TABLE OF CONTENTS

Acknowledgement

Railways are an important asset of the nation. They not only bind the nation together and maintain its integrity but also help in the growth of country's economy. Rail connectivity is thus a very crucial for development of any area. There are many areas in the country where a narrow gauge rail line exists but with almost the entire nation now adopting broad gauge under unigauge policy, it is very crucial for the conversion of the existing narrow gauge sections to a broad gauge to maintain their connectivity with the national trunk rail network. This is more important for the present link which connects the Jhagadia Industrial state and on which freight movement is not possible both due to operational and transshipment constraints.

This Pre Feasibility study is very important as it will determine whether the project is to be taken up for gauge conversion or not. Like all studies, this study too has been accomplished as a result of coordinated and dedicated efforts of all the team members (mentioned in Annexure 8) and support from experts in different organizations.

We acknowledge with gratitude the role of Gujarat Infrastructure Development Board in giving us this opportunity to contribute, through research input, to the Pre Feasibility Study for Gauge Conversion of Ankleshwar Jhagadia Narrow Gauge Rail Link. In this context, we are especially grateful to Mr Jayant Parimal (CEO), GIDB and Mr. Sayan Bhattacharya (Senior Manager), GIDB.

We extend our thanks to Shri Nayan Rawal (GM, Projects), GIDC and Shri N S Mathur (GM-Planning), GMDC for their valuable inputs during the course of study and making us gain as insight into the future activities of Jhagadia Industrial Estate and several aspects of mineral freight transport through rail.

We express our gratitude to Shri Ashok Panjhwani, (President), JIA, Shri B L Uppal, (Vice President), JIA, Shri S Chaturvedi of Remi Metals, Mumbai, Mr Joy Shroff of United Phosphorus Limited, Delhi, Mr. Kheruka of Gujarat Borosil Limited, Mumbai, Mr Ajay Sriram and Mr S K Agarwal of DCM Sriram Consolidated, Delhi and all members of Jhagadia Industrial Association for providing us valuable inputs on traffic and their future plans which are the key inputs of the study.

Our thanks are due to Shri Vinod Patel of Unique Engineering, Ahmedabad for his assistance for carrying out the topographical survey of the project alignment.

As project director of this study, I take this opportunity to also acknowledge with gratitude the role of our team members with whose sincere and dedicated effort, this study has been done.

Akhileshwar Sahay
President and Group Business Development Head
Feedback Ventures (P) Ltd

Disclaimer

The information in this Final Report has been prepared based on information collected from primary and secondary surveys and from the representatives of all industries presently functioning in Jhagadia Industrial Estate. Wherever information was not readily available, reasonable assumptions have been made, in good faith to draw meaningful inferences and these have been mentioned in the respective sections of the report. All such assumptions are subject to further corroboration based on availability of information. The information and analysis presented in this Final Report is not and does not purport to be comprehensive or to have been independently verified. This report has been prepared by Feedback Ventures (P) Ltd for its client, Gujarat Infrastructure Development Board for its use for furthering the project. No external agency shall use any part of this report without the prior permission from Gujarat Infrastructure Development Board.

The information contained in this Final Report is selective and is subject to updating, expansion, revision and amendment. It does not, and does not purport to, contain all the information that may be required.

This Final Report includes certain statements, estimates, projections and forecasts with respect to industries presently functioning in Jhagadia Industrial Estate. Such statements, estimates, projections, targets and forecasts reflect various assumptions made by the management, officer and employees of Feedback Ventures (P) Ltd. Assumptions and the base information on which they are made may or may not prove to be correct. No representation or warranty is given as to the reasonableness of forecasts or the assumptions on which they may be based and nothing in this Final Report is, or should be relied on as, a promise, representation or warranty.

Executive Summary

The objective of the study was to make an assessment of the feasibility of gauge conversion of the existing narrow gauge rail link between Ankleshwar and Jhagadia in Bharuch district of Gujarat. This report presents the analysis, findings and recommendations with respect to the above.

We present a summary of our study and recommendations under the following heads:
> ➢ Assessment of the existing NG alignment, its suitability and standards for conversion to BG
> ➢ Industrial Development Scenario with a focus on Gujarat and Jhagadia
> ➢ Project Traffic: Demand Assessment And Projections
> ➢ Project Cost Estimations; Capital And O&M Costs
> ➢ Project Revenues
> ➢ Financial Appraisal
> ➢ Conclusions and Recommendations

E1   Assessment of the Existing NG Alignment
The existing rail alignment is a Narrow Gauge (765 mm / 2' 6") track taking off from Ankleshwar station, which is located on Class "A" Mumbai – Delhi route main line of the broad gauge network. The NG rail link is about 22 Km in length and is a part of the route from Ankleshwar to Rajpipla (63 Km). The salient features of the existing rail link may be summarized as under:

Parameter	Characteristic
Section:	Ankleshwar - Jhagadia
Branch Line:	Ankleshwar - Rajpipla
Distance:	21.2 Kms
Gauge:	Narrow Gauge 762 mm (2.5 feet)
Link Station:	Ankleshwar on Delhi/Ahmedabad- Mumbai Trunk Route
Division:	Vadodara
Railway:	Western Railway, HQ- Churchgate Mumbai
Taluka:	Jhagadia
District:	Bharuch, Gujarat
Service	
o Passenger:	One train each way
o Freight:	No freight service
Nearest goods shed:	Ankleshwar
Nearest Container Depot:	Ankleshwar
Roads:	
o National Highway	NH-8 (Delhi - Mumbai)- 13 Km
o State Highway	SH-64 between Ankleshwar- Rajpipla runs parallel to the estate
System of operation:	One engine only
Type of Loco:	ZDM

Parameter	Characteristic
Number of stations:	One at Jhagadia – D class
Ruling Gradient:	1:150 section and 1:1000 station
Number of bridges:	37 (3 major)
Number of level crossings:	26 (7 manned)
Number of curves:	9 (max 4 degrees)

The consultants have adopted the Terms of Reference and Standards of Construction for conversion to BG as per "Indian Railways Engineering Code" Chapter II Para 209-210 for making an assessment of the existing rail alignment. These have been detailed out in the relevant sections of the Main Report which follows.

E2 Industrial Development Scenario

India is the tenth largest economy in the world, and has the second largest GDP among developing countries, based on purchasing power parity. Since 1991 India has undergone a sea change in its outlook toward foreign investment and global collaboration. Industrial sector with an impressive growth of 8.4% in first three quarters of 2004-05 has been one of the main contributors of the growth of Indian economy. Among the industrial sector, Chemical and Petrochemical Industry occupies an important place, and the industry has grown at a pace outperforming the overall growth of the industry. Chemical Industry constitutes about 14% of India's industrial production and 10% of the total exports from the country. A substantial proportion of these exports go to USA, Europe and other developed nations.

Gujarat is one of the most industrialized states in India. With supporting infrastructure, good governance and encouragement to industries, especially chemical and allied industries, the state has become the ultimate destination for many investors both from within and outside India to make profitable investment.

Gujarat Industrial Development Corporation (GIDC) is a premier promotional government agency, which oversees the provision of infrastructure to the industries in the state. GIDC has developed several industrial estates all over the State and is also developing functional estates to fulfill specific needs of certain industries.

Jhagadia is one of the largest industrial estates developed by GIDC over an area of 1700 hectares. The estate is primarily planned for chemical, ceramic and other water intensive industries. At present the estate is only 15% occupied, hence there is scope for establishment of more units. With the neighboring estates at Ankleshwar and Panoli being fully saturated, and there being no other planned chemical estate in the adjoining areas, especially for chemical industries, Jhagadia is bound to develop as the obvious available option. With the inherent location and infrastructure advantages of Jhagadia Industrial Estate and the future of Chemical Industries in Gujarat, supporting infrastructure and support from Gujarat government, in the near future, the estate will fully evolve and function as the most viable option for the future investors.

E3 Project Traffic

The exercise involved identification of project influence area, carrying out the primary traffic surveys, interviews with the representatives of the industries and the stakeholders and key industrial players. For estimation of the existing traffic, a structured questionnaire was

prepared and circulated to all the existing industries of the Jhagadia Industrial estate. The data was further substantiated with the inputs of industrial players through personal interviews.

At present there is very low passenger traffic and no freight traffic on the existing narrow gauge rail link and passenger movement to/from Jhagadia takes place through SH-64. The entire raw material and finished products from Jhagadia Industrial Estate move by road. Hence, likely current and future demand for the rail line in terms of goods that can move by rail if the proposed rail link is converted to broad gauge was arrived from the traffic survey and inputs from the existing industrial establishments.

Jhagadia Industrial Association is very keen on having the gauge conversion of the existing rail link executed. Many industries expressed their willingness to move their products and raw materials by rail in case the conversion of the existing narrow gauge takes place and key players were even interested in having private sidings. Keeping the developments expected to take place in the Estate, future plans of key Industrial players of the estate in mind, the expected capacity utilization of the resources of the industrial estate, and the location advantages offered to the chemical industries, the following traffic growth rates were used for traffic projection:

Base Year	Horizon Year	Average Annual Growth Rate	Cumulative growth over 4 year period	Remarks
2006	2010	3.5%	15%	Conservative
2010	2014	5.7%	25%	Moderate

To be on the conservative side, the traffic projection was done for present day estimated rail traffic only. While projecting the railable traffic, no generated / induced traffic was considered for new industries which will occupy about 85% of the still unutilized area of the estate in future. The projected traffic is as follows.

	2006	2010	2014
Containers **			
Inwards	6,625	11,644	14,492
Outwards	10,827	26,814	40,550
Total	**17,452**	**38,458**	**55,042**
Covered Wagons			
Inwards	71,000	310,133	436,968
Outwards	53,000	248,750	310,938
Total	**124,000**	**558,883**	**747,906**
Open Wagons			
Inwards	202,500	462,250	577,813
Outwards	-	-	-
Total	**202,500**	**462,250**	**577,813**
Tanker Wagons			
Inwards	71,500	92,725	115,906
Outwards	22,500	45,000	56,250
Total	**94,000**	**137,725**	**172,156**

Note: ** Traffic volume expressed in tons (in TEU for containers)

Taking into account the wagon capacities (as expressed in the table below) and WR wagon turn around times, the traffic in terms of number of trainloads per annum and trains per day is also presented.

	Container	Covered wagons	Open Wagons	Tanker Wagons
Pay Load (Tonnes)	Variable as per commodity transported	62.81	60.0	54.2
No of wagon per trains	45	58	40	48

Traffic in terms of number of trainloads per annum and trains per day

	Trainloads per Annum				Trains per day		
	2006	**2010**	**2014**		**2006**	**2010**	**2014**
Containers							
Inwards	147.2	258.8	322.0		0.4	0.8	1.0
Outwards	240.6	595.9	901.1		0.7	1.8	2.7
Total	**387.8**	**854.6**	**1223.2**		**1.1**	**2.5**	**3.6**
Covered wagons							
Inwards	29.6	129.2	182.1		0.1	0.4	0.5
Outwards	22.1	103.6	129.6		0.1	0.3	0.4
Total	**51.7**	**232.9**	**311.6**		**0.2**	**0.7**	**0.9**
Open Wagons							
Inwards	55.6	126.9	158.6		0.2	0.4	0.5
Outwards	0.0	0.0	0.0		0.0	0.0	0.0
Total	**55.6**	**126.9**	**158.6**		**0.2**	**0.4**	**0.5**
Tanker Wagons							
Inwards	27.5	35.6	44.6		0.1	0.1	0.1
Outwards	8.6	17.3	21.6		0.0	0.1	0.1
Total	**36.1**	**52.9**	**66.2**		**0.1**	**0.2**	**0.2**
Grand Total (GT)	**531.2**	**1267.3**	**1759.6**				
					1.6	**3.7**	**5.2**

Hence the total freight traffic translates to about 3.7 and 5.2 trains per day in 2010 and 2014 respectively.

E4   Project Development Cost

The existing alignment of the narrow gauge section is the most suitable alignment for the project as it has the sufficient ROW and thus minimizes additional land requirement and cost. For the estimation of cost, the different cost components e.g. land requirement, civil engineering works, signaling and telecommunication requirements were identified and assessed. Suitable adjustments were also made to gross costs to arrive at the net project cost. The following table gives the component wise cost of the project.

SI No	Description	Cost (Rs)
1.	Preliminary expenses	1,200,000
2.	Land cost	4,876,094
3.	Gross civil engineering costs	372,964,319
4.	Add General charges for Gauge Conversion including Preliminary expanses and Land (6.43 %)	24,372,299
5.	Less CRM for Civil Engineering	14,559,565
6.	Net civil engineering costs	388,853,146
7.	S&T Engineering costs	29,700,000

Sl No	Description	Cost (Rs)
8.	Electrical Engineering costs	5,202,200
9.	Mechanical Engineering Costs	9,925,698
10.	Net project cost (Rs)	**433,681,044**

The total cost of the project comes out to be Rs 433.68 million (including 3% contingency). The derived unit cost of construction (in Rs crore/Km) is also similar to the gauge conversion of Bharuch – Dahej project in neighboring area being developed by RVNL. Project costs were escalated at 5% per annum during the proposed 2 year construction period and the year wise construction cost arrived at is shown in the table below.

	2007	2008	2009	Total
Investment Phasing	30%	65%	5%	100%
Construction Cost (Rs Million)	150.6	342.6	27.7	520.9

Thus, this results in cost escalation of Rs 87.2 million.

E5   Project O&M Costs

The O&M cost for the project corridor has been calculated through the following two methods:
  (i) Fully Distributed Cost (FDC) Method used as standard railway practice where railway zone specific unit cost rates are adopted from the "Summary of End Results for Freight Services – Unit Costs" published by the Indian Railways for internal consumption.
  (ii) SPV Method as used in Konkan Rail Corporation Limited (KRCL) where rolling stock is considered on hire basis form Indian Railways. This is now adopted for evaluation of new rail projects in the country being developed on PPP mode.

O&M Cost comprises of following components
  ➢ Staff Cost
  ➢ Material Cost
  ➢ Variable Cost

A comparative picture of the OM cost estimate arrived at from the two methods is shown in the table below.

O&M Cost comparison (Rs Million at 2006 prices)

Cost Component	2006		2010		2014	
	FDC Method	SPV Method	FDC Method	SPV Method	FDC Method	SPV Method
Staff Cost	19.4	15.5	23.6	18.9	28.7	22.9
Material Cost	9.3	11.1	11.2	13.5	13.7	16.5
Variable Cost	7.7	5.7	19.1	13.5	25.8	24.8
TOTAL	**36.4**	**32.4**	**53.9**	**46.0**	**68.1**	**64.2**

The total O&M cost as per FDC Method will be Rs 53.9 million at 2006 prices in 2010 on start of operations. The total O&M cost as per SPV Method will be Rs 46.0 million at 2006 prices in 2010 on start of operations. Coaching expenses (and revenues) have not been considered in both the methods of O&M cost estimation as these will be operated by the existing railway and ROW for coaching operations will be provided free of charge. **It may be noted that O&M cost estimated through FDC method is more than that estimated**

through SPV method during the operation of the project rail. This is in line with the O&M management strategy for new rail line projects by hiring the rolling stock and contracting the staff and materials requirements to Indian railways as per benchmarked standards. Moreover, rolling stock cost (for wagons and locomotives) also has to be added to the capital cost in the estimation of project cost through FDC method which coupled with higher O&M cost is very unlikely to render the project financially feasible. The O&M costs arrived through SPV method have been used as the input in the suggested Financial Model developed for the project.

E6   Project Revenue
The coaching revenues from the existing passenger traffic are very low and there are no freight revenues on the existing narrow gauge rail link. In view of the low traffic and absence of any future plans of railways, no estimation of future passenger traffic and revenue was done. It is also suggested that loss on account of passenger revenues should be borne by Indian railways.

The freight revenues were projected for each commodity using the projected traffic volume, commodity lead and the rates charged by the Indian railway. The estimated revenues from traffic is as follows:

	2006	2010	2014
Containers			
Inwards	1.7	2.9	3.6
Outwards	3.3	7.4	10.9
Total	**5.0**	**10.3**	**14.5**
Covered Wagons			
Inwards	4.2	18.0	25.3
Outwards	3.3	15.2	19.0
Total	**7.5**	**33.2**	**44.3**
Open Wagons			
Inwards	11.0	24.8	31.0
Outwards	-	-	-
Total	**11.0**	**24.8**	**31.0**
Tanker Wagons			
Inwards	5.6	7.3	9.1
Outwards	1.2	2.4	3.0
Total	**6.8**	**9.7**	**12.1**
Grand Total (GT)	**30.3**	**78.0**	**101.9**

(Rs Million at 2006 prices)
The total revenues will be Rs 78.0 million at 2006 prices in 2010 on start of operations.

E7   Financial Appraisal
The financial model has been developed for SPV method assuming that it will be a more realistic and implementable approach for the project execution. The key assumptions for the financial appraisal are as follows:

Parameter	Assumption
Debt Equity Ratio	1.5:1
Inflation rate	5% per annum on cost streams 3% per annum for revenue stream
Interest rate	8.5% per annum

Parameter	Assumption	
Debt Tenure	15 years (3 year construction period+ 1 year moratorium+ 11 year repayment	
Pre operative charges	➢ Syndication fees at 1% of the debt sanctioned ➢ Lenders upfront fee as 0.1% of the debt sanctioned ➢ Incorporation and establishment expenses of Special Purpose Vehicle ➢ Cost of Lenders Engineer during the construction period and ➢ Cost of preparation of DPR as 1% of the construction cost	
SPV Costs	Costs incurred in SPV incorporation	
Preliminary Cash Balances	1% of the project cost	
Taxation	Corporate Tax	MAT
	33.66%	8.42%
Tax Holiday	Ten-year 100% tax holiday over a 20-year time frame as per section 80-IA of IT Act, 1961	
Depreciation	➢ SLM- 3.33% as per Company Act ➢ WDV method- 10% as per IT Act	
Insurance Premium	0.7% p.a. of the cost of the facility	
Period of Analysis	20 years (model developed for 30 years)	

The total landed project cost of the project adopting the above analysis comes to Rs 622 million.

Financial analysis was done for a base case scenario, which did not include any grant, and as the project had borderline financials, grant as Viability Gap Funding (VGF) of 20% of the landed cost was considered to assess the project viability in concessioning mode. The details of both the scenarios are presented below.

Financing pattern in base case scenario with no grant

Financing Pattern	Share	2007	2008	2009	Total
Debt	60%	101.4	214.9	56.4	372.7
Equity	40%	74.7	161.9	12.5	249.0
Debt/Equity Disbursement		30.0%	65.0%	5.0%	621.7

Financing pattern with 20% VGF grant scenario

Financing Pattern	Share	2007	2008	2009	Total
Grant Disbursement		10.0%	90.0%	0.0%	
Grant	20%	12.2	110.0	0.0	122.3
Debt	48%	105.3	135.4	52.4	293.1
Equity	32%	58.8	127.4	9.8	196.0
Equity Disbursement		30.0%	65.0%	5.0%	611.4

Key indicators of financial analysis are:

Financial Indicator	Base case	20% VGF
Pretax Project IRR	6.4%	6.6%
Post tax Project IRR	6.1%	6.1%
Equity Post Tax IRR	4.1%	7.7%
Average DSCR	0.93	1.17
Minimum DSCR	0.84	1.05

It may be observed that either on a stand alone basis or even with maximum permissible VGF of 20% from GoI, the project economics do not give comfort at least on the IRR criteria as a project with an Equity IRR of 7-8% is generally not financially viable and attractive.

Sensitivity analysis was also carried out to assess the sensitivity of key financial indicators to project parameters like traffic, project cost, O&M cost and Interest Rate and it was observed that the project has the highest sensitivity to traffic and becomes undoable even if it gets moderate combined shocks; a scenario not totally unrealistic based on the facts of the case.

Having evaluated the project viability and bankability as a gauge conversion exercise form Ankleshwar staion to Jhagadia station which has been presented in the previous sections of the report; the consultants have also analyzed another scenario as suggested by Jhagadia Industrial Association by considering sidings to individual establishments in the estate in the form of a ring rail type arrangement around the estate to further improve the rail connectivity of large industrial establishments within the estate. A 17 km long siding was envisaged and the unit rates of cost for construction and operations calculated from the original model were used to arrive at the additional construction and operation cost for the sidings. The project cost arrived at in this scenario is presented below:
  ➢ The total construction cost, including the additional land cost will be Rs 892 million.
  ➢ The additional land cost of the 30m wide ROW for the ring rail type siding will be Rs 139 million.
  ➢ The cost escalation during construction will be Rs 179 million.
  ➢ It may be noted that the project landed cost will be Rs 1225 million as against Rs 611 million in the previous case as follows:

Financing Pattern	Share	Rs. Million
Landed Cost		1225
Debt Funding	48.0%	588
Equity Funding	32.0%	392
Grant	20.0%	245

  ➢ The O&M cost will be Rs 81.5 million at 2006 prices on start of operations.
The project financials arrived at in this scenario are presented below:

Financial Indicator	Value
Pretax IRR	#DIV/0!
Postax IRR	#DIV/0!
Equity IRR	#DIV/0!
Average DSCR	-0.25
Minimum DSCR	-0.29

  ➢ The project will not have any positive net cashflows resulting in measurable IRRs.

It may also be noted that dedicating about 17km long 30m ROW for the ring rail type siding arrangement form the estate land which is under the ownership of GIDC will be a difficult proposition. Although the additional construction cost for the ring rail type siding has been included in the project cost, this might not be the case in light of Indian Railways policy for sidings to individual establishments. Refer annexure 13 for details of the same. Rail line projects have very specific standards of construction especially pertaining to alignment geometrics and constructing a ring rail type siding facility within the estate will be a more challenging than assumed for financial evaluation.

As an alternate approach to gauge conversion of Ankleshwar – Jhagadia rail link to improve connectivity of Jhagadia Industrial Estate with the broad gauge national rail network, the same can also be achieved by improving the road connectivity to the existing facilities at Ankleshwar viz BG station, goods yard and CONCOR ICD by four laning of SH-64 and improvement of internal roads within the estate. The consultants have also estimated the approximate cost for the same which is presented in the table below.

Details

Road Length (Km)   16
Old Road Width (m)   7.5
Median Width (m)   4
New Road Width (m)   7.5
Hard Shoulders (m)   2
Soft Shoulders (m)   3

Sl No	Component	Unit	Rate/Unit (Rs)	Thickness (mm)	Quantity	Cost (Rs Million)
1	Clearing/ grubbing	Ha	35,000	-	26	0.92
2	Excavation (soft soil)	cu-m	50	500	132,000	6.60
3	Embankment	cu-m	150	500	24,000	3.60
4	Subgrade	cu-m	170	500	132,000	22.44
5	GSB	cu-m	1,400	200	52,800	73.92
6	WMM	cu-m	1,600	250	50,000	80.00
7	DBM	cu-m	4,400	160	24,320	107.01
8	BC	cu-m	5,500	50	13,600	74.80
9	Prime coat	sq-m	15		272,000	4.08
10	Tack Coat1	sq-m	5		272,000	1.36
11	Tack Coat2	sq-m	6		272,000	1.63
					Total	**376.36**

The total construction cost including strengthening of existing pavement will be about Rs 380 million. The cost of maintaining the 4 lane road facility will however be much lesser than sustaining rail operations on the converted section. It has been assumed that SH-64 has sufficient ROW earmarked to enable 4 laning without the requirement of additional land acquisition and the associated costs involved.

