ES 1 Introduction

ES 1.1 Project outline

The Shah Deniz Stage 1 Project is the first stage in the development of the Shah Deniz gas field. The Stage 1 project comprises an “Upstream” component consisting of wells, drilling, offshore facilities, marine pipelines and onshore terminal and a “Midstream” component consisting of a sales gas pipeline system from the terminal to the Turkish-Georgian border. The Midstream component, known as the South Caucasus Pipeline (SCP) is part of the Azerbaijan-Georgia-Turkey (AGT) pipelines project that is also responsible for the Baku-Tbilisi-Ceyhan (BTC) oil pipeline. This Environmental Statement addresses the Upstream component of the Shah Deniz Gas Export Project Stage 1 Development.

The Shah Deniz Contract Area lies in the Azerbaijan sector of the Caspian Sea approximately 100 km south east of Baku (Figure ES.1) and covers an area of 858 km² in water depths ranging from 50 m to 500 m.

Figure ES.1 Shah Deniz Contract Area

A Production Sharing Agreement (PSA) between the State Oil Company of Azerbaijan Republic (SOCAR) and a number of Foreign Oil Companies (FOC) grants rights to the FOC to invest in and develop the Shah Deniz field to produce and market the hydrocarbons. BP has been appointed as operator on behalf of the other PSA Partners.

Early appraisal well drilling has indicated that the Shah Deniz field is a world-class gas-condensate discovery, the full potential of which requires further appraisal. The Stage 1 development will target approximately one third of the total potential resource in the Shah Deniz field, some 11.9 Tcf gas in place. Gas will be produced, conditioned and transported over the lifetime of the development that is estimated to be at least 30 years.

The Stage 1 offshore development will be in the Eastern Flank of the field where water depths range from 100 m to over 500 m, with drilling and production occurring at fixed facilities in some 100 m of water. To maintain gas production rates from the field, further development is
anticipated several years after initial gas production from a subsea facility to be located some 4 km south of the fixed facilities in 350 m of water.

The project will require offshore drilling and production facilities. Gas and liquids will be separated offshore before transfer, via separate marine pipelines to a gas and condensate reception and processing facility onshore. The onshore reception and processing facilities will be located adjacent to the existing and planned future AIOC oil reception facilities at Sangachal 38 km to the southwest of Baku.

ES 1.2 Environmental assessment

This Environment Statement (ES) has been prepared following a detailed Environmental and Socio-economic Impact Assessment (ESIA) of the proposed Shah Deniz Stage 1 project. The ES has been prepared for submission to the Azerbaijan Ministry of Ecology and Natural Resources (MENR) to gain approval for the project and as such, has been conducted in accordance with the legal requirements and policies of Azerbaijan. The assessment has also been carried out in a manner that ensures it satisfies the international environmental and social guidelines as recommended by the International Finance Institutions (IFI) requirements and in the context of BP’s Health, Safety and Environment (HSE) Policy.

This impact assessment represents the latest environmental work programme to be conducted and completed to date by BP in Azerbaijan. A full list of environmental and socio-economic programmes of work carried out by BP (and AIOC) to develop a knowledge and understanding of the environments in which their project developments occur, are outlined in Table ES.1. These studies have assisted BP in identifying and understanding the potential effects that its proposed activities may have on these environments, enabling the proposed programmes to be designed and planned in a manner that would minimise any adverse effects.

<table>
<thead>
<tr>
<th>Environmental / Social Programmes Undertaken</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACG Baseline Assessment</td>
<td>1995</td>
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<tr>
<td>Seismic Survey EIAs</td>
<td>1995</td>
</tr>
<tr>
<td>Appraisal Drilling EIAs for GCA Wells 5, 6</td>
<td>1996</td>
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<tr>
<td>Northern Route Export Pipeline EIA</td>
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<td>Western Route Export Pipeline EIA</td>
<td>1997</td>
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<td>Supsa Terminal EIA</td>
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<tr>
<td>EOP Environmental Impact Assessment</td>
<td>1997</td>
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<tr>
<td>Ongoing monitoring for EOP</td>
<td>1997 - present</td>
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<tr>
<td>ACG Phase 1 Baseline Assessments</td>
<td>1998, 2000 &amp; 2001</td>
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<tr>
<td>Shah Deniz marine baseline assessment</td>
<td>1998</td>
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<tr>
<td>SDX1 post drilling marine survey</td>
<td>2000</td>
</tr>
<tr>
<td>SDX3 post drilling marine survey</td>
<td>2001</td>
</tr>
<tr>
<td>ACG FFD consultation with regulators and NGOs</td>
<td>2000 - ongoing</td>
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<tr>
<td>Sangachal Terminal, Early Civil Engineering Work Programme ESIA (ACG FFD Phase 1 and Shah Deniz Gas Export Stage 1)</td>
<td>2001</td>
</tr>
<tr>
<td>ACG Phase 1 ESIA</td>
<td>2002</td>
</tr>
</tbody>
</table>

ES 1.3 Benefits of Shah Deniz FFD

The Shah Deniz Gas Export Project together with the linked investments including ACG Full Field Development and the AGT pipeline projects have the potential to deliver major economic benefits as well as a substantial injection of new resources to Azerbaijan.
The projects have the potential to either result in, or create the climate for, the following positive impacts.

- Assist the government in balancing the national budget assuming that spending remains restrained.
- Yield revenues that could be used for investment in the non-oil sector.
- Assist in the development and maintenance of a liberal trade regime by removing the need to raise revenues from import duties and by encouraging modernisation of customs procedures.
- Create an environment that is domestically more favourable to private sector investment and that sets an example making other private sector investors more open to invest. Current estimates suggest that between 10% and 30% of spend on oil and gas projects in Azerbaijan goes to local Azerbaijani firms. Similar figures are predicted for the Shah Deniz development despite the fact that full development of the local supply base will be difficult in the time frame of the project’s rapid construction schedule.
- Add impetus to energy sector reform within Azerbaijan. This in turn should improve the population’s access to energy (gas and electricity) and result in the wider use of cleaner fuels, better ambient and indoor air quality and reduced pressure on traditional sources of fuel (and hence forest products and therefore, biodiversity).
- Contribute to poverty alleviation and sustainable development via the revenues generated, assuming prudent revenue management.
- Create both direct and indirect employment opportunities.

**ES 2 Policy, legal and administrative framework**

The Shah Deniz Stage 1 project is subject to the terms and conditions of the Shah Deniz PSA and the Partners are developing the Health, Safety & Environment (HSE) Design Standards for the project. These will be based on and will incorporate selected international standards where appropriate.

According to Article 26.4 of the PSA, the partners shall comply with the present and future Azerbaijani laws or regulations of general applicability with respect to public health, safety and protection and restoration of the environment to the extent that such laws and regulations are no more stringent than the Environmental Protection Standards.

Beyond the framework of the PSA and Stage 1 HSE standards, the project will also be undertaken with due regard to international conventions as ratified by the Azerbaijan government. Applicable national and international guidelines and standards, including the requirements of the IFI, have also been reviewed as part of this ESIA in order to ensure that the development is undertaken in a manner that is compliant with these guidelines and standards (Figure ES.2).
ES 2.1 International Finance Institutions guidelines and standards

As Partners in the PSA may seek Bank finance for the project, the environmental and social standards, practices and guidelines set forth by the IFI have been used in the preparation of this ESIA. Potential IFI include:

- European Bank for Reconstruction and Development (EBRD);
- World Bank Group (WBG) including potentially the International Finance Corporation (IFC) and Multilateral Investment Guarantee Agency (MIGA);
- United States Export-Import Bank (US ExIm);
- Overseas Private Investment Corporation (OPIC);
- Other Multilateral Lending Agencies (MLAs); and
- Other Export Credit Agencies (ECAs).

ES 2.2 National legislation

In Azerbaijan, major private and public developments require the preparation of an ESIA. The objective of the ESIA process is to provide a means whereby adverse impacts can be identified and either avoided or minimised to acceptable levels.

The fundamental principle of the ESIA is applied by the Azerbaijan Ministry of Ecology and Natural Resources (MENR) using the Law of the Azerbaijan Republic on Environmental Protection, August 1999 and the Handbook for the Environmental Impact Assessment Process, 1996 published with the assistance of the United Nations Development Programme (UNDP). The handbook includes requirements for scientific expertise and public consultation in the ESIA process. Following submission to the MENR, the ESIA document is reviewed for up to three months by an expert panel including a one-month approval period.
ES 2.2.1 Azerbaijani regulatory agencies

The main environmental regulatory body is the MENR. This body is responsible for the following:

- development of draft environmental legislation for submission to the Parliament (Milli Mejlis);
- implementation of environmental policy;
- enforcement of standards and requirements for environmental protection;
- suspension or termination of activities not meeting set standards;
- advising on environmental issues; and
- expert review and approval of environmental documentation including EIAs.

In addition, the MENR has responsibility for the implementation of the requirements set out in international environmental conventions ratified by the Azerbaijan Republic.

ES 2.3 Ratified international conventions

The Azerbaijan Republic has entered into and ratified a number of international conventions, many within the last year. BP will endeavour to assist the government in meeting their obligations with respect to these conventions.

ES 3 Environmental and socio-economic impact assessment

The ESIA process incorporates a number of steps. A key element of the Shah Deniz Stage 1 ESIA process has been the on-going interaction between the environmental and engineering design teams with the objective of removing, or at a minimum, reducing as many of the potentially significant environmental impacts as practicable, while enhancing positive benefits of the project wherever possible. This has been achieved by assessing a wide range of options against numerous criteria including environmental and social impact, safety, technical feasibility, cost, ability to meet project commercial objectives and stakeholder concerns.

A critical element of the ESIA process is the public consultation and disclosure programme involving a wide range of stakeholders. The objectives of this process were to inform stakeholders about the project, allow stakeholders to raise key issues and concerns associated with the project, source accurate information, identify potential impacts and offer the opportunity for alternatives or objections to be raised by the potentially affected parties, non-governmental organisations, members of the public and other stakeholders.

The concluding steps of the ESIA process are the public disclosure of a draft ES for which comment is sought from the public and regulatory authorities. After the disclosure period of 60 days, the draft ES is revised and a final ES is submitted to the MENR. A decision, as to whether environmental approval shall be granted, should be forthcoming from the regulatory authority 30 days after submission.

ES 4 Options

A number of alternative engineering design options were considered for the Stage 1 development starting at a conceptual level and subsequently adding detail for each conceptual option through the design and planning process. Development concept options were identified and evaluated using a number of screening criteria. Non-viable options were rejected at an early stage in the process and potentially viable options were taken forward for
further consideration. This process continues into Detailed Design, Construction and ultimately Operation.

In addition to the engineering design options for the project, the “no development option” has also been considered. No development would mean that the potentially significant benefits such as revenue, improved infrastructure and direct and indirect employment that would be created by the project would not be realised. The Shah Deniz Gas Export Project together with ACG Full Field Development and associated projects, particularly the AGT pipeline export projects, represents a unique opportunity for Azerbaijan to develop a stable economy, improve social equity and reduce levels of poverty. No other currently identified prospects offer this potential for the country.

