditions it may reach background level within a few tens of kilometers (McCauley, 1994).

Sound waves travel until they meet an object or they are dissipated by normal decay of the signal. Nevertheless, the intensity of sound waves decays exponentially, and although low level signals travel for long distances, the higher amplitude waves lose much of their energy very close to the airgun source. Typically, most emitted energy is low frequency, between 0.01 and 0.3 kHz, but pulses also contain some higher frequency energy up to 0.5 to 1 kHz. The latter components are weak when compared to the low frequency emissions (Richardson et al., 1995). The low frequency component of the sound spectrum attenuates slowly, but high frequency sound attenuates rapidly to levels similar to those produced from natural sources. The rate of change in sound level from a seismic airgun is relatively rapid, and it may be this factor, as much as any, which contributes to observed effects on marine organisms.

Based on available scientific literature, the potential effects of underwater noise resulting from seismic sources ultimately depends on the perceived sound intensity and the particular hearing capabilities of different marine fauna. In general, the types of effects can be summarized in the following categories (mainly for marine megafauna):

- Irreversible effects on auditory structures from exposure to significant levels of noise (dependent on species) or associated pressure effects to nearby organisms, tissue damage or permanent auditory trauma; the latter is commonly referred to as Permanent Threshold Shift: PTS. These effects may potentially lead to lethal damage.
- Reversible effects on auditory structures (referred to as Temporal Threshold Shift: TTS) from exposure to specific threshold levels (dependent on species) of noise or associated pressure effects to nearby organisms.
- Behavioural disturbance with potential ecological implications such as disruption to feeding, mating, breeding or nursery activities.
- Interference with the use of acoustic communication signals, or naturally produced cues used by marine animals (i.e. auditory masking).
- Indirect effects, such as changes in the abundance or behaviour of prey animals for marine mammals, seabirds and fish.

The exposure time to the airgun signal will be determined by the firing sequence and the duration of the testing. Mobile fauna such as fish and marine mammals will likely move away from the airgun source at the higher sound levels, thereby reducing their exposure times.

The Project will utilize three sets of air guns, each with a volume of 250 cubic inches, totaling 750 cubic inches. The air guns will be configured in a delta frame and will be powered by either compressed nitrogen gas bottles or by compressor. The guns cluster will be fired at 1,800 psi with shots fired at 20 to 30 seconds at same station and five good shots per station will be stacked. The frequency band for the source sound emission to be used during the VSP is 0 to 130 Hz only with a maximum sound level of 195 dB re lµPa@lm.

Subsections 5.5.4 through 5.5.7 discuss the impacts from sound emissions on the different fauna receptors.

5.5.4 P2: Impacts on plankton derived from the generation of sound emissions from Vertical Seismic Profile (VSP) activities

The movement of phytoplankton and zooplankton is largely limited by currents. They are not able to actively avoid the seismic sound source at the rig.

Studies such as those of Kostyuchenko (1971) have shown that a 1.4x104 kilopascals (142.7 kilograms per square centimetre) noise level discharged by an airgun caused damage to larval planktonic species within a range of five metres. It has also been estimated that the wake from passing ship propellers and bow waves from routine maritime traffic will cause a similar if not greater volumetric effect to that of noise disturbance from seismic operations (Swan et al., 1994). Yet, most of the available literature suggests that there is limited impact of seismic activity on zooplankton, and any impact present is limited to 10 m from the source (Dalen & Knutsen 1986, Parry et al. 2002, McCauley et al. 2017).

Thus, except for larvae, fish eggs and other planktonic organisms (e.g. zooplankton, icthyoplankton, fish eggs) within a few metres of a seismic source, no planktonic organism populations are likely to be significantly affected by VSP discharges. For a large seismic array, injuries and mortality to eggs and larvae are highest at close range, within 2 m of the source, and decrease rapidly with distance from the seismic sources. Outside a range of 5 m, no effects are demonstrated. Furthermore, mortality of fish larvae in the plankton is considered to be insignificant compared with stochastic factors that cause natural mortality to fish larvae (McCauley, 1994). Considering that VSP airguns

are significantly smaller in volume compared to that of large towed seismic arrays, the magnitude of their impact is considered negligible.

5.5.4.1 Descriptors and Residual impacts

Impact descriptors for plankton impacts from sound emissions

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Neglibible	Low	**Negligible**

Potential impacts on plankton populations are considered **negligible**. No mitigation measures are recommended.

5.5.5 B2: Impacts on benthic communities derived from the generation of sound emissions from Vertical Seismic Profile (VSP) activities

Most marine benthic invertebrates have poorly developed mechano-sensory systems and would not be expected to be affected by the sound generated during the vertical seismic profile activities. Main benthic species found in the area correspond to crustaceans and annelids, followed by coelenterates and molluscs.

Research on underwater noise effects on benthic communities have focused on species of commercial importance. Different experiments have been unable to show significant effects on prawn catch rates before, during and after seismic surveys. Data on the impacts of seismic sound on macro invertebrates (scallop, sea urchins, mussels, periwinkles, shrimp, gastropods, cephalopods) show no significant increase in mortality below sound levels of 220 dB re 1µPa@1m. Some show no mortality at 230 dB re 1µPa@1m (Royal Society of Canada, 2004). However, Carroll et al. (2017) noted that limited investigations on the physiological responses of marine invertebrates to seismic noise are available; such as those of Day et al. (2016) where rock lobsters where exposed to acoustic sources having found damage in statocyst hair cells and low haemolymph counts; in the case of exposed scallops, Day et al. (2016) also found lower haemolymph counts. De Soto et al. (2013), showed however, that long exposure to seismic sources (in laboratory conditions) can result in delayed development and abnormal growth.

No specific mitigation measures are in place to reduce the potential effects of seismic surveys on benthic invertebrates; however, based on the information above, any effects on these are predicted to be highly localised and no population effects anticipated.

5.5.5.1 Descriptors and residual impact

Impact descriptors for seabed and benthic community impacts from sound emissions						
Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Small	Low	**Negligible**

Considering the duration of proposed seismic vertical profile (8-12 hours), the depth of the well location and the available information on effects of noise on benthic communities, the potential impact of noise from project related activities is assessed as **Negligible.** No mitigation measures are recommended.

5.5.6 F1: Impacts on fishes derived from the generation of sound emissions from Vertical Seismic Profile (VSP) activities

All fish species hear with varying degrees of sensitivity within the frequency range of sound produced by seismic sound sources (Hawkins, 1973; Popper and Fay, 1973; Tavolga et al., 1981; Fay, 1988; Popper and Fay, 1993; Fay, 2000). The effects of anthropogenic sound on fish have been summarised by several authors, including Popper (2003), Hastings (2008), Popper and Hastings (2009a, b), Slabbekoorn et al. (2010), Popper and Hawkins (2012), Halvorsen et al. (2013) and Popper et al. (2014). The best hearing range for most fish is believed to be in the frequency range of 100 to 1,000 Hz (Fay, 1988). Available data indicate that fish cannot hear sounds above approximately 3 to 4 kHz, with the majority of species able to detect sounds only to 1 kHz or below. Studies have demonstrated that some species can detect sounds below 50 Hz (i.e., infrasound), but it remains unclear whether these sounds are sensed by the ear or via the lateral line (Karlsen, 1992; Knudsen et al., 1994; Popper, 2012).

Noise emissions generated by the drilling/VSP operations have the potential to affect the behaviour of some species of fish that are sensitive to sound, namely ‘hearing specialists’. Behavioral effects in fish have been observed between 182-207 dB re 1 µPa (rms) and between 160 - 186 db re 1 µPa (peak) (Pearson et al. 1992, McCauley et al. 2000, Wardle et al. 2001). Such sounds levels are only expected very close to Project activities and especially during the development of the VSP, estimated to last between 8 and 12 hours. In any case it is expected that noise levels will decrease to levels unlikely to have effects on fish within 1 to 3 km from the source.

Among the fish species of conservation value in the Caspian Sea there are four species of sturgeons (Russian Sturgeon, Ship Sturgeon, Persian Sturgeon and Stellate Sturgeon). Sturgeons are anadromous fishes, thus they

migrate to river systems for reproduction and therefore they are not expected to be impacted by the Project during their reproductive period. Outside this period, potential impacts on sturgeons, and more generally on other pelagic fish species can include disrupted behaviour when exposed to boat noise (e.g., Sarà et al. 2007) but also attraction towards the vessel (Dagorn et al. 2001), depending on species.

Noise emissions generated by the VSP operations have the potential to affect the behaviour of some species of Caspian fish species that are sensitive to sound, especially those regarded as 'hearing specialists' (in the Caspian, typical species are the shad (genus *Alosa*) and kilka (genus *Clupeonella*). Species besides the sturgeon such as grey mullet, herring, anchovy kilka, big eyed kilka and beluga migrate across the Southern Caspian region during spring (March-April) and autumn (October-November); whilst during the winter months, species such as herring, anchovy and big-eyed kilka are found wintering near the western shores and southern slopes of the Absheron sill. However, they are expected to be passing through and would only be likely to be in the vicinity of the MODU for a very short period of time. They are also highly mobile and able to avoid any underwater sound that could cause lethal effects.

With regards to potential auditory trauma, according to Popper et al. (2014), the threshold for recoverable injury is more than 207 dB Peak re 1 μPa^2 s, 0-p or 203-207 SEL cum, which implies that a fish to suffer auditory trauma should be exposed to such noise level for hundreds of hours, and therefore any effect is considered unlikely, especially considering the duration of the VSP activities. In addition, the continuous nature of noise produced by vessel and MODU engines also reduces the chances of startle reactions in fish, which could occur during the VSP.

Only fish in the immediate vicinity of the seismic sources on commencement of the firing would be expected to suffer any notable injury, while those located beyond this distance from the source may show altered behaviours. Impacts to fish are therefore expected to be limited to the duration of activities and localised in the vicinity of the seismic source.

5.5.6.1 Mitigation measures

No measures are recommended specifically to mitigate the potential impacts of seismic sound sources on fishes, though it is considered they may benefit from soft-start procedures implemented for marine mammals; contributing to avoid the presence of fish in the vicinity of the source during that period by giving them time to swim away from the noise source as the levels increase progressively.

5.5.6.2 Descriptors and residual impact

Impact descriptors for fish impacts from sound emissions

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Small	Low	**Negligible**

Impacts to fish are therefore expected to be limited to the duration of activities and localized in the vicinity of the MODU. Considering also the implementation of the JNCC recommendations the impact of noise on fish is assessed as **Negligible**.

5.5.7 M2: Impacts on marine mammals derived from the generation of sound emissions from Vertical Seismic Profile (VSP) activities

The only marine mammal species potentially present in the ADUA exploration area is the Caspian seal (*Pusa caspica*). Marine mammals including seals, rely on sound for echolocation, detection of predators and prey, and communication within or between social groups. As a result the existence of anthropogenic noise sources could lead to several effects on these species, including:

- Temporary or permanent hearing loss (TTS, PTS[9]);
- Disruption of behavior (e.g., feeding, breeding, resting, migrating);
- Masking of important sounds (e.g., communication signals);
- Physiological stress or physical injury; and
- Ecosystem changes that result in reduction of prey availability.

Both PTS and TTS represent actual changes in the ability of an animal to hear, usually at a particular frequency, whereby it is less sensitive at one or more frequencies as a result of exposure to sound (Nowacek et al. 2007). Southall et al. (2007) proposed a dual criterion for assessing injury from noise based on the peak sound pressure level (SPL) and sound exposure level (SEL) (a measure of injury that incorporates the sound pressure level and

[9] PTS is a permanent loss of hearing caused by some kind of acoustic trauma. PTS results in irreversible damage to the sensory hair cells of the ear, and thus a permanent loss of hearing (Hastings and Popper, 2007). Temporary Threshold Shift (TTS) is also an effect of sound, but is considered auditory fatigue rather than an injury

duration), with the one that is exceeded first used as the operative injury criterion. For a pulsed sound source such as that generated from a seismic source, the levels for PTS are 218 dB re 1µPa (peak) and 186 re 1µPa^2-s for SPL and SEL respectively. There is thus a range at which permanent or temporary hearing damage might occur, although some hearing damage may already occur when received levels exceed 183dB re 1µPa^2-s SEL. The latest NOAA (2018 criteria) makes a distinction among Otariid and Phocid pinnipeds (Caspian seal being the latter) with SPL levels being the same, but SEL levels 1 dB lower (i.e. 185 re 1µPa^2-s).

Pinnipeds have functional hearing both above and below the water, although they have broader functional hearing ranges in water (Kastak and Schusterman, 1998). Southall et al. (2007) estimated functional hearing across all pinnipeds as extending between 75 Hz and 75 kHz under water and between 75 Hz and 30 kHz in air. However, they also noted that there appears to be a segregation in functional hearing within pinniped taxa, with phocids (seals lacking external ear pinnae that are less mobile on land, such as harbour seals and *Pusa caspica*) extending to much higher frequencies, especially in water, than otariids (lion seals and fur seals that have distinct external ear pinnae and are more agile on land). The most recent NOAA (2018) revised technical guidance made a distinction of pinnipeds into PW (Phocidae) and OW (Otariidae) hearing groups; based on a review of the literature, phocid species had consistently demonstrated an extended frequency range of hearing compared to otariids, especially in the higher frequency range (Hemilä et al. 2006; Kastelein et al. 2009a; Reichmuth et al. 2013).

