GUJARAT GAS LIMITED

India's largest CGD Company ISO 9001:2015 Certified

EXECUTIVE SUMMARY

FOR ENVIRONMENTAL PUBLIC HEARING

Natural Gas transportation pipeline network for Steel pipeline with Length 45.77 Km & 8"/12" Diameter and for MDPE pipeline with length 14.228 km & 125 mm,90 mm,63 mm Diameter in Dahanu Taluk of Palghar District in Maharashtra State

Executive Summary

Gujarat Gas Limited, is India's largest city gas distribution company, promoted by Government of Gujarat has planned to set up CGD network in the entire Thane Geographical area (consisting Palghar District and Thane District in Maharashtra state) to provide natural gas for domestic, commercial and industrial use for which GGL has received authorization from PNGRB (Petroleum and Natural Gas Regulatory Board), for laying, building, operating and expanding City Gas Distribution Network in Palghar District and Thane GA. GGL is also in planning to setup CNG stations along the roads at various locations to facilitate Compressed Natural Gas (CNG) to en-route vehicles which will support to reduce air pollution.

Gujarat Gas Limited is committed to reach out in a phased manner to every possible natural gas user in its expanded geographical area.

To supply Piped Natural Gas (PNG) for various industrial, commercial & residential consumers within and around city, GGL proposes to lay Natural Gas pipeline network consisting of 45.77 Kms of Steel pipeline (8"/12" Diameter) and 14.228 kms of MDPE pipeline (125 mm,90 mm,63 mm Diameter) in Dahanu Taluka of Palghar District in Maharashtra State.

In order to assess the current status of the environment and the likely impacts which may be caused due to the proposed activities of the Pipeline Project, GGL had entrusted Secon Pvt. Ltd. for undertaking Environmental Impact Assessment (EIA) study and preparation of Environmental Management Plan (EMP) for this proposed pipeline section having total capacity of 1.6MMSCMD.

As per the latest categorization by CPCB & MoEF & CC, "Oil and Gas transportation pipeline" activity falls under the industrial activity of "Green Category" due to its very marginal environmental impact. However, the proposed Dahanu Taluka pipeline network is intra - state pipeline which falls in Dahanu Taluka and Dahanu Taluka is notified as ecologically fragile area/ecologically sensitive area as per MoEF & CC notification vide dated 20th June 1991 (as amended on 24.2.1999) and as per present EIA notification 14 September 2006 it attracts the provision of obtaining prior environmental clearance from MoEF & CC as per project activity 6(a), Category A.

As per CRZ notification 2011, proposed pipeline network in Dahanu Taluka falls in CRZ Area for length 6.22km in Dahanu Taluka as a part of Umargam-Gholvad pipeline section and 8.394km in Dahanu Taluka as a part of Boisar-Dahanu pipeline. For both of these pipelines sections the cases were discussed in the Maharashtra Coastal Zone Management Authority in its meeting on 01.03.2019 and were granted for CRZ recommendations to MoEF & CC vide No. CRZ 2019/CR 5/TC4, Dated 17th June 2019 & No. CRZ 2019/CR 6/TC4, Dated 17th June 2019 respectively.

In order to assess the current status of the environment and the likely impacts which may be caused due to the proposed activities of the Pipeline Project, and for the same this Environmental Impact Assessment (EIA) study and preparation of Environmental Management Plan (EMP) is presented herewith.

1.1. Location

Particulars	Ch.Km	Latitude (N)	Longitude (E)	Village	Taluka	District	State
Take-off Point	0/00	20° 8'7.38"N	72°44'38.17"E	Zai	Dahanu	Palghar	MH
Terminal Point	45/77	19° 26' 59.20" N	73° 48' 14.90" E	Kolavali	Dahanu	Palghar	MH

Proposed pipeline will start from Zai Village from the upstream source of Umargam to Gholvad pipeline and terminate at Kolavali village in Dahanu Taluka with connecting to downstream source of Dahanu to Boisar Pipeline having steel pipeline network for 45.77km & associated PE pipeline network 14.228km in Dahanu Taluka.

