The impacts of a major oil spill on industrial fishing could arise from direct mortality of target species; imposition of a ban on fish catches and a ban on consumption for toxic reasons; reduced marketability due to perceived or real pollution risks; and fouling of fishing gear.

The extent and duration of the impact will depend on prevailing environmental conditions, the type and amount of fuel spilled, and the timing and success of any clean up measures.

*Table 9.13 Impacts of Worst Case Oil Spill on Industrial Fishing*

| **Nature of Impact** | **The impact of a major oil spill on the Sofala Bank would have serious consequences** |
|---|---|
| **Magnitude** | **Magnitude – High**<br>*Extent*: **Regional to International** as a major oil spill would affect fisheries of Sofala Bank, a major source of export revenues for Mozambique.<br>***Duration:*** **Medium** but depends on success of clean up action and recovery rate.<br>***Intensity***: **High** especially if oil spill occurs in peak prawn fishing season (March to May) when 50% of annual catch is caught but will depend on type of oil. |
| **Probability** | **Likely** (the impact is likely to occur in the remote event of a well blow out or vessel collision) |
| **Significance** | **Major** |
| **Degree of confidence** | **Moderate** |

*Table 9.14 Significance: Impact of a Worst Case Oil Spill on Industrial Fishing*

| **Phase** | **Significance with embedded mitigation (excluding clean-up measures)** |
|---|---|
| Drilling | **MAJOR (-ve)** |
| Post-Drilling (Residual) | **MODERATE (-ve)** |

*Residual impacts of a major oil spill on industrial fishing could be considered to be of moderate significance for a period of three to five years after the event.

### *9.3.10 Mitigation of an Oil Spill*

Mitigation measures range from measures that are intrinsic to the technological safety equipment and procedures and which are undertaken as a matter of course by international drilling contractors ('embedded mitigation'), and additional mitigation measures, which can be considered as extra preventive or amelioration measures. The latter would include the development and testing of an emergency response plan *with* other key stakeholders in the project area ('additional mitigation').

From the modelling results, the minimum time of water surface oiling after the occurrence of a spill would be very short (<24 hours to landfall) for the spill scenario arising from the Delta well site in Sofala Concession. The spill

scenario arising from the Charlie well site is likely to have a minimum water surface oiling time of <48 hours as it is 50 km further from land than Delta. Under this scenario, there will be relatively little time to execute the oil spill response plan before oil may reach sensitive areas along the coast. Furthermore, the potentially strong tidal flows suggest that the spills may be difficult to contain (eg by booming) and that the sensitive ecology of the region (eg mangroves, estuaries, and sea grass) suggests a need to judiciously examine the use of dispersants, if at all. Naturally, the priority will be to implement all possible precautionary measures to ensure the chance of a spill or blow out is maintained at the lowest risk level. This means that all precautionary measures should be adopted to reduce the possibility of a spill to almost non-existent.

The main risk sources for significant oil spills include vessel collisions, uncontrolled well blow-outs and spillages during refuelling. Various standard oil industry measures will be implemented to minimise the risk of an oil spill from occurring. A number of the key precautionary measures are discussed below:

*Blow-out Prevention Equipment*

A safeguard against an uncontrolled release of hydrocarbons during drilling is the use of Blow Out Prevention Equipment (BOP), a specialised piece of safety equipment used to reduce the likelihood of a blow-out occurring. A BOP is installed on top of the well bore, and is designed to close the well in the event of an emergency. This equipment will be thoroughly inspected prior to installation and subsequently pressure and function tested on a regular basis in accordance with oil industry recommended practices.

*Refuelling*

Spillage of fuel oil can occur through a malfunction or failure during refuelling operations at sea. The likelihood of such events will be minimised by conducting refuelling operations in calm weather conditions and rigorous monitoring of the refuelling operations. Pre-booming is also recommended to be undertaken during any refuelling operation at sea.

*Good Communication with other marine users*

Other marine users should be notified prior to the commencement of the operation. Through normal maritime communication channels, stakeholders should be kept informed throughout the drilling operations as to the location of exclusion and safety zones around the drilling rig and the timing of activities. By keeping other marine users informed, potential emergency situations can be prevented.

In addition, collision prevention equipment, including radar, multi-frequency radio, foghorns and lights should be used. Additional measures include 24-hour watches, maintaining the internationally agreed 500 m exclusion zone around the drilling rig, cautionary notices to mariners, presence of a support vessel, and access to current weather service information.

*Combating Oil Spills*

Sasol will prepare an Oil Spill Response Plan for drilling in accordance with IPIECA (1993), which will detail the manner in which spills of different sizes and types will be handled, including the use of equipment and dispersants. The plan should include an analysis and an inventory of available and lacking equipment. The plan should be compiled with the input and knowledge of the Maritime Authority, Port authorities and Fisheries Industry stakeholders to ensure all institutions are informed and are aware of their roles and responsibilities in the event of a disaster. Consideration should be given to conducting an implementation exercise of this plan.

Options for handling oil spills that will be addressed in the Response Plan include containment and recovery and/or dispersion via natural means.

The plan will detail the implementation steps, communication channels, and organisations to be involved and their roles. It will be designed for immediate implementation should a spill arise.

In the event of an oil pollution incident, Sasol's strategy will be to:

- limit the volume of the spill at source;
- assess the fate of the spill;
- contain/recover oil when it threatens coastal/marine resources at sea; and
- clean up areas where oil does come ashore.