E8   Conclusions and Recommendations

➢ Based on the present traffic, medium term future projections, past track record of less than optimal development of Jhagadia Industrial Estate and operational practices of Indian Railways; there is not enough case for an immediate gauge conversion of the study link.

➢ The project financials evaluated under different development scenarios (base case, VGF grant as 20% of the landed cost, ring rail type siding arrangement) do not make the case any better.

➢ The total railable traffic estimated for 2010 and 2014 comes to about 3.7 and 5.2 freight trains per day which will result in only 24% line capacity utilization as a single line section has a line capacity of about 22 trains per day per direction.

➢ Even as of now, none of the likely users are in a position to confirm 'traffic guarantees' for the project to reflect strategic interest in the project.

➢ With NH-8 barely at a distance of 13km and a now operational ICD at Ankleshwar, it is recommended that gauge conversion be deferred to a future date when there is a greater comfort from the traffic perspective.

➢ If Jhagadia Industrial Estate develops fast, in any case if found necessary, the rail line conversion can be carried out in 1.5 to 2 years from 'Concept to Commissioning' based on recent experiences.

MAIN REPORT

1. INTRODUCTION

Feedback Ventures (P) Ltd has been appointed as consultant by Gujarat Infrastructure Development Board (GIDB) to carry out the pre feasibility study for the conversion of the Ankleshwar – Jhagadia Narrow Gauge (NG) rail link to Broad Gauge (BG). The reports submitted earlier as a part of the study covered study parameters pertaining to the following.

Inception Report
➢ Identification of key issues
➢ Preliminary assessment of the existing rail link
➢ Secondary data collection plans
➢ Study methodology

Interim Report
➢ Assessment of the existing NG rail link
➢ The Jhagadia Industrial Estate
➢ Traffic on the existing BG & NG links and
➢ Preliminary Traffic Estimates
➢ Land acquisition requirements

Draft Final Report
➢ Economic development scenario of Jhagadia Industrial Estate
➢ Project Traffic: Demand Assessment and Forecasting
➢ Project cost estimation: Capital and O&M costs
➢ Financial appraisal
➢ Project implementation structure

This Final Report (Draft) has been prepared as a part of the Terms of Reference and is subsequent to the Draft Final Report submitted earlier. The Report is the culmination of all the activities of site visit of the project rail, analysis of collected secondary and primary data and discussions held with the various stakeholders. The report encompasses the following project parameters as a part of the study:

➢ Background
➢ Assessment of the existing NG rail link
➢ Land acquisition requirements
➢ The Jhagadia Industrial Estate
➢ Economic development scenario of Jhagadia Industrial Estate
➢ Project Traffic: Demand Assessment And Forecasting
➢ Project cost estimation: Capital and O&M costs
➢ Financial appraisal
➢ Project implementation structure

1.1 Our understanding of the Terms of Reference

The study focuses around the following issues:

➢ **Demand for the Proposed Rail Link**
Rail Infrastructure Projects are capital-intensive projects and are capable of providing huge benefits not only to the areas they link but also a large area either directly or indirectly. Demand for the rail line reflects the potential future of the rail line and the revenues that can be realized from it.

The consultants believe that demand as such is a very crucial element in the studying the feasibility of the proposed rail line. The need for the gauge conversion of the rail line is dependent on the demand for the same.

In the section under study, at present there is very low traffic on the rail segment. Also there is a state highway, which runs parallel to the link and provides a faster service to the Ankleshwar. Current industries at Jhagadia have very less demand for the rail link. With the future plans of the Jhagadia Industrial estate, the demand may increase to provide better connectivity and to ensure efficient, timely and cost effective delivery to different parts of the country when more industries are set up in the area; especially looking at the benefits, which the Jhagadia Industrial Estate offers towards water intensive industries.

➢ **Future Growth of the Jhagadia Industrial Cluster**
GIDC is in the process of negotiations with many interested parties for setting up their plants in the estate. Looking at the current scenario, the rail line does not seem to be a viable option as the freight traffic demand is very low.

Consultants believe that the future growth of the industrial estate would directly affect the demand for the rail line and as such, the need and viability of the project. Hence this is an important component of the study. It would help to assess the likely traffic on the link, the needed infrastructure and cost of providing the same. This would also be helpful in assessing the market for the rail link.

The rail line will be a cost effective, fast and reliable option to those industries which either have a very large hinterland or which source their raw materials from far away places and ports.

➢ **Commercial Significance of the Rail Link**
Financial viability of the projects reflects the financial benefits over the cost of providing the same. Consultants believe that a project is viable only if ensures greater benefit to the stakeholders especially the industrial community. As such cost-benefit analysis would be extremely helpful in assessing the viability of the project. This would also help in structuring the project especially commercially.

Commercial significance of the project is directly related to the benefits to the industrial community especially the cost, time and efficiency. The greater the benefits of the rail line in terms of time, cost and efficiency, greater is the demand for the rail line and as such the revenues from the project.

➢ **Objectives of the study**
The objectives of the study are to assess existing NG rail link and work out traffic demand, appropriate technical details and designs of the facility, revenue modeling, financial feasibility, economic feasibility, socio-economic and environmental assessment for the project.

Consultants have a rich experience in similar studies and have done extensive work for the sector for many prestigious projects like Paradip- Haridaspur rail link and have delivered high quality solutions to their clients.

To achieve the stated objectives, the study would include but not limited to the following parts as per the Terms of Reference:

Part A: Technical

- ➢ Study route alignment and provide strip map of the alignment. It should bring out suitability of the Right of Way for BG rail link and land acquisition requirements and identify available Governement. land that may be used.
- ➢ Carry out preliminary engineering surveys on the Ankleshwar-Jhagadia NG rail line. Preliminary designs and estimate the cost of construction at current prices. Preliminary survey report should bring out the following:
  - • Condition of present rail track with respect to drainage, embankments, formation, RoW for conversion to BG.
  - • Cross drainage structures and their conditions
  - • No of existing stations, requirement of new stations for passenger movement, LCs
  - • Suitability of the existing alignment for BG track
  - • Electrical and S&T systems and their suitability for retaining them
  - • Existing passenger platforms and their suitability for BG
  - • Freight handling facilities required at Jhagadia
  - • Re-grading requirement for BG track
  - • Transition / connectivity requirements between project route and Mumbai-Delhi BG mainline
- ➢ Carry out Rapid Environmental Impact Assessment
- ➢ Identify firm and non-firm costs and the likely variation in these.
- ➢ Determine contingency provision or assess the adequacy of the contingency provision (if any) based on non-firm project costs and project implementation schedule.
- ➢ Assess the project cost and where possible compare the same with similar projects executed domestically.

Part B: Assessment of cargo/passenger traffic

- ➢ Analysis of activities in the industrial units located at Jhagadia and in near by areas. Assessment of markets for finished products and sources of raw materials of the industrial units and present mode of goods movement. Likely future trends of the industries by type at Jhagadia. Assessment of the potential of Jhagadia industrial area.
- ➢ Broad analysis of cargo and passenger traffic likely to use the project line, including shift from nearby road routes, with their origination and destination points and calculate average lead distance of cargo to be carried by using this rail link.
- ➢ Establish the need for this rail link in view of present and future likely capacity utilization.
- ➢ Independent assessment of the potential market for the project in terms of cargo / passenger profile, projected growth rates, likely market share vis-a-vis competing facilities in the region.
- ➢ Interviews with large users who are likely to benefit from this connectivity and assessment of their traffic projections. Assessment requirements of freight handling facility and siding facility at Jhagadia.
- ➢ Assessment of existing road linkages and adequacy of the same to assess potential competition with rail. _ Assessment of the total cargo/passenger handling capacity envisaged and its adequacy to meet the projected throughput assumptions.
- ➢ Assessment of revenue on the project section for 20 years after the date of commissioning.

Part C: Review of the O&M arrangements

- ➢ Assessment of O&M arrangements and estimation of working expenses based on standard railway norms.

- ➢ Independent assessment of O&M arrangements in case the implementation structure requires O&M to be done by the Railway under a contract - detailed evaluation of adequacy and O&M costs to be incurred which would include the following
  - Analysis of charges for different elements of O&M costs as specified by railway
  - Independent assessment of O&M costs in terms of fixed and variable costs which are in accordance with prudent industry practices.
- ➢ Operation and Maintenance may also be done by agency other than the Railways. The O&M costs as mentioned has to be determined in respect of such models, where responsibility of O&M is with the private entity.

Part D: Financial Appraisal and Project Structuring

- ➢ The Consultant would carry out an analysis to establish the financial and commercial viability of the Project to enable its functioning as an independent, commercially viable entity to be implemented either through BOT, Joint Venture SPV or any other financing mechanism. Specifically, the consultant would:
- ➢ Undertake a detailed financial analysis. Detailed analysis of rakes requirement vis-à-vis policy of Indian Railways on the matter. Financial analysis will take into account cost of rolling stock directly as Capital Investment or indirectly as hire charges in the form of revenue expenditure.
- ➢ Prepare detailed financial projections, involving estimation of the overall project cost (as per preliminary technical report), selection of the appropriate financing mix, detailed estimation of revenue and costs during operations and estimation of the resources to be mobilized/raised.
- ➢ Study and evaluate alternate financial project structures.
- ➢ Evaluate and recommend the preferred implementation structure based on project economics and identification of potential partners. Assess the need for appropriate contingency plan for the project to manage the risks identified, their allocation and mitigation

1.2 Background

Bharuch District in Gujarat has one of the largest agglomeration of Chemical Industries in the country which are located in the industrial estates of Ankleshwar, Dahej, Jhagadia and Vagra which have been promoted and developed by Gujarat Industrial Development Corporation (GIDC); the nodal agency of the Gujarat Govt. for Industry and associated infrastructure development.

Ankleshwar is a Taluka under Bharuch district with about 1,50,000 population. This city is located approximately 10 kms from Bharuch. Ankleshwar is well connected with NH-8 (Mumbai-Delhi) and the Railway station is on Delhi – Mumbai railway trunk route. Ankleshwar is the industrial town-ship over 100 big and small chemical plants. These chemical plants produce insecticides, specialty chemicals and paints. This industrial town-ship is now saturated and can't accommodate more industries.

Govt. of Gujarat has planned to develop Jhagadia as a mega industrial estate to act as a natural successor. Developed over an area of 1700 hectares, the estate is primarily planned for chemical & pharmaceutical industries as well as other water intensive industries. The estate is located along SH-64, which starts from NH-8. Today, there are about 23 large to medium size industries and has the potential to accommodating about 80 more such industries.

Consultants believe that the future growth of the industrial estate would directly affect the demand for the rail line and as such, the need and viability of the project. Hence this is an important component of the study. It would help to assess the likely traffic on the link and the needed infrastructure. This would also be helpful in assessing the market for the rail link.

2. ASSESSMENT OF THE EXISTING NG ALIGNMENT

A detailed topography survey of the existing alignment was carried out by the Consultants as apart of the exercise for assessment of the existing NG link to get a clear picture of the present scenario and enable them to carry out the feasibility for its conversion to NG. The Strip Plan of the alignment produced from the topography survey is attached as a separate Drawings Volume to this report.

This chapter details out the following parameters with respect to the existing alignment.
- ➢ Terms Of References And Standards Of Construction
- ➢ The Existing NG Alignment
- ➢ Approach for conversion to BG

2.1 Terms of References and Standards of Construction for Gauge Conversion

The consultants have adopted the following Terms of Reference and Standards of Construction for conversion to BG as per "Indian Railways Engineering Code" Chapter II Para 209-210 for making an assessment of the existing rail alignment.

- ➢ **Category:** In terms of Indian Railways Engineering Code, Chapter II, Para 210(4), the route of BG rail track shall be classified as "D" class, having speed potential of the section to 100 KM./ per hour.
- ➢ **Gauge:** Broad Gauge (1676 mm)
- ➢ **Alignment**: The present alignment of NG track should be the shortest possible connecting Ankleshwar & Jhagadia direct.
- ➢ **Track Structure:** In terms of Indian Railway Engineering Code Chapter II, Para 210 (4), track structure for Group "D" route (traffic density less than 10 GMT) shall be as below:
  - o **Rails:** The rails shall be 52 Kg/M. section, 90 UTS 1st class. Free or two rail length rails shall be ordered on SAIL and transported to site of requirement. The rails shall be welded by "Thermit" process in situ to form LWRs, as per the site conditions.
  - o **Sleepers**: Sleepers shall be Monoblock Concrete Sleeper (Prestressed) fit for use on 60Kg rails. The sleeper density shall be 1540 Nos./KM, having 250 mm clean machine crushed ballast cushion suitable for traffic density of less than 10 GMT. The average ballast shall be 1954 Cubic Meter per KM required for the LWR track.
  - o **Curvature**: Since this is a Gauge Conversion, existing alignment shall be retained. All profiles of curves shall be retained. All curves shall be transitioned designed for 100 KM/PH speed. 4 degree curves are potential to reduce the designed speed to 80 KM /Hr.
  - o **Ruling gradient of section**: Ruling gradient should not be steeper than 1 in 150 duly compensated for curvature. It is desirable to have 1 in 1200 grade in yards, however gradient should not be steeper than 1 in 400.
  - o **Embankment or Cutting:** The soil, having poor bearing capacity, shall not be used for filling for the embankment. Likewise, the formation of cutting should also be dug out for about a meter and good moorum soil shall be filled. In terms of Indian Railway P Way Manual Chapter II Para 263 – (Corrected vide CS 49 dated 11/4/2000), the width of the embankment shall be 6.850 meters with side slopes of 1 vertical to 2 horizontal, and that of cutting 6.250 meters excluding side drains.

- o **Drainage:** The side drains in cuttings shall be built katchha to a profile having top width of 1200 mm, depth 300 mm with side slopes of 1 horizontal to 1 vertical and bottom width of 600 mm. Existing catch water drains in deep cuttings shall be retained and repaired, wherever required.
- ➤ **Capacity Of Loops**: The loops shall be for full length of a goods train 686 meters CSR.
- ➤ **Level Crossings:** All manned or unmanned level crossing gates shall be retained. No unmanned level crossing gate shall be upgraded or no manned level crossings shall be de-manned. No manned level crossings shall be proposed to be replaced with ROB or RUB.
- ➤ **Bridges:** Standard RCC slabs shall replace all minor bridges. Standard PSC girders shall replace major girder bridges. No minor bridge shall be with girders as super structure. In terms of Para 209 (4), of IR Engineering Code Chapter II, Bridges shall be built to Revised BG ML loading of 1987, with a maximum axle load of 22.5 tones for the maximum trainload of 7.67 tones per meter behind the locomotives with a maximum axle load of 22.9 tones for train load
- ➤ **Fixed structure clearances**: Clearances for fixed structures are adopted as per Schedules of Dimensions for BG (1676 mm). There shall not be any infringements to Standards of moving Dimensions in new alignment of BG track.
- ➤ **Platforms:** The length of passenger platforms shall be sufficient to accommodate a full-length train expected to run in the section. All halt stations should have Rail level passenger platforms.
- ➤ **Station Buildings and Passenger Amenities**: Being the Gauge Conversion, the existing station and station buildings, passenger amenities and staff amenities like staff quarters, platform sheds, drinking water, benches etc. shall continue. If owing to increase of passenger traffic due to conversion to BG, it will be considered by the Division.

2.2 The Existing NG Alignment

Field visits and the topography survey results have been used for making an assessment of the existing alignment. The existing rail alignment is a Narrow Gauge (765 mm / 2' 6") track taking off from Ankleshwar station, which is located on Class "A" Mumbai – Delhi route main line of the broad gauge network. The NG rail link is about 22 Km in length and is a part of the route from Ankleshwar to Rajpipla (63 Km). The maps below show the study rail link and the Delhi-Mumbai link.

The Project Rail Link
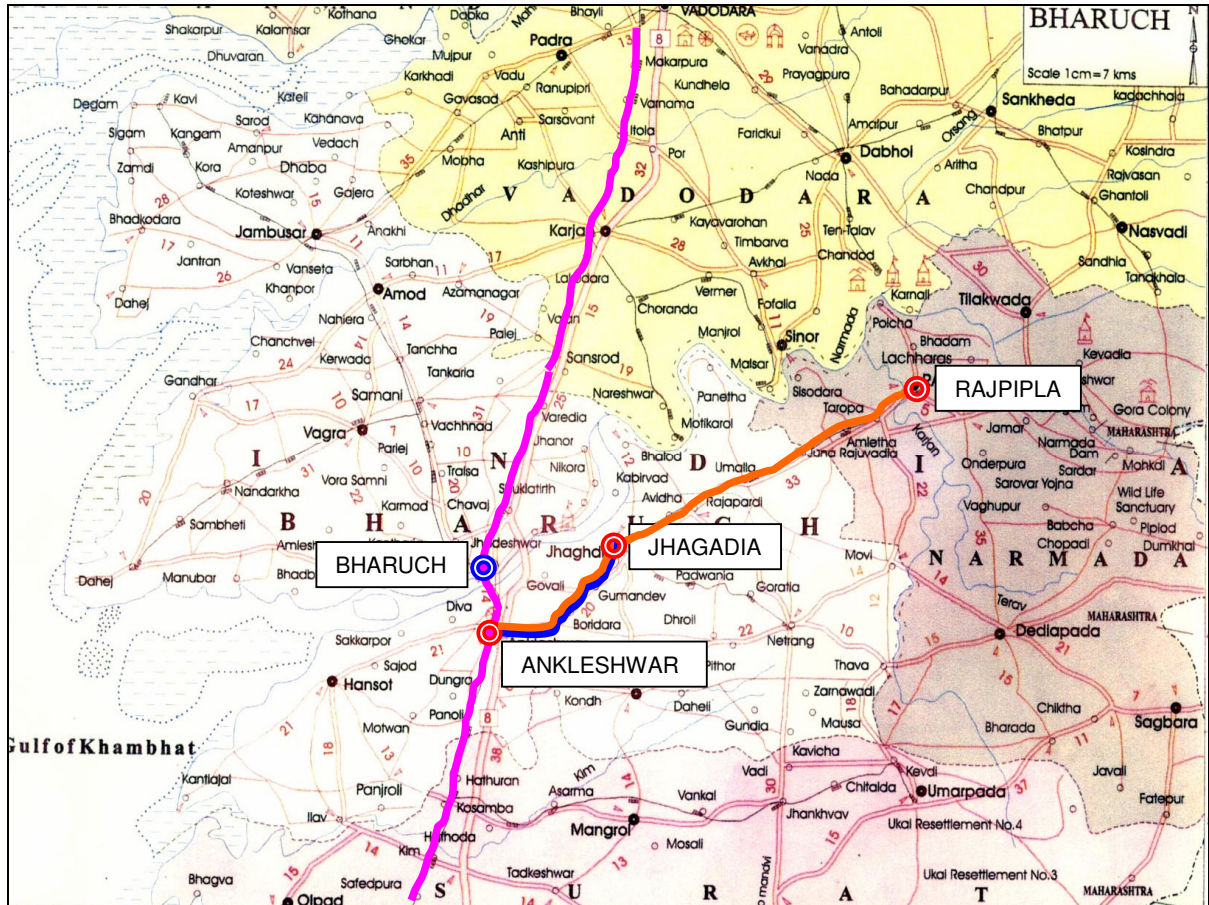
▬▬▬	Delhi - Mumbai main line: BG
▬▬▬	Ankleshwar – Rajpipla line: NG
▬▬▬	Ankleshwar – Jhagadia section: proposed for conversion to BG

The Project Rail Link
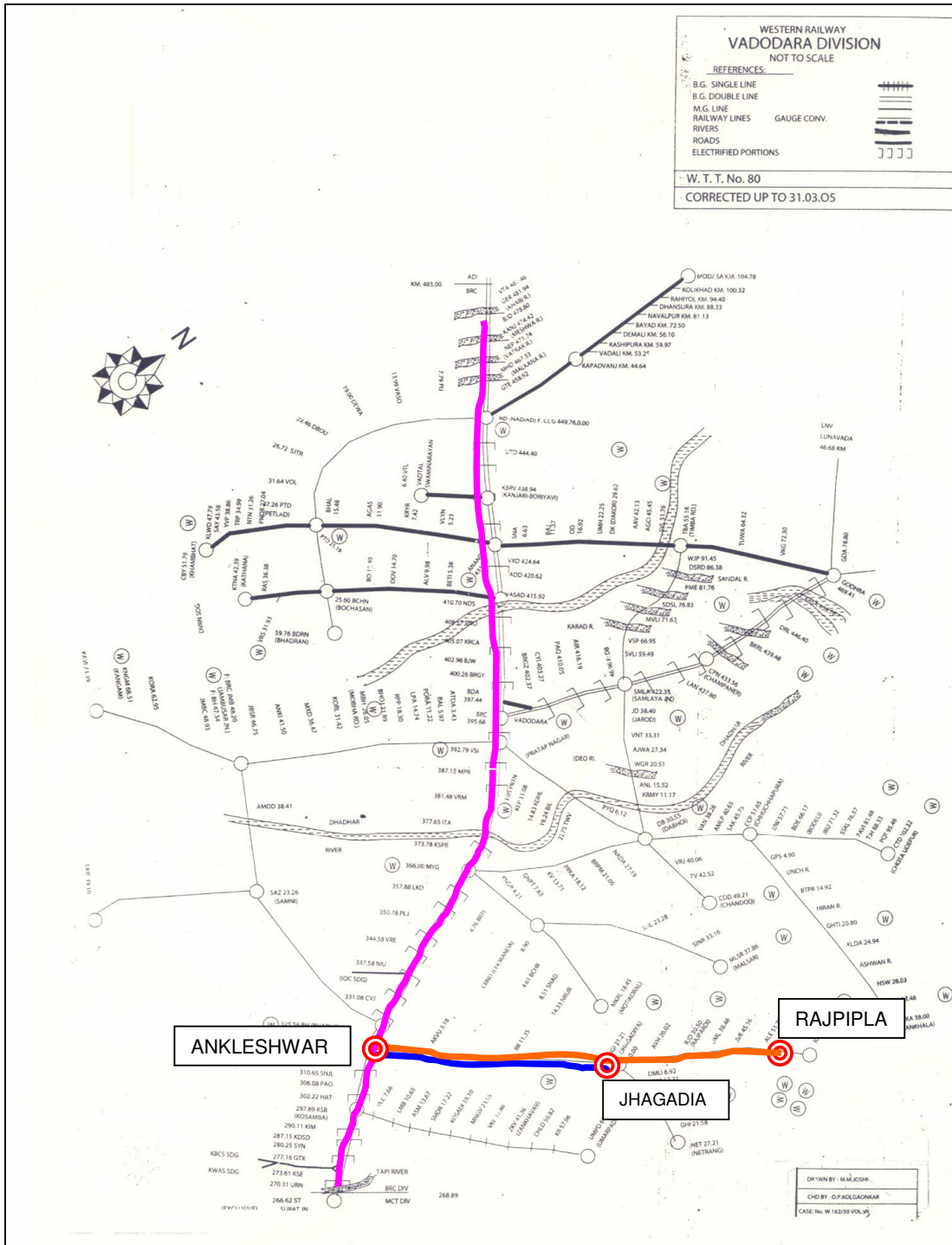
Delhi - Mumbai main line: BG
Ankleshwar – Rajpipla line: NG
Ankleshwar – Jhagadia section: proposed for conversion to BG

The salient features of the study section are as follows:

- **Length under study**: 21.21 Km (approx)

- **Traffic Working system**: Only one train operating on "One Engine System" is worked in the section in day light hours; there is no night working. There is no goods train running, since there is no goods traffic.