Optimum design requirements were considered for each of the components of the project. Offshore this included facilities to provide a long-term centre for the drilling of development wells, the separation of gas and liquids, accommodation for personnel and the onward transportation of the produced hydrocarbons to shore. Several concepts were considered for these facilities and, although many were rejected early in the process, a technical ranking exercise against six key themes was used for the most viable concepts against the following criteria:

- Health, Safety and Environment (HSE);
- design and technical issues;
- project execution;
- drilling issues;
- operational aspects; and
- political issues.

In addition consideration of the availability of infrastructure and resources in Azerbaijan, as well as the wider Caspian region, were included in the review. In this respect, the possibility of schedule conflicts between the construction requirements of the Shah Deniz offshore facility with those of ACG Phases 1 and 2 were investigated.

Three of the concepts were considered to offer technically robust solutions for the facility, with very little difference between them. Overall, the Technip-GeoProduction 500 (TPG500), a proprietary purpose designed jack-up drilling and production platform consisting of all processing and drilling facilities, living quarters and utilities packages was finally selected. The TPG500 offered least risk to potential conflicts with other projects and a parallel investigation of the costs of the various concepts also concluded that this was the most attractive option. The TPG500 also provides some additional environmental benefits over the other options considered in that it allows the minimisation of offshore activity in both installation and commissioning phases in comparison to the installation requirements typically associated with the other offshore facility concepts considered. Further, it also readily facilitates future decommissioning.

Transfer of the produced liquid hydrocarbons to shore using shuttle tanker was discounted in favour of marine pipeline transfer early in the option evaluation process due to this option’s requirement for large offshore processing facility to process condensate to export quality as well as the lack of existing and appropriate tanker vessels within the Caspian Sea. In addition, it is considered that marine pipelines present significantly lower spill risks than offshore loading and shuttle tanker transportation as tanker transportation results in increased vessel movements and a consequent increased collision risk.

A multi-phase (gas and liquid combined) pipeline was considered during the pipeline selection process but was rejected due to the requirement to regularly remove wax build up
thereby introducing operational difficulties relating to practicality and safety. Flow rate turndowns would be required during pigging. Subsequent increases to achieve required production rates would also introduce operational difficulties at the onshore terminal. The decision was made therefore, to select separate single-phase pipelines for gas and condensate. This option offers a higher degree of confidence with respect to operability as the underlying principles of the single-phase lines are better understood for gas transportation.

As the Shah Deniz development included the need for a gas-condensate processing terminal to be sited onshore, it was considered that benefits would result from siting the terminal alongside the ACG facilities at the Sangachal location as opposed to developing a new site at a different location. This siting option would lead to a reduction in environmental impacts (i.e. less total area effected). Further, benefits would be gained from the use of existing access and infrastructure at the site and from integrated operational control as well as combined maintenance and support services. In addition, potential synergy savings would be possible from combined engineering construction works as well as the advantage of developing a skilled workforce at one location.

In its assessment of the options available for the final design of project components and utilities required for the offshore and onshore facilities, the Shah Deniz project has implemented BP’s Upstream Environmental Goals and Design Performance Guidelines for new projects. “Zero Environmental Damage” targets have been used as a starting point for the decision-making process and this, in turn, led to the development of project Environmental Goals which represent the environmental principles for Shah Deniz. Subsequent to defining project Environmental Goals, project Zero Damage Base Cases (ZDBC) for both offshore and onshore facilities were established. The ZDBC included the following steps:

- confirmation of environmental goals for the project;
- identification of options to attain the goals;
- emissions identification and quantification;
- assessment of options against standard criteria including:
  - technical feasibility;
  - safety screening;
  - environmental cost benefit analysis; and
- development of solutions and mitigation proposals;

The process focused on the identification of sources of and the potential for environmental damage of all potentially harmful emissions from the facilities and the identification of options available to eliminate or minimise each of the emissions identified. As such the areas mainly considered included:

- hydrocarbon emissions;
- combustion emissions;
- liquid discharges to sea; and
- energy efficiency.

The ZDBC was established early in the project design process with the initial objective of identifying potential zero damage base case solutions that meet the intent of each of the Environmental Goals established for the project. In cases where the environmental goals could not be attained, alternatives to the ZDBC were considered using some or all of the tools described above to justify the variance from the goal. This process will continue to be used for the evaluation of the project options throughout the project design through to operations.
ES 5  Project description

There are three main components to the Shah Deniz Stage 1 project, each significant engineering undertakings in their own right. These are:

- offshore drilling and production platform;
- three subsea pipelines for the transportation of gas, condensate and monoethylene glycol (MEG), a hydrate inhibitor; and
- an onshore terminal for the reception and processing of gas and condensate.

ES 5.1 Offshore facilities

The offshore drilling and production operations will be carried out from the TPG500 platform (Figure ES.3) to be installed over a pre-installed drilling template. The proposed base-case is to drill nine (9) producing wells at the site. Prior to installation of the TPG500 three wells will be drilled from a semi-submersible drilling rig to enable early production to begin soon after installation of the fixed facility. To maintain gas production in future years, up to five subsea wells will be drilled in the deeper waters to the south for tie-back to the platform facility.

Produced hydrocarbons will be separated into gas and liquids on-board the platform for transfer to shore.

Figure ES.3   TPG500

ES 5.1.1 Pre-platform drilling

The early drilling programme to be carried out prior to the installation of the TPG500 platform will be conducted from the semi-submersible drilling rig, the “Istiglal” that will be towed out and anchored on location.

Three wells will be drilled during this programme and will be drilled in sections with hole diameters of 28”, 22”, 20”, 16”, 12 ¼” and possibly 8 ½” using different drilling fluids. The
28” section will be drilled with a water based mud (WBM) system containing weighting materials and other additives. A synthetic oil based mud (SOBM) system will be used in the lower-hole sections.

Drilled cuttings generated from the 28” section will be deposited directly on the seabed around the well. Cuttings and SOBM from these remaining hole sections will be retained and shipped to shore for treatment and correct disposal. No drilled cuttings generated from the lower-hole sections will be discharged to the sea.

The Istiglal will be supported by a number of conventional utilities including diesel fired (low emission) power generators, sewage treatment systems, a cooling water system, drainage systems, support and supply vessels. Up to 118 people will be accommodated on the rig during the drilling programme.

**ES 5.1.2 Platform drilling**

Drilling will continue from the TPG500 platform once it is installed on location. It is expected that up to six platform wells will be drilled although provision of up to 15 wells will be provided by a 15-slot drilling template on the platform. The well design will be similar to that for wells drilled from the semi-submersible drilling rig although it is expected that the surface-hole sections of each well will be constructed by installing a 36” conductor pipe into position and, using seawater and/or a WBM system, will be drilled out using a 28” drill bit. As with the drilling from the semi-submersible rig, drilled cuttings from the top-hole sections will be discharged directly to the seabed. All cuttings from the lower-hole sections drilled with SOBM will be returned to the platform, retained and shipped to shore for treatment and correct disposal.

To maintain gas production in future years it is expected that further wells will be drilled in deeper waters to the south of the fixed platform. These wells may be drilled from a mobile drilling rig and completed as subsea wells, or, if technology allows, may be drilled from the platform as “extended reach” wells.

There will be a need to achieve flexibility in adapting plans commensurate with reservoir performance. The future sub-sea development and the number of platform wells may be varied based on field production performance and drilling experience.

Utilities on board the drilling platform are combined for both drilling and production operations and these are discussed below.

**ES 5.2 Construction and installation of the offshore facilities**

Many of the components for construction of the TPG500 will be pre-fabricated outside of Azerbaijan and transported in modules in to the country for assembly. The hull structure will be manufactured in four strips, fabricated out of country and towed into the Caspian Sea through the canals to the north of the Caspian and onwards to Azerbaijan for assembly. At the time of writing this document, a location for the assembly of the imported components has not been selected but it is expected that an existing fabrication facility will be used. The construction contractors will source the workforce from within Azerbaijan to a significant extent.

**ES 5.2.1 Production process**

The production process on the TPG500 platform will be a simple process of separation of liquid from gas. The two streams, condensate/water and gas, will be exported by means of
two pipelines to the reception and processing terminal at Sangachal. Some gas will be used on the platform as fuel gas.

Power will be supplied by dual-fuel generators that will also include some degree of waste heat recovery. The generators will normally be fuelled by gas but will be able to run on diesel when necessary and during start-up. The TPG500 will be sized to accommodate up to 118 personnel. All sewage generated will be treated in a customised marine sanitation unit after maceration and prior to discharge to the sea via a submerged caisson. Contaminated drainage will also be treated prior to discharge. Seawater will be drawn from the Caspian for use as drilling and production operation cooling and will be discharged below the sea surface via a caisson.

The platform will be supplied by vessel and helicopter, with all operational solid and chemical wastes back-loaded to the support vessels and returned to shore for treatment and disposal.

**ES 5.3 Pipelines**

The diameter of the subsea gas pipeline will be 26” and the subsea condensate line 12”. The pipelines length will be approximately 90 km between the platform and shore. Both pipelines will be coated to provide corrosion protection and will be concrete coated to provide additional weight that will ensure stability of the pipelines on the seabed, as well as providing mechanical protection against impacts. External corrosion protection has been incorporated into the pipeline design through the use of sacrificial anode cathodic protection. A corrosion allowance will also be incorporated into the pipeline design to ensure that the integrity of the pipelines will not be compromised.

Monoethylene glycol (MEG), used to absorb free water from the gas and condensate in the pipelines, will be continually supplied from the onshore terminal to the platform via a 4” diameter pipeline piggybacked onto the 12” condensate pipeline. The MEG line will not be concrete coated as its stability will be ensured by secure attachment to the condensate line.

**ES 5.3.1 Installation and commissioning of the pipelines**

The pipelines will be installed using the pipe-lay vessel “Israfil Guseinov” in water depths of 8 m and greater. The pipe-laying operation is continuous with the barge moving progressively forward as sections of the pipe are welded, inspected, coated and deployed from the stern of the lay- barge. The pipe-laying vessel will be held in position by eight to 10 anchors.

In water depths less than 8 m, the pipeline will be pulled onshore using a shore-based winch. A temporary trench will be dug across the shoreline and this will be allowed to flood so that the pipeline can be pulled through the nearshore zone and into the shoreline.

The base case plan is to bury the pipeline beneath the seabed in water depths of less than 5 m, a total distance of approximately 2 km offshore. A pipeline trench will be excavated for each pipeline in water depths of up to 2 m. Between the shoreline and the 2 m depth contour, the trench may be up to 8 m in width. Beyond the 2 m water depth mark, the pipeline will be buried into the seabed using a mechanical cutter out to water depths of 5 m and the trench will be approximately 3 m in width. A typical pipeline shore approach is shown in Figure ES.4.

A finger pier, approximately 10 m wide at its base and approximately 100 m long, will be built from the shoreline into Sangachal Bay to provide access for an excavator to excavate the pipeline trench from the shoreline out to water depths of approximately 2 m. The pier will be
a rock groyne type structure constructed by placing rock aggregate in the shallow inshore zone. A pipeline trench will be constructed on either side of the pier, one each for the gas and condensate subsea pipelines.

**Figure ES.4 Typical pipeline shore approach**

Marine pipeline installation operations will occur within the existing exclusion zone that extends for 1,000 m across the existing ACG/Early Oil Project pipeline corridor where the Shah Deniz pipeline corridor is common with this. During installation, exclusion buoys will be placed around the installation area to ensure that other vessels do not encroach upon the area of activity. As pipe-laying progresses the exclusion buoys will be moved along the route.

