Gujarat State Petroleum Corporation Ltd.

Proposed Terms of Reference
For carrying out
EIS/EMP & RA/ DMP

For Drilling of 66 wells and Setting up 8 Early Production Systems
Dist. –Ananad & Kheda.

In
CB-ON/2 (Tarapur) Block
Gujarat

1. INTRODUCTION AND BACKGROUND

1.1 Purpose of the Document

The purpose of this document is to identify the information required by MoEF for an Environmental Impact Assessment (EIA) report. GSPC will prepare and submit an EIA report that examines the environmental Impacts of the proposed Production Operations

1.2 General Information

Gujarat State Petroleum Corporation Limited (GSPC) has been established in year 1979 as a Government of Gujarat undertaking and is involved in exploration and production of Oil and Gas.

GSPC has grown from being an operator of small fields in Gujarat into an expansive oil and gas exploration and production company across India. Its rise in the hydrocarbon sector was helped by the Central Government's opening of the sector to private participation in the early 1990s. GSPC constructed India's first and only Land Based Drilling Platform in the Hazira gas field in 1998, through which gas is being supplied to various industries across Gujarat.

In the last few years GSPC has played a pioneering role in the development of the Nation's hydrocarbon resources, most notably, with its discoveries in the Krishna-Godavari Basin (Off-shore).

The promising and extensive exploration blocks viz. CB-ONN-2000/1, CB-ON/2, CB-ONN-2002/3, CB-ONN-2003/2 along with the small size producing oil/gas fields will greatly help in expanding GSPC's base and substantially augment the production of oil and gas in the State & Country

1.3 Project Background

The Trapur block is located in Cambay-Tarapur tectonic block and covers an area of 1618 square kilometer area. It stretches from South of Kheda to North to Amod, west of Anand and to the Northwest of Khambhat. The nearest available townships area Tarpur, Khambhat, Anand, Nadiad and Kheda. It is well connected by road and Mumbai via Vadodra. The national highway NH-8 passes through the block.

Location details area are as follows:

Taluka: Khambhat, Tarapur, Matar,

District: Anand & Kheda

State: Gujarat

CB-ON/2 Tarapur Block was awarded to the consortium of GSPC, ONGC & GEO GLOBLE, BARBADOS INC. during PRE NELP round of bidding by Govt. of India wherein GPSC is operator for the block.

GSPC has created one of its production facility called Tarapur: Early Production System (EPS) at Block No: 469, Village Milrampura near Kanawada village, P.S. & Taluka: Tarapur, Dist: Ananad. Environmental Clearance for the same was obtained from MoEF vide dated 16th June, 2009.

With the subsequent development of more wells in Tarapur Block, GSPC has planned to connect additional 12 wells to existing Tarapur-EPS and therefore facility is required to be upgraded/ modified for managing the additional production from the new wells.

Location details are shown in the table below.

Sr. No.	Well Name	Latitude	Longitude
1	P#2_L1	22°42'2.1600"N	72°41'45.7400"E
2	P#2_L2	22°41'7.0200"N	72°42'20.4300"E
3	P#2_L3	22°41'1.1300"N	72°44'17.4900"E
4	P1E_L1	22°37'24.4900"N	72°38'15.7100"E
5	P1E_L2	22°36'21.4600"N	72°39'8.6000"E
6	T#F_L1	22°34'43.1700"N	72°30'32.0100"E
7	T#F_L2	22°34'45.4840"N	72°30'28.4334"E
8	P#1_L1	22°36'48.9000"N	72°36'10.4100"E
9	P#1_L2	22°37'26.4900"N	72°36'26.2100"E
10	P#1_L3	22°38'10.3000"N	72°36'58.6800"E
11	PartC_L1	22°38'44.0275"N	72°44'14.8355"E
12	PartC_L2	22°38'18.7300"N	72°40'49.1900"E
13	PartC_L3	22°35'24.5600"N	72°44'11.4200"E
14	PartC_L4	22°35'20.6000"N	72°35'24.1300"E
15	PartC_L5	22°31'10.9900"N	72°39'50.0200"E
16	PartC_L6	22 31’ 08.89”N	72 37’ 20.71”E
17	PartC_L7	22°30'34.3000"N	72°42'58.1000"E
18	PartC_L8	22°32'57.4100"N	72°44'12.3000"E
19	PartC_L9	22°36'47.0500"N	72°43'1.2700"E
20	PartC_L10	22°35'26.7047"N	72°40'20.2219"E
21	PartC_L11	22°27'43.1492"N	72°37'57.6480"E
22	PartC_L12	22 28’ 57.80”N	72 41’ 16.99”E