- **Ruling Grade in section**: The existing gradient is 1 in 150. A list of existing gradients is given in Annexure 1.

- **Curves in section**: The section runs in a flat and straight country. There are 9 curves, which covers about 2.9 Km out of the total 22 Km. There are 4 sharp curves having 4 degrees curvature; one of which is at Ankleshwar Yard after the exit point. There are 2 curves are having 3 degrees curvature, 2 curves having 2 degrees curvature and 1 curve with 1 degree curvature. A list of existing curves is given in Annexure 1.

- **Grading along BG track:** The whole terrain of NG alignment is almost plain. It does not have sharp / deep cuttings, high embankments, perennial rivers and Ghat sections. The HFL marked on bridges are not high anywhere.

- **Drainage:** The entire route is running through an open area, without ant deep cuttings or very high banks. The Highest flood Marks on abutments of the bridges available shows that the flood discharge have never crossed the Rail level. There is no record of over flooding in this terrain. Any type of special treatment is not given to flood waters. There are no other protective works for cross drainage. No flood has ever affected the bridges as well as track.

- **Embankments & Track Formation:** The entire belt under survey is on "Poor" soil. In the beginning after take off from Ankleshwar station, it is "Black Cotton Soil" for about 10 Km with poor bearing capacity. After 10 Km, the soil is sandy mixed with silt again having poor bearing capacity.

- **Level crossing gates:** There are total 23 level crossings, their classification being as under.
    - "Spl" class: 1
    - "A" class: 2
    - "C" class: 20

- At none of the gates, a permanent gateman is posted to operate the gates for road traffic, though some are shown as "Manned" in the list. A traveling Gateman accompanies the train and closes the gates for passage of train and opens afterwards in normal position. The intersection with the Mumbai – Delhi Highway (NH-8) just after the Ankleshwar station is a major level crossing with one of the busiest highways of the country. The list of level crossings on existing NG alignment is given in Annexure 1.

- **Bridges**: There are total 39 bridges along the alignment. There are 3 major bridges having waterway over 60 feet and 36 minor bridges having less than 60 feet waterway. All bridges are to suit a single line NG track. The list of bridges with their location, span and type on NG alignment is given in Annexure 1.

➢ **Foundations of Bridges**: All the minor bridges built for NG are of brick masonry. The major bridges have piles foundations suitable poor bearing capacity soil. The masonry of almost all minor bridges has dilapidated and is beyond repairs.

➢ **Stations:** There is no block station between Ankleshwar and Jhagadia at which traffic is dealt with. There is only one halt station (Jhagadia) for passenger movements. There were other halt stations earlier, which have been closed obviously for non-availability of traffic. The existing stations are:
  o Ankleshwar Udyognagar at Km 3.18
  o Dadhal Inam at Km 6.63
  o Boridra at Km 11.33
  o Gumandev at Km 16.24

➢ Presently the following facilities are available at Ankleshwar for NG:
  o Engine inspection and turning
  o Fueling of Engine
  o Coach maintenance including washing
  o End loading and unloading from NG to BG or from BG to NG for POH of coaches and Engine

➢ **Existing passenger platforms and passenger amenities:** At Ankleshwar and Jhagadia, there are RL passenger platforms for NG. There is a small shelter for passengers at Jhagadia. There is a cover over platform at Ankleshwar. There are no other facilities on platform at Ankleshwar, since the required facilities are available on other BG platforms as well as in 2nd class / 1st class waiting halls at the same station. There are no facilities at Jhagadia. There are no passenger amenities at the other block stations.

➢ **Electrical and S & T Systems:** Since the working on the section is during daytime only; no Electrical installations are in operation. As there is only "One Train Only System" in the section; there are no S & T installations in between Ankleshwar and Jhagadia.

➢ **Ankleshwar Yard**: There is a proposal for a siding for Container Corporation Of India (CONCOR) by the side of an up loop. Its connectivity on Mumbai side is yet to be finalized as HQ of Western Railway has not yet finalized the plans.

➢ **Freight handling facilities at Jhagadia:** Presently, a small covered shed is available on West side of the station, which has not used for ages and is in very poor condition.

➢ **Overhead electric wires crossing the NG tracks**: There are 23 overhead HT electric wires and a telephone wire crossing the NG tracks at different locations. List of such locations is as per Annexure 1.

The salient features of the existing rail link may be summarized as under:

Parameter	Characteristic
Section:	Ankleshwar – Jhagadia
Branch Line:	Ankleshwar – Rajpipla
Distance:	21.2 Kms
Gauge:	Narrow Gauge 762 mm (2.5 feet)

Parameter	Characteristic
Link Station:	Ankleshwar on Delhi/Ahmedabad- Mumbai Trunk Route
Division:	Vadodara
Railway:	Western Railway, HQ- Churchgate Mumbai
Taluka:	Jhagadia
District:	Bharuch, Gujarat
Service	
o Passenger:	One train each way
o Freight:	No freight service
Nearest goods shed:	Ankleshwar
Nearest Container Depot:	Ankleshwar
Roads:	
o National Highway	NH-8 (Delhi - Mumbai)- 13 Km
o State Highway	SH-64 between Ankleshwar- Rajpipla runs parallel to the estate
System of operation:	One engine only
Type of Loco:	ZDM
Number of stations:	One at Jhagadia – D class
Ruling Gradient:	1:150 section and 1:1000 station
Number of bridges:	37 (3 major)
Number of level crossings:	26 (7 manned)
Number of curves:	9 (max 4 degrees)

2.3 Approach for Conversion to Broad Gauge

After a detailed topography survey and reconnaissance of the existing alignment, it may be stated that the present NG alignment is suitable to have Right of Way for BG rail link. No additional land shall be required to accommodate BG Main line, however, for provision of additional facilities of loop lines, good sheds and circulation areas, additional land shall be required at Jhagadia and Boridra stations. The main belt of Industries (Jhagadia Industrial Estate), which the project is expected to serve, is located near Boridra and Jhagadia stations facilities for handling goods traffic will have to be located at either of these locations. The main activities to be carried out on the existing alignment have been outlined below.

➢ **Track Structure:** In terms of Indian Railway Engineering Code Chapter II, Para 210 (4), track structure for Group "D" route (traffic density less than 10 GMT) shall be as below:
   o **Rails:** The rails shall be 52 Kg/M. section, 90 UTS 1st class. Free or two rail length rails shall be ordered on SAIL and transported to site of requirement. The rails shall be welded by "Thermit" process in situ to form LWRs, as per the site conditions.
   o **Sleepers**: Sleepers shall be Monoblock Concrete Sleeper (Prestressed) fit for use on 60Kg rails. The sleeper density shall be 1540 Nos./KM, having 250 mm clean machine crushed ballast cushion suitable for traffic density of less than 10 GMT. The average ballast shall be 1954 Cubic Meter per KM required for the LWR track.
   o **Curvature**: Since this is a Gauge Conversion, existing alignment shall be retained. The existing alignment has 4 sharp curves of 4 degrees. Since the cost of realignment of these curves to minimize the degree shall be very high, the same will be retained in new alignment of BG. All curves shall be transitioned designed for 100 KM/PH speed. 4 degree curves are potential to reduce the designed speed to 80 KM /Hr.
   o **Ruling gradient of section**: Ruling gradient should not be steeper than 1 in 150 duly compensated for curvature. It is desirable to have 1 in 1200 grade in yards, however gradient should not be steeper than 1 in 400.
   o **Embankment or Cutting:** Earthwork for embankment shall be done with good earth well compacted, to a depth of at least 0.50 Meter below the formation level, so as to obtain 98% dry density. No locally available earth shall be used, as it is black cotton soil with poor load bearing capacity. The width of the formation shall be 6.850 meters for embankments and 6.250 meters for cuttings excluding side drains.
   o **Drainage:** The side drains in cuttings shall be built katchha to a profile having top width of 1200 mm, depth 300 mm with side slopes of 1 horizontal to 1 vertical and bottom width of 600 mm. Existing catch water drains in deep cuttings shall be retained and repaired, wherever required.

➢ **Loop lines:** Boridra station shall be provided with a passenger loop and a goods loop with goods shed with cover and a circulating area sufficient for handling goods traffic. Jhagadia halt station shall be provided with a loop line for engine turning as it will be the terminal point for the proposed BG. Facilities for BG/ NG end loading/ unloading, platform for NG coaches/ Engine, POH for engine depot at Dabhoi (presently such facility is at Ankleshwar yard) will also have to be provided. At Rajpipla, facilities for C & W examination of NG coaches, engine examination & fueling, a small sick line cum inspection line shall be required. Since these facilities are presently available at Ankleshwar, they shall no longer be available after gauge

conversion up to Jhagadia. A small BG washing siding and a stabling siding for BG Engine or Rail car halt shall be also be required at Ankleshwar.

- ➢ **Level crossings:** Of the existing 23 level crossings, none are proposed for upgrading. The present practice carrying a "Traveling Gateman" with the train to man the gates during the passage of train shall continue. A ROB shall be proposed at the level crossing across NH 8 for avoiding rail – road traffic conflict as the road traffic is likely to increase substantially with he six laning of the NH.

- ➢ **Bridges:** None of the existing bridges are suitable for continued usage after conversion to BG and all of them will have to be rebuilt to the following specifications.

1. Foundations:	Pile foundations, after soil explorations
2. Sub Structure:	Mass concrete
3. Super structure	PSC girders with deck ballasted slab
4. Track over the bridges:	Ordinary track as of approaches to be carried through

- ➢ There has not been wash away of any bridge in the past and the waterways of all bridges have been found to be adequate. HFL available are not alarming to go for raising of formation level. The proposed structures of the bridges are given in Annexure 2.

- ➢ **Station buildings:** All existing stations with buildings, platforms and other passenger and staff amenities shall be retained for BG. A station building with a passenger shelter, RL platform for passengers are proposed at Boridra. Repairs to station building, raising of platform and a shelter for passengers are proposed at Jhagadia station.

- ➢ **Electrical Engineering:** As the existing train of NG section is run only during the day on "one train system of working", therefore no electrical installations are in operation between Ankleshwar (Excl) and Jhagadia. After conversion of the section to BG and provision of an additional freight handling stations at Boridra & Jhagadia, electrical engineering requirements will have to be provided for. There shall be circulating area with road approaches to goods loop / goods sheds, offices for goods dealing staff, which shall have to be electrified. No night working for passenger trains is expected. There are 23 electrical HT wires crossings the alignment, which will have to be lifted up for sufficient height for BG track.

- ➢ **S & T arrangement:** The route under study from Ankleshwar to Jhagadia (NG) section is a single line, non-controlled, non-interlocked section. There are no traffic signals and the points are non-interlocked. The standards of signaling presently being adopted on double line sections which aims to achieve maximum utilization of line capacity have been proposed for the study section. In light of this:

  - o *At Ankleshwar Junction:* After connecting converted BG track to the existing main line, the passenger loop shall be, like other lines at this station, fully track-circuited, fully equipped with interlocked points and with "Multiple Aspects Color Light Signals". Few alterations in signaling frame shall be required.
  - o *Section up to Jhagadia:* The section will have Multi Aspect Color Light Signalling, Panel Interlocking, Token less Block Instruments, Fiber Optic Cables for communication and control office to co-ordinate the working.

  o *Telecommunications between Ankleshwar station and Jhagadia station:* Fiber optics cables shall be used for communication and data transfer between he stations of the study section and Ankleshwar BG Station.

2.4 Additional Land Requirement

For the Gauge Conversion from NG to BG, the alignment is proposed to be kept the same as that of NG. From the study, it may be concluded that the present NG alignment has sufficient and suitable ROW for BG rail link and therefore no additional land shall be required to accommodate BG Main line. However, for provision of additional facilities of loop lines, good sheds and circulating area, additional land shall be required at Jhagadia and Boridra. Facilities for handling goods traffic may be developed either at Boridra or Jhagadia depending on suitability to serve the Jhagadia Industrial Estate in the most efficient possible manner.

The land requirement at both the stations to develop facilities for freight handling are as below:

Station	Land Requirement (Sq M)
Boridra	1,500
Jhagadia	16,400
Total	**17,900**

The above areas have been depicted in the Volume II (Drawings) of the Interim Report submitted earlier.

There is however some encroachments on the railway land in some stretches along the alignment, which will have to be cleared. The details of these are given in Annexure 1.

It may be noted that the approach road to Jhagadia station passes through Jhagadia town and it has a limited ROW which is as low as 15m in some stretches. Moreover the small town has a small but dense population. In fact the last 100m of the approach has no road at all. This would pose serious constraints for loading/ unloading operations when freight trains start operating on the proposed narrow gauge line. Also, the existing station at Jhagadia is not in proximity to the industrial estate as compared to the station at Boridra. In light of these constraints, a fresh look at the location of the proposed goods yard for the project at the Jhagadia end will have to be taken.

3. THE JHAGADIA INDUSTRIAL ESTATE

Jhagadia was planned as a mega industrial estate by GIDC in the early 90s to act as a natural successor to the saturating estate at Ankleshwar with the provisions of required infrastructure like, water, power, effluent disposal and connectivity. Developed over an area of 1700 hectares, the estate is primarily planned for chemical & pharmaceutical industries as well as other water intensive industries. The estate is located along SH-64, which starts form NH-8. Today it houses some 23 large to medium sized industries and has the potential of accommodating about 80 more such industries.

The consultants have carried out a detailed study of the industries in the Estate by interacting with the representatives of all the operating units on a one to one basis to get an overview of the existing scenario. A detailed description of the principal operating units with respect to their raw materials used, finished products and extent of markets serviced is given below. The Proforma used for collecting the information during the interviews is given in Annexure 7.

1. **Anglo French Drug & Industries Ltd**
    M/S Anglo French Drug & Industries Ltd was established in 1994. It is a medium large industry. The industry produces Fabrics and its articles. This industry is situated out of GIDC Jhagadia estate. The main raw material is Yarn which comes from Vapi / Bhiwandi by road. In 2004-05 the industry used 303.96 thousand tones of Yarn. The main finished product is fabric and its articles, which is sent to Karnataka, Delhi And Chennai. In 2004-05 the company dispatched 421.38 thousand tones of finished products. In future the industry plans to transport its raw materials through pipelines from their sources. Though, the industry likes to avail road transportation, in case of BG conversion, this company may send their goods to out of Gujarat by containers or covered wagons.

2. **Aarti Industries Ltd**
    Aarti Industries Ltd was established in 2000. It is a medium class chemical industry. The industry produces chemicals like NB, DNCB and BNCB. The main raw materials are Benzene, CAN, Sulphuric Acid, and MCB, which come from Jamnagar, Bharuch, Vapi and locally by road. The main finished products are NB, DNCB & BNCB that are sent to Ahmedabad, Vadodara and Vapi by road. In 2004-05 the company produced 22703 thousand tons of output. In future the industry does not have any plans. In case of BG conversion, this company may send their goods to out of Gujarat by containers or tank wagons via Jhagadia.

3. *Ajanta Paper and General Product Limited*
    Ajanta Paper and general product limited was established in 2000. It is a newsprint and writing - printing industry. The industry produces newsprints, writing and printing paper. The main raw materials are local newspapers, white record and imported paper, which come by road. The main finished products are newsprints, which are sent to all over India by road.

4. **Chemiorganic Chemicals Pvt. Ltd**
    M/S Chemiorganic Chemicals Pvt Ltd was established in 1998. It manufactures chemical dye intermediates. The main raw materials are Benzene and chlorine, which come domestically from RIL, Jamnagar by road. In 2004-05 raw material required was 25784 tons.   The main finished products are Monochloro Benzene, Paradichloro Benzene, Orthochloro Benzene, which are sent to Maharashtra and other states by road. In 2004-05 the company produced 40416 thousand tons of output. In case of BG

conversion, this company will use containers and tankers for moving the products via Gumandev.

5. **DCM Shriram Consolidated Ltd**

   DCM Shriram Consolidated Ltd was established in 1996. It is a Chlor Alkali Industry. The main raw materials are Salt & Furnace Oil, which come domestically from Dahej Port and Hazira and Gujarat Refinery respectively by road. In 2004-05 salt required was 1,17,200 tons. The main finished products are Caustic Soda, Chlorine, Hydrochloric Acid, Sodium Hypochloride and Hydrogen, which are sent to all over India by road. In 2004-05 the company produced 6406 thousand tons of output. In case of BG conversion, this company this company will use containers and tankers for moving the products via Jhagadia.

6. **Gulshan Polyols Ltd**

   Gulshan Polyols Ltd was established in 1997. It is a process Industry. The main raw materials are Starch/Corn and Lignite, which come domestically from Bhuj by road/rail. The main finished products are Sorbital 70%, which is transported by road. In 2004-05 the company produced 28.88 thousand tons of output. In case of BG conversion, this company this company will use containers and covered wagons for moving the products via Gumandev.

7. **Gujarat Borosil Ltd**

   M/S Gujarat Borosil Ltd started its commercial operations in 1994. It is a glass manufacturing Industry. Industry is situated out of GIDC Jhagadia estate. The main raw materials are silica sand, dotomite soda ash, limestone and sodium sulphate, which come domestically from Chotila & Amod (Gujarat), Mithapur & Veraval (Gujarat), Sojat city (rajasthan) and Kosamba by road. The Raw Materials required in 2004-05 are up to the limit of 8300 MT. The main finished product is shut glass from 3 mm to 12 mm, which is moved by road. In 2004-05 the company produced 62570 m of sheet glass. This company is interested to move both type of goods i.e. raw material and finished material by rail if BG is constructed. They will like to have a private siding to their factory.

8. **Huber Chemicals India. Pvt. Ltd**

   Huber Chemicals India Pvt Ltd was established in 1994. It is a manufacturing Industry. The main raw materials are Sodium Silicate, Alum, Sulfuric Acid, Magnesium Hydroxide liquid, which come domestically from from Mehsana, Nadiad, Ankleshwar & Vapi locally by road. In 2004-05 the quantity of raw material required was 48758.40 MT. The main finished products are Precipitaed Silica, Aluminium Silicate that is being transported to Mumbai/ Goa/ Punjab/ Hyderabad/ Tamil Nadu & Gujarat by road. In 2004-05 the company produced 10390.50 MT of output. In future the industry plans to transport raw materials through pipelines also. In case of BG conversion, this company this company will use containers and tank wagons for moving the products via Gumandev. If BG connection can be made between Bharuch-Dahej & Ankleshwar-Jhagadia, the goods can be converted to rail. This industry will be main user of rail connectivity and will use all types of wagons.

9. **JNP Products Pvt. Ltd**

   JNP Products Pvt. Ltd is a new unit and is a sister concern of Farmson Analgesics. The main raw materials are para nitro phenol; catalyst named palladium and distilled acetic acid, which are moved by road. The main finished products para amino acid. This industry is under trial run. They will transport raw material and finished products in container from Jhagadia after resuming full production.

10. MTZ Poly Films Ltd

MTZ Poly Films Ltd was established in 1994. The main raw material, Pet Chips comes from Calcutta by road. The Raw Materials required in 2004-05 were up to the limit of 60 thousand tones. The main finished product is BOPET film, which is moved to local area and Delhi by road. In 2004-05 the company produced 14,000 m of output out of which 10.400 tones are supplied to local area by road and 3600 tones are sent to Delhi by road. After conversion, the finished product for Delhi and the raw material from Calcutta can be moved by rail in containers.

11. Nanco Chemicals Pvt. Ltd

Nanco Chemicals Pvt. Ltd was established in 2005 and is in trial run. The main raw materials used are sodium silicate transported from Mehsana. The main finished product is sodium solid liquid. However, even after production in full swing, this company will transport the raw material/ finished product in its own tankers and pipeline to & from Mehsana.

12. Panoli Intermediates Ltd

Panoli Intermediates Ltd is an intermediate manufacturing industry. The main raw materials benzene and chlorine which come from RIL, Jamnagar, Grasim, Nagda, Rayon Industries, Veraval & UPL, Ankaleshwar by road. The Raw Materials required in 2004-05 were up to the limit of 32 thousand tones. The main finished product is MCB + DCB, which is moved to Vadodara, Gandhidham by road. In 2004-05 the company produced 24000 m of output. In case of BG facility, they will transport their raw material / FP by rail in all types of wagons.

13. Remi Metals Gujarat Ltd

Remi Metals Gujarat Ltd was established in 1995. It manufactures alloy steel and seamless pipes. The main raw materials MS Scrap, Sponge Iron, Pig Iron & Ferro Alloys which come from Gujarat, Maharashtra & MP by road. The Raw Materials required in 2004-05 were up to the limit of 76,146.952 MT. The main finished product is Alloy Rolled Product (Steel) and Seamless Tubes, which are moved to Gujarat, Maharashtra by road. In 2004-05 the company produced 52,887 MT of output. In case of BG facility, they will transport their raw material / FP by rail in containers and wagons through Gumandev and Jhagadia.

14. Sitaram Paper Mills Ltd

Sitaram Paper Mills Ltd was established in 1996. This industry is out of GIDC Jhagadia estate and producing craft paper. The main raw materials waste paper, coal & lignite, which come from Mumbai and Bhuj & Rajpardi by road. The Raw Materials required in 2004-05 were up to the limit of 76,146 MT. The main finished product is craft paper, which is moved to Delhi, Madras, Bangalore & Ahmedabad by road. In 2004-05 the company produced 13,000 tons of output. This industry will not use rail link even after conversion.

15. SWIL Ltd

SWIL Ltd manufactures copper cathodes. The main raw material is Copper Bearing, which come by road. The Raw Materials required in 2004-05 were up to the limit of 76,146 MT. The main finished product is Copper Cathodes and Copper Anode and others, which is moved by road. In 2004-05 the company produced 6921 MT of output. In future, when it will run on 100% capacity, they will require raw materials to the tune of 1,33,251 MT and the production will be increased to 72,000 MT. In case of BG facility,

the industry will use container for movement of raw materials and finished products via Jhagadia.