Seals produce underwater sounds over a wide frequency range, including low frequency components. Babushina (1997) provided audiogram data for the Caspian seal (0.5–20 kHz (behavioural, air) and 1–40 kHz (behavioural, water)). Sills et al. (2015) assessed that ringed seals (*Pusa hispidus*) possess hearing abilities comparable to those of spotted seals (*Phoca largha*) and harbor seals (*Phoca vitulina*); with best sensitivity being 49 dB re. 1 µPa (12.8 kHz) in water, and −12 dB re. 20 µPa (4.5 kHz) in air, rivalling the acute hearing abilities of some fully aquatic and terrestrial species in their respective media. Critical ratio measurements ranged from 14 dB at 0.1 kHz to 31 dB at 25.6 kHz, suggesting that ringed seals– can efficiently extract signals from background noise across a broad range of frequencies.

The physiological effects of loud low frequency sounds on seals are not well documented, but include cochlear lesions following rapid rise time explosive blasts (Bohne et al.1985), temporary threshold shifts (TTS) following exposure to octave-band noise (frequencies ranged from 100Hz to 2 000Hz, octave-band exposure levels were approximately 60-75 dB, while noise-exposure periods lasted a total of 20-22 min), with recovery to baseline threshold levels within 24 hours of noise exposure (Kastak et al. 1999).

Information on the behavioural response of seals to seismic exploration noise is lacking. Reports of studies conducted with Harbour and Grey seals include initial startle reaction to airgun arrays, and range from partial

avoidance of the area close to the vessel (within 150 m) (Harris et al. 2001) to fright response (dramatic reduction in heart rate), followed by a clear change in behaviour, with shorter erratic dives, rapid movement away from the noise source and a complete disruption of foraging behaviour (Gordon et al. 2004). In most cases, however, individuals quickly reverted back to normal behaviour once the seismic shooting ceased and did not appear to avoid the survey area. Seals seem to show adaptive responses by moving away from airguns and reducing the risk of sustaining hearing damage. Potential for long-term habitat exclusion and foraging disruption over longer periods of exposure (i.e. during full-scale seismic surveys conducted over extended periods) is however a concern, but is not expected to be the case in this Project.

Reichmuth et al. (2016) performed laboratory measurements in trained spotted (*Phoca largha*) and ringed seals (*Pusa hispida*); where they observed a lack of observed auditory responses at noise levels predicted to cause TTS, indicating that initial predictions based on extrapolations (e.g. from those of Southall et al., 2007) were sufficiently precautionary. The relatively low-magnitude behavioural responses observed during noise exposures indicated that individual animals can learn to tolerate loud, impulsive sounds, but do not imply that similar sounds would not elicit stronger behavioural responses in wild seal individuals. These findings suggest that the auditory systems of Arctic seals may be relatively resistant to impulse noise exposure at low frequencies. It is expected Caspian seals are less likely to be affected by the seismic noise, being highly mobile creatures, and thus they would be able to avoid severe sound sources at levels below those at which discomfort occurs but may still be subject to TTS effects.

During seismic operations off southern California in 1995, California sea lions showed mixed reactions, some moving away from the source, others coming closer, while others showed no response (Arnold, 1996). Similar information was obtained during seismic operations in the Beaufort Sea in 1996 and 2001 (Harris et al., 2001). Thompson et al. (1998) found a change in short-term behaviour of harbour seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) exposed to noise from seismic sources. Harbour seals responded variably, some avoiding the seismic zone, whereas others showed no reaction even from a distance of 500 m from the sound source. As for grey seals, when they were exposed to a single seismic source of 10 cu in., they had an avoidance reaction, moving away from the sound source, swimming faster and/or making longer dives; with most observed individuals returning to the area after the seismic operations.

Given the expected timeframe and location of the drilling activities (Q1 of 2020) the Caspian seal is not likely to be present during the prospective drilling activities, considering it coincides with the winter seasons and thus major part of the population is in the northern Caspian breeding on the ice caps. Nonetheless depending on the specific spudding date and drilling duration, the last weeks of drilling activities may coincide with their spring migration where they head to the southern Caspian.

The potential impact of physiological injury as a result of exposure to high-amplitude seismic sounds is deemed to be limited/localised to the immediate vicinity of the operating airguns within the VSP survey area. As discussed previously, existing references on underwater sound produced under comparable operational scenarios have indicated that sound levels produced would not exceed injury criteria beyond hundreds of meters of the VSP airgun itself.

In terms of behavioural effects, due to acoustic exposure, as explained previously, they are generally more variable, context -dependent and less predictable than the effects of noise exposure on hearing or physiology. This is because behavioural responses to anthropogenic sound are dependent upon operational and environmental variables, and on the physiological, sensory and psychological characteristics of exposed animals. It is important to note that the animal variables may differ (considerably in some cases) among individuals, of a species and even within individuals depending on various factors (e.g. sex, age, previous history of exposure, season, and animal activity). The drilling location is deemed to overlap with the migration route of the Caspian Seal population (e.g. western coast and mid-Caspian migration routes; with an estimated 2-3% population located in Absheron peninsula surroundings), and behavioural avoidance of the drilling area is expected to be likely should migrating Caspian seals be found during the latter part of the drilling schedule.

The potential impact of physiological injury to seals from seismic noise is deemed to be low and would be limited to the VSP survey area, although the sounds would be audible beyond the survey area, causing any sort of behavioural reactions. As with other vertebrates, the assessment of indirect effects of seismic surveys on Caspian seal is limited by the complexity of trophic pathways in the marine environment. The impacts are difficult to determine, and would depend on the diet make-up of the species (and the flexibility of the diet), and the effect of seismic surveys on the diet species. The broad ranges of fish prey species (in relation to the avoidance patterns of seismic surveys of such prey species) and the foraging ranges of Caspian seals suggest that indirect impacts due to effects on predators or prey would be low.

The Caspian seal is considered a sensitive species given its conservation status, it is likely that drilling during the main winter months will coincide that no or limited individuals of Caspian seals are present in the area, though they may potentially start to appear in the ADUA in significant numbers at the start of their spring migration (e.g. late March-April); it estimated that approximately only 10% of the global population migrate through the western Caspian towards the south during spring, with an expected 2-3 thousand individuals in the Absheron peninsula and surroundings; thus the receptor sensitivity is considered medium under a precautionary approach. Given the impact magnitude discussed above, the species is expected to be relatively highly sensitive to underwater sounds;

5.5.7.1 Mitigation measures

In order to avoid potential effects on marine mammals, adherence to the mitigation measures set out in the UK-JNCC (Joint Nature Conservation Committee) 2017 “Guidelines for minimising the risk of injury to marine mammals from geophysical surveys” will be undertaken. These guidelines are the most commonly adopted by operators in regions without statutory guidelines.

VSP operations will be monitored and recorded, which will include among others: visual monitoring (Pre-shooting), use of “soft-start” procedures, and when geophone repositioning is expected to take longer than 40 minutes, regardless of airgun volume a full 20-minute soft-start is to be undertaken before the start of the next line or VSP data collection.

5.5.7.2 Descriptors and residual impact

Impact descriptors for marine mammal impacts from sound emissions

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Negligible-small	Medium	**Negligible to Minor**

It is widely accepted that marine mammals are able to avoid an operating VSP seismic array because of their swimming abilities. In light of the proposed mitigation measures being the combined implementation of visual monitoring and soft-start procedure, it is considered unlikely that Caspian seals will be exposed to levels that may lead to pathological or significant permanent auditory disruption. Most likely effects are related to Temporary Threshold shifts (TTS) and potential behavioral effects; which may be experienced at varying distances from the VSP airgun source, thus the potential impact for these effects is considered to range between **Negligible to Minor**.

5.5.8 FA1: Impacts on marine fauna due to the change of seawater quality due to discharge of effluents and waste

The discharge of effluents from seismic fleet may lead to temporary changes on the distribution of fish species due to opportunistic feeders being attracted to organic discharges as a potential source of food. Any change derived from this is considered to be small and within natural variation given the limited amount of the organic content introduced and the expected absence of significant changes in planktonic communities. Other effects on fish could

be related to toxicity from the depletion of oxygen as the biological demand increases (e.g. from the residual chlorine content from black waters). Similarly, secondary impacts could arise if plankton or fish communities are affected by these changes as that could lead to potential feeding problems or intoxication from contaminated prey. Nevertheless the effects of changes in water quality on plankton and fish have been assessed as negligible and no changes in fish or plankton populations are expected.

However, given the mitigation and control measures for discharges, the relatively small volumes discharged, their rapid dilution and dispersion in the marine environment (leading to predicted significance of negligible impacts on water quality), and the ability of mobile fish/mammal species to avoid polluted waters, the impact is considered **Negligible**.

5.5.8.1 Descriptors and residual impact

Impact descriptors for waste discharges on marine fauna

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Occasional	Local	Small	Low	**Negligible**

Resulting impacts on marine water quality and marine flora where assessed negligible. Similarly, impacts on marine fauna are likely to be **negligible.**

5.5.9 M1: Impacts on marine mammals linked to the physical presence of the MODU, its mobilization and demobilization and the movement of the support vessels.

In addition to the impacts linked to underwater noise emissions (see Section 5.5.7), the physical presence of the MODU and movements of support vessels can have potential impacts on the Caspian seal, which is the only mammal species found in the Caspian Sea. These impacts may also be due to collision with moving vessels or the potential use of anchored structures by these.

Impacts related to physical presence are expected to occur primarily in the offshore environment, in the area directly around the MODU. It is anticipated that activities will last for approximately 60-90 days and will involve the MODU and auxiliary vessels. Vessels will be involved in the ship-to-shore transfer of drill cuttings and muds and crew changes during well drilling, extending the impact into the near-shore and coastal environment.

The potential behavioural modifications exhibited by marine mammals that are close to physical structures in or near their habitat may include:

- Movement away from the area.
- Avoidance of the area and/or obstruction of normal movement patterns.
- Mother/pup separation.
- Interrupted feeding.

Given the broad movement ranges and mobility of the Caspian seals, it is expected that they may be somewhat habituated to the presence of vessels (including the use of structures for resting). In addition with the mitigation measures applied by the Project disturbance to Caspian seals is not expected to be significant.

The movement of vessels implies also an increased risk of collision. The consequence of a vessel collision with a seal may range from minor disturbance or injury to a worst case of fatality. This risk is considered limited given the relatively low volume of Project related traffic and the speed that Project vessels are expected to move at (typically less than 12 knots). In fact, both behavioural effects and risk of collisions are usually most profound in the case of small fast-moving vessels which frequently change direction, in contrast to the large and relatively slow moving support vessels associated to the Project.

5.5.9.1 Mitigation measures

Measures to be implemented by the Project to mitigate disturbance impacts and reduce the risk of Project vessels collision with marine mammals include:

- Vessels will not be allowed to intentionally approach marine fauna, such as Caspian seals, and, where practicable, will alter course or reduce speed to further limit the potential for disturbance.
- Maintain a record of Caspian seals observed during the drilling activities to gain a better understanding of their presence in the area.
- Use of designated navigation channels where applicable and comply with speed and wake restrictions.
- Check that potential structures that may be used for resting by Caspian seals are designed to avoid their entrance/presence on these.

- The Project will ensure that vessel engines are not left to idle unnecessarily. Vessels will be powered down to safe operational levels.

5.5.9.2 Descriptors and Residual impact

Impact descriptors for physical presence of MODU/vessels

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Often	Local	Small	Medium	**Minor**

Given the expected timeframe and location of the drilling activities (i.e. winter, deep offshore) the Caspian seal is not likely to be present. Considering that seals, if present) may be potentially exhausted from spring migration and actively searching for food in the area, the potential impact from a vessel strike may be probable but will be reduced through the avoidance of seal feeding/resting areas adjacent to the coast to the extent possible, hence impact magnitude is assessed as small. Overall, the receptor sensitivity is considered medium and the significance of the impact is thus assessed as **Minor.**

5.5.10 IL1: Impacts on fauna due to artificial lighting.

The presence and movement of the MODU/vessels may have behavioural impacts on marine fauna, causing them to avoid or to be attracted to the area. This impact will occur primarily in the offshore environment, but may extend to the near shore and coastal environment due to the movements of the support vessels involved.

In particular, there may be impacts on pelagic fish species which are known to be attracted by light (Castro Hernández, 1991); Kilka fisheries in the southern Caspian use a funnel net with light during night-time hours to attract fish (Kideys, 2001). Therefore, nocturnal activity that includes lightning may attract shoals of these species towards the vessels if they are stationary or very slow moving. This attraction effect also applies to seabirds.

Birds typically migrate at night and are attracted to artificial light during their migrations. Nocturnally migrating birds have been known to die or deplete their energy reserves during migration as a result of encountering artificial light sources (Poot, 2008). The level of impact, however, is dependent on the location of offshore lighting, time of year, and weather conditions. For example, birds tend to be attracted to offshore lighting during poor weather, i.e. overcast nights (OSPAR 2009b).

Light emissions from the vessels involved in the Project during the night may be visible at considerable distances, depending on weather and sea conditions. Birds that are attracted to the light will expend energy reaching the vessels, but this will only cause a small increase in overall energy expenditure to the individual. As this type of behaviour is usually seen during nights with fog and/or >80% cloud cover (Van de Laar, 2007) the frequency and duration of periods when this impact may occur may be significant.

Supply vessels passing through and near coastal areas may disturb individual or groups of birds in sensitive coastal habitats such as stopover areas where feeding, resting and breeding takes place. The “Shahdidi spit” important bird and biodiversity area (IBA), is located about 15 km from the western boundaries of the ADUA exploration area and has a considerable number of seabird trigger species. It is expected that birds may be found in small numbers as they cross the area and in some cases may be attracted by vessels and offshore infrastructures such as platforms as these are often attracting fish as well.

5.5.10.1 Mitigation measures

Measures to be implemented by the Project to mitigate disturbance from lighting of Project vessels shall include:

- Project vessels to avoid sailing through areas with large aggregations of seabirds where possible.
- Project will control and reduce overall light intensity to the extent practicable, without adversely affecting maritime or operational safety..