23	PartC_L13	22°29'32.8500"N	72°51'51.8800"E
24	PartC_L14	22°23'30.0200"N	72°43'16.5600"E
25	PartC_L15	22°25'54.7200"N	72°45'59.6500"E
26	PartC_L16	22°24'18.6266"N	72°47'7.2346"E
27	PartC_L17	22°27'51.6500"N	72°45'33.0600"E
28	PartC_L18	22°22'4.2900"N	72°41'13.2800"E
29	PartC_L19	22°28'26.9100"N	72°57'13.3000"E
30	PartC_L20	22°26'9.7759"N	72°48'13.9599"E
31	PartC_L21	22°28'22.1400"N	72°50'32.3100"E
32	PartC_L22	22°30'4.9300"N	72°47'59.8300"E
33	PartC_L23	22°30'14.6200"N	72°53'51.6500"E
34	PartC_L24	22°25'13.0900"N	72°57'15.0000"E
35	PartC_L25	22°24'52.3800"N	72°55'11.4500"E
36	PartC_L26	22°27'49.7700"N	72°55'19.5300"E
37	PartC_L27	22°25'45.9500"N	72°51'33.9500"E
38	PartC_L28	22°25'30.3300"N	72°40'19.5900"E
39	PartA_L29	22°43'30.1200"N	72°42'11.0300"E
40	PartA_L30	22 41 13.28”N	72 40’ 15.19”E
41	PartA_L31	22°39'48.0800"N	72°39'10.7100"E
42	PartA_L32	22°38'16.4000"N	72°37'58.0800"E
43	PartA_L33	22°34'45.4700"N	72°33'11.3400"E
44	PartA_L34	22°32'14.0049"N	72°35'24.8577"E
45	PartA_L35	22°31'39.9491"N	72°29'55.6781"E
46	PartA_L36	22°30'31.8868"N	72°32'23.9630"E
47	PartA_L37	22°28'52.8013"N	72°34'57.2534"E
48	PartA_L38	22°28'58.9700"N	72°36'35.5200"E
49	PartC_L39	22°27'15.3000"N	72°35'57.7600"E
50	PartB_L40	22°19'1.0600"N	72°42'9.7400"E
51	TP-L1	22°32'1.1000"N	72°30'36.2200"E
52	TP-L2	22°33'53.2100"N	72°39'2.7400"E
53	TP-L3	22°32'39.8152"N	72°30'10.3543"E

54	TP-L4	22°33'30.2300"N	72°29'35.5400"E
55	T#7	22°32'30.3998"N	72°30'51.3999"E
56	T#D	22°34'9.6667"N	72°29'56.3750"E
57	T#E	22°32'55.1298"N	72°30'16.6202"E
58	T#F	22°34'56.7663"N	72°30'45.5205"E
59	P#3	22°40'17.4285"N	72°37'36.7646"E
60	P#2	22°41'10.4897"N	72°42'58.0060"E
61	P#1E	22°37'24.5445"N	72°39'2.6143"E
62	TS # 1	22°17'20.1374"N	72°44'47.5039"E
63	TS # 4	22°17'30.3588"N	72°42'31.6411"E
64	TS # 5	22°18'16.3845"N	72°40'55.5271"E
65	TS # 7	22°21'9.6558"N	72°42'40.5327"E
66	BORSAD-1	22°26'37.6472"N	72°53'58.0898"E

As per the EIA Notification of 14.9.2006, all oil & gas E&P projects require prior Environmental Clearance (EC) from MoEF.

1.4 Scope of Environmental Impact Assessment Report

The Environmental Impact Assessment report for this block will be prepared for reporting the environmental status around the proposed facilities by assessing the environmental impact of the proposed Production Operation in the area and suggesting the mitigation measures.