The pipelines will be flooded with filtered seawater following installation and pressure tested to check for any defects or leaks. Following installation of the offshore platforms, the pipelines will be tied-in to the facilities. Carrying out these operations may require the use of a number of vessels. Once connected to the platform facilities the entire system will be pressure tested using treated water left in the pipeline following installation. Following a successful test, the water will be flowed to the terminal for disposal. The project base-case for disposal of hydrotreat water is via deep well injection onshore although other options are being assessed. Such options include re-use in a nearby cement manufacturing plant, offshore disposal and re-use as irrigation water.

The onshore segment of the subsea pipelines (i.e. between the shoreline and gas-condensate reception and processing terminal), will be trenched to a depth of 1 m to top-of-pipe. Pipeline installation activities in the onshore environment will occur within a corridor of approximately 30 m width for each pipeline trench. Following installation the corridor will be re-instated and, if shown through longer-term monitoring to be necessary, re-habilitated with direct planting. It will be necessary to cross several existing services (i.e. other pipelines; road; railway line) between the shoreline and the terminal and this will be achieved by directionally drilling underneath the existing services thereby avoiding disturbance to these existing infrastructure.

**ES 5.3.2 Pipeline operation**

The pipelines are designed to require very little maintenance. A pipeline integrity management system will however, be developed. The strategy will consist of a number of inspection and monitoring activities as well as a programme of regular cleaning of the 12” condensate pipeline using pigs that will push wax to the onshore terminal.
ES 5.4 Onshore facilities

The Shah Deniz gas and condensate processing terminal will be constructed alongside the existing terminal at Sangachal (Figure ES.5) and will comprise of the following principal components:

- Two gas process trains to treat a total of 900 MMscfd. Facilities will include reception, conditioning, recompression, flare, fuel gas system, metering and export facilities.
- Two condensate stabilisation trains each sized to provide a nominal capacity of 31,000 bpd. Facilities will include; reception, stabilisation, tank storage, metering and export by pipeline as a product co-mingled with ACG crude oil export.
- Terminal utilities.

Figure ES.5 Proposed layout of terminal facilities


ES 5.4.1 Construction

The sequence of terminal construction activities are illustrated in Figure ES.6
The Shah Deniz Stage 1 terminal and ACG phased terminal expansion requires the use of additional land to that originally acquired for the EOP and ACG facilities. The total land acquisition for all terminal facilities will amount to 730 ha including the 256 ha previously acquired by AIOC of which 40.5 ha is presently occupied by the existing terminal. Within the land acquisition area, a total 428 ha will be required for the new facilities with the remaining 302 ha being designated a “no development zone” around the terminal facilities. The outer limits of the no development zone will be pegged rather than fenced in order to allow access to herders and grazing animals and to maintain a general right of way. Table ES.2 presents the areas that will be occupied by each planned component of the terminal facilities.

### Table ES.2 Proposed terminal facilities land-take area breakdown

<table>
<thead>
<tr>
<th>Terminal Areas</th>
<th>Areas (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing EOP</td>
<td>40.5</td>
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<tr>
<td>ACG Phase 1 terminal facilities</td>
<td>41.8</td>
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<tr>
<td>Shah Deniz terminal area</td>
<td>33.3</td>
</tr>
<tr>
<td>ACG/Shah Deniz flare area</td>
<td>34.7</td>
</tr>
<tr>
<td>BTC pumping station</td>
<td>2.5</td>
</tr>
<tr>
<td>Drainage channel</td>
<td>22.5</td>
</tr>
<tr>
<td>New access road</td>
<td>2.5</td>
</tr>
<tr>
<td>Workers camp area</td>
<td>13.0</td>
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<tr>
<td>ACG Phase 2 facilities</td>
<td>24.1</td>
</tr>
<tr>
<td>ACG Phase 3 facilities</td>
<td>24.7</td>
</tr>
</tbody>
</table>

An early civil engineering works programme (which was the subject of a separate ESIA¹) began in January 2002 and will prepare the terminal area for both the Shah Deniz Stage 1 and ACG Phase 1 terminal facilities and will include:

- the clearing, grading and levelling of land in the area on which the terminal facilities will be built;
- the excavation of a flood protection drainage channel and construction of a bund wall on three sides of the proposed terminal site;
- the construction of a security dyke along the south-eastern boundary of the terminal site;

• the construction of a security perimeter fence (inside the bund wall) and lighting;
• the construction of a new access road for the terminal site and railway crossing along with two additional roads within the terminal site; and
• relocation and potential modification of utilities services.

Figure ES.7 illustrates the location and extent of the above features within the terminal land acquisition area.

Figure ES.7 Early civil engineering work programme activities

Following completion of the early civil engineering at the site, construction work on the ACG Phase 1 terminal proper will commence immediately. Shah Deniz terminal facility development is anticipated to commence in early 2003. When construction work commences for Shah Deniz terminal, activities will continue until the completion of commissioning (with gas) in mid 2005.

Terminal foundations and underground services will be constructed prior to pre-fabricated components arriving on site. Once on site, these components will be positioned and secured in their appropriate locations. While process modules will be commissioned prior to transportation to the terminal site, at various stages during the construction programme, non-destructive testing and inspection will be used to confirm the integrity of the equipment.
Pressure vessels, storage tanks and piping runs will be tested with treated water under pressure and the water will be contained for appropriate disposal.

It is anticipated that approximately 1,000 personnel will be needed at the peak of the terminal construction programme when both the ACG Phase 1 and Shah Deniz terminal facilities are being constructed. Construction personnel will include expatriate and local workers. A minimum of 75% of the workforce will be sourced locally from the area around Sangachal or from elsewhere in Azerbaijan during the early stages of construction but may fall to approximately 65% towards the end of the construction programme. The sourcing of the workforce is a reflection of the work being undertaken, the skills required and the available personnel. A large proportion of the workforce, including all expatriate workers, will be accommodated in a construction camp sized for up to 500 workers and located outside the existing security wall of the terminal. Prior to the completion of the camp, the majority of workers will travel to the site from Sangachal, Umid, Sahil and existing camps.

**ES 5.4.2 Terminal operations**

The gas stream must be dehydrated and conditioned to meet the pipeline export transportation and sales gas specifications. The sales gas hydrocarbon dew point will be achieved by means of gas expansion and recompression. An export compressor will achieve the compression of the gas to the required export pipeline pressure. The export gas will be metered to custody transfer standard before entering the export pipeline. Control of the gas production rate shall be achieved by means of the turbo expander inlet valves. Choke valves on the offshore wells can be adjusted for coarse control of the gas flow to the onshore terminal.

The Shah Deniz condensate has a high wax content and as a result, the condensate pipeline will be pigged frequently to control wax build-up. The pig receiver will be heated so that the wax arriving ahead of the pig will be received in liquid form. The wax components will be processed along with the rest of the condensate stream.

Condensate stabilisation will be achieved in a stabiliser column. All flash gas generated in the stabilisation process will be recovered and compressed using a single compressor. The flash gas shall be routed to the gas processing plant. The condensate should be stored above the wax appearance temperature of 40°C and it may be necessary to heat the tanks to maintain this temperature during periods of low production or during shutdowns.

The main condensate storage tank capacity shall be nominally 165,000 bbls corresponding to three days production. This will ensure that gas production is unaffected by short term outages of the condensate export system. An off-specification condensate storage tank and return pump will be provided for use during start up and shut down of the plant. Any vapour generated in the off-specification tank will be recovered and burnt in the fired heaters.

A flare gas recovery system will be installed to recover the relatively small quantities of gas from depressurisation of equipment, for maintenance, blanket gas, leaking relief and control valves. There will therefore, be no routine flaring of gas at the terminal under normal operating conditions. There will however, be occasions when the flare will have to be used to burn excess gas, for example during a plant shut down. All hydrocarbon vapours generated during plant upsets and emergency blowdown shall be routed to the flare system for safe disposal by combustion. The flare tip will be provided with automatic ignition and will burn any gases in excess of the flare recovery system capacity.

Power generation will be by Rolls Royce RB211 low-NOX gas turbine. The generators will be gas fuelled.
A temporary wastewater treatment system has been installed at the terminal site for the treatment of sewage waters generated during the terminal Early Civils construction programme. Effluent from this system is transferred by truck to the nearby Sahil Sewerage Treatment Plant for appropriate disposal. A biomass reactor treatment system will be installed for subsequent terminal construction and operation programmes. Effluent from this system will be used for irrigation of ornamental plantings in and possible near to the construction camp and in the terminal office site. The treated water may also be used for dust suppression during the construction programme.

Uncontaminated storm water from internal roads and non-process areas of the site will drain to open ditches located within the terminal bund wall perimeter and on either side of the Shah Deniz terminal site. Water from these drainage lines will be discharged via culverts to outside the terminal bund wall on the southeast side of the facility.

An open drains system will be provided to collect and treat contaminated surface run-off from drip trays and paved areas around equipment containing hydrocarbon liquids. All equipment that contains some inventory of hydrocarbon will be located in kerbed areas that drain to the collection sump.

The open drain system is designed to ensure that there is no planned normal overflow to the Caspian. The system collects the maximum predicted precipitation over a certain time period, plus an allowance for fire monitor/hose reel usage. Any free oil or contaminants present in the drainage water will be removed before the water is pumped to the produced water disposal system.

In the very rare event of a major plant emergency, requiring the usage of very large volumes of firewater, there is the potential for an overflow of water to flow to the Caspian. This however, is an unlikely event and not under normal operating conditions. In such an event, the water overflow is taken from the bottom of the collection sump. As this occurs only after a period of time, the majority of any oil contamination will have floated to the surface where it is collected thereby removing the contamination from the overflow discharge.

A closed drains system, draining to a collection drum will be provided to collect hydrocarbon liquids when draining equipment and piping for maintenance. The drum will be vented to the flare gas recovery system and the collected liquids shall be pumped back to the process for recovery.

**ES 6 Existing natural environment**

**ES 6.1 Overview**

The offshore project setting is in the Caspian Sea, an enclosed body of water occupying 386,400 km² and with a shoreline of 5,360 km. The Caspian is approximately 1,200 km long and averages about 310 km in width. Caspian sea levels have fluctuated significantly over time and it is currently about 27 to 28 m below the world ocean level. The sea level dropped by 2.9 m in the period between 1929 and 1977 and rose by 2.4 m between 1977 and 1997. The recent sea level rises have resulted in the flooding of coastal land and damage to settlements, industrial enterprises and irrigated land.

The geological history of the Caspian has resulted in a unique assemblage of fauna. About 75% of the species of the Caspian are endemic, 6% are from the Mediterranean and 3% are from the Arctic. The remaining 16% are freshwater immigrants that have adapted themselves to the salinity of the Caspian. These freshwater immigrants tend to inhabit the less saline northern Caspian waters.
The Caspian exhibits a multitude of environmental stresses. Most are the result of the many years of pollution from a vast array of land-based sources that reach the Caspian via the 130 rivers that drain its watershed. The largest of these is the Volga. This river receives domestic waste from over half the population of Russia, along with a significant percentage of the country’s heavy industry. It is estimated that the Volga contributes 80% of the pollution load entering the Caspian.