5.5.10.2 Descriptors and Residual impact

Impact descriptors for artificial lighting

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Often	Local	Negligible	Medium	**Negligible**

The sensitivity of the seabirds is considered to be medium. The magnitude of the impact on the seabirds is considered to be negligible, taking into account that the disturbance will be very localised, only affecting a small number of birds offshore, and will be short term, occurring periodically throughout the Project. The resulting impact significance is considered to be **negligible.**

5.5.11 PA1: Impacts on sensitive coastal areas due to the support operation from coastal facilities

Support operations (supply vessel/ helicopter transport) to Project will be conducted from an existing shore base in Baku. Base location is still to be determined but no base construction activity is planned.

The closest protected area is the Absheron National Park, which is located some 22.7 km to the west from the ADUA exploration area boundaries and more than 50 km from the Aypara-1 well. Likewise, the Absheron archipelago and Pirallahi bay and Shadidi spit IBAs, though not officially protected are located about 6.5 and 15 km from the ADUA exploration area respectively and more than 30 km from the well. The main sensitivity of these internationally recognised areas are the avifauna, thus prospective helicopter flight paths routes will be defined in accordance with relevant authorities to avoid to the extent possible sensitive areas where birds are known to aggregate. Other project impacts on birds have been discussed in the lighting impact section (Section 5.5.10).

The Project will not overlap with this National Park nor the IBA's, except in case of oil spills (see Section 5.8). Onshore facilities for this project include the supply which will be in Baku, and will include storage and maintenance activities, office work and treatment of muds. These activities will be very likely carried out within the existing port area, where other industrial activities are present and the absence of any coastal or marine protected areas in the vicinity of Baku port, no impact on sensitive coastal areas is expected from onshore activities in this base.

5.5.11.1 Descriptors and Residual impact

Impact descriptors for protected areas

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance
Indirect	Temporary	One-off	Local	Negligible	Medium	**Negligible**

Considering that the Project will not exert any significant impact on the biodiversity values for which the protected areas where designated the impact is assessed as **negligible**.

5.5.12 FS1: Impacts on Fisheries due to the presence and operation of the MODU and support vessels

The presence of project elements may cause impacts related to routine discharges of the MODU, auxiliary vessels and ballast water discharge, as well as impacts due to light emissions.

No impact derived from the discharge of drilling wastes (i.e. muds and cuttings) on pelagic commercial species has been considered given the location of the well in a relatively deep offshore area (circa 150 m depth). Only demersal and benthic populations could be temporary affected due to smothering effects and the plume of suspended solids generated and no fishing activities are expected on such resources at those depths. In addition these effects are of temporary nature and spatially limited to the immediate vicinity of the well (effects would be expected within approximately 1 km radius from the well), and are thus considered as not significant on commercially exploited species.

Routine discharges of treated black/grey water will take place from vessels involved in the project. These discharges will be mainly formed by organic substances.

As already assessed, the volumes of wastewater expected to be discharged by the Project will not exceed 64 m^3/day (considering the maximum workforce involved in the project, this is 200 people). As a result, temporary changes to the distribution of fish species may occur as opportunistic feeders are attracted to organic discharges as a potential source of food. The magnitude of changes expected will be small and within natural variation, and therefore considered to be negligible.

The discharge of organic matter could also lead to an increase of phytoplankton production that would, eventually, lead to an increase in fish biomass. However, it could also result in algal blooms that could affect fish populations. The toxicity of some discharges (e.g. drainage water), could also potentially have harmful impacts on the health of fish species.

Small pelagic fish species (e.g. Clupeids of the genera *Clupeonella*) which inhabit the surface layers of the water column are likely to be impacted by the presence of the MODU and auxiliary vessels as many pelagic fish species are known to readily associate with floating objects (known as Fish Aggregating Devices) (Røstad et al. 2006). Fish may be attracted also to the artificial lights on the Project vessels, as light acts as a stimulus for many fish species. Fish aggregations around the drilling platform and support vessels are therefore likely to occur on night time, aggregating in the vicinity of these vessels.

It must be noted also that the main pelagic species found in offshore locations in the Caspian Sea that are targeted by commercial fisheries are not expected to be permanent residents in one area, and those attracted to the drilling platform are not likely to spend significant periods of time under it. The effect is considered insignificant considering the temporary nature of the residency of fish near these.

The closest important area for the fishing industry is named Oil rocks and is located about 27 km south from the Aypara-1 well. Fishing fleet interaction may span from vessel/vessel interactions, as well as interaction with fishing gear, though these will be in major part expected with the supply vessel navigation rather than the MODU. In terms of fishery activities, increased vessel traffic as a result of Project development increases the risk of maritime accidents involving commercial fishing. Though the MODU will be mostly at a fixed location, supply vessel transit will be continuous. Furthermore, an exclusion area of 500 m around the MODU and transport vessels will be established for safety and security reasons.

5.5.12.1 Mitigation measures

Measures to be implemented by the Project to mitigate impacts on fisheries include:

- Mitigation described in Impact W1 (Section 5.4.2).
- Screen mesh will be used in any MODU intake pipe to avoid fish entrainment.
- In order to minimise impacts to commercially exploited species derived from physical presence of project vessels and light emissions, the Project will control and reduce overall light intensity to the extent practicable, without adversely affecting maritime or operational safety.
- An exclusion zone of 500m around the MODU will be enforced to ensure safety distance with other sea users such as fishing boats.
- Notify relevant authorities, fishing associations and industrial fishermen of drilling activities, dates, location, exclusion areas…
- Ensure procedures are in place for dealing with claims in the event of damaged fishing gear.

5.5.12.2 Descriptors and Residual impact

Impact descriptors for fishery interactions.

Type	Duration	Frequency	Extent	Magnitude	Sensitivity	Significance

Direct	Temporary	Often	Local	Small	Low	**Negligible**

Considering the offshore location, only commercial fishing vessels have the potential to occur on the Project area thus receptor sensitivity is considered low, on the other hand the magnitude of the impact is considered to be small given the highly localized and stationary Project setting and the limited length of the project (60-90 days). The significance of the impact if thus assessed as **negligible.**

5.5.13 FS2: Impacts on Fisheries due to the generation of noise emissions during the seismic survey activities

Any Project-related reduction in the fish stock in the area as a result of Project activities is considered very unlikely, though temporary displacement of pelagic shoals may occur in the vicinity of the drilling/VSP activities. The main area of potential impact is generally related to interactions with fishing and shipping boats. This is the area of focus for mitigation. In summary, the Project is unlikely to significantly affect fishing activities in the wider Project area. This impact is linked to impact F1 on fish, considered of **Negligible** importance (see Section 5.5.6) and fish are expected to benefit from underwater noise mitigation set for mammals (e.g. soft starts - see Impact M4).

5.5.14 NT1: Impacts on Navigation, Traffic and Sea users

The transport of crew and goods as part of the project activities will increase shipping traffic in the area, which could increase the risk of collision between vessels. The presence of the MODU may also potentially interfere with shipping and navigation, due to the presence of its 500 m exclusion zone.

Maritime transport plays a significant role in the economic development and prosperity of Azerbaijan and Baku is the biggest seaport in the Caspian Sea. The ADUA exploration area is located in an area of intense maritime traffic due to the connection routes between Azerbaijan and neighboring countries (especially Turkmenistan). The intense maritime traffic is mainly linked to oil and gas vessels, but also to fishing boats (see above), commercial trade and ferry services/passenger. Potential disruption or interference with these all these sea users may occur during project activities.

During the Project, movements of the MODU will be limited to mobilization and demobilization as well as support vessels movement. The potential impacts on other sea users are estimated to be limited, given the short duration of the Project (60-90 days) and the limited number of vessels compared to the existing traffic conditions within the region. With regards to the physical presence of the MODU, the potential impacts on other sea users are also estimated to be limited due to the small extent of the exclusion zone.

5.5.14.1 Mitigation measures

To reduce the potential for this impact, the following mitigation measures will be implemented:

- Notification to relevant marine authorities and advanced notice to mariners prior to commencement of the drilling program including notification of the establishment of the exclusion zone.
- Provision of data for inclusion on nautical charts.
- Vessels will use designated and relevant navigation channels where applicable and comply with designated exclusion zones.
- Navigational marks and lights on the MODU.
- Safety exclusion zone will be monitored for the safety of the facility and other users of the area.
- Enforce specific procedures to prevent excessive speeds and rapid change of direction for vessels when operating in the field to reduce risks of collisions.
- Ensure that vessels are equipped with collision risk reducing devices i.e. navigational lights and beacons, marker buoys, etc.

5.5.14.2 Descriptors and Residual impact

Impact descriptors for maritime navigation

Type	Duration	Frequenc	Extent	Magnitude	Sensitivity	Significance
Direct	Temporary	Often	Local	Small	Medium	**Minor**

Considering the maritime traffic intensity in the Project area, the relatively fixed location of the MODU, temporary duration of the Project (60-90 days) together with the mitigation measures described, the potential Project impacts to maritime traffic during the survey are assessed as **Minor.**

5.6 Summary of Impacts from Routine Events

The evaluation of impacts associated with routine events is presented in Table 5.6.

Table 5.6: Summary of Impacts and Mitigation measures for Routine events of the Aypara-1 well drilling

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual impact
Air Quality and Climate Change	Routine MODU operation, and support vessels	Potential reduction in localized air quality and contribution to greenhouse gases	• Advanced planning to ensure efficient operations, including the planning of vessels trip to acquire supplies; • Ensure MODU has valid Engine International Air Pollution Prevention Certificate in place (marine diesel engines >130kW). • Appropriate maintenance policies and procedures of equipment and generators will be followed and its implementation audited by an Equinor representative; • Regular monitoring of fuel consumption; • Engines and equipment will be switched off when not in use; • Use of low-sulphur marine fuel where possible; and • Compliance with Tier II of revised MARPOL 73/78 Annex VI which sets limits on sulphur dioxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances.	**Negligible**

Seawater Quality	Routine and operational discharges during the project (i.e. black and grey water, bilge water, ballast, etc.). Drilling and installation of well infrastructure, including the discharge of cuttings and muds	Potential localized reduction in water quality, including increased turbidity and BOD Potential introduction of alien invasive species from ballast water discharges	• The vessels will be equipped with a sewage treatment unit compliant with MARPOL Annex IV regulations, with International Sewage Pollution Prevention Certificate (“ISPPC “); • Discharges will comply with MARPOL Annex IV and the Azerbaijani law; • Limited quantities of water released during weekly testing of the fire water pumps, with no chemical dosing. • Bilge and drainage oily wastewater will be contained onboard and transported to shore for disposal; • Maintenance of an Oil Record book and a vessel’s logbook. • Use and discharge of drill fluids and cuttings, completion fluid or cement products will be subject to a Chemical Management Plan. • All Ballasting activities will comply with the International Convention for the Control and Management of Ship’s Ballast Waste and Sediments (BWM Convention), including: ○ all ballast water will be stored in specifically designated tanks to avoid cross contamination and remain free of oil; ○ ballast water discharges will be continuously monitored for oil sheen and in case of visibly oil contaminated ballast water discharges will be stopped; ○ ballast water exchange will take place at least 200 nautical miles from nearest land and at depths over 200 m; ○ any ballasting operations will be logged in a record book; and ○ the vessels will have a Ballast Water Management Plan (BWMP) in place. • SOBM on cuttings will be reduced as far as is achievable with current technology. Mud on cuttings will not exceed an average of 6.9% before disposal; • The usage and discharge of drilling muds and fluids during drilling activity will be continuously monitored. • Components of water based drill fluids will be either categorized as Low Toxicity (based on OSPAR's OCNS) or listed as a Plonor product under OSPAR.	**Negligible**

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual impact
			Contractor will aim at minimizing the number and quantities of additives and will aim selecting additives with a good environmental behaviour. • Barite used for WBM will follow the maximum allowable content of heavy metals (<1mg/kg and cadmium <3mg/kg dry weight). • Ecotoxicological analyses (as available from published literature) of the proposed drilling chemicals will be considered on the final selection of additives for the drilling fluid; • Cuttings will be discharged by a caisson located at least at a sufficient depth to avoid impact to surface waters. • Selection of a pipe dope that is heavy metal free to avoid introduction of heavy metals. • Cooling water discharge location/depth will be selected to ensure that temperature 100m from the discharge point will be no greater than 3ºC above ambient water temperature (IFC EHS Guidelines Oi l& Gas Development - Offshore). • No chemicals injected into cooling water system. Concentrations of copper and aluminium in water will be below international Environmental Quality Standards (EQS) and national Maximum Permissible Concentration (MPC) levels.	