16. United Phosphorus Ltd (Unit – 5)

United Phosphorus Ltd (Unit – 5) was established in 1969. It is a chemical industry. The main raw materials are Salt, White Phosphorus, Rock Phosphate, Coke, Coal, Lignite, Phenol, Isobutylene, Thionyl Chloride and Solvents etc. The Raw Materials required in 2004-05 were Salt to the tune of 96,000 MT and Rock Phosphate, Silica and Coke to the tune of 35,000 MT, Phenol 3,000 MT. The main finished product is Caustic Lye, Chlorine, Phosphorus, Phosphorus tri Chloride, Phenol Derivatives, DVACI etc. The outputs are sent to Gujarat, Maharashtra and Dahej Port. In 2004-05 the company produced 1,42,000 MT of output. In case of BG facility, they will transport their raw material / FP by rail in containers and all wagons through Gumandev.

17. Vardhman Acrylics Ltd

Vardhman Acrylics Ltd was established in 1999. It is a manufacturing industry. The main raw materials are coal, Acrylonitrile and Methyle Acrylite. Acrylonitrile comes from Mundra & Kandla Port and Vadodara by road. Methyle Acrylite is transported from Mumbai/Vadodara by road. Coal comes from Nagpur by road and Lignite from Rajpardi. The raw materials consumed in 2004-05 were as follows:

Acrylonitrile:	16,606 MT
Methyle Acrylite:	1,685 MT
Coal:	39,535 MT
Lignite:	10,744 MT

The main finished product is Fibre & TOW. The outputs are sent to Ludhiana, Bhiwandi, Mandideep by road in trucks. In future the industry may get its raw materials from a nearby port. In case of BG facility, the company may use containers for movement of FP via Gumandev.

18. Yashasvi Rasayan Pvt. Ltd

Yashashri Rasayan Pvt. Ltd is under construction. It is an intermediate industry.

19. Other industries

Following industries are also operational within the estate but have not given the details regarding their manufacturing capacities though they were approached a number of times by the Consultants.

- Dragon Drugs Pvt. Ltd
- KLJ Organics Ltd
- Pepsico India Holdings Pvt. Ltd
- Gujarat Gas Ltd
- Rajshree Polyfils Ltd

However, preliminary investigations have suggested that none of these industries is likely to be a major volume player with respect to transport of raw materials/ finished goods by rail.

20. Upcoming Industries

Besides the already functioning industries, several industries have also finalized their plans for setting up new establishments within the estate. The details of these as forwarded by GIDC are presented in the table below:

SI No	Industry Name	Approximate Area (Ha)	Remarks
1	Nitrex Chemicals	10.00	
2	Gulbrandsen Technologies	2.90	
3	Johnson Matty Ceramics	3.90	
4	Sagar Copper	4.94	
5	United Phosphorus	48.13	Capacity expansion
6	Sarana Chemicals	3.90	
7	Yashasvi Rasayan	3.56	
8	S Kumars Nationwide	28.88	
9	Kohler Ceramics ##	95	In advanced stages of finalization
10	Rajasthan Spinning ##	--	
11	Sejal Floatglass ##	60	
12	WSI Industries ##	38	

Source: GIDC letter no GIDC/PROJ/370 dated 4th August 2006
As informed by GIDC during discussions (not mentioned in the above referenced letter)

3.1 Infrastructure within the Estate

GIDC is playing a pro-active role for ensuring the success of the estate and has made provisions for adequate infrastructure provisions within the estate for sustained operations of the industries. As per the information communicated to the consultants by GIDC, the following facilities exist within the estate.

Infrastructure

Communication : Reliable telephone, telex and fax services

Road Network : 30 Km four lane and 45 Km double lane within the estate

Water Supply : Filtered water supply system based on the Narmada river. Planned 77 Million Litres per day (MLD), Commissioned 45 MLD.

Power Supply : One 220/66 Kilo Volts (KV) and two 66/11 KV sub-stations

Drainage : 78 MLD effluent collection and disposal system. Primary treatment to be done by individual units

Housing : A 400 hectares housing sector to be developed near the estate

Plot Availability : Plots of all sizes are available

Further more, pricing and payment terms for land in the estate have been kept liberal to attract investors.

Price & Payment Terms

Price : Rs 250/sqm + Rs 15 as frontage charges. Stamp duty at 10% of the total cost.

Down Payment : Full or a deferred payment plan with minimum of 30% of the total industrial plot value as down payment and the balance payable in quarterly installments with Interest.

Interest : @ 16% p.a.

Repayment Period : 10 Years.

Additional incentives as per Govt policies have also been offered for making the industrial investment environment more affordable.

Incentives

Available	:	Under Category I of State Government Incentive Policy 1995-2000
For SSI Units	:	Subsidy-20% of fixed capital investment or Rs. 1.5 Million (USD 42857), whichever is lower.
Other Incentives	:	➢ Sales Tax Exemption-100% of the eligible fixed capital investment for 7 years.
		➢ Sales Tax Department-125% of the eligible fixed capital investment for 9 years.
		➢ 100% Export Oriented Unit (EOU) benefits available.

Source: GIDC (letter no: GIDC/PROJ/476 dated November 14, 2005 placed at Annexure 12)

National Science And Technology Entrepreneurship Development Board web site (http://www.techno-preneur.net/new-timeis/InfrastructureFacilities/StateGovt/gujarat/jhagadia.htm)

4. DEVELOPMENT SCENARIO OF CHEMICAL INDUSTRIES IN GUJARAT

4.1 India: Growth Trends and Future of the Economy

India is the tenth largest economy in the world, and has the second largest GDP among developing countries, based on purchasing power parity. Since 1991 India has undergone a sea change in its outlook toward foreign investment and global collaboration. India's real GDP growth averaged a growth of 6% per annum between 1981. The GDP grew by 6.9% in the financial year ended March 2005.In India, the industrial sector has continued to grow in keeping with the trend of growth of the overall economy. The general index of industrial production registered an impressive growth of 8.4 per cent in the first three quarters of 2004-05. The improvement in industrial sector is particularly pronounced in manufacturing, capital goods and consumer durables. The present trend in industrial production is likely to be maintained because of better support from infrastructure sector, macro-economic policies, and removal of barriers to trade. Development and Growth of infrastructure projects will spur the demand for engineering and capital goods etc. and contribute to the overall growth of the economy.

Indian Economy opened up to in 1991 promises further liberalization and pace has been set up for the Indian industry to rise further. The policy regime in respect of the infrastructure sector has been further liberalised and made investor-friendly. Many initiatives have been taken for the growth of this sector, which include setting up of Infrastructure Development and Finance Corporation, relaxation of norms for ECBs, automatic approval of FDI and reduction in income tax and custom duty rates etc. The present trend in industrial production is likely to be maintained because of better support from the infrastructure sector, macro-economic policies, and removal of barriers to trade. Development and Growth of infrastructure projects will spur the demand for engineering and capital goods etc. and contribute to the overall growth of the economy. The industrial sector continues to grow in keeping with the tempo of growth. The overall growth in the general index of industrial production is high. The foreign direct investment in India is increasing with Gujarat being one of the leading getters. With the booming infrastructure in India, India is now viewed as the prime investment location in the world. The launch of new SEZ policy has made it easy and the new thrust is now on setting up of SEZs, which are set to promote the international trade in India.

4.2 Gujarat: The Frontrunner State

Gujarat since its inception has emerged as a leading state in the country and has become the ultimate destination for many investors both from within and outside India to make profitable investment. Gujarat has been the front-runner in the overall economic development of the country all these years, as is evident from the fact that with mere 6% of geographical area and 5% of the population of India, the state contributes to 21% of the country's exports and 6.42% of the national GDP at constant prices. Gujarati traders capitalize 30% of the total stock market. The state is one of only four enjoying a per capita annual income of Rs 13,490, which is above the national average of Rs 10,207 (for the year 1999-2000 at 1993-94 constant prices). The growth of industrial sector Gujarat at 8.52% is way ahead of many Indian states and other Asian Tigers like Singapore, Malaysia and Korea. Endowed with rich natural resources, a vast reservoir of skilled manpower and one of the most developed industrial infrastructure, the State contributes significantly to the economic development of the nation.

Since the early nineties onwards, Gujarat has established itself as a leader in various industrial sectors - Textiles, Engineering, Chemicals, Petrochemicals, Drugs & Pharmaceuticals, Dairy, Cement & Ceramics and Gems & Jewellery etc.

All this has been made possible due to many advantages which Gujarat offers as compared to other states like the strategic location, vast natural resources, higher reliance on rapid industrialization instead of reliance on the agricultural sector and excellent governance during the years. Together with this, Gujarat has been successful in providing the support infrastructure needed for the industrial growth, which is evident from the facts below:
Source:

Roads, Railways and Airports

The road network in Gujarat is one of the best in the country, with 74,000 km of road length. Over 95% of this road length is surfaced.

Gujarat has an extensive rail network connecting all major centers in the State. Currently the state has trains running on Broad Gauge, Meter Gauge and Narrow gauge. The total length of railway lines in Gujarat is 5310 Km. It is Indian Railways policy to convert MG and NG lines to BG under the unigauge system. In future a dedicated freight corridor is also planned along the golden quadrilateral route on India and connecting ports. Gujarat had highest number of Airports in India - 11 including an international airport at Ahmedabad.

Source: http://www.gujaratindia.com/State Profile/profile3.htm
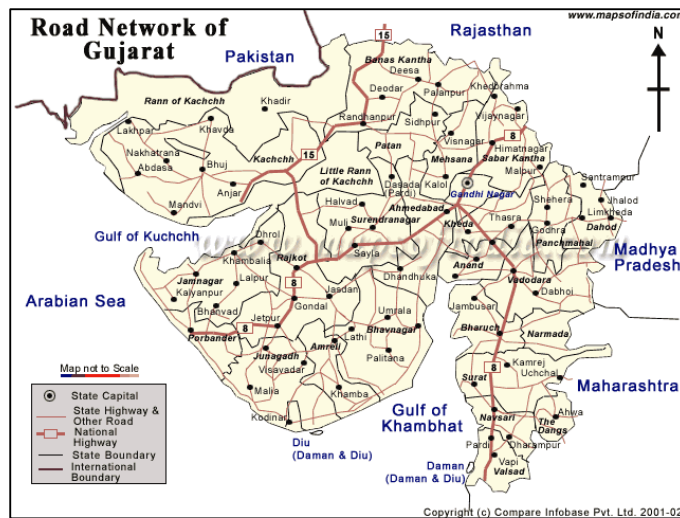
Telecommunication

By the end of 2002, there were over 29.10 lakh telephone connections spread over 2925 telephone exchanges in the State. Gujarat is one of a few states with a very high tele-density of 5.89 telephone connections per 100 persons. As on 31st July, 2005, there were 1.62 million cell phones in Gujarat.

Source:

http://www.gujaratindia.com/State Profile/profile3.htm
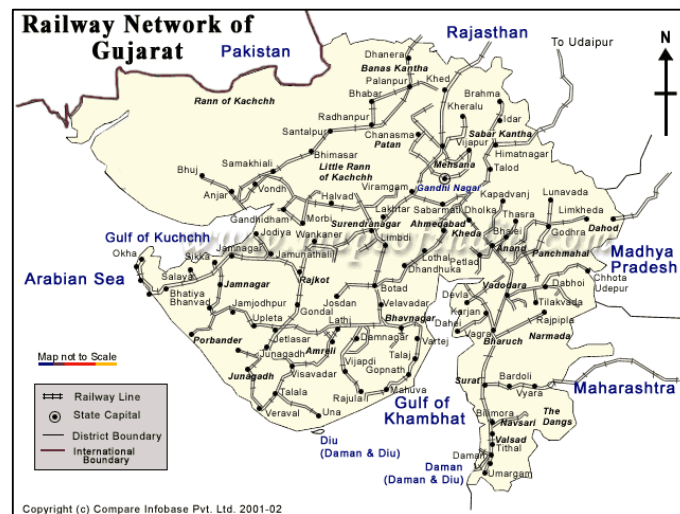
Ports

Gujarat has 1600 km. long coastline, representing a third of the nation's waterfront. Gujarat is strategically positioned to service the vast north and central Indian hinterland. The State has 40 minor and intermediate ports geographically dispersed across South Gujarat (13 ports), Saurashtra (23 ports) and Kachchh region (4 ports). One Major port of Kandla, is under the administrative control of the Central Government.

Of these, Pipavav is developed with private sector investment, while Mundra and Dahej have been developed in joint sector. Ports at Dholera. Hazira. Maroli and Positra are currently under various stages of development. The ports at locations like Mithivirdi. Simar and Vansi Borsi are open for private sector investment. The total investment in the port development is now estimated at Rs. 23,594 crore. This sector thus offers enormous opportunities not only for direct investments, but also in ancillary activities.

Source: http://www.gujaratindia.com/State Profile/profile3.htm - Ports,
http://www.gmbports.org/port_pog.htm

Power

By the year 2006-07. Power generation is targeted to reach to a level of 14,937 MW in Gujarat from the current level of 8,615 MW. Gujarat achieved as much as 35% of augmentation in its power generation capacity during the period 1995-96 and 2000-01. The Independent Power Producers (IPPs) have contributed significantly in this addition. Gujarat in fact, is one of the first few states in India to have encouraged private sector investment in the infrastructure.

Source:

Gas Grid

State of Gujarat is uniquely positioned as abundant reservoir of the country. Gujarat State Petroleum Corporation Ltd. (GSPCL), the nodal agency of Government of Gujarat has initiated the task of creating gas grid infrastructure in the form of a high-pressure pipeline network for transportation of natural gas. This ambitious project of gas grid in Gujarat is estimated to cost at Rs 1400 crore, to be implemented by 2010 AD. The basic
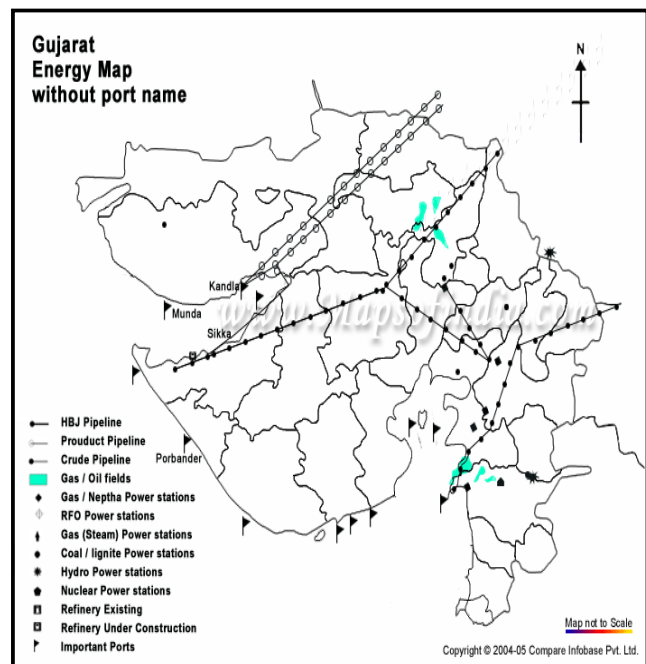
objective of the project is to cover the entire state with a network of gas pipelines for transmission and distribution of natural gas, both for domestic and industrial purposes.
Source:

Infocities
Infocities are being set up near Gandhinagar with numerous facilities where an entrepreneur can virtually plug into the network with ease. The Software Technology Park with satellite linkages in Gandhinagar is progressing well.

Industrial Parks
Under the Gujarat Industrial Policy - 2020, the State Government is encouraging setting up industrial parks such as employment-intensive parks, hi-tech parks like biotechnology parks, IT parks, investment-oriented parks and trade centers. In addition, Dahej, Mundra, Jamnagar and Pipavav have also emerged as the potential centres for development of industrial parks over last five years.

4.3 Industries in Gujarat

Gujarat is the leading industrialized state of the nation. The major industries in Gujarat include the following:
  - Agro & Food Processing
  - Biotechnology
  - Chemical and Allied Industry
  - Drugs and Pharmaceuticals
  - Engineering industry including Automotive Industry
  - Gems & Jewellery
  - Information Technology & IT Enabled Services
  - Mining and Mineral based industry
  - Textile & Apparel Industry
  - Tourism

Gujarat is leader in many of the above industries. The advantageous position of Gujarat as already elaborated by the policy supports from the Government has resulted in the state become the prime industrial destination of the country. The State has successfully carved out a formidable position for itself on the national map especially in manufacturing sector, as is reflected from the status of dominance in many areas pertaining to manufacturing. The illustrative list of some of the selected products, wherein Gujarat contributes significantly is as under:

S.No	Sector / Industry	Share of Gujarat in National Production
1	Engineering	
	▷ Power Driven Pumps and Monoblok Pumps	74%
	▷ Air & Gas Compressors	70%
	▷ Steel Casting	57%
	▷ Forgings	12%
	▷ CI Casting	10%
2	**Chemical Products**	
	▷ **Soda Ash**	**94%**
	▷ **Liquid Chlorine**	**70%**
	▷ **Paints & Enamels**	**20%**

S.No	Sector / Industry	Share of Gujarat in National Production
	➢ **Caustic Soda**	**17%**
	➢ **Sulphuric Acid**	**16%**
3	**Petrochemical Products**	
	➢ **Caprolactum**	55%
4	Plastic Products	
	➢ Laminated/Decorative sheets	14%
5	Drugs and Pharmaceuticals	45%
6	**Dyes**	
	➢ **Azo Dyes**	**20%**
	➢ **Reactive Dyes**	**17%**
7	**Fertilizers**	
	➢ **Phosphatic Fertilizers**	**66%**
	➢ **Nitrogenous Fertilizers**	**29%**
8	Mineral Based Industries	
	➢ Cement	10%
9	Food Products	
	➢ Baby food and Instant Milk Powder	43%

***Source*:** http://www.smallindustryindia.com/policies/state/gujrat/pstguj01x.htm

4.4 Role of GIDC

Gujarat Industrial Development Corporation (GIDC) is the nodal Government agency that has played a pioneering role in provision of industrial infrastructure within the state.

As a premier promotional agency, Gujarat Industrial Development Corporation (GIDC) is striving to provide all the basic infrastructure facilities to the industries in Gujarat. GIDC is developing industrial estates all over the State and offering basic amenities in major developed industrial estates. It is also developing functional estates to fulfill specific needs of certain industries. All across the state, GIDC has planned for 274 Industrial Estates of which 168 are developed and functional.

***Source*:**
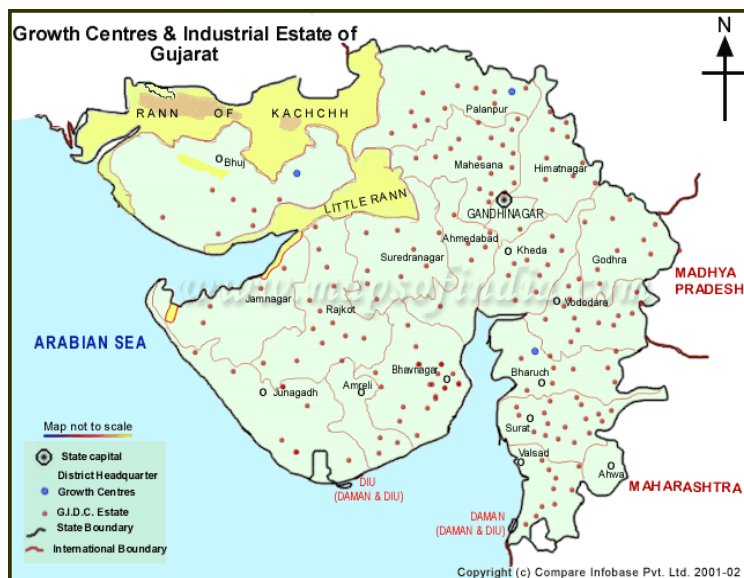
4.4.1 GIDC Estates

For Chemical and Water intensive industries, estates are under development at Vilayat, Jhagadia and Dahej near Bharuch. A similar mega estate for Engineering and non-water intensive industries is under way at Savli near Baroda.

INDUSTRIAL ESTATE	NOS
Functional Estate	166
Estates under various stages of Planning	91
Land Acquired	22954 hect.
Land Developed	14272 hect.
Sheds Constructed	12291 Nos.
Housing Constructed	12922 Nos.
Plots Allotted	10265 hect.
Sheds Allotted	12104 Nos.
Housing Qtrs. Allotted	11668 Nos.

GIDC has developed a state of the art Petrochemical Complex at Dahej located at about 45 kms from Bharuch city. The Dahej Industrial Park will have facilities like private airstrip, effluent collection and disposal, etc. with a liquid chemical port and railway line.

Source*:*

4.5 Chemical Industry in India: The National Scenario

The Chemical and Petrochemical Industry occupies an important place in the country's economy, as the Chemical industry has grown at a pace outperforming the overall growth of the industry at 8% during the previous year. The Chemical Industry produces a wide spectrum of products, which include Pharmaceuticals, Dyes, Man-made Fibers, Plastics, Pesticides, Fertilizers, Cosmetics and Toiletries, Paint, Auxiliary Chemicals and wide range of Organic and Inorganic compounds for applications ranging from automobiles, textile industry, engineering industry, construction chemicals and food additives to veterinary and health care products.

The Chemical Industry constitutes about 14% of India's industrial production and 10% of the total exports from the country. A substantial proportion of these exports go to USA, Europe and other developed nations.

The Indian Chemicals Industry comprises both small and large-scale units. The fiscal concessions granted to small sector in mid-eighties led to establishment of large number of units in the Small Scale Industry (SSI) sector. Currently, the Indian Chemical Industry is in the midst of major restructuring and consolidation phase. With the shift in emphasis on product innovation, brand building and environmental friendliness, this industry is increasingly moving towards greater customer-orientation. Even though India enjoys an abundant supply of basic raw materials, it will have to build upon technical services and marketing capabilities to face global competition and increase its share of exports. In terms of consumption, the chemical industry is its own largest customer and accounts for approximately 33 per cent of the consumption. In most cases, basic chemicals undergo several processing stages to be converted into downstream chemicals. These in turn are used for industrial applications, agriculture, or directly for consumer markets. Industrial and agricultural uses of chemicals include auxiliary materials such as adhesives, unprocessed plastics, dyes and fertilizers, while uses within the consumer sector include pharmaceuticals, cosmetics, household products, paints, etc

Source*:* http://www.chemicals.nic.in/chem3.htm - introduction

4.6 Growth of Chemical Industry in Gujarat

Chemical and Petrochemical Industry is the leading sector in terms of the projects filed and under implementation category as indicated by the investment in chemical and allied sector vis-à-vis total industrial investment in all sectors. The Chemical Industry in Gujarat comprises of about 500 large and medium scale industrial units, about 16,000 of small-scale industrial units and other factory sector units. Since August 1991 to May 2003, chemical and allied sector accounted for an investment of Rs 1,531 billion which is 50.3% of total investment of the state. Similarly 1,324 projects of the chemical and allied sector involving an investment of Rs. 531 Billion have been commissioned/concluded, accounting for about 59.6% share in investment of the total projects commissioned. Also 616 projects envisaging an investment of Rs. 429 Billion are under implementation in Chemicals and Allied Industry. The Small Scale and Factory Sector industry in Chemical and allied field has also shown an impressive contribution in the sub-sectors of Dyestuff and Pharmaceuticals, Paints and Fine Chemicals producing large number of value added products.