Oil extraction and refining complexes in Baku and Sumgait are also major sources of land-based contamination that impact the Caspian as are many of the older generation offshore oil production facilities. Overall it is estimated that a million cubic meters of untreated industrial wastewater is discharged into the Caspian annually. This discharge, along with variety of chronic sources of industrial pollution, has resulted in almost 30% of the Azerbaijan coast being exposed to some form of land-based contamination.

The combined effect of these and other factors is illustrated by the collapse of the Caspian fishing industry. The effects have been particularly noticeable for the sturgeon fishery, where the Azerbaijan quota has been reduced in recent years.

ES 6.2 Offshore environment

Prominent features of the Shah Deniz Contract Area are the nine mud volcano vents in the centre and an area of slope instability to the east. In general the volcanoes can be considered to lie in a southeastly orientation along the centre of the Contract Area. Accumulations of mud volcano output material at the seabed and also at depth in the sediment sequence, suggest the presence of mud volcano activity at the site over relatively long geological timescales.

There is a strong water depth gradient in the Contract Area range with water depths ranging from less than 40 m in the northeast to over 700 m in the southeast. Water depth at the Stage 1 location is 105 m. The surface waters are highly oxygenated in the winter months, reaching saturation levels in the spring due to increased water mixing during the winter and phytoplankton activity in the spring. During summer months, as the surface water temperature increases, the water column becomes stratified.

The surface sediments in the Shah Deniz Contract Area are predominantly composed of fine clays and silts with occasional deposits of shell debris. In the shallowest waters, the marine biology of the sediments are characterised by low diversity of amphipod and gastropod species coupled with a relatively high abundance of polychaetes and the bivalve Abra. In the vicinity of the Stage 1 offshore location and in deeper waters a much greater diversity of amphipods and gastropods is present.

A number of resident and non-resident fish species inhabit the Shah Deniz Contract Area several of which are of commercial importance. The most important commercial species include the big eye kilka (Clupeonella grimmi), anchovy kilka (Clupeonella engrauliformis), big eye shad (Alosa saposhnikovi) mullets (Liza auratus and L. salines) and sturgeon (Acipenseridae). The distribution and abundance of these species varies with depth and season.

A summary of the environmental sensitivities in and adjacent to the Shah Deniz Contract Area is provided in Figure ES.8. The key environmental sensitivities are associated with:

- the presence of numerous fish species including species that pass through the Contract Area during migration periods;
- spawning periods of anchovy and big eyed Kilka;
• migrating birds that use the Apsheron Peninsula as an important stop-over point;
• the presence of seals during the summer and spring and autumn migration periods; and
• spring time benthos and plankton recruitment and increased biological activity and productivity.

Figure ES.8 Summary of offshore environmental sensitivities

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Within the Contract Area Rhizosemia caravis dominates the phytoplankton population. (75-96% of the total biomass) Zooplankton population is dominated by copepods Acartia clausi (introduced) and Eurytemora grimmii (native species), with the larger native Limnocalanus also present biomass. Peak productivity occurs in spring as sea temperature and light levels increase.

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<th>Benthos</th>
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A large portion of the western part of the South Caspian is distinguished in the summer by high benthic biomass levels from 100 - 1000g/m. The peak development of benthos is observed in the spring and summer with a deadline occurring in winter.

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<th>Fish</th>
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The majority of the fish species found in the Contract Area over the course of the year are present during spawning and wintering migration periods in the spring and autumn. The spring migration is the most sensitive period for the Contract Area as during this period fish abundance levels are at their greatest.

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The majority of bird species can be found on the Apsheron peninsula during the winter and early spring as they overwinter and feed in the nearshore areas. The peninsula also acts as an important stopover during spring and autumn migrations.

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<th>Seals</th>
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From mid March the seals migrate south from pupping, breeding and moulting sites in the north Caspian to feeding areas in the southern and middle Caspian, moving offshore to feed on kilka during the summer. From October and November 90% of the population start their northward migration again. 10% remain in the area and may be encountered in the Contract Area.

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<th>Fishing</th>
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The most important commercial fish species in the Contract Area are the Big Eye kilka, Anchovy, Mullet and Big Eye shad.
ES 6.3 Nearshore and coastal environment

There are several ecological features and seasonal activity within Sangachal Bay. These include:

- seagrass mats and patchy areas of algae;
- fish spawning and nursery grounds for juvenile fish; and
- spring time increases in benthic and plankton productivity and recruitment.

Seasonal fluctuations in the environmental sensitivity occur and are illustrated in Figure ES.9. As water temperatures and light intensity increase fish, plankton, seagrass, algae and benthic communities increase productivity. The majority of the annual recruitment occurs during this period.

Figure ES.9 Seasonal changes in sensitivity

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Peak phytoplankton productivity occurs during the spring, as seawater temperature and light intensity increase, Zooplankton abundance will lag behind that of phytoplankton.

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<th>Benthos</th>
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The peak development of benthos is observed in the spring and summer with a decline occurring in the winter.

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Abundance of fish in the area peaks during the late spring and summer when the area is used as a spawning and nursery ground. During late summer as seawater temperatures increase fish move to cooler deeper waters and return in the autumn. As sea water temperatures drop in the winter abundance of fish declines to the lowest levels.

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<th>Birds</th>
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Key times of year for resident bird species will be during the breeding and nesting period in spring and summer. The general area is used as an over-wintering area for a number of bird species.

Figure ES.10 illustrates the spatial variation in the seabed sensitivity in Sangachal Bay. This has been developed using information on the distribution of seagrass and algae as well as sediment types and their mobility. Areas that support seagrass and red algae are considered the most sensitive as well as fine-grained sediments that are highly mobile. Disturbance of highly mobile sediments will lead to increased water turbidity.

Areas that supported sparse communities of seagrass and red algae or are sandy sediments that could support seagrass mats were classified as medium. Areas where seagrass or red algae were not observed during the survey and areas composed of silty sand were assigned the lowest sensitivity.
ES 6.4 Onshore environment

ES 6.4.1 Flora (habitat)

The habitats within a 5 km radius of the existing EOP terminal can be divided into two main types as follows:

- semi-desert with desert elements comprising, most of the inland areas, with scattered marshy areas; and
- a coastal community succession of sandy beaches leading to ephemeral, shallow lagoons (usually waterlogged from September/October to March) with a few marshy slacks comprised of riparian vegetation.

The main components of the semi-desert flora are the low perennial bushes wormwood and saltwort species and ephemeral species. The perennial bushes can be observed year-round.
Ephemeral species flower early in spring and within one to two months set seed then wither until the autumn rains stimulate new growth.

Tamarisk thickets are scattered throughout the semi-desert in topographically lower areas, especially alongside and on the banks of the various ephemeral streams, near depressions (often manmade) and where water pipes are leaking.

Seeds of the Sharp-edged Darling Iris (*Iris acutiloba*) listed in the 1989 Red Book of Azerbaijan and in the 1997 International Union for the Conservation of Nature (IUCN) Red List of Threatened Plants were found in the area of proposed terminal development.

The coastal area’s sandy beaches are predominated by the pioneer shrub species. The beaches transition to a littoral ecotone. This zone leads to primarily ephemeral reed-beds.

Slightly inland from the coastline is an area with mixed semi-desert and coastal vegetation. In this area two rare and endemic species, Baku Calligonum (*Calligonum bakuense*) and Baku Astragalus (*Astragalus bacuensis*), were found. These species are listed in the 1989 Red Book of Azerbaijan and in the 1997 International Union for the Conservation of Nature (IUCN) Red List of Threatened Plants.

**ES 6.4.2 Fauna**

The coastal and semi-desert habitats were found to host a reasonably high level of faunal species diversity. The area southwest of the land acquisition zone showed the greatest concentration of species.

The Spur-thighed tortoise (*Testudo graeca iberia*) a species listed in the 1989 Red Data Book of the Azerbaijan Republic and in 1994 IUCN Red List of Threatened Animals as “vulnerable”, has been previously observed throughout the terminal area and it was encountered during surveys for this ESIA carried out in May/June 2001 in the coastal area close to the interface with the inland areas.

Two red-listed bird species were also observed during the 2001 survey namely, the Black-bellied Sandgrouse (*Pterocles orientalis*) (1989 Red Book of Azerbaijan) and the Lesser Kestrel (*Falco naumanni*) (1997 IUCN Red List of Threatened Animals).

The peak sensitive times for fauna species are during mating seasons and while the animals are pregnant. For mammals, these periods vary widely depending upon the species. For amphibians and reptiles, breeding and incubation occurs during April through to August. Birds breed in the region between March to August with the spring and fall migrations occurring March to April, and August to October, respectively. Over-wintering birds inhabit the coastline in great numbers from October to March.

**ES 7 Existing Socio-economic environment**

**ES 7.1 National baseline**

The Caspian has traditionally been a region of strategic importance providing a direct link between Europe and Asia and a border between two world religions. Azerbaijan is surrounded by newly independent states and more established countries such as Turkey and Iran. The advent of independence and the economic and social transformation process has been marked by armed conflict, social unrest and ethnic tension.
In 1999 Azerbaijan had a population of 7.9 million people with 52% residing in urban areas and 48% in rural areas. Azerbaijan has a diverse ethnic structure with Russians, Armenians and Lezghins make up approximately 20% of the total population. Over 10% of the Azerbaijani population has become internally displaced as a result of the continuing occupation of part of its territory by Armenia. Islam is the major religion with the majority of the population defined as Muslim. In Azerbaijan women and men possess equal rights and liberties under the constitution although economic and educational gender parity has not been reached.

The income level of most Azerbaijani households remains low. In 2000, the average monthly salary in Azerbaijan was AZM205,112 (US$44). Several indicators suggest however, that real household income has increased in recent years.

The unemployment rate is difficult to track in Azerbaijan. Changes in the public sector profile can however, be tracked and show public sector employment falling steadily in the past decade. This decline has been somewhat offset by increases in the private sector. Unofficial labour markets are also prevalent throughout the country, primarily in the larger settlements.

Until recently the Azerbaijani economy was in the grip of a substantial decline that began in 1989. Whilst GDP has continued to grow since 1996, such growth has been erratic with a recent slowdown. In 2000 however, there was a record increase in growth of 11.3%. Recent monetary and fiscal policies appear to be stabilising the economy and creating a platform for recovery.

Agriculture is the most important sector in terms of employment with around 30% of the workforce directly engaged in agricultural production. Resource based industries have developed a greater importance to the overall economy as compared with manufacturing, due primarily to the development of the oil sector and specifically offshore oil production. The oil and gas sector currently accounts for around 25% of GDP and almost 80% of merchandise exports. As new oil and gas fields and pipeline routes come on stream, export of oil and gas will dwarf the export of other goods and services. Light industry remains underdeveloped due to the former reliance on Soviet markets and a general difficulty in competing with imported goods. The accumulation of foreign assets through the Azerbaijan State Oil Fund and the development of the non-oil economy will however, be vital for providing Azerbaijan with some protection against adverse oil shocks.

Shipping activities in Azerbaijani waters include commercial trade, passenger and vehicular ferry transport, military, scientific and research operations and services and supply operations to the offshore oil and gas industry. Azerbaijan has eight commercial ports centred around the Apsheron Peninsula and the capital, Baku.