The EIA report will:

- Assist in understanding the environmental and socio-economic consequences of the project's development and operation;
- Address the project impacts, mitigation options, and discuss possible measures to prevent or mitigate impacts,
- Assist in the future monitoring of environmental protection measures as appropriate for the various types of impacts.

The scope of work includes collection of baseline data except monsoon within the study area (baseline monitoring will be carried out covering all the Drilling wells / facilities location) with respect to major environmental components viz. air, noise, water, land, biological and socio-economic components, impact assessment of proposed activities and preparation of environmental management plan.

The detailed scope of the study includes:

1.4.1 Environmental Monitoring

Air Environment

- Collection of surface meteorological data like wind speed, wind direction, dry bulb temperature, wet bulb temperature, relative humidity, rainfall, cloud cover in the study area during the period of survey.
- Measurement of 48 hourly average background concentration levels of PM_{10}, $PM_{2.5}$ SO_2, NOx, CO, HC, NMHC and VOC as per Ministry of Environment and Forest (MoEF) guidelines.

Noise Environment

- Monitoring of noise levels within *1 km of proposed wells*

Water Environment

- Collection and analysis of surface and *ground water samples within the vicinity of proposed well site*

Land Environment

- Determination of land-use pattern using satellite imagery.
- Sampling and analysis of soil quality.(physical and chemical) at *5 locations in the study area*

Biological Environment

- Study of terrestrial and aquatic environment.

Socio-economic Environment

- Collection of baseline data including demographic details, infrastructure resource base, economic resource base, health, education, industries, aesthetic attributes (places of religious, archaeological and tourist importance)

1.5 Risk Assessment and Disaster Management Plan (DMP)

This includes the following:

Level 1: Hazard Identification

- General description of project.
- Study of operational information, including safety concepts used.
- Listing of key plant equipment
- Listing of hazardous inventory and identification of key hazardous substances to be used.

Level 2: Consequences Analysis

- Analysis and quantification of primary effects (consequences) of identified scenarios, in terms of distances to radiation, overpressure or toxic endpoint.

Level 3: Development of DMP

- Development of DMP report using standard procedures for the purpose.

Level 4: Recommendations

- Recommendations to reduce the probability or consequence of hazards studied and for implementation of the DMP. These are given on the basis of the study findings and professional judgment.

2. ENVIRONMENTAL SETTING

2.1 Introduction

The environmental baseline survey included collection of primary and secondary data.

2.2 Methodology

The methodology for conducting the baseline environmental survey will consider the guidelines given in the EIA Manual of the MoEF and the scoping study. Baseline information with respect to air, noise, water and land quality of the block will be carried (except monsoon). This data will be used primary field studies.

2.2.1 Primary Data Collection

- Ambient air quality
- Noise
- Groundwater and surface water quality
- Soil quality
- Landuse pattern

2.2.2 Secondary Data Collection

- Flora and Fauna
- Socio-economic conditions
- Sensitive areas such as forests, sanctuaries, places of historical, archeological and tourist importance

2.3 Study Area Included in Environmental Setting

The study area considered will be core area and 10 km from boundary of block.

2.4 Data Collection and Source

S.No.	Environmental Attribute	Source of Data Collection
1.	Land use	Recent satellite imagery for the study area will be collected from the Google Earth Pro and interpretation of satellite image will be done in terms of land-usage of the study area
2.	Important features within	Distance of important features such as National Park/Wildlife Sanctuary, Tiger Reserve/Elephant Reserve / Turtle Nesting Ground,