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual impact
Seabed and Benthic communities	Drilling and installation of well infrastructure, including the discharge and deposition of cuttings and muds Vertical Seismic Profile activities.	Generation of noise emissions Loss of seabed, habitats and benthic fauna in the direct footprint of the well and where cuttings and cement are deposited Potential localized and short term increase in total suspended solids (TSS) in the water column and near the seabed Impacts on sediment quality and benthic organisms from contaminants contained in WBM directly discharged to seabed and SBM coated in cuttings discharged from the MODU	• Use and discharge of drill fluids and cuttings, completion fluid or cement products will be subject to a Chemical Management Plan. • No discharge of SOBM or associated cuttings. SOBM and associated cuttings will be returned to shore for treatment and disposal. • Components of water based drill fluids will be either categorized as Low Toxicity (based on OSPAR's OCNS) or listed as a PLONOR product under OSPAR. Contractor will aim at minimizing the number and quantities of additives and will aim selecting additives with a good environmental behaviour. • In the event that new drilling fluids are used during drilling operations, drilling fluid toxicity will be tested under Caspian Specific Ecotoxicity tests or similar procedures. • Barite used for WBM will follow the maximum allowable content of heavy metals (<1mg/kg and cadmium <3mg/kg dry weight). • A mud recovery system will be available to reuse WBM as needed to minimize mud consumption (i.e. solids control equipment - shakers & centrifuge - will separate cuttings from the mud system and maximise recovery and re-use of drilling mud). Discharge to sea will be via a caisson at least 15m below sea surface. • WBM and cuttings will only be discharged after treating fluids to reach PSA specified chloride levels (<4 times ambient concentration of receiving waters). • A pre-drill and post-drill environmental survey with a remote operated vehicle (ROV) will be carried out in the vicinity of the well site to show evolution of recovery. • Hydraulic fluid used in BOP and function tests is biodegradable and has been formulated to meet CEFAS and OSPAR requirements. Only small volumes will be released at the seabed.	**Negligible** (Underwater sound) **Negligible** (Seabed discharges)

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual impact
Plankton	Routine and operational discharges during the project (organic liquid/solid discharges)	Potential localized increase in organic matter and reduction in water quality	Applicable embedded measures related to water quality will apply.	**Negligible**
Fish	Routine operation of MODU and support vessels. Vertical Seismic Profile activities.	Impacts due to the generation of noise emissions Secondary impacts due to changes in water quality	• Applicable embedded measures related to Noise generation will apply (see summary of impacts on marine mammals); • Applicable embedded measures related to water quality will apply.	**Negligible**

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual impact
Marine Mammals	Physical presence of the MODU and support vessels, including their movements Operation of MODU and support vessels Vertical Seismic Profile activities.	Disturbance from the presence of Project vessels; Potential collision risk with Project vessels; Impacts due to the generation of underwater noise emissions Secondary impacts due to changes in water quality	Embedded measures related to Noise generation: • Implementation of pre-search and soft start / ramp up procedure as recommended by the Joint Nature Conservation Committee (JNCC, 2017) guidelines, during VSP activities; • Good maintenance procedures on vessel engines Measures related to rest of impacts • Vessels will not be allowed to intentionally approach marine fauna, such as Caspian seals, and, where practicable, will alter course or reduce speed to further limit the potential for disturbance. • Maintain a record of Caspian seals observed during the drilling activities to gain a better understanding of their presence in the area. • Use of designated navigation channels where applicable and comply with speed and wake restrictions. • Check that potential structures that may be used for resting by Caspian seals are designed to avoid their entrance/presence on these. • The Project will ensure that vessel engines are not left to idle unnecessarily. Vessels will be powered down to safe operational levels. Applicable embedded measures related to water quality will apply.	**Negligible to Minor** (physical presence, risk of collision and noise generated by VSP) **Negligible** (secondary impacts due to changes in seawater quality)

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual impact
Seabirds	Operation of Project vessels	Disturbance from the presence and movements of Project vessels/helicopter, including lighting. Secondary impacts due to changes in water quality	• Should helicopter operations be required, the flight paths routes will be defined in accordance with relevant authorities and avoiding, to the extent possible, sensitive coastal areas and islands around the Absheron peninsula. • Project will control and reduce overall light intensity to the extent practicable, without adversely affecting maritime or operational safety. • Project vessels to avoid sailing through areas with large aggregations of seabirds where possible.	**Negligible**
Protected areas	Onshore operations	Disturbance to sensitive coastal areas from onshore activities	Applicable embedded measures related to water quality will apply.	**Negligible**

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual impact
Navigation, Traffic and Sea user	Project vessels movements	Impacts to maritime traffic Increase of collision risk	• Notification to relevant marine authorities and advanced notice to mariners prior to commencement of the drilling program including notification of the establishment of the exclusion zone. • Provision of data for inclusion on nautical charts. • Vessels will use designated and relevant navigation channels where applicable and comply with designated exclusion zones. • Navigational marks and lights on the MODU. • Safety exclusion zone will be monitored for the safety of the facility and other users of the area. • Enforce specific procedures to prevent excessive speeds and rapid change of direction for vessels when operating in the field to reduce risks of collisions. • Ensure that vessels are equipped with collision risk reducing devices i.e. navigational lights and beacons, marker buoys, etc. •	**Minor**

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual impact
Fisheries	Physical presence and operation of Project vessels Vertical seismic profile activities	Impacts due to the presence of MODU and associated exclusion area for fisheries Impacts due to the generation of underwater sound emissions Secondary impacts due to changes in water quality	• Mitigation measures are expected to be the same as those described for water quality (see Impact W1). • Applicable embedded measures related to Noise generation will apply (see summary of impacts on marine mammals); • Screen mesh will be used in any MODU intake pipe to avoid fish entrainment. • In order to minimise impacts to commercially exploited species derived from physical presence of project vessels and light emissions, the Project will control and reduce overall light intensity to the extent practicable, without adversely affecting maritime or operational safety. • An exclusion zone of 500m around the MODU will be enforced to ensure safety distance with other sea users such as fishing boats. • Notify relevant authorities, fishing associations and industrial fishermen of drilling activities, dates, location, exclusion areas… • Ensure procedures are in place for dealing with claims in the event of damaged fishing gear	**Negligible** (presence of Project vessels) **Negligible** (impacts from underwater sound and from water quality changes)

5.7 Cumulative Impacts

Cumulative impacts are the result of the combined effect of a number of individual impacts, which may be of no significance when on the scale of a single occurrence.

The potential for the Project to have cumulative impacts with other activities and with known or committed developments taking place in the area at the same time has been considered. This Section presents the assessment of the cumulative impact risk associated with the main receptors studied in the previous sections.

Activities in the vicinity of the ADUA exploration area have the potential to cause cumulative impacts. The activities considered in assessing offshore cumulative impacts may include:

- The oil and gas exploration activities in the vicinity of the ADUA exploration area; and
- The shipping and fishing related traffic in the ADUA area.

5.7.1 Interference with shipping and navigation of other sea users

The vessels taking part in the Project activities will increase shipping traffic in the area, which could increase the risk of collision between vessels. Though no other similar drilling projects are envisaged to occur simultaneously in the area, considerable O&G related traffic/activity is expected. However, the limited number of vessels involved in the survey (up to 4 vessels), the limited duration of the Project and the relatively low density of shipping traffic in the area is not expected to result in a significant increase in the shipping activity in the area and therefore the impact due to the interference with other sea users will remain as Minor. No particular mitigation measures in addition to those already reflected in Section 5.5.14 are required.

5.7.2 Noise disturbance to marine fauna

Cumulative impacts linked to submarine engine noise generated by other sea users together with the one generated by Project activities could potentially be significant if there was a large amount of shipping traffic in the Project area, or if other drilling activities were taking place in neighbouring blocks/areas over the same period.

For the current Project, drilling activities known to be planned in nearby Blocks that may potentially occur at the same time may include the Azeri Central East (ACE) project located some 30 km to the southeast of the ADUA

area; noise from routine drilling activities (envisaged to start late 2019 until end of 2020; though VSP is not envisaged in this aforementioned Project) may lead to relatively increased underwater sound levels throughout the wider offshore area. Other activities such as D230 well drilling to the North of the Area and Karabagh KPS-4 well drilling are envisaged to be developed before/after the present Project. It is likely that there may be simultaneous drilling activities occurring along neighbouring areas to the ADUA exploration area; nonetheless these activities where considered to have a minor negative effect (BP, 2019) and are at a considerable distance from the Aypara-1 well location. As a result, cumulative impacts from noise disturbance are considered to be **negligible**.

5.7.3 Atmospheric emissions

Atmospheric emissions result from the combustion of diesel fuel by the various vessels (including the MODU) taking part in the Project. Taken cumulatively, these emissions are small, intermittent and localised and are not expected to constitute any significant deterioration of the air quality in the Project area (see Section 5.4.1). Other possible contributors to air emissions are the other vessels crossing the area, especially those related to O&G activities (e.g.at the ACE Project location). However, the cumulative impact of emissions generated by all shipping traffic in the area should not lead to any significant deterioration of the air quality, though there may be potentially localized exceedances in areas where traffic is most intense; and no particular mitigation or management measures (beyond those already in place for Project activities detailed in previous sections i.e. Section 5.4.1) are required to address this cumulative impact which is assessed as **negligible**.

5.7.4 Waste generation and effluent discharge

The Project's waste generation (including both liquid and solid waste, whether hazardous or not) will be localised, of small scale, and limited in time. Only offshore drilling activities of comparable characteristics as the Aypara-1 drilling would be expected to generate muds/cuttings (e.g. D230, KPS-4; ACE drilling activities). No other significant waste generators have been identified in the vicinity of the Project area and the cumulative impacts linked to the generation and management of waste by other sea users is considered to be **negligible**.

5.8 Accidental Events: Oil Spills

Accidental events occur under abnormal operations and present non-routine and unplanned environmental risks. Prevention is the primary emphasis in any discussion of the potential environmental impacts of accidental events and it is important to consider the likelihood of an event as a key factor.

The risk of an oil spill into the marine environment is inherent in all offshore oil and gas developments. As a result, this section summarizes the results of the Oil Spill Risk Assessment undertaken by Oil Spill response Limited (OSRL) for the Aypara-1 Exploration Well (OSRL, 2019a). The potential impacts for unplanned events include the scenarios described in Table 5.7.

Table 5.7: Scenarios considered in the Oil Spill Risk Assessment (Source: OSRL, 2019a).

Scenario	Description	Discharge Volume
Major Spills – blowouts		
S1*	Subsea Blowout – summer	1,125 Sm^3/d for 21 days (23,625 m^3)
S2*	Subsea Blowout – autumn	1,125 Sm^3/d for 21 days (23,625 m^3)
S3*	Surface (topside) Blowout – summer	1,125 Sm^3/d for 21 days (23,625 m^3)
S4*	Surface (topside) Blowout – autumn	1,125 Sm^3/d for 21 days (23,625 m^3)
S5*	Worst case surface blowout - autumn	1,125 Sm^3/d for 105 days (118,125 m^3)
S6*	Subsea Blowout – winter	1,125 Sm^3/d for 21 days (23,625 m^3)
S7*	Worst case surface blowout - winter	1,125 Sm^3/d for 105 days (118,125 m^3)
Major Spills – inventory spills		
S8*	Marine Diesel (surface) – summer	1,000 m^3 in one hour
	Subsea blowout - winter	,125 Sm3/d for 21 days (23,625 m3)
	Worst case surface blowout - winter	1,125 Sm^3/d for 105 days (118,125 m^3)
S9	Well release	24 m^3 in 15 minutes
S10	Oil Based Mud	1,000 m^3 in one hour
S11	Water Based Mud / Chemicals	1,000 m^3 in one hour
Minor Spills from drillship or FSV (Fast Support Vessel)		
S12	Diesel	< 50 m^3 instantaneous
S13	Oil Based Mud	< 50 m^3 instantaneous
S14	Water Based Mud / Chemicals	< 50 m^3 instantaneous
S15	Hydraulic Oil	< 25 m^3 instantaneous
*: indicates that this scenario has been modelled using a stochastic modelling (OSRL, 2019)		

5.8.1 Methodology

The modelling of the spills and evaluation of risks require the definition of several elements:

1. Characteristics of the oil: this is a key factor in determining the oil's behaviour in the environment and the associated response. As this is an exploration well the exact oil properties are not known. "Fram" Crude Oil has been identified as a suitable surrogate. Fram forms a stable and viscous emulsion. It is predicted to be relatively persistent at the sea surface, with a reduced potential for chemical dispersion. Fram is a paraffinic oil that shows evaporative losses of around 15 - 30% after one day (depending on wind speed and temperature).

2. Spill scenarios: the scenarios or "events" that should be modelled need to be defined based on the type of project. The scenarios typically reflect what in the context of the project could be considered as worse situations.
3. Hydrodynamic modelling: defining the conditions of the water body where the spill would occur is a key element. The modelling incorporates the sea currents, winds and other parameters that are key to define the behaviours of any type at any given moment.

For oil spill modelling there are several commercial options but in all cases a Stochastic modelling is carried out. Stochastic modelling is the result of overlapping multiple simulations of the same spill. The output is a probabilistic map where the probability of oiling is presented for all areas that have been theoretically oiled over under any of the multiple runs of the modelling. In addition the modelling also provides track of the fate of released chemicals into the various phases and forms including the surface slick, shoreline, atmosphere, water column (dissolved or submerged liquid droplets), and sediment deposition using the following processes: advection, spreading, evaporation, dispersion, dissolution, entrainment, emulsification, photo-oxidation, sinking, sedimentation, and biodegradation.

Scenario seven (S7; worst case surface blowout - winter) has been chosen as the worst case scenario (Figure 5.3). It should be noted that stochastic maps are often misinterpreted as the potential impact of a single oil spill originating at this well. Stochastic maps, however represent many individual trajectories post-processed for each scenario. Full details and maps on: Average oil-on-water thickness; On-water arrival time; Probability of shoreline oiling; Quantity of shoreline emulsion stranding and Shoreline arrival time are provided in the Oil Spill Modelling Report for Aypara Exploration Well (OSRL, 2019b).