Fishing in the Caspian has represented a relatively major contribution to GDP at approximately 1%. The fishing industry employs nearly 4,000 people or 7.3% of the workforce in the food industry. The Caspian is an important fishing area with commercial catches of sturgeon, sprat, carp, darters, gobs, herring, salmon and mullet. Fish stocks have however, fallen substantially since the advent of independence among the littoral states. The industry today is in serious decline not only as a result of falling stocks but also disrupted export routes and markets and inadequate supplies of materials for processing and packaging.

Azerbaijan’s access to external markets has continually been disrupted by regional political turmoil. The key route for the transport of goods, including oil and gas, to Western markets is through Georgia to the Black Sea though exports also proceed through Russia and Iran. The geographical location of Azerbaijan creates dependence on its neighbours, especially Russia,
for the transport of imports and exports with 90% of road freight and 95% of rail freight passing through Russia. Baku itself is a major transport hub for the entire Caspian region.

In 1999 foreign investment in Azerbaijan decreased by 26%. In aggregate, foreign investment flows have been small (outside the oil sector). Notably, there has been little impact on the entire industry base of Azerbaijan including the agricultural/agri-business that is the heart of the Azerbaijani economy.

The privatisation process and the private sector remain small in relation to state concerns. There is a steady growth of joint venture enterprises involving foreign companies within Azerbaijan. Tax system reforms began in 1995. Taxation remains however, challenging and unpredictable.

Privatisation in the agricultural sector began in 1996 and has progressed rapidly. The privatisation of livestock is nearing completion.

Most of Azerbaijan’s infrastructure is in a degraded condition and is in need of upgrade. Clean water is a scarce resource and the problem is compounded by inefficient water use.

Access to effective health services is weak as a result of the deterioration of medical buildings and shortages of up-to-date medical equipment. This has been compounded by the near collapse of emergency services and primary care in most rural areas. Within Baku, a number of modern health facilities have recently become operational however the majority of the population is unable to afford or access these services.

Health indicators for 1997 show male life expectancy as 66.5 years while female life expectancy as 74 years. The birth rate in the same year was 17.4 per thousand and deaths at 6.2 per thousand. The leading causes of mortality in Azerbaijan include cardiovascular disease, cancer, respiratory infections and accidents. The incidence of communicable diseases is on the increase.

Azerbaijan’s educational progress is hampered by funding problems and structural weaknesses within the education system. There is also a need for improvement in terms of access to and the quality of, systems and learning.

According to the World Bank, around 20% of families in Azerbaijan can be classified as severely vulnerable. The actual overall income per capita considerably exceeds the official salary level, indicating that unofficial financial turnover has become the main source of income for a large percentage of the population. The major causes of increasing poverty could be perceived as the general economic decline and the fragmentation of the social welfare system. This poverty is intensified by the reduction of access to social services. Social inequality is also a rising problem and is compounded by a tendency towards migration from Azerbaijan, with the consequence that the proportion of young people in the population is decreasing whilst the proportion of elderly citizens is increasing.

This situation is made more complex by the ongoing economic crises, the unresolved conflict with Armenia and the problem of accommodating over half a million people displaced from territories now occupied by Armenia. There are currently about one million Azerbaijani refugees and Internally Displaced People (IDP) within Azerbaijan, accounting for one-seventh of the country’s total population.

There are approximately 950 NGOs officially registered in Azerbaijan, although only between 90 and 110 of these are active. The 1995 constitution and 1992 press law ostensibly guarantees free media. The print media in Azerbaijan are however, subject to various
restrictions. Recent reports have suggested a lifting of restrictions.\(^1\) The two state-owned television stations dominate the electronic media, although in addition to these there are a number of private and two Russian TV channels. Azerbaijan’s telephone system is a combination of old Soviet era technology and modern cellular telephones. Satellite service between Baku and Turkey provides access to 200 countries.

Azerbaijan is a country of ancient history and culture. In ancient times, several states existed on the territory of present day Azerbaijan. In the mountains of Gobustan there is a concentration of rock carvings, settlements and tombstones recording the history of the Azerbaijani people from the Stone Age onwards. The Azerbaijani language is a member of the south Turkic group of languages. Following independence the Government began to phase out the use of Russian, which was widely spoken during Soviet times and is still often spoken in urban areas and understood throughout most of Azerbaijan.

**ES 7.2 Regional baseline**

The terminal site at Sangachal is located in the Garadag District (Figure ES.11), part of the Baku Administrative Region extending from just south of Baku to Gobustan.

Population figures indicate that almost 94,300 people are resident in the District. The majority of the population in the District is Muslim with only a small minority, (approximately 7.4%) being Christian.

**Figure ES.11 Garadag Region**

\(^1\) Baku Sun, 2002.
The average monthly income in Garadag District for 2001 is estimated to be US$75. This figure masks the findings of recent survey work in the area local to the Stage 1 and ACG Phase 1 projects, which indicate approximately 35% of those surveyed in Sangachal, Sahil and Umid receive no income at all.

The oil and gas industries support large numbers of workers while activities in the agricultural sector appear to be largely confined to grazing during the winter season. Fishing is limited and is concentrated around Elet, Sangachal and Lokbatan and appears to be undertaken for recreational and subsistence purposes.

The Baku-Alyaty highway routed along the Sangachal Bay coastline passes to the south of the terminal location and is a main highway. A number of utility lines and pipelines are also routed along the coast parallel to the highway and railway line. These utility lines provide electricity, communications, oil, gas and water.

Health services in the area are provided through medical ambulance stations in the main settlements and also two hospitals. Health issues that have arisen include a typhus epidemic in 1989 and respiratory problems.

Figures indicate problems of overcrowding in schools and colleges. A rough estimate is that 5.7% of school age children graduate from secondary school. Of these, 36.5% are continuing their education in colleges and other higher schools.

The Internally Displaced Persons (IDP) and refugees in Garadag District are primarily located in Lokbatan, Sahil, Gizildash and Sangachal settlements. Just over 20% of IDP in the District are from Armenia while the remaining 80% are IDP from occupied territories of Fizuli, Agdam, Zengilan, Gubadli, Kelbejer, Jebrayil, Lachin districts and Shusa, Khojavend, Khojali city and villages of the Nagarno Karabakh region.

**ES 7.3 Local baseline**

The area local to the project includes Sangachal town, Umid IDP/cement camp, herding settlements, railway barrier operations, a 15th century restaurant, a road-side café/garage, fishing related communities and stone mine operations.

Sangachal town has approximately 4,000 residents, 13% of whom are IDP. The majority of the residents are Muslim. The average monthly income for the Garadag region as a whole in 2001 is US$75 (AZM346,500). Meanwhile a survey of Sangachal residents indicates that 35.6% of respondents have no income at all and of the remaining population some 50% earn between AZM100,000 and AZM500,000. The majority of Sangachal residents view their standard of welfare as poor (51.9% of respondents).²

Officially between 250 and 300 people are employed in Sangachal, although this excludes those involved in agriculture, which is thought to comprise a further 5-10%. The majority of people in employment work in a number of State-run enterprises in the town. Unemployment is a key problem in Sangachal with official figures showing between 30-50% of people unemployed.

Sangachal Bay is under the jurisdiction of the Azerbalyk State Fisheries Concern (ASFC). The ASFC allow fishing with rods for subsistence and recreational purposes. The fishing

² This information has been drawn from the Azeri Holland Friendship Society survey of Sangachal, Umid and Primorsk. There are methodological difficulties with the interpretation of the survey data and at present these figures are indicative only.
The season varies depending on species although it is largely in the spring (February-April) and autumn (August-October).

The majority of the population is housed in state owned apartments with satisfactory supplies of electricity and gas. Cold water is piped into the town. Bottled water is not used for drinking, washing or cooking. The sewage system is basic. There are five garbage disposal sites in the town and they are emptied once or twice a week. There are very few roads in and around Sangachal and most of these are covered in gravel.

It appears there are no major health problems in Sangachal town. A recent survey indicated that over 50% of the Sangachal population assessed their health as poor. An immunisation campaign is being undertaken within the town. There is no hospital or pharmacy in Sangachal however an ambulance station provides basic first aid.

Sangachal has only one school. Last year approximately 10 children went onto university education. Sangachal school faces a number of key problems including necessary and ongoing building maintenance and lack of computer equipment for pupils.

Almost 13% of Sangachal residents are classified as IDP. IDP in Sangachal do not live in permanent accommodation but are housed in either public buildings or abandoned homes. Whilst IDP receive free medical services and also education, they do have to pay for medication. The receipt of foreign aid for IDP at Sangachal and Umid is limited and infrequent and no figures were available on the amounts, frequency or purpose.

Access to telephones is limited to 30% of the households, however the majority of people have access to televisions. There is very limited circulation of newspapers, although radio is accessible to all.

Officials within the government, at the national and regional level, undertake decisions affecting the community, such as those connected with investment and events. In addition to this formal process, Sangachal has a group of elders who bring forward issues and concerns from the residents to the local executive power.

Umid Camp is a settlement with one area housing IDP and another housing workers from the Garadag Cement Plant at Sahil. In total there are more than 1,000 people living in Umid Camp in 130 households. It is estimated that 48.3% of the population is male and 51.7% female. It is estimated that 72% of the households within Umid Camp as a whole are IDP households. The Camp houses a school, medical office, bakery and post office. Households are supplied with gas, electricity and cold running water. The sewage system is a simple open drainage ditch around the camp. The roads in and around the camp are gravel based.

Information indicates that there are low levels of employment, an apparent unreliability of foreign aid, a low level of national aid and injuries to male members of some of the households. All of the employment sources within the camp are state run enterprises. A few residents are involved in fishing, however this is for subsistence purposes to supplement diet. Many of the IDP families have been affected by the war and this specifically affects employment opportunities where the men have been injured. As a result it is often the women within the household who work and not the men, as would normally be the case.

Medical services within the camp are limited and the existing medical facility is a basic first aid post. All the children from the IDP Umid Camp are immunised by doctors from Primorsk hospital. Whilst medical facilities are free, there is a limited supply of medicine. Assistance from international organisations is on a very infrequent and ad hoc basis. Umid camp has one school and is attended by approximately 120 children.
The site in and around the terminal area is winter grazing land for a number of pastoralists and their animals. There are two herding settlements within the vicinity of the terminal, one in the Central North area and another situated at the foot of the West Hills.3

The West Hills settlement is used by herders during the winter months. There are approximately 31 people living at the West Hills settlement during the winter months. The herders spend around eight months a year at the settlements from approximately mid-August to mid-May each year. The herders are paid a wage for looking after state owned sheep. In addition they earn a living from their own produce such as cheese and wool. The children of the West Hills settlement are not normally vaccinated and usually attend the Sangachal school. The Central North settlement is used by herders during both the winter and summer seasons. Those living in the Central North settlement sustain a living through grazing sheep and cattle. It is understood that they remain in Shamahar during the winter to attend school. There are no water, gas or electricity supplies to these settlements. No accurate health data has been obtained to date. Medical assistance is sought from Sangachal. It is understood that they remain in Shamahar during the winter to attend school.4

Sangachal Bay attracts commercial fish and their fry for spawning and wintering. Azerbalyk State Fisheries Concern has fishing nets and cages positioned in the Bay, which remain there all year round, although fishing is only undertaken during the months of January-May and September-December. There are some 3 or 4 fishermen employed to work these nets and cages.