S.No.	Environmental Attribute	Source of Data Collection
	the study area	Core Zone of Biosphere Reserve, Habitat for migratory birds, Lakes/Reservoir/Dams, streams/rivers, estuary/sea, mangroves, Notified Archaeological sites, Defense Installation, airports, railway lines, national and state highways will be provided.
3.	Climatic condition of the Study Area	Interpretation of climate will be based on the long-term climatological tables available with IMD, and from the nearest IMD-observatory from the project site
4.	Site Specific Meteorology	Site specific meteorological data for one season will be collected by carrying out site specific monitoring. The parameters for which data will be collected are: • Wind Speed • Wind direction • Temperature • Relative Humidity • Cloud Cover
5.	Ambient Air Quality	The ambient air monitoring will be carried out spread over study period as per NAAQS-2009. The criteria for selecting sampling stations will be in accordance with the Bureau of Indian Standards' (BIS) IS: 5182 (part XIV). The frequency of monitoring will be 48 hrs per week at each station with samples being changed six times. (at 8-hour intervals). The parameters monitored will be PM_{10}, $PM_{2.5}$ Sulphur Dioxide (SO_2), Nitrogen Oxides (NO_x), Hydrocarbons (HC), Non Methane Hydrocarbons (NMHC) and Carbon Monoxide (CO) & VOC. These parameters have been selected based on the guidance given by the MoEF. The ambient air results will be compared with the value range indicators provided by CPCB.
6.	Noise	Hourly noise readings will be taken at all AAQM stations and compared with CPCB norms.

S.No.	Environmental Attribute	Source of Data Collection
7.	Ground Water	Groundwater will be collected from suitable number of locations to cover the ground water in the study area. The groundwater will be analysed for pH, temperature, electrical conductivity, total suspended solids, total dissolved solids, hardness, chlorides, Sulphates, sodium, potassium, nitrates, fluorides, alkalinity, ammonia, heavy metals, and total Coliform count. The groundwater analysis results will be compared with Indian Drinking Water Standards IS:10500.
8.	Surface Water	Surface water will collected from suitable number of locations to cover the surface water resources within the study area. The samples from pond will be analysed for pH, temperature , Electrical conductivity, turbidity, color, total dissolved solids, total suspended solids, chlorides, Sulphates, potassium, phosphates, nitrates, salinity, magnesium, BOD, COD, dissolved oxygen, oil and grease, alkalinity, residual chlorine, ammonia, heavy metals, coliform count, biotic environment. The surface water analysis results will be compared with Indian Drinking Water Standards IS:10500. The river water samples will be tested for pH, electrical conductivity, BOD, boron, free ammonia, SAR, DO and total coliform. The analysis results will be compared with minimum quality specified by CPCB for qualification of a particular river stretch to satisfy the use classification (classification of river water as per their intended use into Class A, B, C, D and E).
9.	Land	The soil samples will be collected from suitable number of locations to cover the various soil types. The soil samples will be tested for pH, texture, SAR, particle size, electrical conductivity, organic matter distribution, bulk density, water holding capacity, porosity and permeability. Data on terrain, geology and mineral resources will be collected from secondary sources.

S.No.	Environmental Attribute	Source of Data Collection
10.	Socio-economic profile	This will include details on: • Demography • Education and Literacy rates • Occupation pattern • General Infrastructure, Utilities and Public Amenities (water supplies, educational and health facilities, power supply, roads and railways
11.	Biological Environment	Collection of data on flora and fauna from secondary sources

3. PROJECT DESCRIPTION

3.1 Details Covered

The details covered would include:

- Approach to site
- Overview of Drilling and *Production operations*
- Equipment required for Drilling and *Production activity*
- Raw material consumption for Drilling and *Production operations*
- Workforce arrangement
- Power requirement – Source of power and average consumption including backup sources with fuel consumption details
- Water Requirement –Water requirements for sanitation, fire-fighting storage / make-up and drinking. The source of water and storage provisions will also be described. A water balance diagram would be provided.
- Wastewater Generation - This would cover the quantity of wastewater generated in the form of Produced Water & Domestic activities. The disposal options will be described.
- Air Emissions – This would cover the details of emissions generated from the Production operations such as D.G set and flaring of associated gas.
- Solid Waste management – This would cover the qunatity of waste generated such as Used Oil, Cotton contaminated with oil, batteries and the disposal options for the wastes.
- Noise Generation – This would cover the source of noise generation such as operation of SRP and diesel-generating sets.
- Safety and Environment – Relevant OISD & Environmental standards will be followed.

- Abandonment of operations – This would cover the activities to be undertaken on abandonment of Production activities.

3.2 Purpose of Studying Project Activities

The primary purpose of describing the proposed activities is to establish the likely effect on the environment, human beings and local communities, the wildlife and aquatic life in the contract area and in the adjoining / neighboring areas in consequence of the relevant phase of petroleum operations to be conducted under this contract. Besides identification of these impacts, evaluation of methods and measures for minimizing environmental damage shall also be done.