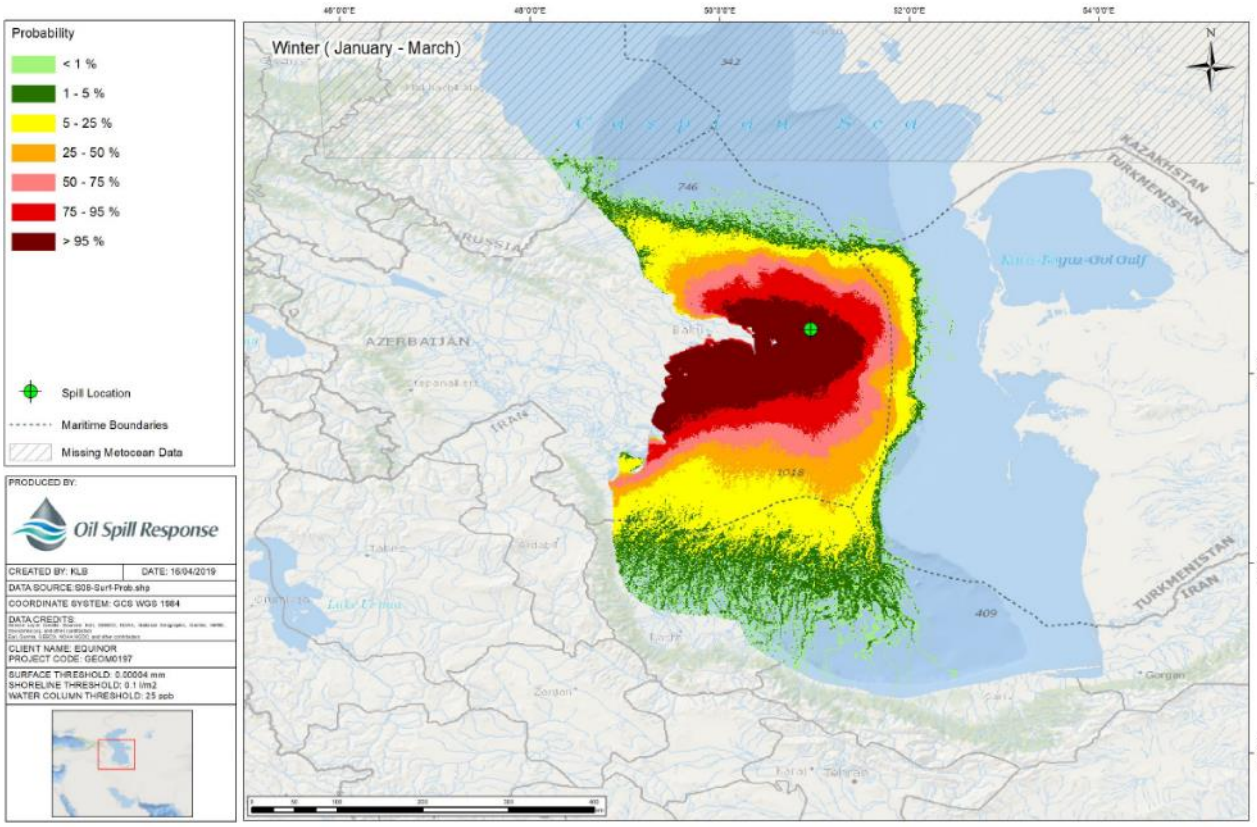

Figure 5.3: Surface Probability for the Worst-Case Scenario (OSRL, 2019b)

With information on coastal sensitivities, or other areas that may be located within the study area, and the modelled fate of spilled oil, a consequence analysis (e.g. OSRL's Risk Assessment report) has been carried out and is summarized in the next section. Finally, the oil spill response mechanisms and procedures for managing oil spill events are detailed. These will subsequently be presented in more detail in an Oil Spill Response Plan to be developed in advance of commencement of operations.

5.8.2 Environmental Risk Assessment

Environmental risk is a combination of the likelihood of the spill occurring and the magnitude of consequence (considering sensitivity/value of receptor and size of the potential event. To this assessment, a further probability factor: namely the likelihood of the event reaching a sensitive receptor, needs to be added. The criteria used in determining the likelihood of an unplanned event is presented in Table 5.8. The criteria used to designate the severity or magnitude of an accidental event is presented in Table 5.9.

Table 5.8: Definition of Likelihood Categories (Equinor, 2019)

Rating	Probability	Probability
1	10^{-6} - 10^{-5}	< 0,001%
2	10^{-5} - 10^{-4}	0,001 - 0,01%
3	10^{-4} - 10^{-3}	0,01- 0,1%
4	10^{-3} - 10^{-2}	0,1 - 1%
5	10^{-2} - $5{\cdot}10^{-2}$	1 - 5%
6	$5{\cdot}10^{-2}$- 0,25	5 - 25%
7	0,25 – 0,5	25 - 50%
8	> 0,5	> 50%

Table 5.9: Severity Criteria for Accidental Events (Source: OSRL, 2019a)

Impact Rating	People's health and safety	Environment
1– 3 / Minor	Medical treatment, injury, event or work-related illness with need for treatment or with temporary health effect	Very limited impacts (restitution time < 1 month) on populations (local), ecosystems or environmentally sensitive areas of local importance. Local impact on individual organism level
4 / Moderate	Injury, event or work-related illness that result in brief absence or restricted/substitute work or some functional impairment. Medically manageable	Short term impacts (restitution time <1 year) on populations (local), ecosystems or environmentally sensitive areas of local importance
5 / Serious	Serious injury, event or work-related illness with absence from work, restricted work or permanent health effects. High level of medical treatment, serious functional impairment	Short term impacts (restitution time <1 year) on populations (national or regional), ecosystems or environmentally sensitive areas of national or regional importance -Medium term impacts (restitution time 1-3 years) on populations (local), ecosystems or environmentally sensitive areas of local importance
6 / Severe	1-3 fatalities or work-related illness/ exposure with significant life shortening effects	Medium term impacts (restitution time 1-3 years) on populations (national or regional), ecosystems or environmentally sensitive areas of national or regional importance Long term impacts (restitution time 3-10 years) on populations (local), ecosystems or environmentally sensitive areas of national importance
7* / Major	4 - 20 fatalities or work-related illness with significant life shortening effects -Larger parts of installation/plant / office	Large oil spill in populated area. Long term impacts (restitution time 3-10 years) on populations (global or national), ecosystems or environmentally sensitive areas of international or national importance.

		Very long or permanent impacts (restitution time > 10 years) on populations (regional), ecosystems or environmentally sensitive areas of regional importance
8* / Catastrophic	20 - 200 fatalities -Majority of installation/plant / office	Large oil spill in densely populated area. Very long or permanent impacts (restitution time >10 years) on populations (global or national), ecosystems or environmentally sensitive areas of international or national importance
9* / Extreme	-More than 200 fatalities -Loss of installation/plant / office	Long lasting oil blow-out

The two topside scenarios 3 and 4 are not considered further in the risk assessment as they are conservatively represented by Scenarios 1 and 2, so the six scenarios considered in the risk assessment where
:

- Scenario 1. Subsea blowout of 1,125m^3 of oil per day, for 21 days during summer (July-September)
- Scenario 2. Subsea blowout of 1,125m^3 of oil per day, for 21 days during autumn (October-December)
- Scenario 5. Worst case topside blowout of 1,125m^3 of oil per day, for 105 days during autumn (October-December)
- Scenario 6. Subsea blowout of 1,125m^3 of oil per day, for 21 days during winter (January - March)
- Scenario 7. Worst case topside blowout of 1,125m^3 of oil per day, for 105 days during winter (January - March)
- Scenario 8. Topside diesel spill of 1,000m^3 over 1 hour, during summer (July-September)

Based on the above criteria the Risk matrix can be elaborated in order to assess the unplanned events. This matrix is presented in Table 5.10. The full description is available in the Oil Spill Assessment report's Risk register.

Table 5.10: Risk Matrix – Initial risks (pre-mitigation) (Source: OSRL, 2019a)

	Probability / Likelihood							
Consequence	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1, 2, 3		S10, S11	S9	S13, S14	S12, S15			
4, 5		S8						
6								
7		S1, S2, S6						
8, 9		S5, S7						

Risk Level	Actions
	Intolerable and must be reduced
	Further risk reduction actions required
	ALARP Zone (As Low As Reasonably Practicable): need to demonstrate that likelihood of occurrence has been reduced to as low as reasonably practicable and that contingency measures are in place to minimize consequence
	Manage for continuous improvements by application of best practice

The severity of potential environmental effects will depend on a range of factors, such as the size and duration of the spill, the duration of exposure, the time of year, weather and sea conditions and the extent of weathering of the oil. These factors affect the toxicity of the oil and how amenable it is to natural and chemical dispersion, and to clean-up once on shore. In addition, the general condition and life stages of individuals potentially affected at the time will influence the resilience they exhibit to possible oiling, and the speed and extent of recovery.

The following assessment is based on a general understanding of known oil spill effects on the types of habitats, communities and species that occur in the region.

5.8.3 Evaluation of Potential Consequences

In the event of a well blowout or a hydrocarbon spill, the marine environment offshore and coastal shoreline of the Caspian Sea would be impacted. Offshore, there will be localized impacts to water quality, however, the more significant impacts would be to marine biodiversity, and in particular those species that frequent the sea surface, including seabirds and seals. Fish species and larger invertebrates in deeper water will tend to avoid the sea surface or leave the impacted area in the event of a spill. Onshore, impacts could include contamination of coastal habitats impacts on species such as coastal birds and fish.

Nature of oil spill impacts on key receptors are presented in Table 5.11.

Table 5.11: Receptor Sensitivity and associated Impact from an Oil Spill (Source: OSRL, 2019a)

Species	Sensitivity/ Importance	Oil Spill Impact
Plankton		
Phytoplankton & Zooplankton	• Abundance dependent on environmental conditions • Form key part of food chain	• Toxicity, leading to death of plankton • Reduce future populations in food chain
Fish		
Sturgeon	Valuable to fisheries for producing caviar 80-90% of world's sturgeon population are found in Caspian Sea	• Ingestion: fish tainting, reduced growth, death • Reduced egg hatching and larval survival • Smothering: suffocation, damage to fins and scales • Loss of habitat / sources of food
Herring, Kilka	Important as a source of food for other fish	
Mullet, Shad	Commercial fish species	
Mammals		
Caspian Seal	Endemic to Caspian Sea, on IUCN Red List Absheron Peninsula haulout and feeding area	• Ingestion: digestive complications, decreased chance of survival • Inhalation: respiratory damage, disorientation, death • Loss or damage of habitat/food
Birds		

Ducks Geese Swans Grebes Divers Pelicans Cormorants Gulls Terns Flamingos Cranes Herons Sandpipers	• Mass migration and overwintering. IUCN endangered or vulnerable • Migratory seabirds • Seabirds, dive for fish • Overwintering seabird • Seabirds, dive for fish • Seabirds, important coastal breeding • Filter feed on shellfish and algae • Migratory coastal wading bird Siberian Crane, critically endangered • Coastal wading birds • Coastal water birds, eat small invertebrates • Fish eating bird of prey	• Smothering: reduced mobility, loss of buoyancy, hypothermia, death • Inhalation: respiratory damage, death • Ingestion: pneumonia, organ damage, death • Decreased reproduction, development deformities • Loss or damage to habitat • Contamination from food sources: filter feeders and tainted fish
Flora		
Seagrass – coastal habitat	Environmentally sensitive habitat, important nursery ground for young fish, stabilizes sea bed	• Habitat damage, loss of nursery grounds • Sea bed erosion
Socioeconomic		
Fisheries	Traditional fishing for Gobi, sturgeon, herring and big-eyed kilka. During winter months species found wintering near the western shores and migration routes.	• Disruption to species population's behaviors over winter period, species mainly at depth, fishermen won't be able to access.
Tourism	Cruising, national parks, historical sites	• Disruption and restricted access

5.8.4 Control / Mitigation Measures

In order to achieve the objectives of 'As Low As Reasonably Practicable' (ALARP), Statoil Azerbaijan will implement a range of prevention measures designed to minimize the risk of any oil spills.

A number of design measures will be introduced to reduce the risk of spill from operations such as leaks from on-board the MODU, releases of hydrocarbons from vessel collision and refueling etc. Design measures will also be introduced to reduce the risk of blow-out. A summary of the mitigation measures to be implemented by Statoil Azerbaijan during the exploration drilling program is provided below:

- Oil spill response equipment installed in two of the supply vessels such as: offshore boom 200 m system, skimmer, floating storage inflatable barge, dispersant (spray system, spray, only to be used if approved by authorities) and sorbents;
- Oil spill response equipment installed at shore base in case of port spills such as: harbor and/or bunkering System, fence boom (150 m), wire skimmer and pump unit, fasttank, temporary oil storage tank, or flexitank, sorbents pads and bale;
- Following established drilling safety standards to manage potential drilling hazards and minimize the risk of control loss;
- Comprehensive operational planning, risk assessment and provision of suitably specified equipment for drilling;
- Blow Out Preventor (BOP) will be installed during the drilling activities;
- An Oil Spill Contingency Plan (OSCP) and Emergency Response Plan (ERP) will be implemented;
- Any spills will be reported to Azerbaijan authorities, together with the response action taken.
- Training of personnel with respect to the handling and deployment of oil spill response equipment;
- All vessels will comply with IMO codes for prevention of oil pollution and have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs) and suitable storage and disposal procedures for waste oil;
- Approach procedures and poor weather operational restrictions for visiting vessels and transfer operations at the MODU;
- Audits of the MODU and vessels including detailed list of contract requirements in terms of spill prevention procedures that must be in place;
- Regular maintenance and inspection of equipment and high spill risk points (in particular bunkering hoses, bunds, storage tank valves etc.);
- Procedures in place for bunker transfer to minimize the risk of spillage;
- Use of bulk handling methods and non-return valves for diesel transfer to reduce the risk of spillage; and
- Lube and hydraulic oil will be stored in tanks or sealed drums and will be well secured and stored in bunded areas, all of which will be properly maintained and inspected.

Despite comprehensive prevention measures in place, the residual risk of an oil spill remains. An approved Oil Spill Contingency Plan (OSCP) will be in place for the proposed drilling operations, including access to Tier 1 and 2 resources, such as use of containment domes, use of floating barriers/skimmers, use of approved dispersants etc., as well as Tier 3 equipment provided by international providers such as Oil Spill Response Limited (OSRL).