Fishing is also undertaken some 1-2 km from the coast via nets are thrown into the sea. This fish catch is reported to be low quality and, as a result, is not sold commercially but is used for subsistence purposes. Fishing vessels also catch sprats some 40-60 km further out to sea using a combination of lights and nets.

Other activities and sites within the local area include:

- a **roadside café/garage** beside the main road to Baku near to the entrance of the terminal site. It is owned and run by two Sangachal residents.
- an **open cast stone mine** (Firuza stone mine) operating approximately 10 km from Sangachal town and north of the proposed terminal site. The materials are used for construction in the local area. It is estimated that there is enough stone in the mine to remain in operation for a further 20-30 years. The mine is in operation 24 hours a day with employees working in shifts. There are around 25 people employed at the mine.
- a 15th century **historical restaurant** that was a “caravanserai” and is now a protected state monument approximately 1 km southeast of the terminal site.
- a **railway barrier/crossing** with an associated hut (attended 24 hours per day) situated on the access road into the terminal site. Four people share the job as railway barrier operator, with each working a 24 hour shift and then having three days off. The hut provides shelter with basic facilities.
- **archaeological finds** are scattered around the local area and the proposed terminal site. Survey work undertaken as part of the Shah Deniz Stage 1 ESIA identified some surface finds in the area along with the possibility of sub-surface archaeological features.

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3 Information gathering on the herding settlements is ongoing and the information presented here may change and expand as new data emerges from this process.

4 This information has been taken from the BP Resettlement Action Plan process for the ACG & Shah Deniz Projects 2001/2.
ES 8 Environmental impact assessment

For the purposes of the environmental impact assessment process, the Shah Deniz Stage 1 project was defined as comprising 85 routine and planned non-routine activities. Each activity was assessed for its potential to interact with 23 identified environmental receptors. Where an interaction was identified, it was denoted as an environmental aspect. Each aspect was then in turn assessed for its environmental impact and ranked in terms of its impact significance.

The environmental impact assessment process determined that the majority of environmental aspects identified did not result in significant impacts. This is partly a result of the characteristics of the project and partly the result of project design that has sought to mitigate identified and potentially significant impacts during the early design stages by:

- eliminating the cause of the potential impact through design modifications;
- reducing the negative effects through design and/or operational practices; and
- development of mitigation procedures to minimise the harmful effects of residual impacts.

Clear examples of where project design is such that environmental impacts are minimised include:

- the decision to adopt an offshore facility which requires minimum offshore activity in installation and commissioning;
- the decision to contain and ship to shore for disposal all drilled cuttings generated from wells drilled with synthetic oil based mud;
- scheduling pipeline installation activities in the nearshore as far as is practicable to avoid environmentally sensitive times (e.g. marine organisms’ breeding seasons);
- the decision for the pipeline to follow, as much as possible, the existing ACG pipeline corridor to the Sangachal terminal, will minimise disturbances to the seabed;
- the decision to locate the Stage 1 terminal alongside the existing ACG terminal and proposed Phase 1 terminals resulting in a reduced land-take requirement;
- the decision to pursue onshore injection of produced water generated at the terminal into dedicated disposal wells;
- use of gas as fuel gas for offshore and onshore facilities;
- the decision to use a turbo-expander for the gas dewpoint process onshore (the largest power consumer at the terminal) as opposed to conventional power generation;
- the decision to install flare gas recovery at the terminal to remove the requirement for routine flaring;
- the decision to fit automatic ignition on the terminal flare therefore removing the need for a pilot-light; and
- the decision to design and install a water treatment plant at the terminal location that will contain and treat sewage waters and eliminate the need to discharge sewage waters to sea.

The impact assessment found no “high” significance environmental impacts associated with the proposed Shah Deniz offshore activities, however four pipeline activities and four onshore activities were assessed to result in impacts of “high” significance. Figure ES.12 illustrates these assessment results in terms of the project’s offshore, subsea pipeline and terminal components.
### Key

<table>
<thead>
<tr>
<th>Project component</th>
<th>Environmental receptor</th>
<th>Evaluation of impact significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Marine</strong></td>
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<tr>
<td>Terrestrial</td>
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</tbody>
</table>

### Offshore
- 35 activities
- 297 identified aspects
- No “high” impacts

### Pipeline
- 22 activities
- 288 identified aspects
- 10 “high” impacts
  - 7 environmental receptors
  - 4 contributing activities:
    - Nearshore pipeline trench construction
    - Finger-pier construction
    - Landfall construction
    - Onshore pipeline trench construction

### Terminal
- 25 activities
- 124 identified aspects
- 10 “high” impacts
  - 7 environmental receptors
  - 4 contributing activities:
    - Ground clearance and grading
    - Excavation of drainage channel
    - Construction of access road / railway crossing
    - Power and heat generation
Although all potential impacts have been considered during this comprehensive impact assessment only the specific environmental issues and proposed additional mitigation measures associated with the activities identified as having the potential to result in “high” significance environmental impacts are discussed below.

**ES 8.1 Installation of 26” and 12” pipelines in Sangachal Bay**

Pipeline installation activities in Sangachal Bay, using methods typical of those used worldwide, would result in direct temporary physical disturbance of the seabed, some localised loss of rocky outcrop and the direct loss and indirect disturbance of seagrass habit. The base case pipeline route has been selected to minimise these impacts by considering seagrass and algae habitat distribution in the nearshore and identifying a route with limited impact alongside the existing ACG pipeline and future proposed ACG pipelines. In addition, the seasonal sensitivity of the bay has been considered during the development of the construction schedule with installation activities, wherever possible and practical, avoiding the times of the year with highest biological activity (i.e. spring and late summer).

The nearshore section of the pipelines from offshore will be buried for approximately 2 km from the shoreline. The decision to bury the pipeline has been made for pipeline integrity reasons and will reduce the risk of third party damage. As stated earlier a trench will be mechanically excavated in water depths of up to 2 m. For each pipeline, a trench of up to 8 m in width, approximately 100 m long would result from these excavation activities. Beyond water depths of 2 m, the pipeline will be buried into the seabed using a mechanical cutter and would be approximately 3 m wide and 1,900 m long. Trenching activities for both pipelines will therefore result in the direct loss of seabed habitat over an area of approximately 1.3 ha. Deposition of excavated material adjacent to the trench is estimated to impact an area of at least the same size and possibly up to twice as large. Trench construction activities are therefore, estimated to directly impact 2.6 ha of seabed habitat.

In order to mechanically excavate the trench in the inshore area, it is planned to construct a finger-pier from the shoreline to the 2 m depth contour to support the excavation equipment. The pier will be approximately 10 m at its base and 100 m long. The total area of seabed that will be directly impacted by the structure will therefore, be approximately 0.1 ha.

It is planned to remove the finger pier following installation and to return the area to its original status to minimise the potential to cause a change in coastline configuration in areas removed (i.e. distant) from the pier. Removal of the pier will result in further short-term disturbance and a re-suspension of sediments thereby potentially impacting again on nearby seagrass beds and benthos. The project is therefore considering alternatives to the construction of the finger pier, such as using a flotation pontoon or floating barge, although preliminary indications are that there are potential difficulties associated with the possible alternatives, in particular, the availability of suitable and appropriate equipment in the region.

Apart from the direct impacts on the seabed including rocky outcrops in the pipeline right of way, the most important environmental receptor that will be affected in the Bay would be the seagrass beds. Seagrass habitat is important in terms of the ecological role it plays as a spawning and nursery area for a range of marine organisms including commercially important fish species. The root structure of seagrass beds also plays an important role in the stabilisation of seabed sediments. In total, approximately 450 ha of sensitive seagrass habitat are present in Sangachal Bay and it is estimated that between 20% and 25% of the pipeline corridor in the Bay consists of these seagrass beds. The total area of seagrass habitat that would be directly impacted as a result of pipeline installation activities is, therefore as a percent of total sensitive habitat in the Bay, very small (i.e. <1%).
The excavation activities however, would also result in increased turbidity of the water column from mobilised sediments. Depending on the strength of currents at the time of trench construction, sediments could be mobilised, transported and deposited considerable distances away from the immediate trench construction area and impacting additional benthic habitat and organisms. The dynamic sediment in the Bay suggests the presence of currents strong enough to mobilise the Bay’s benthic sediments and as such marine flora and fauna in the Bay are to some degree, accustomed to turbid waters and hence could be expected to be able to sustain short term, low to medium level disturbance. Deposition of significant amounts of sediment over a short timeframe however, may lead to the smothering of marine flora and fauna with potential mortality of the impacted species. Consideration is being given to the use of silt screens around the pipe-lay activities that will trap and limit the lateral movement of mobilised sediments.

Impacts resulting from pipeline installation in the nearshore are considered to be of “high” significance in light of the ecological value of and long restoration times (i.e. years) for seagrass habitat.

The pipeline contractor will develop a management plan prior to any pipeline installation works commencing and will maintain an active monitoring and recording programme during all construction and installation activities. One of the key objectives of the plan will be to restore the impacted habitat as close as possible to its pre-project condition including the removal of the finger-pier. A post-restoration audit will be conducted. The re-instatement will also be followed by monitoring surveys to ascertain how rapidly and effectively the habitat is becoming re-colonised.

Although the nearshore area would be expected to recover over time, recovery of the seabed and associated communities around the pipeline route would be hampered by the subsequent installation of future pipelines required for further developments including later phases of the ACG Full Field Development and potentially, also the future development of the Shah Deniz field. These activities would lead to additional and cumulative impacts on seagrass habitats and benthos within the Bay.

**ES 8.2 Terminal and onshore pipeline construction**

Construction of the terminal flood protection drainage channel, terminal access road, construction camp, and clearance and levelling of the ground in preparation for the terminal facilities construction will result in the loss of in excess of 170 ha of terrestrial (semi-desert) habitat. As the features will be long term, there is no opportunity for habitat restoration within this footprint. It should be noted however that this area of direct loss also includes the ground clearance and levelling work required for the ACG Phase 1 terminal facilities that is an approved development.

Installation of the three Shah Deniz pipelines in the coastal and onshore environmental would include the excavation of trenches from the shoreline landfall sites to the terminal site and as such would result in the temporary loss of approximately up to 6 ha of habitat.

In addition to impacts on flora as a result of direct habitat loss there is also the potential for these activities to directly impact fauna, resulting in their mortality.

The drainage channel to be constructed, in order to protect the terminal from flood, will result in an alteration to the local hydrological regime with the potential to also impact on wetland habitat (wadis and marshes) in the vicinity of the terminal site. Further investigations will be conducted to establish the potential impacts of the channel, including a watershed analysis, to analyse channel flow and the spatial fate of diverted water. An ecological study to predict the
effects a changed hydrological environment has on nearby wetlands is also under consideration although monitoring may be sufficient.

As described earlier, the environment around the terminal site location and the onshore pipeline corridor host a number of nationally and/or internationally red-listed flora and fauna species. Listed flora species are the endemic Baku Calligonum, the Baku Astragalus, and the Sharp-edged Darling Iris. Listed fauna species found in the area include the Spur-thighed tortoise, Black-bellied Sandgrouse and the Lesser Kestrel. Hence, the impacts associated with these installation and construction activities are considered to be significant.