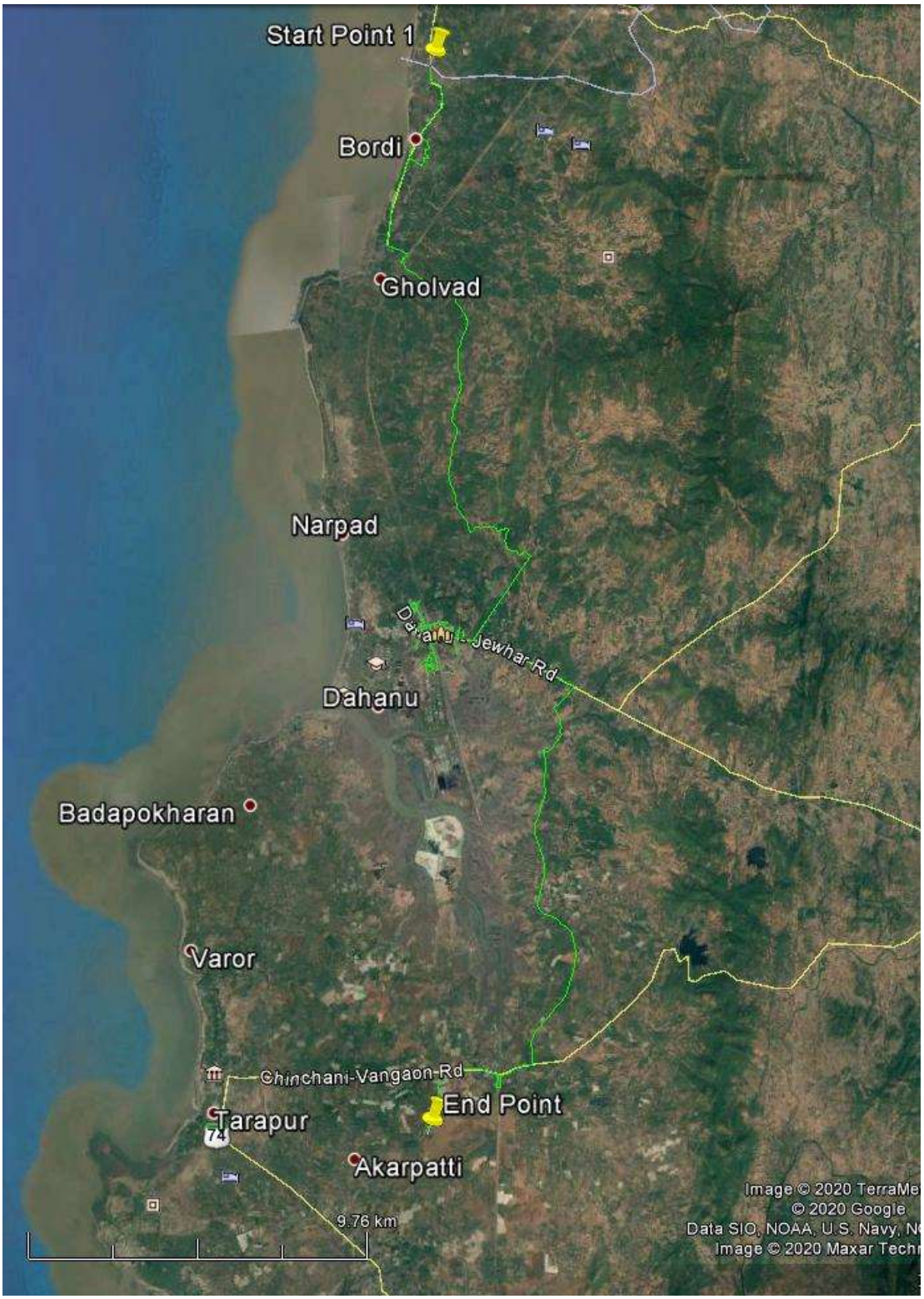


Fig.: Location of Dahanu Taluka Pipeline Network

1.2. Project Description

Unlike other liquid i.e. Petrol, Diesel and solid fuels that generate lot of pollution on combustion and create lot of issues while handling, natural gas being a clean and environment friendly fuel does not create any considerable pollution, inside the plant or house, does not litter and does not cause damage in handling of all these points which ensures good condition of house, plant and equipment. In view of environment friendly features of natural gas, its uses are recommended in various industries for commercial purposes and in houses for domestic purposes.

Gujarat Gas Limited is engaged in distribution of natural gas by PNG (piped natural gas) to its various consumers and customers through city gas distributing (CGD) network.