5.8.5 Residual Risk

The risks of these individual activities may affect the biophysical and human environment in various ways, but are expected to be 'Tolerable if ALARP' (As Low As Reasonably Practicable)" for the three "blowout" spill scenarios (Table 5.12) on the basis that:

- The most likely spills associated with the project would be small scale.
- These likely spills can be mitigated via the project oil spill response measures.
- Large oil spills are highly unlikely to occur.

Table 5.12: Risk Assessment Matrix – Residual Risks (Source: OSRL, 2019a)

	Probability / Likelihood							
Consequence	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1, 2, 3		S9, S10, S11	S12, S13, S14	S15				
4, 5	S8							
6		S1, S2, S6						
7								
8, 9	S5, S7							

Risk Level	**Actions**
	Intolerable and must be reduced
	Further risk reduction actions required
	ALARP Zone (As Low As Reasonably Practicable): need to demonstrate that likelihood of occurrence has been reduced to as low as reasonably practicable and that contingency measures are in place to minimize consequence
	Manage for continuous improvements by application of best practice

5.9 Summary of Impacts from Accidental Events

The evaluation of impacts associated with accidental events is presented in Table 5.13.

Table 5.13: Evaluation of the Significance of Potential Environmental Impacts associated with the Aypara-1 well drilling (Accidental Events).

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual Impact
Seabirds and Coastal Birds	Crude Oil / Diesel Spill	• Stains of oil on the plumage may destroy the insulating and water repelling properties which may ultimately cause the death of the bird through reduced mobility, loss of buoyancy, hypothermia. • Toxic effects after the ingestion of oil during preening, ingestion of oiled prey, inhalation of oil fumes or absorption of oil through skin or eggs may also lead to death. • Indirect effects may result from destruction of bird habitats or food resources.	• Oil spill response equipment installed in two of the supply vessels and at shore base (in case of port spills). • Drilling safety standards. • Comprehensive operational planning, risk assessment and provision of suitably specified equipment for drilling. • Use of a BOP. • Oil Spill Contingency Plan (OSCP) and Emergency Response Plan (ERP). • Reporting of any spill to Azerbaijan authorities together with response action taken. • Handling and deployment of oil spill. • MODU and vessels will comply with IMO codes for prevention of oil pollution and have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs).	**Tolerable if 'ALARP'**
Marine Mammals (Caspian Seal)	Crude Oil / Diesel Spill	• Symptoms of acute exposure to hydrocarbons and chemicals from oil spills include irritation to the eyes and lungs, lethargy, poor coordination and difficulty with breathing. Individuals may then drown as a result of these symptoms. • Ingestion: digestive complications, decreased chance of survival • Loss or damage of habitat/food		**Tolerable if 'ALARP'**

Receptor	Project activity	Impact Description	Mitigation and Control Measures	Residual Impact
Coastal Habitats	Crude Oil / Diesel Spill	• Toxic concentrations of oil may develop in the shallow water • Long persistence time of the oil effects may be encountered for a long period. • Destruction of sensitive coastal habitats, including the Absheron National Park and the Absheron archipelago and Pirallahi bay IBA, as there is no wave action to remove the oil and oil components tend to adhere to the flat substrate preventing removal by tides.	• Approach procedures and poor weather operational restrictions. • Audits of the MODU and vessels. • Regular maintenance and inspection of equipment and high spill risk points. • Procedures in place for bunker transfer to minimize the risk of spillage. • Use of bulk handling methods and non-return valves for diesel. • Lube and hydraulic oil will be stored in tanks or sealed drums and will be well secured and stored in bunded areas.	**Tolerable if 'ALARP'**
Fish Stocks	Crude Oil / Diesel Spill	• Clog fish gills causing asphyxiation • Fish exposed to elevated concentrations of hydrocarbons absorb contaminants though their gills, accumulating it within their internal organs which can lead to long-term, sub-lethal effects. • Smothering of fish eggs and larvae		**Tolerable if 'ALARP'**
Fisheries	Crude Oil / Diesel Spill	• Loss of revenue from fishing bans • Damage to fishing vessels and equipment • Reduction in both food and economic resources		**Tolerable if 'ALARP'**

6 Environmental Management Plan

6.1 Introduction

This chapter provides a description of how the mitigation measures identified in Chapter 5 Impact Assessment will be incorporated into the Project design and subsequently implemented throughout the duration of the exploratory drilling programme.

The Environmental Management Plan (EMP) identifies actions required, assigns responsibilities and sets timings for completion. The plan will be incorporated into the overall environmental management of the project and will be incorporated into the corresponding contract agreements (e.g. drilling and vessel contractors). The plan will act as a “live” document to track progress through to completion of the drilling programme. The plan also provides a mechanism for monitoring the environmental performance of the contractor, and where required instigating further remedial action as required.

The mitigations measures and the parties responsible for their implementation are summarised below and presented in
Table 6.2.

6.2 EMP Objectives

The EMP is designed to serve as the connection between the mitigation and management measures identified in this EIA and the drilling programme execution with the following main objectives:

- Providing the mechanism to ensure compliance with Azeri legislation, Equinor Health, Safety, and Environment (HSE) policies, management system and procedures, international law and standards, and good Oil & Gas industry best practices;
- Providing the mechanism for ensuring that all proposed mitigation measures identified in the EIA to mitigate potentially adverse impacts are implemented;
- Providing a framework for mitigating impacts that may be unforeseen or unidentified;
- Evaluating effectiveness or inefficiency of these mitigation measures and, if required, modify them or include new mitigation/preventive measures; and
- Establishing a monitoring programme and record-keeping protocols so that pertinent additional information that was not available during the compilation of the EIA can be collected in order to provide quality assurance for the conclusions of the EIA.

The EMP is an integral part of the system that also has the longer-term objectives of:

- Ensuring that health, safety, social and environmental issues are integrated into the business risk management and decision-making process;
- Rationalising and streamlining health, social and environmental activities throughout the lifetime of the Project to add value and efficiency;
- Encouraging and achieving the highest environmental performance and response from all employees and contractors;
- Providing the standards for overall planning, operation and review; and
- Enabling management to establish environmental priorities.

In addition, the EMP serves as a set of contractual clauses and specifications that define the Contractor's environmental and social responsibilities at the tendering stage.

6.3 Environmental Management Framework

Statoil Azerbaijan will have an overall and ultimate responsibility for the proposed operations.

The environmental management activities of the proposed drilling programme will be conducted within a framework comprising the HSE policies of Equinor and HSE Management System which provides the basis on which health, safety and environmental priorities, responsibilities, and risks are systematically managed.

6.3.1 Equinor standards

The sustainability issues that Equinor prioritises reflect Equinor's value chain, the business context faced and Equinor's pursued strategy: *"Always safe, High value, Low carbon"*. Safe and secure operations, empowered people, and stakeholder engagement have been defined as key enablers for Equinor's strategy, along with technology and innovation. Climate change considerations have also been further embedded in the corporate strategy.

Equinor key values are:

- Responding to climate change;
- Health, safety & security;
- Managing our environmental impact;
- Value for society;

- Respecting human rights;
- Transparency and integrity.

Equinor sustainability strategy aims to enable cost effective environmental and social performance that protects and creates value for Equinor and communities, to effectively address the climate change challenge and to respect human rights.

Equinor aims to avoid causing significant harm to the local or regional environment. Equinor takes a precautionary approach and apply a combination of corporate requirements and risk-based local solutions to manage the environmental performance. We strive to adhere to high standards of emissions to air (monitoring of CO_2, nitrogen oxide -NOx-, non-methane volatile organic compounds and SOx emissions), waste management and impact on ecosystems—wherever it works. This includes integrating environmental and social risk management into planning and decision-making processes, at all levels in the organisation.

Equinor works closely with the suppliers to qualify and implement new technology to improve the cleansing of produced water, and is concerned with valuing and protecting biodiversity and the ecosystem. Equinor follows precautionary rules and regulations to minimise the potential negative effects of its activities, especially during drilling operations. Equinor also supports research programmes to increase knowledge about ecosystems and biodiversity.

Equinor continues to be an active participant in a joint Biodiversity Working Group of IPIECA and the International Oil and Gas Producers Association (IOGP). This cooperation has resulted in the development of specific tools and recommendations for industry best practice. Equinor also supports the maintenance and development of the World Database on Protected Areas and other GIS-based databases containing information on high-value biodiversity areas. Equinor uses these databases actively in environmental risk and impact evaluations.

Finally, Equinor safety and security strategy aims to enable safe and secure operations through efficient operations where zero harm to people, assets and environment can be achieved.

6.3.2 Other Standards, Guidelines and International Conventions

Statoil Azerbaijan will comply with the requirements of applicable international, regional and national maritime law and will follow best industry standards such as those promulgated by the International Marine Organisation (IMO), the International Association of Oil and Gas Producers (IOGP) as well as the Azeri Authorities.

In addition to the international conventions listed above, Statoil Azerbaijan will also consider, where appropriate, adhering to international standards including International Finance Corporation (IFC) guidelines, World Bank Environmental, Health and Safety (EHS) guidelines, IPIECA guidelines, Joint Nature Conservation Committee (JNCC) guidelines; and topic-specific conventions that are not restricted to a specific geography or ratified by Azerbaijan, such as the International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM, 2004).

6.3.3 Consultation and notifications

It is important that the drilling contractor maintains regular communication with the relevant regulatory authorities as well as relevant stakeholders such as the Ministry of Ecology and Natural Resources (MENR), the Ministry of Energy, the State Oil Company of the Republic of Azerbaijan (SOCAR), maritime and port authorities, fisheries, shipping and other sea users.

Prior to the commencement of the drilling program, notification of drilling/support vessels details will be sent to MENR, which will inform the relevant regional agencies and sub-departments concerned.

All appropriate environmental permits and any attached conditions will be obtained from MENR. Statoil Azerbaijan will provide the drilling contractor with details on the environmental sensitivities within the project area and the procedures and mitigation measures to be applied while operating in these waters.

6.3.4 Mitigation Framework

The mitigation measures and the parties responsible for their implementation are summarized below and presented in Table 6.2.

All crew members, including any support craft, will be made aware of the standards and controls applicable to the conduct of the drilling programme before operations commence.

All equipment (including engines, compressors, generators, solids separation equipment, sewage treatment plant, oily water separators) will be regularly checked and maintained in accordance with manufacturer’s guidelines in order to maximize efficiency and minimize malfunctions and unnecessary discharges to the environment during the drilling activities.

Wastes will be minimized, appropriately segregated and stored on-board prior to disposal at authorized and adequately equipped port reception facilities.

Clear lines of communication and operational procedures will be established between the MODU and accompanying vessels before the start of the survey.

6.4 Potential impacts and mitigation measures

6.4.1 Overview of impacts considered

Chapter 5 of the EIA considered the following potential impacts from the proposed Project activities:

- Potential reduction in localized air quality and contribution to greenhouse gases as a result of emissions from mobilization and demobilization of the MODU, drilling operations conducted and operation of the supply vessels;
- Degradation of water and sediment quality as a result of routine and operational discharges of effluents and wastes to the sea (i.e. black and grey water, ballast, etc.);
- Degradation of water and sediment quality as a result of the discharge of drilling cuttings;
- Impacts on seabed and benthic communities due to operation of the MODU (e.g. anchoring), installation of well infrastructure, discharge and deposition of drill cuttings, and the performance of vertical seismic profiling activities (VSP) generating noise emissions;
- Impacts on plankton due to the change of seawater quality resulting from effluents and waste discharges to the sea as well as potential introduction of invasive or alien species into Azeri waters;
- Impacts on fish resulting from the noise emissions generated during VSP activities and from the change of seawater quality due to the discharge of effluents and waste to the sea;
- Impacts on marine mammals (Caspian seals) resulting from the mobilization/demobilization and presence of the MODU, the potential collision risk with Project vessels, the generation of underwater noise emissions during VSP activities, and impacts due to the change of seawater quality resulting from the discharge of effluents and waste to the sea;
- Impacts on seabirds resulting in disturbance due to the physical presence (e.g. lighting) and movements of the MODU and the operation of the support vessels as well impacts due to changes in water quality resulting from the effluent and waste discharges to the sea;
- Impacts on sensitive coastal areas resulting from the operation of the onshore facilities and helicopter/support vessel transit;
- Impacts on other sea users from the increase of collision risk and disturbance of marine traffic resulting from project vessel movements;

- Impacts on fisheries, commercial and artisanal fishing activities resulting from the presence and operation of Project vessels and associated exclusion area for fisheries, the generation of underwater noise emissions due to VSP activities, and the changes in water quality;
- Damage to receptors and resources as a result of accidental events – impacts resulting from accidental events including fuel spills from vessels and hydrocarbon or crude spills as a result of well blow-out.

6.4.2 Issue Specific Management Plans and procedures

In support of the seismic survey operations and as per the standard practice in the offshore O&G industry, a number of management plans and procedures will be develop prior to the start of the activities. These will serve to address key areas of environmental/social impact requirements and therefore are being mentioned along the relevant sections of the EMP.

This section summarizes the requirements for these issue specific management plans[10]:

- Waste Management Plan (WMP).
- Ballast Water Management Plan (BWMP).
- Emergency Response Plan (ERP).
- Oil Spill Response Plan (OSRP).
- Shipboard Oil Pollution Emergency Plan (SOPEP).

summary of the objectives and contents of the plans are summarized in the following sections.

6.4.2.1 Waste Management Plan (WMP)

A Waste Management Plan (WMP) will be developed for the Project to establish waste streams, procedures for the storage, packaging and labelling of waste, including liquid and solid waste and hazardous and non-hazardous wastes, define transportation procedures for final disposal, and to define the responsibilities associated to waste management activities.