The onshore section for the pipelines will utilise the narrowest possible pipeline corridor in order to minimise the aerial extent of disturbance to habitat. Excavated soils will be collected and stored with the topsoil layer stored separately from the subsoil. These soils (subject to suitability) will be used to backfill the open trench following pipe-lay with the topsoil layer being re-instated to, as close as possible, pre-disturbance conditions. The potential for direct impact resulting in mortality of individual animals will be mitigated through site control and the restriction of vehicle movements in the area.

Monitoring programmes will be conducted following installation and re-instatement to determine the extent to which habitats and specific species have been disturbed and to ensure that the area disturbed is colonised with natural flora and fauna. In the event that natural recolonisation does not occur at an effective rate, habitat restoration will be conducted including direct planting of relevant flora species.

Impacts resulting from the construction of the terminal and associated facilities are considered to be significant due to the permanent removal of a large area of habitat that hosts the red-listed flora and fauna species in the area.

An environmental management plan to be developed by the construction contractor will include procedures designed to minimise direct impacts to animals in the area during construction. This plan is already in place for early civil engineering programme at the site which began in January 2002 and includes provision for environmental awareness training to ensure that all personnel understand the key sensitivities in the area of work activity and the required vehicle movement controls. In addition, HSE representatives have been on site to monitor construction activities and to identify vulnerable fauna, such as the red-listed Spur-thighed tortoise, for rescue where and when appropriate.

A habitat compensation programme designed to compensate for habitat loss is also under evaluation. This programme would seek to mitigate, through semi-desert habitat rehabilitation/restoration, the habitats lost to the most significantly impacted flora, birds and herpetofauna from terminal construction activities.

In addition to habitat compensation, a Spur-thighed tortoise augmentation programme is under development in order to compensate for impacts associated with construction activities. This programme includes a captive breeding effort with assistance from specialists with previous experience of conducting such programmes with the objective of breeding the animals and subsequently releasing them to the wild thereby adding to currently viable populations in Azerbaijan.

**ES 8.3 Greenhouse Gas Emissions**

The amount of greenhouse gas (primarily carbon dioxide and methane) that would be released as a result of the Shah Deniz Stage 1 development over the life of the project are comparatively small for a development of its size and nature. Given international concerns regarding the potential for greenhouse gases to contribute to global warming, the fact that
emission of such gases has been raised by project stakeholders as an issue of concern and the implications for BP in terms of its Corporate policy to reduce greenhouse gas emissions from its global operations, impacts associated with their release are considered to be of “high” significance. The cumulative emissions of the Shah Deniz and ACG projects are also of concern given the appreciable quantities that will be released as a result of the latter development. BP is committed to monitoring the quantities of all atmospheric releases and to implementing reduction strategies where technically and financially feasible.

ES 9 Socio-economic impact assessment

For the purposes of the socio-economic impact assessment process, the Stage 1 project was defined as comprising 82 routine and planned non-routine activities. Each of these activities was assessed for its potential to interact with 11 identified socio-economic receptors. Where an interaction was identified, it was denoted as a socio-economic aspect, each aspect was then in turn assessed for its socio-economic impact and ranked in terms of its impact significance.

The socio-economic impact assessment process determined that the majority of socio-economic aspects identified did not result in significant impacts. This is partly a result of the characteristics of the project and partly the result of project design that has sought to identify all potentially significant impacts during the early design stages by:

- eliminating the cause of the potential impact through design modifications;
- reducing the negative effects through design and/or operational practices; and
- development of mitigation procedures to minimise the harmful effects of residual impacts.

Of the 85 routine and planned non-routine project activities identified, 10 activities were assessed to have the potential to cause 19 “high” impacts. Two activities were assessed as having the potential to result in a socio-economic impact of “critical” significance. These impacts (on the local herding population and the existing café/garage business) are being addressed through a mitigation process seeking an acceptable outcome to all parties. Figure ES.13 illustrates these assessment results in terms of the project’s offshore, subsea pipeline and terminal components.
Figure ES.13  Socio-economic impact assessment results (routine and planned non-routine activities)

<table>
<thead>
<tr>
<th>Project component</th>
<th>Environmental receptor</th>
<th>Evaluation of impact significance</th>
</tr>
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</tr>
</tbody>
</table>

Key

- Archaeology / Cultural Property
- Fishing
- Shipping
- Land Use
- Population in the vicinity of activity
- National Employment Base
- Utilities
- Community Infrastructure
- Transport
- Oil and Gas Infrastructure
- National Industrial Base
- Government Revenue
- Transboundary
- International Procurement
- Liability / Reputation

1 “high” impacts
1 socio-economic receptor
1 contributing activity:
Mobilisation of workforce

1 “critical” impact
3 “high” impacts
2 socio-economic receptors
4 contributing activities:
Pipeline installation onshore
Construction of nearshore trench
Pipeline installation in the nearshore
Pipeline installation offshore

6 “high” impacts
4 socio-economic receptors
3 contributing activities
Vessel operations and utilities
Rail transport
Road freight

1 “critical” impact
6 “high” impacts
3 socio-economic receptors
7 contributing activities
Land acquisition and tenure
Ground clearance and grading
Modification of existing services
Construction of access road and railway crossing
Mobilisation of workforce
Terminal construction
Demobilisation
ES 9.1 Transportation of equipment and materials to Azerbaijan for onshore and TPG500 construction and assembly

The transportation of materials and equipment into Azerbaijan for both onshore terminal construction and TPG500 construction, will have an impact on fishing and shipping activities and the road transport infrastructure.

BP has endeavoured to promote transport synergies with its other concurrent Caspian projects (e.g. ACG Phase 1) wherever schedules allow. This will enable the co-ordinated transportation of similar items to minimise the overall load on the transport routes in Azerbaijan. Some of the project options remain under evaluation and further logistics will be defined as the project develops. Sea transportation routes could include from Europe to the Black Sea and into the Caspian through the Don Volga canal or from Europe to the Baltic Sea and into the Caspian through the Baltic Volga canal.

Although exact figures for current volumes of traffic are not available for all sections of all routes, it is known for instance, that vessel traffic is high in the Turkish Straits generally and especially in the Bosphorus Strait to and from the Black Sea and further shipping will add to the volume. Transportation through the Don Volga canal will require passage through the Bosphorus. At this stage of the development of transportation logistics it is estimated that six barges in total will be used to transport Shah Deniz materials through the Don Volga canal; five in May 2004 and one in June 2004. In addition, 13 riverships will be used for transportation through the Don Volga canal; two ships in each of June, July and August of 2003, five in May 2004 and two in June 2004. Given the low numbers of ships to be used it is unlikely that the Shah Deniz project itself will significantly contribute to river traffic during the construction period.

All vessels will be of international maritime standard and the use of these waterways will be compliant with this transport infrastructure network. Detailed forward planning will be in place for the project and this will include notification of other users of these transport routes of the schedules to minimise any interference caused, thereby reducing any significant impact to shipping that has not been anticipated.

The majority of road and rail vehicle movements for equipment and materials transportation will take place between April 2003 and May 2004. Over this period on average approximately 100 trailers a month will be utilised for road freight transportation with peaks of approximately 200 trailers a month between September and December 2003. Some loads may be considered abnormal and require police escort. For ongoing road and rail transport, contractors will be required to supply detailed transport and traffic management plans including scheduling road traffic activities at times when they will least interfere with other users. As the rail transport network within Azerbaijan is under-utilised, rail transport is not expected to be significantly impacted. The onshore construction contractor will be required to provide affected communities with education on traffic and safety issues.

ES 9.2 Terminal construction and onshore pipeline installation

The terminal construction and onshore pipeline installation activities themselves will impact significantly on the local herder population, the existing café/garage business and on transport facilities in the local area. In addition, the workforce associated with the construction

5 BP Internal report Total Tonnage ACG-AGT-SD March 2002
6 Information supplied by BP March 2002 in ‘Total Tonnage SD-AGT-ACG’.
7 Information supplied by BP March 2002 from internal report ‘Total Tonnage ACG-AGT-SD’.
activities, and any inwardly migrating population seeking employment, may have a significant impact on the social, cultural and health issues in the local and regional community.

Construction of the terminal flood protection drainage channel, terminal access road, construction camp and clearance and levelling of the ground in preparation for the terminal facilities construction will require a land-take in addition to that already being used for the EOP terminal. The land-take for the Stage 1 and ACG Phase 1 terminal construction (including that portion of the existing AIOC property that is presently undeveloped) will result in the loss of 438.6 ha of existing grazing land used by the local herder population; that is, approximately 30% of their existing grazing land in the area. As the land-take will include both the Shah Deniz gas terminal and ACG Phase 1 terminal facilities, there will be no need for any further land-take for future phases of the developments. The initial land-take however, will result in a permanent reduction in grazing area in the vicinity of the terminal.

The nature and extent of the Qobu State Cattle Breeding Enterprise herders’ grazing rights are presently being investigated. In the event that it is found that their grazing rights are adversely impacted by the project, the issue of any applicable compensation will be addressed in the first instance by the local executive authority, the district Department of Lands and the Ministry of Agriculture (which has administrative responsibility for the Qobu State Cattle Breeding Enterprise). So far as feasible, preference will be given to providing the affected herder families with rights to replacement grazing area equivalent to that lost to the project.

Commitments and procedures to be followed for project land acquisition will be documented in a Resettlement Action Plan prepared in accordance with World Bank Operational Directive 4:30 on Involuntary Resettlement.

The route for the onshore pipeline installation has been chosen and will pass under, or close by, the existing café/garage business located near the access road to the Sangachal terminal. This route will entail the removal and relocation of the existing business to an alternative site. It is proposed that the alternative site be within the Sangachal area. Immediate impact mitigation is relatively straightforward. Discussions are currently ongoing with the café/garage owners to ensure that no disruption to livelihood in the short and long term will be caused by the relocation process. Results of the discussions and details on the resettlement actions and agreements will be documented in the publicly available Resettlement Action Plan.

The workforce, and any inward migrating population seeking employment, associated with the terminal and onshore pipeline construction activities (including the Early Civil Engineering Works Programme) may impact on the local and regional community in a number of ways. The main possible significant impacts would be associated with tension created within the local community as a result of labour drawn from outside Azerbaijan, a potential increase in activity in the informal economy in the area, potential market distortion as a result of increased wages and possible associated price inflation and health impacts associated with reproductive health issues and communicable diseases.

Tension may occur within the local community if labour is seen to be unfairly drawn from outside Azerbaijan. Members of the local community may feel that employment opportunities should be for the local and Azerbaijani national population only. Tensions associated with the importation of a labour force from outside of Azerbaijan may become associated with the ethnicity. A number of measures have been included in the operational practices of the project to address this issue including a percentage target of local and Azerbaijan workforce content as a requirement of tender and worker and camp management measures, including regulated hours and on-site entertainment facilities.
An increase in money circulating within the local economy as a result of an increase in waged workers and more (and/or more prosperous) local businesses within the local community may have an impact on both the informal economy and contribute to local market distortion and pricing increases. These issues are recognised as being significant but diffuse and difficult to address properly. Direction will be sought through the BP Social Investment Strategy as to the best way to mitigate such activities, should they occur.