Proposed pipeline in Dahanu Taluka will start from Umargam road at Zai Village in Dahanu Taluka of Palghar District and almost run parallel to existing road RoW of PWD authority as well as Dahanu Taluka Municipalty road and terminate at Kolavali Village in Dahanu Taluka of Palghr District in Maharashtra state.

Compared to other fuel, due to very low/negligible air pollution generating quality of natural gas, the use of the same will be improving the quality of environment. Also Transportation of Natural gas through pipeline being an environmental friendly activity and has very negligible environment impact compared to the transportation of other fuels by road transport.

Project highlight:

M/s. Gujarat Gas Limited proposes to set up Natural Gas (PNG Network) in Dahanu Taluka, Palghar District of Maharashtra State to supply Natural Gas (PNG) for various industrial, commercial & residential consumers within and around city. The Salient features of the proposed pipeline network is furnished as under:

Table 1.1 Salient feature of the Dahanu Taluka Pipeline network

Pipeline Network in Dahanu Taluka (Pipeline length and Dia)	**Steel pipeline: Length 45.77 Km & 8"/12" Dia. MDPE pipeline: length 14.228 km with 125 mm,90 mm,63 mm Dia.**	
	Steel Pipeline	MDPE Pipeline
Design pressure	49 bar	10Bar
Operating Pressure	42 bar Maximum	4 Bar
Inlet & Outlet Pressure	Inlet Range (26 to 42 bar(g)) &Outlet Pressure 19 bar	Inlet presser: 4 Bar Outlet Pressure: 1 Bar

Inlet & Outlet Temperature	0 ºC to 65 ºC (Design)	Between 0ºC to 55ºC
Operating Temperature	0 to 55 ºC	Between 15ºC to 45ºC
No. of SV / IP / RT Stations along the pipeline	No SV stations, only underground valves at every 3 kms stretch of pipeline	No SV stations, only underground valves at every 1 kms stretch of pipeline
Capacity	Steel Pipeline: 1.6 in MMSCMD	MDPE Pipeline: 0.093 in MMSCMD
Pipeline material	Carbon steel pipelines with Pipe material and pipe type are API 5L Gr. X-70 PSL-2 and LSAW/HSAW respectively.	Poly ethylene (PE) grade P-100,SDR-17.6 & IS-14885
Coast of project	₹ 11,100 per meter	₹ 764 per meter
Capex Outlay of Boisar-Dahanu Section	₹ 50,80,47,000/-	₹ 1,08,70,192/-
Total Cost of Project	₹ 51,89,17,192/-	
Applicable standard and code	PNGRB guideline as per Technical Standards & Specifications including Safety Standard for CGD (T S 4), ASME B 31.8	
Schedule of construction and completion	Construction will be started after obtaining all requisite permissions from the boards/authorities and will be completed within 1 year.	
Labour requirement	During project execution only 80 nos.	
Energy requirement and source number of DG sets with capacity in KVA	No stationery/permanent DG sets required during operation of pipeline. Temporary 3KVA DG set will be required for electro fusion welding during only construction phase of laying of PE pipeline Network. Temporary 12KVA DG set will be required for welding during only construction phase of steel laying of pipeline.	
Company Environment Policy, Safety Policy and Health Policy	GGL policy in practice	
Capacity of each station, discharge pressure and temperature & facilities provided / proposed Terminal / Station / IP	NA	
Pipeline & Instrumentation logical	Schematic diagram is attached herewith as Attachment 1. The	