The following activities are developed in the waste management plan:

- Waste generation at the MODU and supply vessels, and onshore logistics base.

[10] It should be noted that these plans are not part of the EIA Report but management plans that need to be in place prior to the start of the operations.

- Temporary waste storage at the MODU and supply vessels, and onshore logistics base.
- Waste transportation from offshore to the onshore base.
- Waste unloading at the onshore base.
- Waste transportation from the onshore base to the final destination of the waste.
- Supervision of the contractors that will be in charge of waste treatment and management.

The final onshore destination for disposal of the waste will be included in the plan. Good international practice requires a commitment to adopt the various measures aimed at preventing inappropriate discharges of wastes at sea. These measures must be put into practice on the project vessels and onshore support facilities. As so, the project's waste management first reference will be the Azeri legislation, international legislation and Equinor Standards.

6.4.2.2 Ballast Water Management Plan (BWMP)

The discharge of ballast water into the marine environment is controlled by the International Convention for the Control and Management of Ship's Ballast Water and Sediments. Even though Azerbaijan is not signatory of this convention, the use of an onshore base in a mainland port, the MODU and support vessels involved in the Project will undertake ballast operations in accordance with this convention. As so each Project vessel will have a Ballast Water Management Plan.

The function of the Ballast Water Management Plan is to assist in complying with measures intended to reduce the harmful effects on the marine environment that are spread through aquatic microorganisms transferred from one area to another through ballasting operations, while maintaining safety.

The BWMP will include the following elements:

- A description of the ballast water management system on each vessel, and how it operates.
- Procedures for monitoring and reporting.
- Operational along with the method to be used for ballasting as well as safety aspects.
- The locations at different coastal water for ballast exchange.
- Sampling point and treatment method.
- Roles and responsibilities of the personnel on board for carrying out ballast operation.

6.4.2.3 Emergency Response Plan (ERP)

The purpose of the ERP is to assist the Equinor Incident Management Team to prepare for and respond quickly and safely to any incident within onshore and offshore operational sites, regardless of incident type and size.

The specific objectives of the ERP are the following:

- Define notification, activation and mobilization procedures of the Incident Management Teams to be followed when an incident or threat of an incident occurs.
- Describe positions on the Incident Management Teams and define the roles and responsibilities of team members, including organizational structure and lines of responsibility to be adhered to during an incident response.

This plan shall contain procedures applicable to foreseeable incident scenarios for the drilling activities. The plan shall define the emergency response organization, the incident notification procedure, the assessment process of an incident, the emergency team activation process, the response planning, the incident stand-down as well as training and emergency exercises requirements and objectives.

6.4.2.4 Oil Spill Response Plan (OSRP)

Specific to the emergency scenario of an oil spill risk, an Oil Spill Response Plan will be developed, as per relevant best practice guidelines.

The oil spill contingency plan will provide a detailed oil spill response and removal plan that addresses controlling, containing, and recovering an oil discharge in quantities that may be harmful to navigable waters or adjoining shorelines.

It will include:

- A definition of the authorities, responsibilities, and duties of all entities involved in oil removal operations.
- Procedures for early detection and timely notification of an oil discharge.
- Assurance that full resource capability is known and can be committed following a discharge.
- Actions for after discovery and notification of a discharge.
- Procedures to facilitate recovery of damages and enforcement measures.

With regards to Statoil Azerbaijan's oil spill response strategy, it adopts the internationally recognized Tiered response system for assessing the severity of an oil spill. The purpose of the three levels is to establish, as soon as possible, what is the correct level response to combat the spill. The severity of the spill depends on the size of the spill, the complexity of the response, and the potential consequences for people and for the environment.

6.4.2.5 Shipboard Oil Pollution Emergency Plan (SOPEP)

Regulation 37 of MARPOL Annex I requires that all ships of 400 gross tonnage and above carry an approved Shipboard Oil Pollution Emergency Plan (SOPEP). The purpose of a SOPEP is to assist personnel in dealing with unexpected discharge of oil, to set in motion the necessary actions to stop or minimize the discharge, and to mitigate its effects on the marine environment. This regulation requires the SOPEP to include the following as a minimum:

- The procedure to be followed by the master or other persons in charge of the ship to report an oil pollution incident, as required in article 8 and Protocol I of the MARPOL Convention, based on the guidelines developed by the IMO.
- The list of authorities or persons to be contacted in the event of an oil pollution incident.
- A detailed description of the action to be taken immediately by persons on board to reduce or control the discharge of oil following the incident; and
- The procedures and point of contact on the ship for coordinating shipboard action with national and local authorities in combating the pollution.

Each vessel used by the Project, will have a SOPEP that is suitable to respond to its own specific risk inventory.

Regulation 17 of MARPOL Annex II applies if the MODU carries drilling muds in bulk. It stipulates that every ship of 150 gross tonnage and above that is certified to carry noxious liquid substances in bulk shall carry on board a Shipboard Marine Pollution Emergency Plan (SMPEP) for noxious liquid substances approved by the Administration. The SMPEP should consist of at least the following:

- The procedure to be followed by the master or other persons in charge of the ship to report a noxious liquid substances pollution incident, as required in article 8 and Protocol I of the present Convention, based on the Guidelines developed by the IMO;
- The list of authorities or persons to be contacted in the event of a noxious liquid substances pollution incident;
- A detailed description of the action to be taken immediately by persons on board to reduce or control the discharge of noxious liquid substances following the incident; and

- The procedures and point of contact on the ship for coordinating shipboard action with national and local authorities in combating the pollution.

MARPOL dictates that the SMPEP may be combined with the SOPEP. A Shipboard Marine Pollution Emergency Plan will be prepared by Equinor for the Project's MODU.

6.4.2.6 Other issue specific plans

In addition to the management plans described in previous sub-sections, the following table describes a preliminary list of plans that will be detailed and made fully operational prior to the commencement of the drilling activities. The list can be modified is considered appropriate but in any case the topics covered under the list must be fully covered within the final list of plans and procedures

Table 6.1: Additional Environmental and Social Management Plans

Management Plan	Objectives
Chemical Management Plan	• To define procedures and ensure proper handling of project chemicals. This plan includes the management for hazardous and non-hazardous materials.
Stakeholder Engagement Plan (with Grievance Mechanism) -	• To establish and maintain positive community relations through effective communication and consultation. • To effectively manage community grievances and comply with the Project Grievance Procedure.
Local Procurement Plan	• To maximize Project procurement from local suppliers and economic benefit for local businesses.
Environmental Monitoring Plan	• Establish monitoring of sea water quality, marine fauna, air emissions, seabed monitoring, routine effluent and discharge monitoring for all project phases
Security Management Plan	• To ensure that the safeguarding of project, related personnel and property is carried out in a legitimate manner that avoids or minimizes risks to the community's safety and security.
HSE Plan	• To define strategic HSE objectives and HSE performance targets of the project, as well, the key actions, resources, organization and schedules to achieve them.

6.5 Responsibilities

6.5.1 Statoil Azerbaijans's Role and Responsibility

Statoil Azerbaijan will ensure that the project is carried out in accordance with Global Equinor HSE policies and in line with the Equinor HSE Management System. Although contractors will carry out most of the HSE critical activities Statoil Azerbaijan will retain the overall responsibility and accountability for managing the Contract, including HSE (Health, Safety and Environment).

The different roles within Statoil Azerbaijan organization are explained below.

6.5.2 Statoil Azerbaijan Drilling Manager

The Drilling Manager will be the Equinor Representative. He/she will be based in Equinor's onshore offices either in Azerbaijan or Norway, and will be responsible for ensuring all operations are performed consistently with the performance objectives detailed in the EMP; for reporting all incidents through to Equinor and notifying relevant authorities as required, as well as for ensuring all personnel receive Equinor's environmental training prior to commencement of drilling and immediately notifying the Incident Management Team of any spills when appropriate.

6.5.3 Statoil Azerbaijan Drilling Supervisor (Company Man)

While the MODU is drilling at any Equinor drilling location, the Drilling Supervisor will provide any relevant assistance or advice to the rig Offshore Installation Manager, regarding the health, safety & welfare of personnel on board.

The Drilling Supervisor will be responsible for:

- Ensuring all activities are carried out in a safe and efficient manner at the drilling location and for proactively promoting health, safety and welfare of all personnel on the MODU;
- Ensures that all work programs are carried out to the appropriate standard, and in a timely manner, without injury or risk to any person working offshore, whilst giving due consideration to Equinor's Reputation;
- Responsible for the safe implementation of the drilling program through the Senior Toolpusher and service company personnel;
- Reports directly to the Equinor Drilling Manager;
- Ensures that the HSE Bridging and interface document requirements including training and safety meetings are fully implemented during work activity;
- Exercises the authority and responsibility to stop any work that they feel could result in injury or destruction of equipment or property.
- The Drilling Supervisor will not be an Equinor employee, but a consultant with relevant experience for the project.

6.5.4 Offshore Installation Manager (Drilling Contractor Offshore)

The Offshore Installation Manager (OIM) is the highest authority on the MODU and will be responsible for ensuring all operations aboard is carried out in a manner consistent with the EMP. He/she will ensure that Equinor's HSE

policy is followed, and for monitoring performance against relevant environmental procedures, legislative requirements, commitments and conditions applicable to the drilling program. He/she is charged with ensuring all personnel are adequately trained and is responsible for notifying the Drilling Supervisor of any incidents arising from operations that may have an adverse impact on the performance objectives in the EMP.

The OIM has the authority to overrule a decision made by the Drilling Supervisor if not in accordance with drilling contractor HSE policy or could expose MODU personnel or equipment to a risk that has not been mitigated in a proper and adequate way.

6.5.5 Statoil Azerbaijan HSE Coordinator (Onshore)

The Statoil Azerbaijan HSE Coordinator will be responsible for providing expertise on safety issues that may arise during the conduct of emergency response operations as well as for managing all environmental matters. He/she will be responsible for reviewing the drilling contractor's HSE management plans for acceptability and ensuring compliance with the Equinor EMP, reviewing environmental audits to ensure compliance with the agreed environmental performance objectives and providing advice in the event of an oil spill or other environmental incidents. He/she will receive support from the Statoil Azerbaijan HSE Supervisor on the drilling unit and Statoil Azerbaijan Shore Base HSE Supervisor.

6.5.6 Statoil Azerbaijan Rig HSE Supervisor (Rig and Onshore)

The HSE Supervisor (rig and shore) will be responsible for:

- Provide analysis tracking of HSE hazards as part of Pre-Start Safety Reviews, Mechanical Integrity & Critical Equipment inspections, and Incident investigation processes. Review and follow up.
- Liaise with Contractors HSE representatives.
- Assure that all Personnel have completed the required HSE training prior to work onsite. Record Personnel onsite along with required records and documentation for regulatory compliance.
- Participate as the Onsite Safety Advisor for Tactical Management Team as part of the Emergency Management Plan.
- Support field execution of contractors Health Safety and Environment program. Assist with implementation of Contractor HSE bridging document requirements.
- Advising rig and shore base supervisors and personnel on safety, health, and environmental related issues.
- Conduct worksite inspections, coaching and mentoring to ensure compliance with safe working practices and in particular all applicable regulations and requirements.
- Conduct Health, Safety, and Environment inspections as stated in Equinor and local regulations.

- Assist in conducting emergency training exercises as needed at the rig and/or shore base.
- Ensure reporting of contractor incident, accident, and safety indicators

6.5.7 Drilling Contractor Requirements

The EMP will be the overarching contractual document for all environmental and social management requirements to which all contractor and subcontractor plans and documents will be aligned. It will be provided to all relevant contractors for the project, who will be required to include the following provisions to ensure that the EMP is effective:

- Clearly defined roles and responsibilities for the execution of the EMP.
- Ensure that all crew and supply base staff or contractors are familiar with Equinor's global standards.
- Appropriate reporting and remedial action procedures to ensure that any incidents are reported promptly and dealt with effectively.
- Review, assessment and revision of the EMP as required.

All contractor documentation used to bridge to the main EMP, and hence facilitate the implementation of its requirements, will be subject to review and approval by Statoil Azerbaijan.

6.6 Reporting

In addition to daily survey progress reporting required by Statoil Azerbaijan, it is recommended that the drilling contractor carries out the following reporting/documentation:

- Daily contact with the relevant port in the drilling area to update on drilling progress and MODU position.
- Logging of all sightings and contacts with other vessels (e.g. fishing or cargo vessels).
- Logging of all health, safety and environmental accidents and incidents, including any incidents involving cargo or fishing vessels in Azeri waters.
- End of drilling programme report to include the final HSE report with details of HSE accidents and incidents and environmental performance as described above.

In case of any HSE incidents, Statoil Azerbaijan will conduct a proper incident investigation and prepare a respective report detailing the events and corrective and preventative measures implemented. All incidents where local regulatory standards are exceeded will be reported to the authorities in Azerbaijan.

6.7 Management of change

In an operation with this dimension and duration there are uncertainties and changes that need to be addressed in a structured and transparent manner.

As a result, Statoil Azerbaijan will implement a clear and transparent management of change procedure, in order to identify gaps, evaluate risks and uncertainties and to take them into account. This procedure will be applied in case of changes from the original scope of work (e.g. equipment, operating procedures, materials and operating conditions) which would require to develop additional/ amended programs and/or add cost form the original estimated expenditure. Whenever these changes are planned or if they occur out of operational necessity, the Management of Change procedure will be implemented prior to the change.

6.8 Summary of mitigation to be implemented as part of the Project

A summary of the EMP with its corresponding recommended measures is presented in Table 6.2below.
This section and Table 6.2is intended to be read in conjunction with the full text of the accompanying EIA document, which provides important context and background, as well as describing the impacts which the listed measures aim to mitigate or manage, and the residual impact which may remain.