Communicable diseases and reproductive health issues are recognised to be of significance as a result of both the construction workforce and any inward migrating population in search of employment. The worker and camp management measures noted above, along with screening and treatment measures for labour drawn from outside Azerbaijan, will go some way towards addressing these impacts. Contractors will be encouraged to advertise any employment opportunities to help manage expectations but it remains difficult to predict if any significant inward migration will occur as individuals search for employment or to anticipate what measures could be used to control health issues among these people.

Noise levels from the combined operation of the Shah Deniz, ACG and EOP terminals were modelled for the Shah Deniz and ACG ESIA studies. Results indicate that under normal operating conditions, terminal operations will meet the World Bank Guidelines at all nearby sensitive receptors.

Design work in relation to the Shah Deniz terminal flare (which will be used for infrequent emergency shut-down events only) is ongoing. The final flare configuration will comply with the World Bank Guidelines on noise levels at sensitive receptors.

The terminal and onshore pipeline construction activity is likely to lead to an increased road traffic load on the main Baku-Alyat highway and may cause some inconvenience and nuisance to local users and possible deterioration in road infrastructure, although no roads within Sangachal, Umid or Primorsk will be utilised as part of the construction process. Contractors will be required to supply detailed transport and traffic management plans, including scheduling road traffic activities at times when they will least interfere with other users. The onshore construction contractors will also be required to restore any transport access routes, to at least their pre-construction condition, if any deterioration has occurred as a result of construction transportation activities. In addition, the onshore construction contractor will be required to provide affected communities with education on traffic and safety issues.

The public transport system is already overstretched in the local area and an increase in use (arising from project activities) may exacerbate this and impact negatively on the local population. To avoid placing extra pressure on these systems, contractors for onshore construction will use private buses to transport day workers to the site. There may however, still be an increased load placed on the system should camp workers use the system to travel to and from the site for entertainment purposes outside working hours.

**ES 9.3 TPG500 construction**

At present the location for the TPG500 final construction is yet to be decided. Current plans indicate that an existing fabrication yard within the capital city of Baku will be used for these activities. When a yard near Baku is chosen, it will be necessary to assess the socio-economic impacts associated with the use of the yard on the local community. This will be achieved via the completion of a separate ESIA process that will form an addendum to this ESIA document. The socio-economic impact assessment in presented this Environment Statement report does not address TPG500 construction per se but does address the transportation of construction materials and the pre-fabricated hull sections of the TPG500 into Azerbaijan and the impacts on offshore fishing and shipping as a result of transportation activities.
ES 9.4 Nearshore pipeline installation

The fishing currently undertaken within Sangachal Bay will be temporarily directly affected by the proposed Stage 1 developments, as there will be restrictions on access and use of the Bay during pipeline installation. In addition, there will be some disruption to the subsistence and recreational fishing undertaken in the Bay by local residents.

As a result of the restrictions on access and use of the Bay, consultation are ongoing with Azerbalyk, the state fishing concern, over the movement of fishing nets and cages to ensure that their livelihoods are not affected by the removal of the nets and the destruction of the cage. These negotiations will be documented as part of the Resettlement Action Plan that will be publicly available.

Information has been gathered to assess the extent of existing fishing activities and establish the legality of those activities. Significant, disruption to any legal commercial fishing activities will be compensated. Subsistence or recreational fishing activity and any illegal fishing activities will not be compensated. To avoid destroying existing fishing nets, the need for removal of illegal nets will be widely advertised. The significanc of the contribution of illegal and subsistence/recreational fishing activities to local livelihoods is unclear and clarification may not be possible (Chapter 7). Current understanding is that subsistence/recreational fishing activity can be undertaken from comparable alternate locations in terms of accessibility and productivity. If not, as noted above, this may adversely affect local socio-economic conditions.

ES 9.5 Offshore installation, hook-up and commissioning and operations

Some 100 fishing boats operate 40-60 km from shore catching sprats and this activity is likely to be negatively impacted by offshore installation of the pipeline although only for a limited duration of time. Baku is also home to one of the key fishing markets in the area and those trying to access it may need to make a small diversion during construction.

ES 9.6 National employment and industrial base

ES 9.6.1 Construction phase

ES9.6.1.1 Direct effects

The onshore and offshore construction contractors will only source labour from the international market where the national labour force cannot supply the skills required for the programme. A target of 75% locally sourced labour for onshore construction programmes has been set for the Shah Deniz and related ACG projects. The contractors are committed to using a maximum of 15% of the man-hours from outside Azerbaijan. It is anticipated that some training of local workers will be required and as such, training and development programmes are to be implemented by Shah Deniz contractors.

Approximately 1,000 people will be employed during terminal construction. Employment will gradually build up from January 2002 to September 2002, when it will continue at peak levels until February/March 2004. Terminal construction is envisaged to be complete by the end of 2004/beginning of 2005.

8 Likely date for choosing the terminal contractor for ACG Phase 1 is estimated to be November 2001. These figures are the estimated maximum number at the peak of construction. Source : BP.
Approximately 300 personnel\(^9\) will be employed for the construction of the pipelines and 75% of these will be Azerbaijani. In addition, the construction of the TPG500 will require (on average) 300-400 personnel over a period of 12 to 15 months, peaking at around 500. A target of between 60-70% Azerbaijani has been set for the TPG500 construction workforce.

Preliminary estimates indicate that total construction costs in relation to Shah Deniz Stage 1 development will be approximately US$2 billion.\(^{10}\) It has been estimated that approximately 40% of this expenditure will occur within Azerbaijan (i.e. US$0.8 billion).

**ES9.6.1.2 Indirect and induced effects**

The European Bank for Reconstruction and Development (EBRD) estimates that approximately 70% of expenditure (i.e. procurement and income) will leak from the Azerbaijani economy. On this basis it is considered that a combined indirect and induced multiplier of 1.43 is appropriate for the construction phase on the basis of the size of the area and the limited duration of this particular form of direct employment. For the purpose of estimating the indirect and induced employment effect during the construction phase, the multiplier coefficient applies equally to construction workers recruited locally and those brought in from outside the local area. In both cases, construction jobs represent new employment opportunities for the local economy.

Based on the above, it has been estimated that the impact of Stage 1 is detailed in Table ES.3 below.

**Table ES.3 Direct and estimated total (onshore and offshore facilities) impact (US$ million)**

<table>
<thead>
<tr>
<th></th>
<th>Azerbaijan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct:</td>
<td>800</td>
</tr>
<tr>
<td>Indirect and Induced:</td>
<td>344</td>
</tr>
<tr>
<td>Total:</td>
<td>1,144</td>
</tr>
</tbody>
</table>

*Source: Consultants estimates.*

**ES 9.6.2 Operational phase**

**ES9.6.2.1 Direct effects**

The workforce required for the onshore and offshore operations will be smaller than that required for construction being approximately 65 in total (45 offshore and 20 onshore). It is proposed that after five years, some 70% of the operational jobs would be occupied by Azerbaijani nationals. Within this it is envisaged that approximately 60% of all professional positions will be held by Azerbaijani.

The key issue during the operational phase will be the role of local people and whether they can benefit from the employment opportunities. BP has a preference for filling the employment places with local people, whilst bearing in mind the necessary skills and experience that will be required. BP has commenced inviting individuals to register at recruitment centres in early 2002 to ensure that any suitable candidates identified can undertake the necessary training in advance of project operational requirements from 2005.

It is estimated that the costs during the operational phase of the project will be approximately US$54 million per annum and in the region of 70% of this expenditure is expected to be

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\(^9\) These figures are the estimated maximum number at the peak of construction. Source: BP.

\(^{10}\) Source: BP.
incurred within Azerbaijan (i.e. US$37.8 million). Based on a 30 year operating period for Stage 1, this equates to an estimated total spend of US$1,620 million, of which approximately US$1,134 million will occur within Azerbaijan.\footnote{Source: BP}

**ES9.6.2.2 Indirect and induced effects**

The indirect employment effect arises from secondary business supplying goods and services to on site activities, which in turn, create further economic activity by purchasing additional supplies. The induced employment arises from the creation of additional personal income derived from the first (direct workers), and successive (indirect workers) rounds of spend. The extent of the indirect and induced employment impacts within Azerbaijan will be conditioned by the “leakage” caused by the payment of income (such as the payment of wages and salaries, profits, rents, interest and taxes) rather than the purchase of goods and services to individuals or organisations outside the locality.

Considering the indirect and induced effect for offshore construction activities, it has been estimated that the impact on the Azerbaijani economy resulting from the operation of the Stage 1 development over a 30-year period is as presented in Table ES.4.

**Table ES.4 Direct and estimated total impact (US$ million)**

<table>
<thead>
<tr>
<th></th>
<th>Azerbaijan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct</td>
<td>1,134.0</td>
</tr>
<tr>
<td>Indirect and Induced</td>
<td>487.6</td>
</tr>
<tr>
<td>Total</td>
<td>1,621.6</td>
</tr>
</tbody>
</table>

**Source:** Consultants estimates.

**ES 10 Conclusions**

The Shah Deniz Gas Export Project (Stage 1 development), in conjunction with the ACG Full Field Development project and other associated projects (e.g. the AGT pipeline export projects) represents a unique opportunity for Azerbaijan to develop a stable economy, to improve social equity and to reduce poverty. These projects are collectively by far the largest investments ever committed in Azerbaijan.

This Environmental and Socio-Economic Impact assessment describes the extensive engineering design and environmental evaluations conducted over a number of years in preparation for the Shah Deniz Stage 1 development. One of the prime objectives of these past studies was to identify and characterise the potential environmental and socio-economic impacts at each iteration of the conceptual and detailed engineering design process and to either eliminate the cause or contributing factors leading to the impacts through re-design, or reduce the potential effect to an acceptable or manageable level, through mitigation measures and operations management.

Although impacts from the project have been eliminated and/or reduced a result of project design, there remain some residual environmental impacts that have been assessed as being of “high” significance. These are mainly associated with pipeline installation and terminal construction activities and principally pertain to physical impacts to nearshore and onshore habitats and consequent effects on important species of plants and animals. In addition, a number of residual socio-economic impacts have been assessed as being of “high” and “critical” significance. These include potential impacts on fishing and shipping activities, the
transport infrastructure, social and cultural interaction issues, land use and effects on the national employment and procurement base.

There is a range of other important but less significant environmental and socio-economic impacts associated with the project that will require an ongoing management commitment. In this respect, the operator and the project partners are committed to the development of an improved understanding of the socio-economic and environmental issues that characterise the project and to a programme of management and continued improvement in socio-economic and environmental performance.

Notwithstanding the predicted adverse effects, the project, together with the subsequent development proposals, has the potential to make a very significant positive contribution to the development of Azerbaijan over the coming decades. Importantly, the project could indirectly add impetus to energy sector reform within Azerbaijan and could stimulate the creation of new industries that could form the foundation of a more robust Azerbaijani economy. The project should also improve the population’s access to energy (gas and electricity) and result in the wider use of cleaner fuels leading to better ambient and indoor air quality and reduced pressure on traditional sources of fuel and hence forest products and therefore, biodiversity. The combined effects of these outcomes would also reduce the country’s greenhouse gas emission inventory and partially offset the emissions generated by the project.