<table>
<tr><td>diagram (P&ID's), design criteria and operation philosophy</td><td>pipeline system is designed as per PNGRB T4S guideline for City Gas Distribution and ASME B 31.8</td></tr>
<tr><td>Details of SV/IP/DT Station along the pipeline routes</td><td>NA</td></tr>
<tr><td>Details of Population Density Index</td><td>305 /Sq. KM</td></tr>
<tr><td>Information about Water consumption: Domestic & Industrial (Processing/boiler/cooling/washing/other/Rain Water Harvesting?) and waste water disposal system</td><td>A. Requirement of water will be various activity during construction phase of PE pipeline is as given below which will be met by tanker supply from nearby municipal source
<table>
<tr><th>S. no</th><th>Activity</th><th>water consumption in liters</th></tr>
<tr><td>1</td><td>PE laying by HDD Method</td><td>112000</td></tr>
<tr><td>2</td><td>Watering & compaction of the Trench</td><td>108000</td></tr>
<tr><td>3</td><td>Water consumption for domestic use</td><td>31200</td></tr>
<tr><td></td><td>Total</td><td>251200</td></tr>
</table>
B. In case of laying of Steel pipeline 10KLD water will be required during construction phase which will be made available from the nearby municipal Source. Waste water generated if any will be non toxic and reused for gardening purpose.
No water consumption requirement or waste water generation post commissioning of said pipeline network i.e. during operations.</td></tr>
<tr><td>TSDF Membership</td><td>NA</td></tr>
<tr><td>CRZ Area</td><td>- In Boisar to Dahanu pipeline section 8.528Km length of proposed pipeline falls in CRZ- I, CRZ-III, CRZ-IV CRZ area out of 36km of total pipeline length and rest of the pipeline passes through non CRZ Area. CRZ recommendation from the Maharashtra Coastal Zone Management Authority has been granted vide No. CRZ 2019/CR 6/TC 4, Date: 17.06.2019.
- In Umargam to Gholvad pipeline section 10.7km length of pipeline falls in CRZ- I, CRZ-III, CRZ-IV CRZ area (which includes 4.46km in Gujarat State & 6.22km in Maharashtra State) out of 12.6km total pipeline length and rest of the pipeline passes though non</td></tr>
</table>

	CRZ area. CRZ recommendation from the Maharashtra Coastal Zone Management authority has been granted **Vide No. CRZ 2019/CR 6/TC 4, Date: 17.06.2019 and from Gujarat Coastal Zone Management Authority has been granted vide no. ENV-10-2019-5-E(T-Cell), 02.07.2019**
National Park	Nil
Sanctuaries area	Nil
Coral Reefs	Nil
Mangroves	Nil
Eco Sensitive Area	The proposed pipeline network falls in **Dahanu taluka which is notified as an ecologically fragile area(Ecologically Sensitive Area) as per MoEF & CC notification date 20th June 1991(as amended on 24.02.1999)**
Forest clearance	GGL has already applied to MoEF & CC for necessary Forest Clearance with vide **FP/MH/Others/21131/2016, Dated 25 Aug 2016** and In-Principal, Stage –I forest Clearance has been granted vide **FLD-12A18/CR-301/F-10, Dated 02.01.2019**.

Power requirement

No stationery/permanent DG sets required on pipeline. However, Temporary portable 3KVA DG set will be required for electro fusion welding during only construction phase of laying of PE pipeline Network and Temporary 12KVA DG set will be required for welding during only construction phase of steel laying of pipeline.

List of villages along the pipeline route

List of Villages from which Dahanu Taluka Pipeline network passes through:

Sr.No.	Name of Village	Taluk	District
1	Bordi	Dahanu	Palghar
2	Gholvad		
3	Kalavali		
4	Vangaon		
5	Khambale		
6	Kapshi		
7	Dahene		
8	Pale		
9	Motapada		

10	Savata
11	Saravali
12	Dahanu
13	Musalpada
14	Kankradi
15	Ghatolpada
16	Bhuyolpada
18	Donapada
19	Boripada
20	Dongaripada
21	Khadakpada
22	Khandava

1.3. Solid & hazardous waste management

Solid wastes generated from the temporary campsites and other wastes like paper, cardboard, plastics etc. will be properly collected, segregated and reused / disposed off appropriately (recycle, reuse and composting / landfill) as per the guideline of SPCB.

E- Waste: Now a day there has been lot of awareness towards disposal of E-Waste such as electronic circuits, picture tubes, special glassware, containers, tube lights, CFL tubes etc. The proponent shall carefully collect, store separately and safely, maintain records of inventories and dispose them by giving to TSDF approved by MoEF, New Delhi. The details of the same can be made available as per guidelines of SPCB.

No hazardous wastes are envisaged from pipeline construction activities.