4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Methodology of Impact Assessment

Matrix methodology will be adopted for the impact assessment of this project. This method incorporates a list of impacting activities and their likely environmental impacts, presented in a matrix format. Combining these lists as horizontal and vertical axes in the matrix allows the identification of cause-effect relationships, if any, between specific activities and impacts.

The matrix is prepared considering current as well as proposed mitigation measures.

Models will be used for predicting the impact of the activities on ambient air quality and noise quality. In cases where it is not possible to identify and validate a model for a particular situation, predictions will be arrived at based on logical reasoning / consultation / extrapolation.

4.2 Impact Prediction

S.No	Environmental Attribute	Impact Assessment	Mitigation Measures
1.	Ambient Air Quality	• Describe air quality in the Study Area • Justification of models used, model assumptions, and any model shortcomings or constraints • Complete air dispersion modeling • Estimates of ground-level concentrations of the appropriate air quality parameters; • Compare predicted air quality concentrations with the appropriate air quality guidelines available.	• Discuss the emission control technologies proposed for the Project for minimizing air emissions such as sulphur dioxide (SO_2), oxides of nitrogen (NOX)and particulate matter, • Fugitive emissions control program to detect, measure and control emissions from equipment leaks
3.	Noise	• Noise propagation modelling will	

		be performed for noise generation due to operation of these engines reveals the exposure levels in terms of the occupational and human settlement exposure levels	
4.	Ground Water	• Operations require the use of water for domestic requirements as well as for fire fighting. • Characteristics of wastewater discharged from the exploration / other operations	Implementation program for the protection of groundwater resources
5.	Surface Water	• Identify project activities that may affect surface water quality during Production operation • Describe the potential impacts of the Project on surface water quality within the Study Area; (if any) • Discuss the significance of any impacts on water quality and implications to aquatic resources	
6.	Land Resources	• Disposal of Hazardous waste generated • Spillage of crude oil and diesel	
7.	Flora and fauna	• Explain the significance of any anticipated environmental changes for ecosystem integrity.	
8.	Socio-economic environment	Discuss the social impacts of the Project on the Study Area, including: • local employment, • population changes, • demands on local infrastructure, • construction camps;	Discuss the businesses with regards to employment, training needs and other economic development opportunities arising from the construction and operation of the Project; and strategies to mitigate socio-economic concerns

5. ENVIRONMENTAL MANAGEMENT PLAN

5.1 Introduction

5.1.1 General

The Environmental Management Plan (EMP) will describe both generic good practice measures and site specific measures, the implementation of which is aimed at mitigating potential impacts associated with the exploratory programme.

5.1.2 Purpose of the Environmental Management Plan

The EMP provides a delivery mechanism to address potential adverse impacts, to instruct contractors and to introduce standards of good practice to be adopted for all project works. For each stage of the programme, the EMP lists *all* the requirements to ensure effective mitigation of *every* potential biophysical and socio-economic impact identified in the EIA. For each impact or operation, which could otherwise give rise to impact, the following information is presented:

- A comprehensive listing of the mitigation measures (actions) that GSPC shall implement;
- The parameters that shall be monitored to ensure effective implementation of the action;
- The timing for implementation of the action to ensure that the objectives of mitigation are fully met.

5.1.3 Structure of the EMP

The EMP will comprise direct mitigation and environmental monitoring and an outline waste management plan.

5.2 Mitigation and Environmental Monitoring

5.2.1 Environmental mitigation

The exploration programme shall be designed to avoid or minimise impacts to the environment and local communities wherever practicable. Where residual impacts remain, which may have moderate or significant effects on the environment, mitigation measures will be described in this EIA, which shall either reduce the impact to an acceptable level or adequately offset it.

5.2.2 Environmental Monitoring

Environmental Monitoring Program will be provided.

5.3 Waste Management Plan

The WMP (Waste Management Plan) will cover disposal of all wastes in the Production site itself, with further reference to off-site disposal of those wastes, which cannot be dealt on-site.

6. TABLE OF CONTENTS FOR EIA REPORT (Tentative)

Oil & Gas Exploration & Production Glossary

Risk Assessment & Disaster Management Plan Glossary