The major reasons attributable to such a spectacular growth of this sector in the state are a strong base of petrochemical industry, increasing availability of basic feed stock, relatively low overhead cost, availability of necessary infrastructure, trained and technical manpower and high degree of entrepreneurship and exceptional policy support from the state Government. Gujarat Industrial Development Corporation (GIDC) has set up mega estates, particularly for chemicals at Ankleshwar, Panoli, Vapi, Vatwa, Jhagadia, Vilayat and Dahej to facilitate further development and growth.
Source: http://www.vibrantgujarat.com/sp-chemicals.html

4.6.1   Important Chemical Industrial Estates in Gujarat

Ankleshwar: Ankleshwar is the biggest industrial township in Asia. Today, Ankleshwar has over 100 big and small chemical plants. These chemical plants produce insecticides, speciality chemicals, and paint. The biggest industrial township in Asia is now saturated and cannot accommodate any more industries.

Jhagadia: Jhagadia is one of the largest industrial estates developed by GIDC over an area of 1700 hectares. The estate is primarily planned for chemical and pharmaceutical industries as well as other water intensive industries. Accordingly, infrastructure in terms of power, water and effluent disposal has been developed.

Dahej: Dahej a port location in South Gujarat offers facilities of a chemical port terminal. IPCL has set up a 4.5 million tonne capacity petrochemical complex. In addition, an LNG terminal by Petronet and a solid cargo port are under construction. Adequate land is being developed by GIDC for chemicals and downstream petrochemical industries. Infrastructure in the form of power, water and effluent disposal is available.

Vilayat: Vilayat is located at about 20 km. from Dahej. Developed for chemical downstream industries, the estate is spread over 985 hectares of land and infrastructure facilities like water, road network, power supply and effluent disposal are in place.

Vapi: It is the second largest industrial area in whole Asia. The majority of them are the chemical industries. It was developed by GIDC in 1967. It is spread over 11.4 square kilometers and houses over 1500 industries, most of which are small-scale units (SSIs). Vapi GIDC Estate is centrally located on the National Highway No.8 (Ahmedabad - Mumbai) with the Union Territories of Daman and Dadra & Nagar Haveli on either side. Vapi industrial

town is situated in the southern end of Gujarat's 'Golden Corridor' - a 400 km belt of industrial estates. Vapi is about 170 km north of Mumbai and 90 km south of Surat.

Panoli: Panoli industrial estate is located in Bharuch District. It is primarily developed for chemical industries. The total size of this estate is 605 hectares. It is located on state highway and at a distance of 10 km from NH-8.

The following table illustrates the salient features of these important industrial estates:

Estate	District	Size of the estate area (Hectares)	Industry	Power (MW)	Proximity to Highway NH-8 or State Highway	Railway Connectivity	Price in Rs./Sqm fixed w.e.f. 1st April 2000
Panoli	Bharuch	605	Chemical/ paper/ pharma	20	On NH 8	Broad Gauge	Rs. 300
Ankleshwar	Bharuch	700	Chemical/ paper/ pharma	90	On NH 8	Broad Gauge	Rs. 360
Jhagadia	Bharuch	1700	Chemical	200	On SH-64, 10 Km from NH 8	Narrow Gauge	Rs. 250
Vilayat	Bharuch	1000	Chemical	200	On SH, 14 Km from NH 8	Broad Gauge	Rs. 250
Dahej	Bharuch	5000	Chemical, petro chemicals, others	Direct	On SH, 50 Km from NH8	45 Kms from BG, Gauge conversion under plan	Rs. 195

Source: National Science And Technology Entrepreneurship Development Board web site
http://www.techno-preneur.net/new-timeis/InfrastructureFacilities/StateGovt/gujarat/table.htm

4.7 Jhagadia Industrial Estate- The Way Ahead

Jhagadia Industrial Estate is the largest chemical industrial estate set up by GIDC for water intensive chemical industries and provides many incentives to the future investment makers. At present the estate is only 15% occupied, there is ample scope for establishment of more units.

Jhagadia Industrial Estate is yet to start operations to its designed and planned industrial capacity. The main reason for the non-utilization was that although it was planned as a mega chemical complex, which would have discharged effluents, the same was strictly prohibited by the orders of the state High Court under the pre condition of "Zero Discharge" since 1998. The ruling acted as a big setback for the development of the estate. Recently a Rs 120 crore pipeline has been commissioned which will take the discharge from the industrial estates of Jhagadia, Ankleshwar and Panoli 8 Km into the sea. With this the biggest handicap of the industrial estate, which prohibited its growth, is gone.

With the estates at Ankleshwar and Panoli being fully saturated due to land constraints, high land costs and there being no other planned chemical estate in the state in near by area, Jhagadia is bound to develop as the obvious available option.

The estate has inherent location advantages like:
- Proximity to the ports of Hazira and Dahej
- Natural Gas supply through pipeline
- Infrastructure for chemical industries
- Adequate water supply
- Adequate power
- Proximity to Petro-Chemical complex at Hazira
- Availability of large tracts of land for big required for industrial establishments
- Good connectivity with the national road and rail network

A SEZ is also proposed for ceramics industry, which will be about 200 acres in area. With the proposed port connectivity projects, dedicated rail freight corridor passing through Ankleshwar, proximity to the state of art CNG terminal at Dahej port and broad gauge rail connectivity of Bharuch to Dahej, Jhagadia Industrial Estate is bound to be the most advantageous destination for chemical industries in near future.

Looking at the above inherent advantages offered by Jhagadia Industrial Estate, it can be stated with conviction that in the near future the estate will fully evolve and function as the most viable option for the future investors.

5. PROJECT TRAFFIC: DEMAND ASSESSMENT AND FORECASTING

Demand assessment is a crucial exercise for ascertaining the feasibility of the proposed rail link. The present chapter illustrates the existing traffic and the traffic projections carried out for the rail link.

5.1 Delineation of Project Influence Area

Every project has its domain of influence owing to its interaction with certain areas and as a result both the project and the area are mutually affected. This area is defined as the Project Influence Area. For the subject project, the Project Influence Area can be classified into two categories as follows:

Immediate Influence Area (IIA)
Direct influence owing to the proximity to the project
- ➢ Jhagadia Industrial Estate
- ➢ South Gujarat
- ➢ Rest of Gujarat State

Broad Influence Area (BIA)
Lesser influence owing to greater distance from the project
- ➢ North India- especially Delhi and Ludhiana
- ➢ Western India- Mumbai
- ➢ Eastern India- Kolkata

Jhagadia Industrial Estate, a part of IIA, will have a direct impact on the rail link as almost the entire share of the traffic on the segment will be generated by the Industries in the Estate. The project section from Ankaleshwar to Jhagadia is also important for the Estate as well, as the rail link would provide the crucial rail connectivity to the Delhi-Mumbai trunk route. In view of the proposed dedicated freight corridor from Delhi to Mumbai, with branch links to the ports and other important industrial en route, the development of this section would be very crucial for the growth of the industrial estate at Jhagadia. Presently there are about 22 big and small industries located in Jhagadia. For most of the small industries, most of the Raw Material and Finished Products are sourced and consumed within the state of Gujarat itself.

However as most of the larger industrial establishments source raw materials from far reached areas of Gujarat, imported from Kandla port & JNPT and also Kolkata besides sending Finished Products to Delhi, Mumbai, Chennai, Pune and Ludhiana; the project rail has a clearly identifiable BIA as well as comprising of the northern hinterland and the industrial belt around Mumbai and Pune.

Map Showing the Project Influence Areas

5.2 Identification of Competing Route

The project rail link does not have a competing alternative rail alignment to serve the Jhagadia Industrial Estate. The present narrow gauge faces competition from a parallel road; State Highway 64 (SH-64), which starts from its junction with NH-8 (Delhi-Mumbai), and runs parallel to the rail line for a greater part of the section under study. It runs along the western periphery of the Jhagadia industrial estate and the stations at Ankleshwar Udyog Nagar, Dadhal Inam, Boridra and Gumandev are located parallel to SH 64. The station at Jhagadia is however about 2 Km from SH 64.

Presently all passenger and freight traffic to the estate occurs through SH-64. The passengers and the daily workers who commute to and fro from Jhagadia prefer to use the State Highway for their daily travel. The road based service is faster, easily available and much more efficient than the current rail service. In addition to the state government buses, private transport is also available. Traveling from Ankleshwar to Jhagadia by road takes only 30 minutes, whereas the train run takes about 1.5 hours for the same.

However, the current road connecting the State Highway to Jhagadia Industrial Estate is very poor and the road network within the estate is also in a very poor state. This seriously affects the road traffic from SH-64 to the estate.

5.3 Existing Traffic on Broad Gauge Link

The Consultants, in order to understand rail freight traffic movement patterns at a micro level have also studied the same for Bharuch and Ankleshwar goods sheds on the Delhi-Mumbai trunk route to identify if presently freight traffic from Jhagadia Industrial Estate is using either of these facilities.

5.3.1   Bharuch Goods Shed
Bharuch Goods Shed is located at Bharuch, which is at about 35 kms from Jhagadia Industrial Estate. It is major goods shed open to all goods traffic except POL, which handles significant quantities of both inwards and outwards freight traffic. The traffic pattern at Bharuch goods shed reveals that most of the incoming traffic is for local consumption only and consists of raw materials for the local industries and food grains for distribution through Public Distribution System (PDS). The table below illustrates the inwards traffic at Bharuch.

Details of Inward Traffic dealt at Bharuch Goods Shed

Commodity	From	To	Wt in '000 tons				Earnings (Lakh Rs)			
			2001 -02	2202 -03	2003 -04	2004 -05	2001 -02	2202 -03	2003 -04	2004 -05
FCI –Food Grains	Punjab, Haryana	Local PDS	56	78	49	33	337	493	322	240
Iron/Steel	Bokaro	Construction Industries	1	-	-	-	75	-	-	-
Fertilizer	IFFCO/ KRIBHC O in Baroda, Kalol & Surat	Local farmers, Bharuch	16	5	2	1	35	15	7	4
Iron Slag	Bihar	-	13	4	-	-	148	48	-	-

Commodity	From	To	Wt in '000 tons				Earnings (Lakh Rs)			
			2001-02	2202-03	2003-04	2004-05	2001-02	2202-03	2003-04	2004-05
Cement	Ratlam, MP, Local Industries (only in wagon loads, not full rake)	Local Industries, Road works	-	-	5	25	-	-	21	106
Coal	MP, Bihar, Orissa	Local Industries	4	-	-	-	21	-	-	-

The quantities of inwards commodities are slowly decreasing over the years. This is happening on account of an increasing share of road traffic as a result of improvement of road network in the state and in the country as a whole. Incoming Cement traffic is increasing on account of greater local consumption in industries and construction & road works. Coal is now being imported from Dahej as it is cheaper than Indian coal and hence its transportation has virtually stopped.

The outward traffic at Bharuch Goods shed comes mainly from the Dahej port which is a nearby port and goes mainly towards northern India, MP and eastern parts of India to steel plants. The table below illustrates the outwards traffic from Bharuch.

Details of Outward Traffic dealt at Bharuch Goods Shed

Commodity	From	To	Wt in '000 tons				Earnings (Lakh Rs)			
			2001-02	2202-03	2003-04	2004-05	2001-02	2202-03	2003-04	2004-05
DAP-Fertilizer	Birla Copper-Dahej Port	Northern States, MP & Delhi	223	253	193	197	1116	1296	1033	1057
Imported steam coal	Birla Copper-Dahej Port	MP, UP, Punjab	576	157	427	19	1030	741	1877	743
Sodium Sulphate	Dahej Port by road	Not Available	7	7	5	-	98	108	71	-
Industrial Salt	Dahej	Nagda, MP, Bihar, Northern states	7	5	-	-	18	13	-	-
Iron plate RMC	Dahej	North States	-	-	-	-	-	-	-	-
Cement	Bhuj, Banas, Local industries	Local industries	-	2	-	-	-	2	-	-

Commodity	From	To	Wt in '000 tons				Earnings (Lakh Rs)			
			2001-02	2202-03	2003-04	2004-05	2001-02	2202-03	2003-04	2004-05
Gypsum	Dahej Salt Industries by road	Northern States, Bhilai Steel industries	-	-	-	5	-	-	-	5

The quantities of outwards commodities are slowly decreasing over the years. This is happening on account of an increasing share of road traffic as a result of improvement of road network in the state and in the country as a whole. Incoming Cement traffic is increasing on account of greater consumption in industries and construction & road works outside the state. The share of export traffic is also not high as the Bharuch – Dahej rail Link is yet to be commissioned and this traffic is presently transported through road.

5.3.2 Ankleshwar Goods Shed

Ankleshwar Goods shed is located at Ankleshwar and is open to half rake traffic, which is about 15 km from Jhagadia Industrial Estate. Presently, there has been no outwards traffic from Ankleshwar goods shed since the past few years. At present, only inwards traffic is handled which consists of food grain, cement and variety powder, which is used for local consumption. The above said commodities come from Northern states, Ratlam and Madhya Pradesh respectively.

Details of Inward Traffic dealt at Ankleshwar Goods Shed

Commodity	From	To	Wt in tons				Earnings (Lakh Rs)			
			2001-02	2202-03	2003-04	2004-05	2001-02	2202-03	2003-04	2004-05
Grain	FCI-North States,	Local PDS	55.5	138.26	203.1	66.77	1.3	3.0	4.7	1.4
Cement	Ratlam	Local Industries	299.62	177.6	448.8	nil	25.6	15.5	39.8	0.0
Variety powder	MP	Local	702.08	468.56	702.64	181.24	79.4	54.2	81.3	21.0
Misc.			-	-	-	34.28	0.0	0.0	0.0	1.5

The inwards traffic is showing an increasing trend on account of greater consumption within the district as a result of increasing population and economic activities.

Hence, it may be observed that very low freight traffic from Jhagadia Industrial Estate is being handled either at Ankleshwar or at Bharuch goods sheds.

5.3.3 Inland Container Depot (ICD) at Ankleshwar

Recently CONCOR has started domestic container services from Ankleshwar station through the ICD developed there having a 580m long siding whereby one full rake can be dealt in 2 placements. EXIM services are also likely to be started shortly for which custom clearance arrangements are being worked out. The facilities in the container depot are available for loading of bulk traffic like steel in wagons. The following table shows the traffic handed by the ICD since January 2006.

Time Period	No of Rakes	Destination	Consignees
January 2006- May 2006	6 (CONCOR)	Shalimar (near Kolkatta)	Borosil (Jhagadia), Balaji Tiles (Morbi)
	4 (Freight)	Kosikalan, Ballabhgarh, Golden Rock	Essar Steel- steel plates and ingots to Hazira

The dispatches are form Hazira, Bharuch, Ankleshwar, and Jhagadia Industrial Estate. Thus it may be seen that at present the demand is low though the facilities are available.

5.4 Traffic on Existing Narrow Gauge Link

In the NG section under study, at present there is very low passenger traffic on the rail segment as there is a state highway, which runs parallel to the link and provides a faster service to the Ankleshwar. The entire route is along the SH-64, and the public uses road vehicles for transport purpose. State Govt. buses are also available every hour in addition to private vehicles. The road transport is quick and easily available hence public does not prefer rail. The NG train takes about 1.5 hr to travel between Ankleshwar and Jhagadia where as road vehicles take less than 30 minutes for the same route.

This section was earlier closed due to poor traffic and flood damages but in July 2003, one pair of passenger train was started which is running till now. The following table enumerates the passenger traffic & earnings on the NG section.

Passenger traffic on Section between Ankleshwar and Rajpipla

Year	Passengers (No)
2003-2004	8624
2004-2005	9151
April 2005 to Sept 2005	2837

Presently no records were available with the railway authorities for the passenger traffic to the intermediate stations between Ankleshwar and Rajpipla. The abysmally low existing passenger traffic on the section is not likely to increase much due to availability of faster and more regular passenger bus service on SH-64 to the same destination.

5.5 Present Day Freight Traffic From / To Jhagadia Industrial Estate

The consultants have carried out an extensive exercise for assessment of the present day freight traffic from Jhagadia Industrial Estate. The exercised comprised of the following events

➢ Consultations with the President and Vice president of Jhagadia Industrial Association to make all existing industries aware about the project study to avail accurate response about commodity movements.

➢ Design and circulation of a structured questionnaire (attached as Annexure 7) to gather requisite information on freight movement patterns.

➢ Personal interviews with the representatives of all functioning industries within the estate in Jhagadia to verify and substantiate the information already collected through questionnaire survey.

> ➢ Personal interviews with the higher level management (ED, chairman etc) of four major industries who are the key players today
>> i. Gujarat Borosil Ltd, Mumbai
>> ii. Remi Metals Ltd, Mumbai
>> iii. United Phosphorus Ltd, Delhi
>> iv. DCM Shriram Consolidated Ltd, Delhi
>
> ➢ Personal meetings with GM, GIDC at Ankleshwar.

The following table gives the details of the entire commodity movement for Raw Materials and Finished Products from the estate, which is presently transported through road:

Freight traffic from / to the Jhagadia Industrial Estate moving by road (2004-05)

Name of Firm	Raw Material (Inwards)			Finished Products (Outwards)		
	Material	Quantity (tons)	Origin	Material	Quantity (tons)	Destination
MTZ Polyfilms Ltd	PET Chips	60,000	Calcutta	BOPET Film	3,600	Delhi
					10,400	Local
Chemi Organic Ltd	Benzene	11,136	Jamnagar	Organic and Inorganic Chemical	36,522	Maharashtra & Local
	Chlorine	7,164	Jamnagar			
	Foil	2,300	Jamnagar			
	PNCB	2,400	Jamnagar			
	Nitric	2,124	Jamnagar			
	Sulphuric Acid	2,760	Jamnagar			
Gulshan Polyols Ltd	Lignite	28,000	Kutch	Sorbital 70%	28,000	
	Starch	9,000	Amedabad, Rajpardi			
Panoli Intermediates	Benzene	14,000	Jamnagar	MCB/ DCB	24,000	Baroda and Gandhidham
	Chlorine	18,000	Ankleshwar, Nagda, Veraval			
Anglo French Drugs	Yarn	300	Vapi/Bhiwandi	Fabrics	4,21,000	
Huber Chemical India	Silicate	39,900	Mehsana	Aluminum Silicate	5,345	Mumbai, Gujarat/ Punjab, Hyderabad, Kasna, TN
	Alum	6,370	Nadiad/ Ankleshwar	Precipitated Silica	4,783	Mumbai, Goa, Gujarat
	Sulphuric Acid	1,300				
	Mag. Hydroxide	86,500				
	Paper Bags (No.s)	6,15,600	Vapi			
Aarti Inds. Ltd	Benzene	6,400	Jamnagar	PNCB	3,334	Ahmedabad
	Sagsi	7,500	Vapi	PNCB	5,566	Baroda
	CAN	3,000	Local	NB	7,700	Vapi
DCM Shriram	Salt	1,17,200	Namlev	Caustic Soda	66,000	All over india
	F.O	42,000				
Vardhman Acrylic Ltd	Coal	39,500	Nagpur	Fiber/ TOW	18,000	Ludhiana
	Lignite	10,700				
	acrylonitrile	16,600				
	Methyl Acrylate	1,700				

Name of Firm	Raw Material (Inwards)			Finished Products (Outwards)		
	Material	Quantity (tons)	Origin	Material	Quantity (tons)	Destination
SWIL Ltd	Copper	14,500		Copper Cathodes etc	6,921	Mumbai/ Khetri
United Phosphorous- Unit-5	Salt	96,000	Gujarat	Caustic Lye, chlorine and hydrogen	90,000	Mumbai, Kalambol, Ahmedabad
	Rock Phosphate, silica and coke	35,000	MP, Rajasthan, Gujarat and Goa	Phosphorus tri chlorides	25,000	Gujarat, Maharashtra
	Phenol	3,000	Kandla Port, Maharashtra	Phosphorus oxy chloride	2,000	
Remi Metals Gujarat	Iron & Alloys	76,146	Kandla, Mundra, Bhavnagar, Maharashtra & MP	Seamless & Alloys steel	52,000	Gujarat, Maharashtra, chennai
Gujarat Borosil Ltd	Silica Sand	43,500	Gujarat	Sheet glass 3mm to 12mm	43,500	All over india and abroad
	Soda Ash	12,500	Mithapur and Veraval			
	Dolomite Lumps & Limestone	13,600	Sojat City (Rajasthan)			
	Glass Cullet	14,500	All over India			
	Sodium Sulphate	600	Kosamba			
	Feldspar	2,700	Beawar (Rajasthan)			
Sitaram Paper mill	Waste Paper	14,000	Mumbai, Dahej	Craft Paper	13,000	Delhi, Chennai, Bangalore, Ahmedabad
	Coal/Lignite	7,000	Bhuj, Raipur			
Ajanta Paper & General Product Ltd.	Local News Paper, white record and Imported paper	-	Local	Newsprint	14,000	All over India

5.6 Estimation of Railable Traffic on the proposed Broad Gauge Link

5.6.1 Passenger Traffic

In case of gauge conversion, it will be mandatory as per railway norms to provide a similar service as existing today on the converted section. As it might not be commercially viable to operate a full-fledged passenger train on the section initially, it is suggested that a rail bus service be provided between Ankleshwar and Jhagadia. Meetings with representatives of the existing industries have revealed that a large number of workers commute to the estate from Ankleshwar and Bharuch. They use passenger bus services from Ankleshwar station to Jhagadia Industrial Estate, as the time schedule of the existing train service on the narrow gauge section does not coincide with their shift timings. There is a potential to capture this passenger traffic if the rail bus operations can be extended up to Bharuch through Ankleshwar in such a way that the timings are suited to shifts of industrial workers. Exact passenger traffic estimates have not been carried out at this stage because of the absence of sufficient base data and trends.

5.6.2 Freight Traffic

Demand assessment for the rail line is a crucial element in determining the feasibility of rail link. As the current freight movement is through road and no freight movement by rail takes place on the existing rail link, the Consultants arrived at the likely current and future demand for the rail line in terms of goods that can move by rail if the proposed rail link is converted to broad gauge from the traffic survey and inputs from the existing industrial establishments. The survey results indicated positive inputs and many industries expressed their willingness to move their products and raw materials by rail in case the conversion of the existing narrow gauge takes place.

During the course of the study, the consultants found that Jhagadia Industrial Association is very keen on having the proposed rail link executed to achieve greater production and several industrial firms have identified specific commodities, which they will shift to rail on the commencement of the project. In fact, United Phosphorous Ltd. (Unit No. 5), Vardhaman Acrylics Ltd and Gujarat Borosil Ltd have even expressed their willingness for private siding in case of BG line. Remi Metals Ltd is also willing to have a siding facility but is not very keen for the same at present.

The details of Raw Materials/ Finished Products, which have been considered for transportation by rail in case of BG conversion, have been listed in the table below.