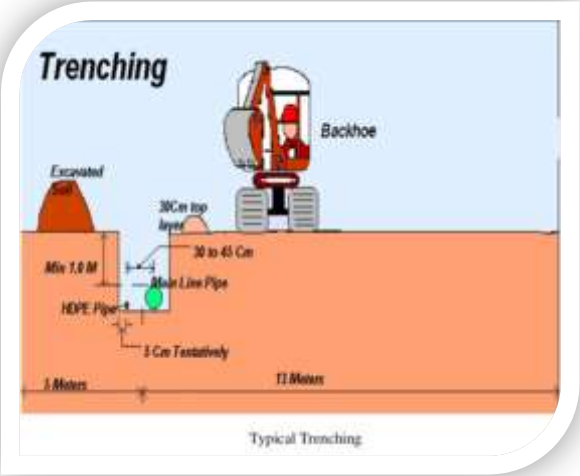
1.4. Main phases of the project

The proposed project, involves two phases construction and operation of the pipeline:

i. Construction Phase

A. For pipeline:

The pipeline shall be designed and engineered, laid and tested in accordance with PNGRB regulations on Technical Standards and Specifications including Safety Standards for City or Local Natural Gas Distribution Networks and as per the provision of ANSI/ASME Code B 31.8 for 'Transmission and Distribution Piping System' and other relevant Codes and Standards.



Typical Trenching

The pipeline construction is proposed to be carried out

through deployment of mainline spreads. During construction, the following activities will be carried out:

1. Clearing and Grading:

Right of Use (ROU) area shall be cleared off for vegetation and other obstacles such as boulders etc. In scrubland, vegetation will be stockpiled for re-spreading as part of the leveling/restoration process.

Right of Work width is kept as 5m on left of pipeline for storing the excavated soil and 15m on right side for movement of equipment

2. Trenching:

Trenchers and backhoe type excavators will be used to dig the trench for laying the pipeline. The topsoil will be removed and segregated from the remaining backfill material excavated from the trench. The topsoil will be replaced in its near original position during the backfilling operation.

3. Stringing:

Line pipe is ordered from the mill, transported to the coating yard for coating and then delivered to a storage location near the construction site. Delivering and aligning the pipe joints along the pipeline route is called pipe stringing.

The pipes, after unloading using side booms will be strung adjacent to the trench. Trailers and cranes will be used for the maneuvering of pipes.

4. Bending:

The pipeline route may not be straight at all time, nor is the terrain flat. Due to these reasons the pipeline has to be bent in the field to fit the three dimensional profile for the trench.

The pipe will be bent using a bending machine to the appropriate angle to match the vertical and horizontal alignment of the trench.

5. Welding:

After the pipes are looped along the right of way and bent as required, welding can begin. Welding will be done using conventional manual welding involving a crew of experienced & qualified welders and fitters.

6. Inspection through Non Destructive Test (NDT)

After a weld is made it is examined to ensure integrity of the weld. For inspection a number of non destructive techniques are used.

7. Radiographic Test:

It is used to test welded joint. From RT we can find our inadequate penetration without high low , inadequate penetration with high-low, inadequate cross penetration, incomplete fusion and incomplete fusion due to cold lap, internal concavity, burnt though, slag inclusion, porosity, cracks, undercutting, accumulation of imperfection and pipe of fitting imperfection.

The NDT and radiographical testing will ensure that desired metallurgical phase has been achieved post welding and other engineering operations.

Each field weld will be 100% radio graphed using X-Ray to test for the soundness of the weld in compliance with specifications.

8. Dye penetration test(DPT) :

It is used to test root weld joint surface. It gives indications of imperfection in root weld. Not all indications shown in DPT are imperfection. Machining marks, Scratched and surface condition may produce indications similar to the imperfection.

9. Magnetic Particle Test (MPT):

It is used to test welded joint surface. It gives indications of imperfections but not all indications are imperfection. Sometimes magnatic and metallurgical variations may produce indications similar to imperfection but they are not relevant to acceptability.

10. Ultrasonic Test(UT):

Ultrasonic waves used to identify defects in weld joint. Indications produced by ultrasonic testing are not necessarily defects. Changes in the weld geometry due to alignment offset of abutting pipe ends, changes in weld reinforcement profile of I.D. root and O.D. cappling passes, internal chamfering and ultrasonic wave mode conversion due to such conditions may cause geometric indications that are similar to those cause by weld imperfections. All above such indications are accepted according to API 1104.

11. Joint Coating:

Pre-coated pipes will be used for the project. Joint welds, which are not pre-coated, will be coated at the site.

12. Lowering:

On Completion of welding, inspection of the welds and coating the pipe will be ready to be buried.

The pipeline is lifted by side book tractors and is carefully lowered to the bottaom of the trench. It is necessary, especially in rocky are to put a pad of fine soil on the trench bottom to protect the pipe coating from damage.