Should an oil spill threaten to reach the coast the most realistic option is to combat the spill at sea. If the sea state permits, booms and skimmers should be deployed.

Strenuous efforts should be made to prevent oil from entering the coastal lagoons and the estuaries. Whenever possible the spilled oil should be recovered at sea as close to the source as possible. Should the sea state prevent mechanical recovery, the use of dispersants could be considered depending on the environment affected and where their use may be required. However, they are often not recommended for use in sensitive shallow water environments due to their chemical toxicity. The international debate on use of dispersants is ongoing as they are often considered to cause more harm than good in coastal environments (see below).

If oil enters mangroves, the main clean-up options are (IPIECA, 1993):

- booming and skimming of oil on the water surface in mangrove creeks;
- pumping of bulk oil from the sediment surface, depressions and channels;
- water flushing of free oil from sediment surface and mangroves, into areas where it may be collected; and
- use of absorbent materials, with subsequent collection and disposal.

*Overview of Dispersants*

Dispersants combat oil spills by breaking oil slicks into tiny droplets which become suspended in the water column. Once suspended in the water column, the tiny droplets can be degraded more readily, and as the oil slick is broken up, the chances of shoreline fouling are diminished.

Dispersants were first used in the Torrey Canyon spill in 1967. Since then, modern dispersants have been developed which are environmentally safer (ie less toxic) than the earlier formulations. The benefits of dispersant application need to be weighed against possible risks. Dispersants can be effective in breaking up oil slicks, thereby reducing the chance of shoreline fouling, through enhancing degradation and weathering of oil. However, in shallow areas dispersants can increase the exposure of organisms and habitats to dissolved hydrocarbons, possibly resulting in greater environmental effects.

Subsection 3.4 of the Mozambique National Oil Spill Contingency Plan (NOSCP) (Plano Nacional de Contingência o Combate a Poluição Maratima) (1) describes the procedures to combat marine pollution, with consideration to the environmental legislation applicable to Mozambican water. The use of mechanical techniques is recommended for oil spill recovery and containment. On the open ocean, mechanical recovery and containment methods are often limited by the sea state. Consequently, when rough conditions prevent deployment of booms and skimmers, the use of dispersant chemicals to prevent the oiling of sensitive shorelines or other valuable habitats is often the only option. It should, however, be noted that, according to NOSCP, the use of dispersants is prohibited in areas from the coast out to the 100 m isobath. Also, dispersants may not be used where potable water sources could be affected, which is the case along the coastline between Inhassoro and the Govuro River mouth where coastal communities access fresh water springs above the high water mark at the base of the cliffs.

### 9.3.11 *Summary of Potential Oil Spill Impacts*

It should be noted that all impacts have been assessed assuming that an oil spill has occurred, and therefore the probability refers to the likelihood of the

(1) Note that the Mozambique NOSCP is currently in draft format.

impact arising in the event of a major oil spill. The rating has no link to the probability of the oil spill occurring.

The significance of oil spill impact ratings impacts have not been assessed with mitigation due to the questionable effectiveness of oil spill mitigation under upset environmental conditions.

Overall, a major oil spill arising from well drilling would have a major impact on the marine and coastal environment, and associated fisheries and tourism. The impact would be more severe if it occurs during peak prawn fishing season (March to June) or tourist season (June, September, December to January).

### *9.3.12 Conclusion*

The overall significance of the impacts of an oil spill is difficult to predict because of the many variables involved. While the probability of an oil spill is extremely low, should an oil spill occur as per the worst case scenarios, the extent of the impact could be experienced as far north as Machesse and as far south beyond Ponta Sao Sebastiao. The intensity of the impact will depend on the type, volume and location of oil spilled and the dispersion of the oil at the time of the spill. Under the worst case scenarios, sensitive marine and coastal habitats as well as marine animals will be impacted, threatening the integrity of the marine and coastal environment of the BANP and surrounds.

Limited response options are available should an oil spill occur. The application of dispersants is not permitted in terms of the Mozambican National Oil Spill Contingency Plan (NOSCP) in water depths above the 100 m isobath leaving mechanical recovery as the only feasibly option should the sea state allow. The focus would therefore be on ensuring precautionary measures are adopted to the extent that the likelihood of spills becomes almost non-existent.

It must be noted that the risks associated with a vessel collision during drilling present a similar risk of an oil spills posed by any fishing or other vessels operating in Sofala Bay. The significant additional risk that exploration drilling would bring to the area are of a potential blow-out scenario, which has an extremely low probability of occurrence (1 in 25,000 for any drilling programme).

While the probability of an oil spill is very low, should a spill occur, the direct impact on the marine environment and the fishing industry in particular could be significant. Impacts resulting from normal exploration drilling activities are representative of the potential impacts that may occur should viable hydrocarbon reserves be found and exploitation of the reserves approved.

In the light of the potential consequences of an accident occurring in the Sofala Bay and affecting the Bazaruto area, the Mozambican Authorities need to consider the acceptability of the risks associated with exploration drilling and gas/condensate production for future oil and gas activities off the coast of Mozambique. This is a strategic issue which revolves around the long term compatibility of the oil and gas sector with the status of the surrounding natural environment and other economic sectors (tourism and fishing) that are dependent on the natural environment. The Government will have to weigh up the tradeoffs between accepting a potential oil spill risk and the associated impacts against the potential to generate significant revenues from hydrocarbon production for Mozambique.