Firm wise estimates of Commodities from the present traffic that will shift to rail in case of BG conversion

| Firm | Inwards | | | | |
	Commodity	Quantity (Tons)	Origin	Wagon Type	Remarks
MTZ Polyfilm Ltd	PET chips	40,000	Kolkata	C	There are some small-scale suppliers who might not want to shift to rail mode. A conservative estimate of two-thirds (about 66%) traffic shifting to rail has been considered.
Chemiorganics Ltd	Benzene	11,000	Vadodara	T	Full traffic likely and assumed to shift to rail. Sourcing changed for Jamnagar to Vadodara as the latter is a better and cheaper supplier.
	Chlorine	5,000	Nagda	T	Sourcing changed for Jamnagar to Nagda as it is a better and cheaper supplier.
	Furnace Oil	2,500	Vadodara	T	The entire amount can be sourced form Vadodara as it is a nearer and better supplier.
Gulshan Polyols	Starch	9,000	Ahmedabad	C	The commodity can be transported through rail in bulk for cheaper transport cost.
	Lignite				Lignite is a self-igniting material and not suitable for bulk transport through rail. This was confirmed by GMDC.
Panoli Intermediates	Benzene	9,000	Jamnagar	T	The entire amount has not been considered, as a part of the receipts will still be transported through road to regulate inventory.
	Chlorine	9,000	Nagda	T	Nagda is nearer Jhagadia as compared to Veraval; hence justifiable quantity considered to shift to rail mode to regulate inventory/ availability of RM.
Anglo French Drugs	Yarn				The average quantity of RM per consignment is not sufficient for rail transport.
Huber Chemicals	Sodium Silicate	30,000	Mahesana	CW-	For the estimated quantities, rail will be a cheaper mode of transport from Mahesana.
Arti Industries	Benzene	5,000	Jamnagar	T	For the estimated quantities, rail will be a cheaper mode of transport from Jamnagar.
DCM Sriram	Salt	15,000	Gandhidham	OW	The quantity from Gandhidham estimated to shift to rail mode. The rest will still come from road due to the proximity of the source.

| Firm | Inwards | | | | |
	Commodity	Quantity (Tons)	Origin	Wagon Type	Remarks
Consolidated	Furnace Oil	15,000	Vafodara	T	Quantities from Jamnagar and Vadodara (reliable suppliers) only estimated to shift to rail mode.
	Furnace Oil	15,000	Jamnagar	T	
Vardhman Acrylic Ltd	Coal	35,000	Nagpur	OW	An estimated 90% is considered to shift to rail mode as some amount will still be transported through road to maintain inventory.
	Lignite				Lignite is a self-igniting material and not suitable for bulk transport through rail. This was confirmed by GMDC.
SWIL Ltd	Copper scrap	10,500	JNPT	C	The entire quantity of imported scrap from JNPT is estiamted to shift to rail mode. In case import/export starts form Dahej port, on conversion of the Bharuch-Dahej section to BG, the traffic can be shifted to Dahej still through rail in container wagons.
United Phosphorus	Coal	25,000	Kandla	OW	Coal imported form Kandla port is considered to shift to rail mode.
	Salt	75,000	Gandhidham	OW	75% of the entire amount is estimated to shift to rail mode, as the balance will still be transported through road due to proximity of source.
	Rock Phosphate	20,000	Udaipur	OW	The entire amount sourced from Udaipur estimated to shift to rail mode.
	Silica	6,000	Rajkot	OW	The entire amount sourced from Rajkot estimated to shift to rail mode.
Remi Metals	Sponge iron	10,000	Raigarh	CW	The quantities sourced form Raipur, Rajgarh and Kandla port estimated to shift to rail mode. In case import/export starts form Dahej port, on conversion of the Bharuch-Dahej section to BG, the traffic can be shifted to Dahej still through rail in covered wagons.
	Pig iron	25,000	Raipur	CW	
	Iron scrap	30,000	Kandla	C	
Gujarat Borosil	Silica sand	20,000	Rajkot	OW	The quantity sourced from Rajkot estimated to shift to rail mode while that sourced from Amod would still move through road.
	Soda ash	6,000	Meethapur	CW	The quantity sourced from Meethapur estimated to shift to rail mode while that sourced from Veraval would still move through road.
	Dolomite	6,500	Bhuj	OW	The quantity sourced from Bhuj estimated to shift to rail mode while that sourced from Rajasthan is not likely to shift to rail mode and would still move through road.

| Firm | Outwards | | | | |
	Commodity	Quantity (Tons)	Destination	Wagon Type	Remarks
MTZ Polyfilm Ltd	BOPET film	3,600	Tughlakabad	C	The entire quantity of FP estimated to be transported through rail by MTZ Polyfilm Ltd.
Chemiorganics Ltd	Chemicals	20,000	Mulund/ JNPT	C	20,000 tons of specialty chemicals to Mulund and JNPT (Mumbai) and 2000 tons to Ahmedabad estimated to shift to rail mode.
	Chemicals	2,000	Ahmedabad	C	
Gulshan Polyols	Sorbital	10,000	Mulund	C	Sorbital quantities to Mulund and Ludhiana estimated to shift to rail mode.
	Sorbital	6,000	Ludhiana	C	
Panoli Intermediates	Chemicals	14,000	Vadodara	C	MCB & DCB quantities to Vadodara and Gandhidham estimated to shift to rail mode.
	Chemicals	8,000	Gandhidham	C	

| Firm | Outwards | | | | |
	Commodity	Quantity (Tons)	Destination	Wagon Type	Remarks
Anglo French Drugs	Fabrics				The firm supplies FP at consumer door as a policy and hence rail transport is not a feasible option.
Huber Chemicals	Aluminium Silicate	5,000	Mumbai/ Mulund	C	Aluminium Silicate quantities to Mumbai and Goa estimated to shift to rail mode.
	Aluminium Silicate	5,000	Goa/ Madgaon	C	
Arti Industries	Chemical	5,000	Ahmedabad	CW	FP quantities to Ahmedabad estimated to shift to rail mode.
DCM Sriram Consolidated	Caustic Soda	20,000	Ahmedabad	CW	Caustic Soda quantities to Ahmedabad, Vadodara and Delhi estimated to shift to rail mode keeping in mind the railable quantities and leads.
	Caustic Soda	20,000	Vadodara	CW	
	Caustic Soda	2,000	Delhi	CW	
Vardhman Acrylic Ltd	Fibre/TOW	12,000	Ludhiana	C	The entire quantities to Ludhiana and Rewari estimated to shift to rail mode.
	Fibre/TOW	6,000	Rewari	C	
SWIL Ltd	Copper Cathodes	35,000	JNPT	C	The entire quantities of exported FP to Kandla and JNPT estimated to shift to rail mode. In case import/export starts form Dahej port, on conversion of the Bharuch-Dahej section to BG, the traffic can be shifted to Dahej still through rail in container wagons.
	Copper Cathodes	5,000	Kandla	C	
United Phosphorus	Phosphorus tri chloride	5,000	Delhi	T	The entire quantities to Delhi estimated to shift to rail mode.
	Caustic lye	10,000	Kalamboli/ Mumbai	T	The entire quantities to Mumbai and Ahmedabad estimated to shift to rail mode.
	Caustic lye	7,500	Ahmedabad	T	
Remi Metals	Alloy Steel	6,000	Chennai	CW	Only the bulk quantities to Chennai estimated to shift to rail mode. The other consumers are supplied FP at door and hence rail transport is not a feasible option.
Gujarat Borosil	Sheet Glass	9,000	JNPT	C	Only the bulk quantities o of sheet glass to JNPT, Pune and Tughlakabad (ICD) for export and regional consumption estimated to shift to rail mode.
	Sheet Glass	15,000	Pune	C	
	Sheet Glass	15,000	Tughlakabad	C	

At present there is no captive power plant in Jhagadia Industrial Estate. The fuel being presently used by the industrial units is the cheapest amongst the options available to them and shift to an alternative new and cheaper source cannot be anticipated presently keeping in mind the options available to the industries.

Moreover, in rail projects, generally traffic estimations are done on an annual basis only because:

> ➤ Rail is a cheaper mode only for bulk commodity transportation and that too for longer leads.

> ➢ The industries served through a rail line source RM/ produce FP in bulk quantities and maintain large inventories from which quantities to be used daily/ weekly are extracted as per requirement.

The preferred type of rail wagon to be used for transportation of the commodity and its capacity with respect to the commodity bas also been indicated in the above table. It has been assumed as per the normal railway practice that lighter commodities can be carried for less tonnage per wagon (than the standard wagon capacity) as compared to heavier commodities where standard wagon capacities have been taken for calculations. The total estimated freight movement by wagon type is given in the table below:

Traffic Volume in Tons

2006	Inwards	Outwards	Total
Containers (C) **	6,625	10,827	17,452
Covered Wagons (CW)	71,000	53,000	124,000
Open Wagons (OW)	202,500	-	202,500
Tanker Wagons (T)	71,500	22,500	94,000

Note: ** Traffic volume for containers expressed in TEU

It may be duly mentioned that the present day railable freight traffic estimates have been carried out keeping in mind the following:
> ➢ Existing ground realities on the current status of the development of the industrial estate, limited number of presently operating industries and current mode of transport of raw materials/finished products.
> ➢ Reasonable traffic estimates after extensive consultations with all industries.
> ➢ Future plans of the key 4 larger industries.
> ➢ The industries in the Estate do not exhibit any seasonal variations in production patterns which may result in large fluctuations in rail traffic volumes.

5.7 Freight Traffic Projections

In the future, with increasing occupancy of the Jhagadia Industrial estate, the demand will increase for provision of better connectivity and to ensure efficient, timely and cost effective delivery of goods to different parts of the country when more industries are set up in the area; especially looking at the benefits, which the Jhagadia Industrial Estate offers to water intensive industries.

After detailed analysis of the existing traffic pattern, meetings with the investment decision-making machinery of large industries in the estate, GMDC and GIDC, the consultants have projected the future traffic on the proposed rail link. At present only about 15% of the industrial estate is operational and GIDC expects the remainder area to be occupied in the next couple of years. With the roadblocks to development, like stay from Gujarat High Court till completion of effluent disposal pipe line, removed and an economy on the upswing, this is a very realistic scenario, GIDC also has plans to set up a 200 acre (Special Economic Zone (SEZ) for ceramic industries within the estate mainly for export oriented industries. Refer newspaper article in Annexure 9 for details.

Interactions with major industrial units have brought out the following facts:

> ➢ United Phosphorus Limited has plans to double its capacity in the next three years which would result in consumption of 1,00,000 tons of rock phosphate (from Hirapur

in MP and Udaipur in Rajasthan), 30,000 tons of silica (from Rajasthan) and 30,000 tons of coke (imported through Kandla port) to produce 10,000 tons of phosphorus per annum.

➢ Gujarat Borosil Limited. has plans to add an additional twice the existing capacity for production of specialized glasses. This would result in consumption of about 500-525 tons of raw material per day. The firm which presently exports only 15% of products will also increase exports to about 30%. As its finished products will be transported through containers, the firm is already in negotiations with CONCOR to initiate a system where the latter carries out door to door delivery consignments booked in bulk at the factory.

➢ Remi Metals as a part of backward integration is in advanced stages of finalizing a blast furnace for iron production. This would use 20,000-25,000 tons of raw materials per month. 70% of this will be sponge/pig iron to be sourced from steel mills of Chhattisgarh and 30% will be coal, which will be imported. This will be over and above the 3000 tons per month of raw materials sourced from Chhattisgarh and 3000 tons per month of imported iron scrap.

➢ DCM Shriram Ltd. also plans to install additional capacity to the existing plant in the next five years to double its productions capacity.

Moreover, 2 of the 4 planned new large industries set to start operations in Jhagadia Industrial Estate have also communicated their expected raw materials & finished product transportation requirements which have also been incorporated in overall traffic projections.

5.7.1 Traffic Growth Rates

The Chemical Industry in Gujarat comprises of about 500 large and medium scale industrial units, about 16,000 of small scale industrial units and other factory sector units.

Since August 1991 up to June 2004, chemical and allied sector accounted for an investment of Rs.1641 billion which is 47.8% of total investment of the state. Similarly 1497 projects of the chemical and allied sector involving an investment of Rs. 554 Billion have been commissioned/concluded accounting for about 55.90% share in investment of the total projects commissioned. Also 398 projects envisaging an investment of Rs. 231 Billion are under implementation in Chemicals and Allied Industry. The Small Scale and Factory Sector industry in Chemical and allied field has also shown an impressive contribution in the sub-sectors of Dyestuff and Pharmaceuticals, Paints and Fine Chemicals producing large number of value added products.

The major reasons which could be attributed to such a spectacular growth of this sector in the state are a strong base of petrochemical industry, increasing availability of basic feed stock, relatively low overhead cost, availability of necessary infrastructure, trained and technical manpower and high degree of entrepreneurship.

Furthermore:

➢ The planning commission has estimated an achievable growth rate of 10.2% for Gujarat during the 10th five-year plan. (Source: Speech delivered by Hon Chief Minister of Gujarat, Sri Narendra Modi at "Vibrant Gujarat Global Investors' Summit" on September 28, 2003).

> Gujarat's Economic growth rate during the past decade was 8.3% (Source: Speech delivered by Hon Chief Minister of Gujarat, Sri Narendra Modi at "Vibrant Gujarat Global Investors' Summit" on September 28, 2003).
> The Indian chemical industries have shown an annual growth rate of 8.6% over the last few years. (Source: Article in Businessline, April 2004).
> A "Center for Monitoring Indian Economy" (CMIE) study carried out in August 200, has estimated an annual growth rate of 11.5% for industries in Gujarat.

Keeping in mind the above mentioned facts & expansion plans, the expected capacity utilization of the resources of the industrial estate, and the location advantages offered to the chemical industries, the consultants have used the following traffic growth rates for traffic projection wherein exact plans were not yet finalized but growth was certainly suggested.

Base Year	Horizon Year	Average Annual Growth Rate	Cumulative growth over 4 year period	Remarks
2006	2010	3.5%	15%	Conservative
2010	2014	5.7%	25%	Moderate

Hence the main assumption considered for carrying out traffic projection may be summarized as:
> Concrete future capacity expansion plans of existing 4 major industries and 2 upcoming industries
> An initial conservative followed by moderate growth rates for railable commodities of the remaining industries after consultations.
> No generated / induced traffic has been considered for new industries. The unutilized area of the estate is about 85% of the total area in which several new industries are in upcoming stages.
> Present day estimated rail traffic has been used as base for making projections.

The firm wise and commodity wise traffic growth rates adopted for carrying out the traffic projections as per the assumptions mentioned in the section above are presented in the table below.

Firm wise adopted Traffic Growth Rates

Firm	Commodity	Origin	Destination	Adopted Cumulative growth over 4-year period (%)	
				2006-2010	2010-2014
-	CONTAINERS		Inwards		
MTZ Polyfilm Ltd	PET chips	Kolkata	Jhagadia	15	25
Gulshan Polyols	Strach	Ahmedabad	Jhagadia	15	25
SWIL Ltd	Copper scrap	JNPT	Jhagadia	15	25
Remi Metals	Iron scrap	Kandla	Jhagadia	FP	25
WSI	Minerals & clays	Verawal	Jhagadia	--	FP
WSI	Minerals & clays	Beawar	Jhagadia	--	FP
-			Outwards		
MTZ Polyfilm Ltd	BOPET film	Jhagadia	Tughlakabad	15	25
Chemiorganics Ltd	Chemicals	Jhagadia	Mulund/JNPT	15	25
Chemiorganics Ltd	Chemicals	Jhagadia	Ahmedabad	15	25
Gulshan Polyols	Sorbital	Jhagadia	Mulund	15	25
Gulshan Polyols	Sorbital	Jhagadia	Ludhiana	15	25
Panoli Intermediates	Chemicals	Jhagadia	Vadodara	15	25
Panoli Intermediates	Chemicals	Jhagadia	Gandhidham	15	25

Firm	Commodity	Origin	Destination	Adopted Cumulative growth over 4-year period (%)	
				2006-2010	**2010-2014**
Huber Chemicals	Aluminium Silicate	Jhagadia	Mumbai/Mulund	15	25
Huber Chemicals	Aluminium Silicate	Jhagadia	Goa/Madgaon	15	25
Vardhman Acrylic Ltd	Fibre/TOW	Jhagadia	Ludhiana	15	25
Vardhman Acrylic Ltd	Fibre/TOW	Jhagadia	Rewari	15	25
SWIL Ltd	Copper Cathodes	Jhagadia	JNPT	15	25
SWIL Ltd	Copper Cathodes	Jhagadia	Kandla	15	25
Gujarat Borosil	Sheet Glass	Jhagadia	JNPT	FP	25
Gujarat Borosil	Sheet Glass	Jhagadia	Pune	FP	25
Gujarat Borosil	Sheet Glass	Jhagadia	Tughlakabad	FP	25
Sejal Floatglass	Floatglass	Jhagadia	Tughlakabad	--	FP
Sejal Floatglass	Floatglass	Jhagadia	Pune	--	FP
Sejal Floatglass	Floatglass	Jhagadia	JNPT	--	FP
Sejal Floatglass	Floatglass	Jhagadia	Shalimar/Kolkatta	--	FP
Sejal Floatglass	Floatglass	Jhagadia	Chennai	--	FP
-	**COVERED WAGONS**		**Inwards**		
Huber Chemicals	Sodium Silicate	Mahesana	Jhagadia	15	25
Remi Metals	Sponge iron	Raigarh	Jhagadia	FP	25
Remi Metals	Pig iron	Raipur	Jhagadia	FP	25
Gujarat Borosil	Soda ash	Meethapur	Jhagadia	FP	25
Sejal Floatglass	Floatglass	Veraval	Jhagadia	--	FP
Sejal Floatglass	Floatglass	Mithapur	Jhagadia	--	FP
Sejal Floatglass	Floatglass	Beawar	Jhagadia	--	FP
Sejal Floatglass	Floatglass	Beawar	Jhagadia	--	FP
-			**Outwards**		
Arti Industries	Chemical	Jhagadia	Ahmedabad	15	25
DCM Sriram Consolidated	Caustic Soda	Jhagadia	Ahmedabad	FP	25
DCM Sriram Consolidated	Caustic Soda	Jhagadia	Vadodara	FP	25
DCM Sriram Consolidated	Caustic Soda	Jhagadia	Delhi	FP	25
Remi Metals	Alloy Steel	Jhagadia	Chennai	FP	25
-					
-	**OPEN WAGONS**		**Inwards**		
DCM Sriram Consolidated	Salt	Gandhidham	Jhagadia	FP	25
Vardhman Acrylic Ltd	Coal	Nagpur	Jhagadia	15	25
United Phosphorus	Coal	Kandla	Jhagadia	FP	25
United Phosphorus	Salt	Gandhidham	Jhagadia	FP	25
United Phosphorus	Rock Phosphate	Udaipur	Jhagadia	FP	25
United Phosphorus	Silica	Rajkot	Jhagadia	FP	25
Gujarat Borosil	Silica sand	Rajkot	Jhagadia	FP	25
Gujarat Borosil	Dolomite	Bhuj	Jhagadia	FP	25
-					
-	**TANKER WAGONS**		**Inwards**		
Chemiorganics Ltd	Benzene	Vadodara	Jhagadia	15	25
Chemiorganics Ltd	Chlorine	Nagda	Jhagadia	15	25
Chemiorganics Ltd	Furnace Oil	Vafodara	Jhagadia	15	25
Panoli Intermediates	Benzene	Jamnagar	Jhagadia	15	25
Panoli Intermediates	Chlorine	Nagda	Jhagadia	15	25
Arti Industries	Benzene	Jamnagar	Jhagadia	15	25
DCM Sriram Consolidated	Furnace Oil	Vafodara	Jhagadia	FP	25
DCM Sriram Consolidated	Furnace Oil	Jamnagar	Jhagadia	FP	25
-			**Outwards**		
United Phosphorus	Phosphorus tri chloride	Jhagadia	Delhi	FP	25
United Phosphorus	Caustic lye	Jhagadia	Kalamboli/Mumbai	FP	25
United Phosphorus	Caustic lye	Jhagadia	Ahmedabad	FP	25

FP: Growth rate as per future expansion plans of the firm communicated to the consultants during interactions.