13. Backfilling:

The excavated soil will be returned to the trench. The topsoil, which has been preserved on the side of

the Right of Use, will be spread over the filled up trench. A crown of soil will be kept on top of the trenched portion to allow for future settlement. Excess or unsuitable material will be cleared from the site and disposed off at a suitable site.

14. Crossings:

The method used for the crossing of waterways and other infrastructure facilities like national highway, state highway, major district roads, canals, rivers, nalas and railway lines will vary from place to place depending on the environmental setting and the geo-technical features of the area.

15. Restoration:

Restoration will be conducted progressively / following the completion of construction works. This will involve removal of foreign material such as construction debris. The terrain will be returned to its original condition by spreading the topsoil over the RoU and agriculture activities will be restored to original.

16. Pressure Testing & Commissioning:

Testing & Commissioning will be conducted progressively / following the completion of construction works. This will involve pneumatic/hydrostatic testing of pipeline system at pressure higher than design pressure to have an assurance about integrity of pipeline system and later on commissioning involving introduction of natural gas first time into the particular pipeline system for supply to customer.

1.5. For associated facilities:

Proposed pipeline will have underground valves at every 3 Kms stretch of Steel pipeline & 1kms stretch of PE pipeline as an associated facilities along the pipeline route.

1.6. Water requirement:

A. In case of laying of Steel pipeline 10KLD water will be required during construction phase including pressure testing which will be made available from the nearby municipal Source. Waste water generated if any will be non-toxic and reused for gardening purpose.

B. Requirement of water will be for various activity during construction phase of PE pipeline is as given below which will be met by tanker supply from nearby municipal source

S. no	Activity	water consumption in liters
1	PE laying by HDD Method	112000
2	Watering & compaction of the Trench	108000
3	Water consumption for domestic use	31200
	Total	251200

No further water requirement during operation stage will be envisaged for this natural gas transportation pipeline.

1.7. Workforce arrangements

The construction works will be temporary and about 80 labourers will be deployed at various locations depending upon the requirement during the construction period. Temporary labour camp/Porta cabin sites will be set up with all treatment facilities near development facilities for construction purposes for staff. Construction workers will be preferably drawn from nearby villages.

1.8. Description of environment

The baseline environmental qualities of various environmental components like air, noise, water, land, flora and fauna and socio-economic form important and integral part of environmental study. The baseline data forms the basis for predicting/assessing the environmental impacts of the proposed project. As per the recommendations of MOEF, the sampling and monitoring has been carried out during non-monsoon season, on dry days. Various environmental components were monitored and samples analyzed. Apart from this, additional data were also collected from secondary sources i.e. Government/Non-Governmental Agencies, Universities, Irrigation Department, Indian Meteorological Department (IMD), Ground Water Board etc. to substantiate the primary data collected from the site.

The baseline quality of various components of the environment, viz. air, noise, water, land, biology, meteorological and socio-economic is assessed within the impact zone of about 1.5 Km on either side along the complete route of the pipe line via physical monitoring and analysis.

AIR ENVIRONMENT

To establish the baseline status of study area, total 04 AAQ monitoring stations were selected, along the pipeline route. In this region, conventional air pollutants viz. PM_{10}, Sulfur Dioxide (SO_2), Oxides of Nitrogen, as well as Carbon Monoxide (CO), are identified for air quality assessment.

Along Pipeline route

The 24 hourly PM_{10} concentration varied in the range of 64.8-80.1 µg/m^3 may be attributed to windblown soil, unpaved road etc. in rural areas in the study region. The concentrations of SO_2 were observed to be varying in the range of 7.2-10.1 µg/m^3. Similarly the concentration of NOx varied in the range 12.7-20.2 µg/m^3 along the pipeline route.

The observed carbon monoxide concentration at all the locations were <0.5 mg/m^3 which were found less than NAAQS.

NOISE ENVIRONMENT

Total Eight (04) locations were identified based on the activities in the village area, traffic areas and sensitive areas

Along Pipeline Route

Equivalent noise levels, Leq (Day) and Leq (Night) were monitored across the pipeline route. The equivalent noise levels varied in the range of 41.1-48.0 dB(A). Vehicular traffic is the major noise sources and contributes mainly to background noise levels in the study area.

Noise levels Day and Night were monitored along the pipeline route were observed the range of 49.8-52.3 dB(A) during day and 40.8-43.1dB(A) night time respectively.