Table 6.2: Summary of mitigation and monitoring measures to be implemented as part of the EMP

N°	Receptor	Project Activity	Impact Description	Mitigation and Control Measures	Responsibility	Monitoring / Recordkeeping Requirement	Reporting Requirements	Frequency / Timing
Routine events								
1	Air Quality and Climate Change	Routine MODU operation, and support vessels	Potential reduction in localized air quality and contribution to greenhouse gases	• Advanced planning to ensure efficient operations, including the planning of vessels trip to acquire supplies; • Ensure MODU has valid Engine International Air Pollution Prevention Certificate in place (marine diesel engines >130kW). • Appropriate maintenance policies and procedures of equipment and generators will be followed and its implementation audited by an Equinor representative; • Regular monitoring of fuel consumption; • Engines and equipment will be switched off when not in use; • Use of low-sulphur marine fuel where possible; and • Compliance with Tier II of revised MARPOL 73/78 Annex VI which sets limits on sulphur dioxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances	Drilling contractor; and supply vessels contractors	• Monitor and record fuel consumption weekly • Maintenance record – as required • Verification of maintenance of equipment • Record of Low sulphur fuel use	N/A	Weekly when vessels are active. Vessels HSE review prior to operations to verify all relevant systems Prior to start of activities

2	Seawater Quality	Routine and operational discharges during the project (i.e. black and grey water, ballast, etc.).	Potential localized reduction in water quality, including increased turbidity and BOD.
			
			Potential introduction of alien invasive species from ballast water discharges
				• The vessels will be equipped with a sewage treatment unit compliant with MARPOL Annex IV regulations, with International Sewage Pollution Prevention Certificate ("ISPPC ");
				• Discharges will comply with MARPOL Annex IV and the Azerbaijani law;
				• Limited quantities of water released during weekly testing of the fire water pumps, with no chemical dosing.
				• Bilge and drainage oily wastewater will be contained onboard and transported to shore for disposal;
				• Maintenance of an Oil Record book and a vessel's logbook.
				• Use and discharge of drill fluids and cuttings, completion fluid or cement products will be subject to a Chemical Management Plan.
				• All Ballasting activities will comply with the International Convention for the Control and Management of Ship's Ballast Waste and Sediments (BWM Convention), including:
				  ○ all ballast water will be stored in specifically designated tanks to avoid cross contamination and remain free of oil;
				  ○ ballast water discharges will be continuously monitored for oil sheen and in case of visibly oil contaminated ballast water discharges will be stopped;
					Drilling contractor; and supply vessels contractors	• Maintain an Oil Record Book and a vessel's logbook
						• Record or estimate volume of sewage discharge – daily
						• Record /consignment note of liquid/solid wastes transferred to shore
						• Record estimates of food waste generation – daily
						• Daily visual inspection of discharge point to ensure absence of floating solids and discoloration of the water
						• Detailed Ballast Water Logbook – as required.
						• Ballast Water Management Plan for each Project vessel
						• All applicable monitoring requirements for
							N/A	At all times when vessels are active.

	○ ballast water exchange will take place at least 200 nautical miles from nearest land and at depths over 200 m; ○ any ballasting operations will be logged in a record book; and ○ the vessels will have a Ballast Water Management Plan (BWMP) in place. • SOBM on cuttings will be reduced as far as is achievable with current technology. Mud on cuttings will not exceed an average of 6.9% before disposal; • The usage and discharge of drilling muds and fluids during drilling activity will be continuously monitored. • Components of water based drill fluids will be either categorized as Low Toxicity (based on OSPAR's OCNS) or listed as a Plonor product under OSPAR. Contractor will aim at minimizing the number and quantities of additives and will aim selecting additives with a good environmental behaviour. • Barite used for WBM will follow the maximum allowable content of heavy metals (<1mg/kg and cadmium <3mg/kg dry weight). • Ecotoxicological analyses (as available from published literature) of the proposed drilling chemicals will be	drill cuttings and mud discharge included under N°3

				considered on the final selection of additives for the drilling fluid; • Cuttings will be discharged by a caisson located at least at a sufficient depth to avoid impact to surface waters. • Selection of a pipe dope that is heavy metal free to avoid introduction of heavy metals. • Cooling water discharge location/depth will be selected to ensure that temperature 100m from the discharge point will be no greater than 3ºC above ambient water temperature (IFC EHS Guidelines Oi l& Gas Development - Offshore). • No chemicals injected into cooling water system. Concentrations of copper and aluminum in water will be below international Environmental Quality Standards (EQS) and national Maximum Permissible Concentration (MPC) levels.				
3	Seabed and Benthic communities	Drilling and installation of well infrastructure, including the discharge and deposition of cuttings and muds Vertical Seismic Profile activities	Generation of noise emissions Loss of seabed, habitats and benthic fauna in the direct footprint of the well and where cuttings and cement are deposited	• Use and discharge of drill fluids and cuttings, completion fluid or cement products will be subject to a Chemical Management Plan. • No discharge of SOBM or associated cuttings. SOBM and associated cuttings will be returned to shore for treatment and disposal. • Components of water based drill fluids will be either categorized as Low Toxicity (based on OSPAR's OCNS) or listed as a PLONOR product under	Drilling contractor	• Documentation of seabed features and benthic ecology findings . • Monitor continuously for visible oil sheen on the sea surface – continuous	Sharing marine environmental data including seabed features and benthic ecology findings with relevant Azéri authorities. Contractor reports inventory of chemicals used and discharged at	At all times when vessels are active.

	Potential localized and short term increase in total suspended solids (TSS) in the water column and near the seabed Impacts on sediment quality and benthic organisms from contaminants contained in WBM directly discharged to seabed.	OSPAR. Contractor will aim at minimizing the number and quantities of additives and will aim selecting additives with a good environmental behaviour. • Barite used for WBM will follow the maximum allowable content of heavy metals (<1mg/kg and cadmium <3mg/kg dry weight). • A mud recovery system will be available to reuse WBM as needed to minimize mud consumption (i.e. solids control equipment - shakers & centrifuge - will separate cuttings from the mud system and maximise recovery and re-use of drilling mud). Discharge to sea will be via a caisson at least 15m below sea surface. • WBM and cuttings will only be discharged after treating fluids to reach PSA specified chloride levels (<4 times ambient concentration of receiving waters). • A pre-drill and post-drill environmental survey with a remote operated vehicle (ROV) will be carried out in the vicinity of the well site to show evolution of recovery. • Hydraulic fluid used in BOP and function tests is biodegradable and has been formulated to meet CEFAS and OSPAR requirements. Only small volumes will be released at the seabed.	• Monitor and record volume (m3), rate (bbls hr/hr) and type of drilling fluids and cuttings discharged into the sea • Record /consignment note of muds/cuttings transferred to shore • Record of composition and volume of mud additives used for each section.	the end of drilling operations to Equinor

4	Plankton	Routine and operational discharges during the project (organic liquid/solid discharges)	Potential localized increase in organic matter and reduction in water quality	• Applicable embedded measures related to water quality will apply.	Drilling contractor; supply vessels contractors	See monitoring requirements specified under N°2	N/A	At all times when vessels are active
5	Fish	Routine operation of MODU and support vessels. Vertical Seismic Profile activities	Impacts due to the generation of noise emissions Secondary impacts due to changes in water quality	• Applicable embedded measures related to Noise generation will apply (see summary of impacts on marine mammals); • Applicable embedded measures related to water quality will apply	Drilling contractor; supply vessels contractors	See monitoring requirements specified under N°2	N/A	At all times when vessels are active
6	Marine Mammals	Routine operation of MODU and support vessels. Vertical Seismic Profile activities	Disturbance from the presence of Project vessels; Potential collision risk with Project vessels; Impacts due to the generation of underwater sound emissions Secondary impacts due to changes in water quality	Embedded measures related to Noise generation: • Implementation of pre-search and soft start / ramp up procedure as recommended by the Joint Nature Conservation Committee (JNCC, 2017) guidelines, during VSP activities; • Good maintenance procedures on vessel engines Measures related to rest of impacts • Vessels will not be allowed to intentionally approach marine fauna, such as Caspian seals, and, where practicable, will alter course or reduce speed to further limit the potential for disturbance. • Maintain a record of Caspian seals observed during the drilling activities to	Drilling contractor; supply vessels contractors	• See monitoring requirements specified under N°2 • Record of marine fauna observations during VSP activities • Maintenance records – as required	Sharing data of marine environmental data including marine fauna observations with relevant Azeri authorities	At all times when drilling unit and/or supply vessels are active

				gain a better understanding of their presence in the area. • Use of designated navigation channels where applicable and comply with speed and wake restrictions. • Check that potential structures that may be used for resting by Caspian seals are designed to avoid their entrance/presence on these. • The Project will ensure that vessel engines are not left to idle unnecessarily. Vessels will be powered down to safe operational levels. Applicable embedded measures related to water quality will apply.				
7	Seabirds	Operation of Project vessels	Disturbance from the presence and movements of Project vessels. Secondary impacts due to changes in water quality	• Should helicopter operations be required, the flight paths routes will be defined in accordance with relevant authorities and avoiding, to the extent possible, sensitive coastal areas and islands around the Absheron peninsula • Project vessels to avoid sailing through areas with large aggregations of seabirds where possible. • Applicable embedded measures related to water quality will apply.	Supply vessels /helicopter contractors	• Monitoring requirements specified under N°2 relative to water quality also apply • Verification of flight path. •	N/A	At all times when drilling unit and/or supply vessels/helicopters are active
8	Protected areas	Onshore operations	Disturbance to sensitive coastal areas from onshore activities	• Applicable embedded measures related to water quality will apply. • Applicable embedded measures related to seabirds will apply.	Supply vessels /helicopter contractors	• Verification of maintenance of equipment.	N/A	Whenever a flight needs to be planed Prior to Project activities and in line with emergency

								response planning
9	Navigation, Traffic and Sea user	Project vessels movements	Impacts to maritime traffic Increase of collision risk	• Notification to relevant marine authorities and advanced notice to mariners prior to commencement of the drilling program including notification of the establishment of the exclusion zone. • Provision of data for inclusion on nautical charts. • Vessels will use designated and relevant navigation channels where applicable and comply with designated exclusion zones. • Navigational marks and lights on the MODU. • Safety exclusion zone will be monitored for the safety of the facility and other users of the area. • Enforce specific procedures to prevent excessive speeds and rapid change of direction for vessels when operating in the field to reduce risks of collisions. • Ensure that vessels are equipped with collision risk reducing devices i.e. navigational lights and beacons, marker buoys, etc. • Onshore treatment of contaminated cuttings will be carried out using thermo-mechanical cutting treatment.	Drilling contractor; supply vessels contractors	• Monitoring of exclusion zone • Bridge logs (date, time, location) of encounters with vessels. • Records of vessel inspections • Records of incidents and near miss events	Contractor notifies Statoil Azerbaijan in case of incident	Prior to the start of the drilling program At all times when drilling unit and/or supply vessels are active
10	Fisheries	Seismic survey activities Physical presence and operation of Project vessels	Impacts due to the presence of seismic fleet and associated exclusion area for fisheries	• Mitigation measures are expected to be the same as those described for water quality (see Impact W1). • Applicable embedded measures related to Noise generation will apply (see summary of impacts on marine mammals);	Drilling contractor; supply vessels contractors	• Keep logs (date, time, location) of encounters with fishing vessels. • Records of grievances /	N/A	Prior to the start of the drilling program

			Impacts due to the generation of underwater sound emissions Secondary impacts due to changes in water quality	• Screen mesh will be used in any MODU intake pipe to avoid fish entrainment. • In order to minimize impacts to commercially exploited species derived from physical presence of project vessels and light emissions, the Project will control and reduce overall light intensity to the extent practicable, without adversely affecting maritime or operational safety. • An exclusion zone of 500m around the MODU will be enforced to ensure safety distance with other sea users such as fishing boats. • Notify relevant authorities, fishing associations and industrial fishermen of drilling activities, dates, location, exclusion areas. • Ensure procedures are in place for dealing with claims in the event of damaged fishing gear.		complaints received, actions taken, and responses provided		At all time when vessels are active Recording of grievances ongoing
Accidental events								
11	**Seabirds and Coastal Birds** **Marine Mammals** **Coastal Habitats** **Fish Stocks** **Fisheries**	**Crude Oil or Diesel Spill**	• **Symptoms of acute exposure to hydrocarbons and chemicals from oil spills** • **Impact on coastal habitats ecosystem** • **Loss of revenue from fishing bans**	• **Oil spill response equipment installed in two of the supply vessels and at shore base (in case of port spills).** • **Drilling safety standards.** • **Comprehensive operational planning, risk assessment and provision of suitably specified equipment for drilling.** • **Use of a BOP.** • **Oil Spill Contingency Plan (OSCP) and Emergency Response Plan (ERP).**	**Drilling contractor; supply vessels contractors**	**N/A**	**Incident Report** **Notification to competent authority in line with spill reporting requirements**	**In case of spill.**

	• **Damage to fishing vessels and equipment** • **Reduction in both food and economic resources**	• **Reporting of any spill to Azerbaijan authorities together with response action taken.** • **Handling and deployment of oil spill.** • **MODU and vessels will comply with IMO codes for prevention of oil pollution and have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs).** • **Approach procedures and poor weather operational restrictions.** • **Audits of the MODU and vessels.** • **Regular maintenance and inspection of equipment and high spill risk points.** • **Procedures in place for bunker transfer to minimize the risk of spillage.** • **Use of bulk handling methods and non-return valves for diesel.** • **Lube and hydraulic oil will be stored in tanks or sealed drums and will be well secured and stored in bunded areas.**	

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