5.7.2 Projected freight traffic

The following table shows the firm wise freight traffic projections for base year (2006) and horizon years 2010 & 2014:

Firm wise Projected Freight Traffic

Firm	Commodity	Origin	Destination	Type of Movement	Traffic Volume in Tons		
					2006	**2010**	**2014**
-	**CONTAINERS ****		**Inwards**				
MTZ Polyfilm Ltd	PET chips	Kolkata	Jhagadia	DC	4,000	4,600	5,750
Gulshan Polyols	Strach	Ahmedabad	Jhagadia	DC	600	690	863
SWIL Ltd	Copper scrap	JNPT	Jhagadia	IC	525	604	755
Remi Metals	Iron scrap	Kandla	Jhagadia	IC	1,500	4,500	5,625
WSI	Minerals & Clays	Beawar	Jhagadia	DC	--	625	750
WSI	Minerals & Clays	Veraval	Jhagadia	DC	--	625	750
-			**Outwards**				
MTZ Polyfilm Ltd	BOPET film	Jhagadia	Tughlakabad	DC	360	414	518
Chemiorganics Ltd	Chemicals	Jhagadia	Mulund/JNPT	IC	1,333	1,533	1,917
Chemiorganics Ltd	Chemicals	Jhagadia	Ahmedabad	DC	133	153	192
Gulshan Polyols	Sorbital	Jhagadia	Mulund	DC	667	767	958
Gulshan Polyols	Sorbital	Jhagadia	Ludhiana	DC	400	460	575
Panoli Intermediates	Chemicals	Jhagadia	Vadodara	DC	933	1,073	1,342
Panoli Intermediates	Chemicals	Jhagadia	Gandhidham	DC	533	613	767
Huber Chemicals	Aluminium Silicate	Jhagadia	Mumbai/Mulund	DC	333	383	479
Huber Chemicals	Aluminium Silicate	Jhagadia	Goa/Madgaon	DC	333	383	479
Vardhman Acrylic Ltd	Fibre/TOW	Jhagadia	Ludhiana	DC	800	920	1,150
Vardhman Acrylic Ltd	Fibre/TOW	Jhagadia	Rewari	DC	400	460	575
SWIL Ltd	Copper Cathodes	Jhagadia	JNPT	IC	1,750	2,013	2,516
SWIL Ltd	Copper Cathodes	Jhagadia	Kandla	IC	250	288	359
Gujarat Borosil	Sheet Glass	Jhagadia	JNPT	IC	600	4,000	5,000
Gujarat Borosil	Sheet Glass	Jhagadia	Pune	DC	1,000	4,000	5,000
Gujarat Borosil	Sheet Glass	Jhagadia	Tughlakabad	DC	1,000	4,000	5,000
Sejal Floatglass	Floatglass	Jhagadia	Tughlakabad	DC	--	1,874	4,806
Sejal Floatglass	Floatglass	Jhagadia	Pune	DC	--	535	1,369
Sejal Floatglass	Floatglass	Jhagadia	JNPT	IC	--	535	1,369
Sejal Floatglass	Floatglass	Jhagadia	Shalimar/Kolkatta	DC	--	803	2,068
Sejal Floatglass	Floatglass	Jhagadia	Chennai	DC	--	1,606	4,112
-							
-	**COVERED WAGONS**		**Inwards**				
Huber Chemicals	Sodium Silicate	Mahesana	Jhagadia		30,000	34,500	43,125
Remi Metals	Sponge iron	Raigarh	Jhagadia		10,000	30,000	37,500
Remi Metals	Pig iron	Raipur	Jhagadia		25,000	180,000	225,000
Gujarat Borosil	Soda ash	Meethapur	Jhagadia		6,000	18,000	22,500
Sejal Floatglass	Soda ash	Veraval	Jhagadia		-	13,414	30,660
Sejal Floatglass	Soda ash	Mithapur	Jhagadia		-	13,414	30,660
Sejal Floatglass	Dolomite	Beawar	Jhagadia		-	15,330	35,040
Sejal Floatglass	Limestone	Beawar	Jhagadia		-	5,475	12,483
-			**Outwards**				
Arti Industries	Chemical	Jhagadia	Ahmedabad		5,000	5,750	7,188
DCM Sriram Consolidated	Caustic Soda	Jhagadia	Ahmedabad		20,000	30,000	37,500

Firm	Commodity	Origin	Destination	Type of Movement	Traffic Volume in Tons		
					2006	**2010**	**2014**
DCM Sriram Consolidated	Caustic Soda	Jhagadia	Vadodara		20,000	30,000	37,500
DCM Sriram Consolidated	Caustic Soda	Jhagadia	Delhi		2,000	3,000	3,750
Remi Metals	Alloy Steel	Jhagadia	Chennai		6,000	180,000	225,000
-							
-	**OPEN WAGONS**		**Inwards**				
DCM Sriram Consolidated	Salt	Gandhidham	Jhagadia		15,000	22,500	28,125
Vardhman Acrylic Ltd	Coal	Nagpur	Jhagadia		35,000	40,250	50,313
United Phosphorus	Coal	Kandla	Jhagadia		25,000	40,000	50,000
United Phosphorus	Salt	Gandhidham	Jhagadia		75,000	150,000	187,500
United Phosphorus	Rock Phosphate	Udaipur	Jhagadia		20,000	100,000	125,000
United Phosphorus	Silica	Rajkot	Jhagadia		6,000	30,000	37,500
Gujarat Borosil	Silica sand	Rajkot	Jhagadia		20,000	60,000	75,000
Gujarat Borosil	Dolomite	Bhuj	Jhagadia		6,500	19,500	24,375
-							
-	**TANKER WAGONS**		**Inwards**				
Chemiorganics Ltd	Benzene	Vadodara	Jhagadia		11,000	12,650	15,813
Chemiorganics Ltd	Chlorine	Nagda	Jhagadia		5,000	5,750	7,188
Chemiorganics Ltd	Furnace Oil	Vafodara	Jhagadia		2,500	2,875	3,594
Panoli Intermediates	Benzene	Jamnagar	Jhagadia		9,000	10,350	12,938
Panoli Intermediates	Chlorine	Nagda	Jhagadia		9,000	10,350	12,938
Arti Industries	Benzene	Jamnagar	Jhagadia		5,000	5,750	7,188
DCM Sriram Consolidated	Furnace Oil	Vafodara	Jhagadia		15,000	22,500	28,125
DCM Sriram Consolidated	Furnace Oil	Jamnagar	Jhagadia		15,000	22,500	28,125
-			**Outwards**				
United Phosphorus	Phosphorus tri chloride	Jhagadia	Delhi		5,000	10,000	12,500
United Phosphorus	Caustic lye	Jhagadia	Kalamboli/Mumbai		10,000	20,000	25,000
United Phosphorus	Caustic lye	Jhagadia	Ahmedabad		7,500	15,000	18,750
				Total	420,500	1,111,225	1,389,031

Note: ** Traffic volume for containers expressed in TEU

Considering that different commodities will be transported through specific rail wagons as already indicated in the above table, the total projected freight traffic by wagon type is as follows:

Projected Traffic Volume in Tons

	2006	**2010**	**2014**
**Containers **			
Inwards	6,625	11,644	14,492
Outwards	10,827	26,814	40,550
Total	**17,452**	**38,458**	**55,042**
Covered wagons			
Inwards	71,000	310,133	436,968
Outwards	53,000	248,750	310,938
Total	**124,000**	**558,883**	**747,906**
Open Wagons			
Inwards	202,500	462,250	577,813

	2006	2010	2014
Outwards	-	-	-
Total	**202,500**	**462,250**	**577,813**
Tanker Wagons			
Inwards	71,500	92,725	115,906
Outwards	22,500	45,000	56,250
Total	**94,000**	**137,725**	**172,156**

Note: ** Traffic volume for containers expressed in TEU

Taking into account the wagon capacities as expressed in the table below, the traffic in terms of number of trains per annum is also presented.

	Container	Covered wagons	Open Wagons	Tanker Wagons
Pay Load (Tonnes)	Variable as per commodity transported	62.81	60.0	54.2
No of wagon per trains	45	58	40	48

Traffic in terms of number of trainloads per annum

	2006	2010	2014
Containers			
Inwards	147.2	258.8	322.0
Outwards	240.6	595.9	901.1
Total	**387.8**	**854.6**	**1223.2**
Covered wagons			
Inwards	29.6	129.2	182.1
Outwards	22.1	103.6	129.6
Total	**51.7**	**232.9**	**311.6**
Open Wagons			
Inwards	55.6	126.9	158.6
Outwards	0.0	0.0	0.0
Total	**55.6**	**126.9**	**158.6**
Tanker Wagons			
Inwards	27.5	35.6	44.6
Outwards	8.6	17.3	21.6
Total	**36.1**	**52.9**	**66.2**
Grand Total (GT)	**531.2**	**1267.3**	**1759.6**

From the total traffic in terms of number of trainloads per annum, the number of trains per day was calculated using WR wagon turn around times. The same are presented in the table below:

	2006	2010	2014
Containers			
Inwards	0.4	0.8	1.0
Outwards	0.7	1.8	2.7
Total	**1.1**	**2.5**	**3.6**
Covered wagons			

	2006	2010	2014
Inwards	0.1	0.4	0.5
Outwards	0.1	0.3	0.4
Total	**0.2**	**0.7**	**0.9**
Open Wagons			
Inwards	0.2	0.4	0.5
Outwards	0.0	0.0	0.0
Total	**0.2**	**0.4**	**0.5**
Tanker Wagons			
Inwards	0.1	0.1	0.1
Outwards	0.0	0.1	0.1
Total	**0.1**	**0.2**	**0.2**
Grand Total (GT)	1.6	3.7	5.2

Hence the total freight traffic translates to about 3.7 and 5.2 trains per day in 2010 and 2014 respectively.

6. PROJECT DEVELOPMENT COST

The consultants have extensive experience in cost estimation exercise owing to the knowledge gained through carrying similar exercises as being strategic consultants to Rail Vikas Nigam Ltd (RVNL) for the following rail projects on PPP structure:

- ➢ Bharuch-Dahej Gauge Conversion project
- ➢ Surat Hazia New Rail Line
- ➢ Tughlakabad Dadri New Rail Line
- ➢ Krishnapatnam- Obverpalli New Rail Line
- ➢ Haridaspur-Paradeep New Rail Line

The cost of the project is estimated to be Rs. 442.59 million including contingency provisions and other adjustments.

6.1 Capital Cost Estimation Methodology

The base rates for cost estimation have been taken from the following 2 sources:
- ➢ Schedule of rates Western Railways (2004 prices)
- ➢ Final Feasibility Report for gauge conversion of Pratap Nagar – Chhota Udaipur Section in Vadodara Division of Western Railways (100 km in length at 2004 prices)

The costs have been worked out for the existing alignment, which is the most suited alignment for the project. From earlier parts of the present study, it has been established that the NG alignment has sufficient and suitable ROW for Broad Gauge Rail Link and therefore no additional land will be required for the gauge conversion to accommodate the Broad Gauge line. Land, as already detailed out in the interim report, will only be required at Boridra and Jhagadia Stations to accommodate loop lines and goods siding respectively. Land cost for the project land requirement has also been taken into account.

6.2 Capital Cost Components

The major capital cost components of the project are as follows:
- ➢ Preliminary expenses
- ➢ Cost of land
- ➢ Cost of Civil Engineering works
- ➢ Cost of Signaling and Telecommunication
- ➢ Cost of electrification of new facilities created
- ➢ Cost of mechanical facilities to be provided
- ➢ Contingencies

The important considerations made while estimating the project cost, which are as follows:

Preliminary Costs: The rates for preliminary costs/expenses have been adapted from the Final Feasibility Report for gauge conversion of Pratap Nagar – Chhota Udaipur Section in Vadodara Division of Western Railways. The preliminary costs of the project includes the cost for preliminary works such as engineering cum traffic surveys before final surveys to be ordered by Railway Board and final location surveys before construction.

Land Cost: Additional land required for accommodation for loop lines and siding at Jhagadia stations have already been mentioned in detail in the Interim Report submitted earlier by the

consultants along with station plans showing their physical layouts. The land rates have been taken from the Final Feasibility Report for gauge conversion of Pratap Nagar – Chhota Udaipur Section in Vadodara division in Western railways. The additional land requirement identified for the project is non-agricultural fallow land and should not pose serious problems at the time of acquiring for the project purpose.

Formation: Earthwork required for gauge conversion will mainly comprise of the estimate for changing the top layer of weak soil by moorum compacted to a depth of 0.50 meter. The quantity of earthwork has been worked out by plotting the cross sections at every 100 meters along the alignment. The width of the formation shall be 6.850 meters for embankments and 6.250 meters for cuttings excluding side drains.

Bridges: The cost estimates for all bridges have been estimated for rebuilding to Broad Gauge Main Line standard. One level crossing (no 2A at KM 2/4-5 across NH-8) has been proposed for replacement with ROB as it is a very busy road and 6 laning of the same has already been sanctioned by NHAI. Cost calculations for all bridges have been done for:

Foundations:	Pile foundations, after soil explorations
Sub Structure:	Mass concrete
Super structure:	PSC girders with deck ballasted slab
Track over the bridges:	Ordinary track as of approaches to be carried through

Track Structure: As per IR Engineering Code, Chapter II, track is proposed to be laid with 52 Kg 90 UTS 1st class rails (LWR) on PSC sleepers to 1540 Nos./ KM density having 250 mm machine crushed clean ballast cushion. Tracks for all Loop Lines have also been proposed to be laid as LWR and hence the same structure of track has been considered.

Maintenance & Equipment: The track after conversion shall be maintained by on- track tamping machines as per norms; hence the existing equipments shall be retained. However, extra cost for the equipments for BG has been proposed.

General Charges: The general charges for all activities including preliminary expanses and land charges at 6.43 % have been considered.

Signaling & Telecommunication: Signaling and telecom facilities will have to be provided to facilitate operations. All proposed 'B' class stations would be provided with Standard III interlocking with MACL, signaling and simultaneous reception facility. The entire section will work on Absolute Block System. 6 quad optic fiber cables will be used for telecommunications. Hence, while cost estimation, provisions have been accounted for:
  ➢ Multi Aspect Color Light Signaling
  ➢ Track circuiting
  ➢ Panel Interlocking
  ➢ Token less block instruments
  ➢ Fiber optic cables for communication and
  ➢ Control System

Electrical Engineering Costs: these have been considered for station buildings, goods shed area, office buildings, circulation area and street lighting for the remodeled Boridra and Jhagadia stations.

Mechanical Costs: these have been calculated by taking into account the following:
Cost of Diesel Rail Car with driver cabins at both ends of the section.

> ➢ Fuelling point for NG at Ankleshwar to be replaced at Rajpipla for the Jhagadia – Rajpipla non-converted section.
> ➢ Setting up of small repair depots at Ankleshwar and Jhagadia for BG and NG rail buses respectively.

Contingency Charges: Contingency charges at 3% have been taken for all items of civil works, which shall be sufficient to account for fluctuations in market trends, for the project to take a shape.

Taking the above considerations into account, the following table illustrates the different components of capital cost and their estimated values for the project:

SI No	Component			Cost (Incl Contingency)
1.0	**Preliminary expenses**			**1,200,000**
2.0	**Land cost**			**4,876,094**
3.0	Engineering Costs			
	3.1	**Civil Engineering Costs**		**372,964,319**
		3.1.1	Stations and Residential bldgs	56,176,738
		3.1.2	Plants and equipments	286,340
		3.1.3	Bridges	
			3.1.3.1 Major	13,135,899
			3.1.3.2 Minor	50,911,561
		3.1.4	Formation	
			3.1.4.1 Earthworks	7,308,825
			3.1.4.2 Walling	325,686
		3.1.5	Permanent Way	
			3.1.5.1 Tracks	114,003,197
			3.1.5.2 Sleepers	55,524,648
			3.1.5.3 Ballast	23,960,836
			3.1.5.4 Level Crossings	37,142,756
			3.1.5.5 Points and Crossings	12,368,146
			3.1.5.6 Misc. and Fencing	51,177
		3.1.6	Dismantling the existing line	1,768,510
	3.2	**S&T Engineering costs**		**29,700,000**
	3.3	**Electrical Engineering costs**		**5,202,200**
	3.4	**Mechanical Engineering Costs**		**9,925,698**

6.3 Adjustments in Project Cost

The costs detailed out above have been subjected to adjustments to arrive at the net project cost as follows:

SI No	Description	Cost (Rs)
	Preliminary expenses	1,200,000
	Land cost	4,876,094
	Gross civil engineering costs	372,964,319
	Add General charges for Gauge Conversion including	24,372,299

Sl No	Description	Cost (Rs)
	Preliminary expanses and Land (6.43 %)	
	Less CRM for Civil Engineering	14,559,565
	Net civil engineering costs	388,853,146
	S&T Engineering costs	29,700,000
	Electrical Engineering costs	5,202,200
	Mechanical Engineering Costs	9,925,698
	Net project cost (Rs)	**433,681,044**

Hence the net project cost works out to Rs 433.68 million. Elaborate details of cost estimation are given in Annexure 2.

6.4 Schedule of Construction

Having regard to the existing alignment, which does not require major upgrading and additional earth works, it is imminently possible to complete the project within a 2-year time frame. 95% of the project cost will be incurred during these two years. Other railway projects coming on SPV mode are also being executed on fast track mode within a similar time frame. However for the purpose of Financial Appraisal, 5% of the project cost has been allotted for spending in the third year. The cost for 2nd and 3rd years has been escalated at 5% to take into account the inflation. The year wise construction cost arrived at is shown in the table below.

	2007	2008	2009	Total
Investment Phasing	30%	65%	5%	100%
Construction Cost (Rs Million)	150.6	342.6	27.7	520.9

It may be noted that this results in a cost escalation of Rs 87.2 million over the construction period.

6.5 Construction Cost: Comparison with other projects

The consultants have extensive experience in cost estimation exercise owing to the knowledge gained through carrying similar exercises as being strategic consultants to Rail Vikas Nigam Ltd (RVNL) for the above mentioned rail projects on PPP structure and would like to present the findings from these earlier studies to give a comparative picture of the Ankleshwar – Jhagadia Project vis-à-vis other projects. A comparison of the capital costs, its components and unit construction cost in Rs crore/Km (total and component wise) is presented in the table below.

Construction cost comparisons

SINo	Project	State	Gauge Conversion/New Line	Length (Km)	Traction (Diesel/Elec)	Single/Double Line	Base Year for cost calculations	Construction Cost Components (Rs Crores)				
								Civil Engg	Electrical Engg	S&T Engg	Mechanical Engg	Total Const Cost
1	Bharuch Dahej	Gujarat	GC	62	E	SL	2004-05	110.10	16.80	34.00		160.90
2	Surat - Hazira	Gujarat	NL	30	E	SL	2004-05	79.00	8.00	11.00		98.00
3	Paradip - Haridaspur	Orissa	NL	82	D	SL	2004-05					456.00
4	Krishnapatnam - Obulavaripalle	Andhra Pradesh	NL	113	E	SL	2004-05	348.77	24.65	52.92	43.56	469.90
5	Tughlakabad - Dadri	Delhi/UP	NL	36	D	SL	2005-06	456.52	39.29	20.36	1.51	517.68
6	Pratap Nagar-Chhota Udaipur	Gujarat	GC	99	D	SL	2003-04	125.91	2.77	16.37	3.56	148.61
7	Viramgam - Bhildi	Gujarat	NL	157	D	SL	1991-92	133.80	1.31	12.88	5.83	153.82
6	Ankleshwar - Jhagadia	Gujarat	GC	22	D	SL	2006-07	38.89	0.52	2.97	0.99	43.37

SINo	Project	State	Gauge Conversion/New Line	Length (Km)	Traction (Diesel/Elec)	Single/Double Line	Base Year for cost calculations	Construction Cost per Km (Rs Crores)				
								Civil Engg	Electrical Engg	S&T Engg	Mechanical Engg	Total Const Cost
1	Bharuch Dahej	Gujarat	GC	62	E	SL	2004-05	1.78	0.27	0.55	0.00	2.60
2	Surat - Hazira	Gujarat	NL	30	E	SL	2004-05	2.63	0.27	0.37	0.00	3.27
3	Paradip - Haridaspur	Orissa	NL	82	D	SL	2004-05					5.56
4	Krishnapatnam - Obulavaripalle	Andhra Pradesh	NL	113	E	SL	2004-05	3.09	0.22	0.47	0.39	4.16
5	Tughlakabad - Dadri	Delhi/UP	NL	36	D	SL	2005-06	12.68	1.09	0.57	0.04	14.38
6	Pratap Nagar-Chhota Udaipur	Gujarat	GC	99	D	SL	2003-04	1.27	0.03	0.17	0.04	1.50
7	Viramgam - Bhildi	Gujarat	NL	157	D	SL	1991-92	0.85	0.01	0.08	0.04	0.98
6	Ankleshwar - Jhagadia	Gujarat	GC	22	D	SL	2006-07	1.77	0.02	0.14	0.05	1.97

It may be observed that Bharuch – Dahej Gauge conversion project to be executed in the state of Gujarat itself is estimated to have a construction cost of Rs 2.60 crore per Km and the estimates for the subject project are Rs 1.97 crore per Km. This similarity is within acceptable limits considering that the Bharuch – Dahej project costs have been estimated for electric traction and as a result the Electrical Engg cost is significantly higher. The component wise unit cost of construction of Pratap Nagar-Chhota Udaipur project is also somewhat similar to the study project as is evident from the above table. Moreover, as each project has its own unique characteristics and parameters and similarities beyond a certain limit should not be expected.

7. PROJECT O&M COSTS

The O&M cost for the project corridor has been calculated through the following two methods:
 (iii) Fully Distributed Cost (FDC) Method used as standard railway practice where railway zone specific unit cost rates are adopted from the "Summary of End Results for Freight Services – Unit Costs" published by the Indian Railways for internal consumption.
 (iv) SPV Method as used in Konkan Rail Corporation Limited (KRCL) where rolling stock is considered on hire basis form Indian Railways. This is now adopted for evaluation of new rail projects in the country being developed on PPP mode.

This chapter briefs the procedure used for calculation of O&M cost and the calculated O&M cost for the project corridor.

7.1 O&M cost components

The O&M cost comprises of the following components
- o Staff Cost
- o Material Cost
- o Variable Cost

7.1.1 Staff Costs:
Staff requirements and remunerations as per KRCL best practices incorporating the synergy of lean staff and mechanical maintenance have been considered for all technical and non-technical staff proposed at 2006 prices. In the SPV method, staff costs for the SPV incorporated have also been considered and the track and other assets will be maintained by SPV as per Indian Railway Standards.

7.1.2 Cost of Material:
Cost of material required for operation and maintenance has been estimated approximately based on length of section, number of block stations falling along the project alignment, and number of bridges. The unit rates have been adopted as per KRCL best practices in the SPV method.

7.1.3 Variable Cost:
It has been assumed that rolling stock of IR will be freely moving over the project railway and therefore cost of loco / wagon hire charges as applicable for inter-railway financial adjustments has been taken into account. Further, in the SPV method, five additional components of variable cost have been estimated viz, running repair charges for wagons, cost of fuel, cost of lubricants, cost of documentation and cost of compensation/ claims.

The GTKM has been estimated from the evaluated NTKM based on following details about Tare/Payload of Wagons and the number of wagons in one train as shown in the table below. These inputs have been used in both the methods of cost estimation.

	Container	BOXN	BCN	BTPN
Pay Load	48.0	62.81	60.0	54.2
Tare	19.0	22.47	25.5	27.0
No of wagon per trains	45	58	40	48

7.2 O&M Cost through 'Fully Distributed Cost' Method (Standard Railway Method)

This is the standard railway method for estimation of O&M costs in accordance with the unit rates of freight charges. The following table shows the O&M costs estimated through this method.

Staff costs				Annual Staff Costs in Million Rs		
Sl No	Department	Cost (For additional assets)	Remarks: Factor to account for costs incurred for current asset maintenance	2006	2010	2014
1	Civil Engineering	419,000	1.5	8.7	10.6	12.9
2	S & T Engineering	90,000	1.5	1.9	2.3	2.8
3	Electrical Engineering	42,000	1.5	0.9	1.1	1.3
4	Mechanical Engineering	137,000	1.5	2.9	3.5	4.2
5	Operating & Commercial	243,000	1.5	5.1	6.2	7.5
6	Stores	-	1.5	0.0	0.0	0.0
	TOTAL	931,000		19.4	23.6	28.7

Material costs				Annual Material Costs in Million Rs		
Sl No	Department	Cost (For additional assets)	Remarks: Factor to account for costs incurred for current asset maintenance	2006	2010	2014
1	Civil Engineering	310,250	1.2	5.2	6.3	7.6
2	S & T Engineering	38,900	1.2	0.6	0.8	1.0
3	Electrical Engineering	4,000	1.2	0.1	0.1	0.1
4	Mechanical Engineering	24,000	1.2	0.4	0.5	0.6
5	Operating & Commercial	28,000	1.2	0.5	0.6	0.7
6	Stores	150,000	1.2	2.5	3.0	3.7
	TOTAL	555,150		9.3	11.2	13.7

The monthly staff and material costs wee converted to annual costs and brought to 2006 price levels by applying an annual escalation at 5%. The details of staff and material cost estimates are presented in the Annexure 3.