WATER ENVIRONMENT

Water Quality Assessment

The analysis results of ground water samples indicate that the pH ranged between 7.47 to 8.17 which are well within the specified standard of 6.5 to 8.5. The TDS was observed to be 303-508 mg/l which is within the permissible limit of 2000 mg/l. The total hardness recorded was in the range of 354 to 434 mg/l as $CaCO_3$ which is also within the permissible limit of 600 mg/l.

The ground water analysis results indicate that the water in the region is fairly potable except that disinfection may be required for ground water in certain areas before being used for drinking. However, the incremental value has no impact with reference to the project activity.

LAND ENVIRONMENT

Land use of the study area

Soil:

Soil was collected at different stretches along the pipeline route. Soil samples were collected from 4 different locations along pipeline route.

Physico-Chemical Characteristics

The texture of the soil was found to be Silty clay in nature. Regular cultivation practices increase the bulk density of soils thus inducing compaction. This results in reduction in water percolation rate and penetration of root through soils.

Chemical Characteristics

pH of soil in the study area was found to be slightly acidic to alkaline in reaction as pH was in the range of 7.37-8.19.

The electrical conductivity (EC), the EC of the soil sample was in the range of 167-286 µs/cm. It was observed that both Calcium and Magnesium carbonate concentrations were in the range of 897mg/kg – 1523 mg/kg and 263mg/kg – 914mg/kg respectively.

Nutrient Status:

Organic matter and organic carbon present in the soil influence its physical and chemical properties and is responsible for stability of soil aggregates. Organic matter and Total Kjeldahl Nitrogen were found in the range of 0.43-1.28% and 136-221mg/kg.

1.9. Environment monitoring programme

Environment monitoring programme is a key component to carry out environment monitoring which includes technical aspects of monitoring the effectiveness of mitigation measures including measurement methodology for Air, Water, Soil and Noise environment, selection of location, data analysis, reporting schedules, emergency procedures, detailed budget & procurement schedules.

The following five environmental components have been considered for the purpose of assessment and evaluation of the environmental impact due to the proposed project:

- Air Environment
- Noise Environment
- Water Environment
- Land Environment
- Biological Environment
- Socio Economic Environment

1.10. Additional studies

Additional Studies like

- √ Risk Assessment and Disaster Management Plan,
- √ Reconnaissance Survey of pipeline route,
- √ Soil Stratification Survey of pipeline
- √ Soil corrosion Survey of pipeline
- √ Detail Engineering Route Survey has been carried out separately for Pipeline as per the standard guidelines details are available separately.

1.11. Project Benefits

- ✓ As a consequence of the rapid rate of industrialization in India, fuel needs are increasing at an equally rapid rate and the supply-demand gap is widening and steps are being taken to address this issue.
- ✓ Natural Gas is used as a low carbon cooking and transportation fuel compared to alternative fuels like LPG, Petrol, Diesel and other traditional fuels.
- ✓ CGD networks ensure uninterrupted supply of ecofriendly cooking fuel in form of PNG and transportation fuel to vehicle in the form of CNG and thus benefiting public health at large
- ✓ Underground CGD networks will help in freeing up congested urban city roads from LPG cylinder distribution tempos/Motor vehicles

- ✓ PNG expansion will free up subsidized LPG cylinders from urban area so that the same can be further distributed to rural/remote areas and it will ensure the continuous cooking fuel supplies to households.
- ✓ Pipelines are internationally recognized as the preferred alternative for transport of fuels from the point of view of safety, economy and relative environmentally friendliness.
- ✓ The project would enhance employment opportunities through contractors for the local people during construction phase.
- ✓ There will not be any adverse impact on communication and transportation.

- ✓ One of the additional advantages of pipeline transportation is that the scope of economic offences like theft / pilferage and adulteration of products would be almost negligible.

1.12. Environment Management Plan

Environmental Management Plan (EMP) is the key to ensure a safe and clean environment. The present chapter on Environmental Management Plan envisages the management plan, which is going to be adopted for the Pipeline Project for the proper implementation of mitigation measures to reduce the adverse impacts arising out of the project activities.

The following issues have been addressed in this EMP:

- Mitigatory measures for abatement of the undesirable impacts caused during the constructions and operation stage.
- Details of management plans (Green belt development plan, Solid waste management plan etc.) institutional set up identified/recommended for implementation of the EMP.
- Post project environmental monitoring programme to be undertaken after commissioning of the project.
- Expenditures for environmental protection measures.