Variable cost estimates

Sl No	Description of Service	Unit Cost Rate	Unit	No of Units	Costs in Million Rs

					2006	**2010**	**2014**	**2006**	**2010**	**2014**
1	**Terminal Services**									
a.	Documentation cost (6 wagons per invoice)	46.92	10% of 4 wheeler loaded wagons		342	660	873	0.02	0.03	0.04
b.	Other terminal services per invoive(per wagon full loads)	223.09	No of loaded wagons		1366	2640	3490	0.30	0.59	0.78
2	**Maintenance Services**									
	Cost of provision & maintenance of carrying units	184.29	Wagon days		127	245	325	0.02	0.05	0.06
3	**Marshalling Cost**	28.55	**per yard handled**		1366	2640	3490	0.04	0.08	0.10
4	**Line Haul Services (per 1000 GTKM)**									
a.	Cost of traction		Per '000 GTKM							
I	Diesel	106.66			28638	72244	97534	3.05	7.71	10.40
ii	Electric	91.37			0	0	0	0.00	0.00	0.00
b.	Cost of other transportation services including train passing staff	27.22	Per '000 GTKM		28638	72244	97534	0.78	1.97	2.65
c.	Cost of track	28.32	Per '000 GTKM		28638	72244	97534	0.81	2.05	2.76
d.	Cost of Signalling	1.81	Per '000 GTKM		28638	72244	97534	0.05	0.13	0.18
	Direct Expenses							**5.1**	**12.6**	**17.0**
5	**General Overhead Charges - % of direct expenses**	22.88%						1.2	2.9	3.9
	Total Working expenses							**6.2**	**15.5**	**20.9**
6	**General Charges as % in total expenses**	0.62%						0.0	0.1	0.1
	Total							**6.3**	**15.6**	**21.0**
7	**Escalation factor to enhance the cost upto current levels (2005-06)**	5.25%	1.0525					7.7	19.1	25.8

Unit Costs have been taken from the Summary of End Results for Freight services Unit Costs 2002-03 (DSE A-June 2004)

General Overhead charges at 22.88% of the expenses and general chares at 0.62% of the total working expenses have also been added to arrive at the final variable cost. Further an

escalation factor of 5.25% has also been applied to bring the variable costs to 2006 price levels as shown in the table above.

Hence, the total O&M cost is as follows.

Component	Costs in Million Rs		
	2006	**2010**	**2014**
Staff costs	19.4	23.6	28.7
Material cost	9.3	11.2	13.7
Variable Cost	7.7	19.1	25.8
Total O&M Cost	**36.4**	**53.9**	**68.1**

The total O&M cost as per FDC Method will be Rs 53.9 million at 2006 prices in 2010 on start of operations.

7.3 O&M Cost through SPV Method (O&M done by Railways under Contract)

Inputs Considered
The following details about the project have been considered for evaluation of O&M costs:

SL. NO.	CHARACTERISTICS	Details
1	Length of section (Km)	22 km
2	Single line / Double line	Single
3	Mode of Traction – Diesel or Electric	Diesel
4	Number and Class of stations	2 (B class)
5	Sectional speed	100 kmph

Total O&M Cost
The components of Staff Cost, Material Cost and Variable Cost as estimated through this method are presented in the table below.

Cost category	Unit	Unit Rates at Base Year (2004) Prices (Rs)	No of Units (2006)	Costs in Million Rs 2006 (at 2006 prices)	Costs in Million Rs 2010 (at 2006 prices)	Costs in Million Rs 2014 (at 2006 prices)
Staff costs						
Civil Engineering	Per staff	112,000	52	6.4	7.8	9.5
S & T Engineering	Per staff	112,000	9	1.1	1.4	1.6
Electrical Engineering	Per staff	112,000	4	0.5	0.6	0.7
Mechanical Engineering	Per staff	112,000	12	1.5	1.8	2.2
Optg. & Comml. Dept.	Per staff	112,000	22	2.7	3.3	4.0
HQ	Per staff	250,000	12	3.3	4.0	4.9
Total			**111**	**15.5**	**18.9**	**22.9**
Material cost						
Permanent Way	Rs. Per track km	291,226	22	7.1	8.6	10.4

Cost category	Unit	Unit Rates at Base Year (2004) Prices (Rs)	No of Units (2006)	Costs in Million Rs 2006 (at 2006 prices)	Costs in Million Rs 2010 (at 2006 prices)	Costs in Million Rs 2014 (at 2006 prices)
Station & Building	Rs. per station	283,973	2	0.6	0.8	0.9
Equipment	Rs. per station	1,083,423	2	1.2	1.5	1.8
Tunnels & Bridges	Rs. per bridge	100,132	41	2.3	2.8	3.3
Total				**11.1**	**13.5**	**16.5**
Variable cost						
Wagon hire charges	Rs. Per wagon day in use	424.00	2434	1.1	3.1	5.7
Wagon Repair charges	Rs. Per wagon day in use	18.00	2434	0.0	0.1	0.2
Loco Hire Charges	Rs. Per engine per hour	958.38	847	0.9	2.6	4.4
Fuel Cost	Rs. Per '000 GTKM	34.68	28638	1.1	3.4	5.5
Lube oil cost	Rs. Per '00 Engine Kms	457.09	198	0.1	0.3	0.5
Crew Cost	Rs. Per '000 GTKM	54.38	20563	1.2	0.6	2.5
Documentation cost per invoice	Rs. Per wagon loaded (outward)	119.82	1298	0.2	0.8	1.2
Claim compensation	Rs. Per '000 NTKM	10.13	9535	0.1	0.4	0.6
Total				**4.8**	**11.3**	**20.7**

General Overhead charges at 20% were also added to the variable cost as the standard practice. An annual escalation of 5% has been applied to bring the cost to 2006 price levels. The resultant O&M cost components are as follows:

Total O&M Cost (Rs Million at 2006 prices)

Component	2006	2010	2014
Staff costs	15.5	18.9	22.9
Material cost	11.1	13.5	16.5
Variable Cost	5.7	13.5	24.8
Total O&M Cost	**32.4**	**46.0**	**64.2**

The total O&M cost as per SPV Method will be Rs 46 million at 2006 prices in 2010 on start of operations.

Coaching expenses (and revenues) have not been considered in both the methods of O&M cost estimation as these will be operated by the existing railway and ROW for coaching

operations will be provided free of charge. The O&M costs arrived through SPV model have been used as the input in the suggested Financial Model developed for the project.

A comparative picture of the OM cost estimate arrived at from the two methods is shown in the table below.

O&M Cost comparison (Rs Million at 2006 prices)

Cost Component	2006		2010		2014	
	FDC Method	SPV Method	FDC Method	SPV Method	FDC Method	SPV Method
Staff Cost	19.4	15.5	23.6	18.9	28.7	22.9
Material Cost	9.3	11.1	11.2	13.5	13.7	16.5
Variable Cost	7.7	5.7	19.1	13.5	25.8	24.8
TOTAL O&M COST	**36.4**	**32.4**	**53.9**	**46.0**	**68.1**	**64.2**

It may be noted that O&M cost estimated through FDC method is more than that estimated through SPV method during the operation of the project rail. This is in line with the O&M management strategy for new rail line projects by hiring the rolling stock and contracting the staff and materials requirements to Indian railways as per benchmarked standards. Moreover, rolling stock cost (for wagons and locomotives) also has to be added to the capital cost in the estimation of project cost through FDC method which coupled with higher O&M cost is very unlikely to render the project financially feasible. The wagon & loco hire charges taken in the SPV Method are on the higher side as listed for a private railway whereas, in a real scenario these may be as per the lesser charges offered to other SPV Railways like Pipavav Rail Corporation where the Govt is a financial partner in the project.

The detailed O&M cost calculations through FDC and SPV methods are provided in Annexure 3 and 4 respectively.

7.4 O&M Cost Control by the SPV

As has been already detailed out in the previous sections, the O&M cost will comprise of a fixed cost component (staff cost + material cost) and a variable cost component directly linked to the traffic on the project rail section.

The O&M cost can be tackled upfront through a negotiated contract with the Vadodara Division of the western Railways which will be entrusted with the O&M operations. If the same were done 10 years back, no benchmark for negotiating O&M cost would have been available. But presently three private railways, which are in operation, can provide sufficient benchmarking for the same. These being:
- Konkan Railways
- Pipavav Rail Corporation
- Mundra Rail Company Ltd

Hence the fixed cost components of the O&M cost can be fixed on the possible best practices of the above three and a provision will be kept for benchmarking the same within the O&M Agreement on a yearly basis along with periodic revisions. It is also possible to make an effort to negotiate with the Indian Railways for having a cap on O&M cost by linking it with revenues but this may be more difficult to achieve. A ceiling on O&M cost with a given

number of pair of trains in operation can also be attempted. As far as certain miscellaneous charges like documentation costs are concerned, it is clarified that in the case of SPV, no documentation charges are payable for inwards traffic and are payable only for outwards traffic. These are minimal as only one Railway Receipt (RR) is issued for a given set of wagons.

Any other innovative method can also be negotiated with the Indian Railways during the contract development stage for keeping the O&M cost under control.

8. PROJECT REVENUE

There are two major components of the project revenue
- ➢ Coaching revenue: Revenue from passenger traffic
- ➢ Freight revenue: Revenue from freight traffic

Revenues have been calculated for the estimated present and projected future traffic on the project rail.

8.1 Estimation of Coaching Revenue

The current coaching revenue on the Ankleshwar - Rajpipla Narrow Gauge line (line on which the project section lies) is very low. The following are details of the trends of revenues on the narrow gauge section as obtained from the past records of Railways.

Year	Passengers (No)	Total earning (Rs)
2003-2004	8,624	78,887
2004-2005	9,151	78,929
April 2005 to Sept 2005	2,837	27,416

The low passenger earnings on the section are due to the poor usage rate of the railway facility that in turn is a result of the poor facility provided and the efficient and timely service provided by the competing road (SH-64). In view of the low traffic and absence of any future plans of railways, the consultants have done no estimation of future passenger traffic and revenue. It is also suggested that loss on account of passenger revenues should be borne by Indian railways.

8.2 Methodology for Estimation of Freight Revenue

The consultants have adopted the following methodology for the calculation of traffic earnings:

- ➢ Calculate the lead for each commodity of goods traffic originating and terminating on the project corridor (Lead=Project distance + Distance on Indian Railways)
- ➢ Calculate freight rate for each commodity according to commodity classification, loadability and lead pertaining to the respective commodity.
- ➢ Apportionment of the revenue generated from the lead to the project section in proportion to its length to the total lead.
- ➢ Calculation of freight revenue for each commodity and addition of Terminal Charges.

8.2.1 Calculation of Lead for Each commodity

The lead of each commodity has been calculated after a detailed study of the movement patterns of the current freight traffic from / to Jhagadia Industrial Estate. The rail distance of the origin / destination of the commodity up to Ankleshwar (taken from Western railway distance charts; distances are not available from Jhagadia) was added to the project distance (22 km) to arrive at the total lead. The commodity wise lead details are given in table at Annexure 5.

8.2.2 Commodity classification:

Railway classifies all freight commodities depending on the market value of the product and the ease of transportation. The classification of commodities comprising the freight to/from

Jhagadia Industrial Estate as per Indian Railways Freight Rate Tables for the year 2004 is as follows:

Wagon Load Class	Commodity
100	Rock Phosphate
120	Industrial Salt, Starch and Silica Ash
130	Copper Scrap, Soda Ash and Caustic lye
135	Caustic Soda
140	Sheet Glass, Coal, Dolomite
145	Sodium Silicate
160	Iron Scrap, Sponge Iron, Pig Iron
180	Alloy Steel
200	Chemical, Phosphorus Tri Chlorides
210	Sorbital
240	Benzene, Chlorine, Furnace Oil

8.2.3 Freight rates of commodities:

Commodity classification and lead wise freight rates have been taken from Freight Rate Tables of Indian Railways. In case of commodities to be moved by containers the freight rate are dependent on whether the commodity is destined for export or import. The rates for such commodities have been taken from Rates Advice No. 10, 2004 of Northern Railways, India. The freight rates for each commodity have been taken at 2004 prices. The revenues arrived at have been escalated at 5% (which is the average inflation rate) to arrive at values at 2006 prices.

8.3 Freight Revenue for Each Commodity

The freight revenue for each commodity has been worked out from the freight rates and the quantity of each commodity to be moved by the rail. The details of freight rates, a commodity classification, wagon type and quantity of each commodity to be moved by rail are given in Annexure 5.

As each commodity movement will involve freight handling operations at Jhagadia terminal, hence as per standard railway practice, the terminal handling charges have been added to the rail movement charges to arrive at the gross earnings on the section. Terminal charges have been taken at an average rate of Rs 35/Ton for all commodities except container traffic where the same are transferred to the container-handling agency. The total revenue (apportioned rail movement charges + terminal charges) from the existing and projected traffic for each wagon type is as per the following table:

Traffic Revenue Estimates (Rs Million at 2006 prices)

	2006	2010	2014
Containers			
Inwards	1.7	2.9	3.6
Outwards	3.3	7.4	10.9
Total	**5.0**	**10.3**	**14.5**
Covered Wagons			
Inwards	4.2	18.0	25.3
Outwards	3.3	15.2	19.0
Total	**7.5**	**33.2**	**44.3**

	2006	2010	2014
Open Wagons			
Inwards	11.0	24.8	31.0
Outwards	-	-	-
Total	**11.0**	**24.8**	**31.0**
Tanker Wagons			
Inwards	5.6	7.3	9.1
Outwards	1.2	2.4	3.0
Total	**6.8**	**9.7**	**12.1**
Grand Total (GT)	**30.3**	**78.0**	**101.9**

The total revenues expected to accrue to the project rail as per the traffic estimates and freight rates adopted is Rs 78 million at 2006 prices in 2010 on start of operations. Detailed year wise revenue estimates have been presented in Annexure 5.

9. FINANCIAL APPRAISAL

The demand for infrastructure is high, but the budgetary resources available to the government for development of the same are limited. Therefore, in all sectors, there is a major initiative on the part of the implementing agencies to invite private sector participation for provision of the much-needed facilities, by offering major incentives and swaps to the investors. In view of the rapid growth in the industrial sector, the Government of Gujarat is looking for strategic options to improve transport facilities. This includes conversion of existing railway lines from narrow /meter gauge to broad gauge and establishment of new railway lines to connect the industrial growth centers and ports. In this area, the Government is looking for private sector participation in general as also foreign direct investments. In a similar drive, the Ministry of Railways is also proposing to offer certain sections of rail network, requiring gauge conversion, doubling or new links to private sector. For this, pre feasibility and feasibility studies are underway which would help in identifying the commercially viable projects.

The present section has been identified by GIDB as a section warranting conversion to broad gauge standards to link principle commercial and industrial centers of the state with the national trunk rail network. The present chapter is an effort in this direction, for the section between Ankleshwar and Jhagadia, which is proposed for gauge conversion. A detailed financial analysis for the same has been undertaken, which is expected to give a guideline for implementation decisions as well as project structuring.

9.1 Key Assumptions to Financial Analysis

The main assumptions made for undertaking the financial analysis are as follows:

Debt Equity Ratio (DER): An initial debt equity ratio of 1.5:1 has been considered for the analysis. This is so, as the financing agencies normally do not extend the loan component beyond 70% of the total project cost for infrastructure projects. The upper ceiling of loan has been assumed for the initial case, so as to limit the equity burden on the private operator. With the proposed DER, the equity component comes out to be Rs 24.9 crores and the debt component as Rs 37.3 crores.

Inflation Rate: An inflation rate of 5% has been applied on the cost streams and an indexing at the rate of 3% per annum has been assumed for the revenue stream. This reflects the scenario, which has been prevailing in the recent past so far as freight tariffs are concerned. The correction process of reducing subsidy on passenger fare and bringing freight tariffs close to input cost is the reason for this low rate of revision of freight tariff which is less than normal yearly inflation.

Interest Rate: The prevailing lending rates in the market for infrastructure projects have been studied, and a rate of interest for the analysis has been assumed as 8.5% per annum.

Debt Tenure & Repayment: A 15 year debt tenure has been considered (including a three year construction period). Repayment of principal will commence after a one-year moratorium period from the first year of operations and will occur in the following 11 years.

Pre-Operative Charges: The pre-operative expenses comprise of the following:
- ➢ Syndication fees at 1% of the debt sanctioned
- ➢ Lenders upfront fee as 0.1% of the debt sanctioned
- ➢ Incorporation and establishment expenses of Special Purpose Vehicle

➢ Cost of Lenders Engineer during the construction period and
➢ Cost of preparation of DPR as 1% of the construction cost

SPV Costs: A provision has been made for SPV incorporation in terms of rentals, utilities, travel, transportation and administration costs.

Preliminary Cash Balances: Provision of 1% of the project cost has been made for preliminary cash balances to ensure smooth cash flows in the initial period of the project.

Taxation: In order to attract private sector in the railway sector, the Government of India has provided a heavy income tax rebate. As per the tax exemptions available under section 80-IA of the Income Tax Act, 1961, a ten-year 100% tax holiday over a 20-year time frame has been considered. Therefore, while calculating the tax liability, the rebate has been claimed in the most optimal manner, which maximizes the returns on investment. The tax rates have been taken as follows:

Tax Charged	Corporate	(Minimum Alternative Tax) MAT
Base Tax Rate	30.00%	7.5%
Surcharge	10.00%	10.0%
Education Cess	2.00%	2.0%
Effective Rate	**33.66%**	**8.42%**

While estimating the tax liability, whichever is higher of Corporate Tax or MAT, needs to be paid by the SPV or the private operator. Refer the Union Budget 2005 for details on Corporate Tax rates.

Depreciation: The depreciation on the project components have been taken as per the Company's and Income Tax Act. On the Company Act, the method of depreciation is Straight Line (SLM), whereas for depreciation as per the IT Act, a Written Down Value (WDV) method has been adopted. While calculating the profitability of a company, the depreciation as per the Company's Act is permissible. But in the process of estimating the tax burden, depreciation as per the IT Act is permissible for deduction from the retained earnings. It is a deduction permissible under Section 80 IA of Income Tax Act. Depreciation at the rates of 3.33% and 10% has been adopted for SLM and WDV methods respectively.

Insurance Premium: The investments in infrastructure are very high, and prone to high levels of risks. In order to cover the risk to a certain extent, all the assets created as part of the project are insured over the construction phase of the project. The insurance premium has been taken as 0.7% p.a. of the cost of the facility.

Period of Analysis: The period of analysis has been taken as 20 years though the model has been developed for 30 years for considering a more realistic scenario.

9.2 Key Indicators of Financial Analysis

Based on the above stated inputs, the exercise of financial analysis has been carried out for the proposed project. The indicators estimated in the process are:
➢ Pre-Tax Internal Rate of Return (Pre-Tax IRR)
➢ Post-Tax Internal Rate of Return (Post-Tax IRR)
➢ Return on Equity (RoE)
➢ Average Debt Service Coverage Ratio (DSCR)

9.2.1 Internal Rate of Return (IRR)

IRR indicates the return a project will generate over a period of time. It is that rate of discount, which makes the Net Present Value equal to zero. By definition, when project IRR is estimated, interest burden falling on the project is not accounted for. Therefore the expected project IRR is targeted as more than the rate at which the loan is raised. In case of pre-tax IRR, tax deductions are not considered, whereas the post-tax IRR accounts for the tax outflows. For the purpose of undertaking the analysis, the targeted post-tax IRR is considered as 9% in case the rate of interest is taken as 8.5%.

9.2.2 Return on Equity (RoE)

Return on Equity is the return that accrues to the investor. The return for viability depends upon the investor's expectation from his investment. RoE accounts for taxes, interest, loan repayment, etc.

9.2.3 Debt Service Coverage Ratio (DSCR)

DSCR reflects the capability of a project to payback its interest and loan component. In a typical profitable project, annual DSCR of 1.5 to 2 is considered acceptable by the financial institutions. However, for infrastructure projects like road and rail, which are not very profitable in the initial years of operation, an average ratio of above 1.2 is considered satisfactory. Average DSCR is estimated over the loan repayment period of the project.

9.3 Project structure

For faster implementation of the project, in order to build confidence among the investors as well as to enable sourcing of loan at a lower rate of interest it is suggested that the project be implemented under the Public-Private-Partnership (PPP) route. A Special Purpose Vehicle (SPV) should be formulated for the purpose, initiated by GIDC in association with the industry stakeholders and the Ministry of Railways. The proposed SPV shall comprise a project specific legal entity and shall be constituted with the objective of housing the project and having responsibility for its development, construction and operation. It shall be incorporated as a Company under the Companies Act, 1956, after following due processes for the formation of a Company.

9.4 Base Case Scenario

In the base case scenario, the financial analysis has been carried out using the inputs as already explained above for a debt equity ratio of 1.5:1, with inflation of 5% on the cost components. Revenue stream has been assumed to escalate at the rate of 3% per annum. Rate of interest on debt has been assumed as 8.5% for the analysis.

The capital cost, as estimated from the quantities, forms the basic cost for a financial analysis exercise. There are a number of other financing costs as have been detailed out below which come into play and together result in the **Landed Project Cost**. The break-up of the landed project cost for the corridor under study is shown in the table below.

Cost Investment	Sum
Construction Cost	433.7
Price escalation during construction	87.2
Insurance Premium	8.2

Cost Investment	Sum
Loan Arranger's Fee	3.7
Upfront Fee	0.4
Lenders Engineer's Fee	3.8
DPR / FA	4.3
SPV Incorporation / Establishment	23.9
Preliminary Cash Balances	5.2
IDC	51.3
Total Landed Project Cost	621.7

The landed cost of the project is estimated to be Rs. 62.17 crores. The landed cost of the project has been computed by adding pre development costs and cost of debt to the construction cost and phasing the total expenditure as 30% in the first year, 65% in the second year and the remainder 5% in third year with 5% escalation every year.

The funding pattern and landed project cost phasing will be as shown in the table below.

Financing Pattern	Share	2007	2008	2009	Total
Debt	60%	101.4	214.9	56.4	372.7
Equity	40%	74.7	161.9	12.5	249.0
Equity Disbursement		30.0%	65.0%	5.0%	**621.7**

The outputs for the financial indicators are shown in the table below:

Financial Indicator	Value
Pretax Project IRR	6.4%
Post tax Project IRR	6.1%
Equity IRR	4.1%
Average DSCR	0.93
Minimum DSCR	0.84

It may be noted that on a stand alone basis, the project is neither financially viable nor bankable. An Equity IRR of 13-14%% or more and a minimum DSCR of 1.3 or more will be more acceptable and is more likely to be able to gather the requisite debt funding at the suggested interest rates from the funding institutions. Moreover, a lower Equity IRR will also make the investors wary of going ahead with the investments.

Even on considering that the project investors will be strategic investors, an Equity IRR of 4.1% is abysmally low and to increase their faith in the project by assuring better returns on equity, an option of Govt funding was explored.

9.5 Viability Gap Funding (VGF) from Ministry of Finance

The Government of India has recognized that there is significant deficit in the availability of physical infrastructure across different sectors and that this is hindering economic development. The development of infrastructure requires large investments that cannot be undertaken out of public financing alone, and that in order to attract private capital as well as the techno-managerial efficiencies associated with it, the Government must be committed to promoting Public Private Partnerships (PPP) in infrastructure development. The Government has also recognized that infrastructure projects may not always be financially viable because of long gestation periods and limited financial returns, and that financial viability of such projects can be improved through Government support. Therefore, the Government has

decided to put into effect the scheme for providing financial support to bridge the viability gap of infrastructure projects undertaken through Public Private Partnerships.

Viability Gap Funding under this scheme will normally be in the form of a capital grant at the stage of project construction and shall not exceed 20% of the total project cost. Viability Gap Funding up to Rs. 100 crore (Rs. One hundred crore) for each project may be sanctioned by the Empowered Institution subject to the budgetary ceilings indicated by the Finance Ministry.

9.6 Scenario with VGF

Keeping in mind the above criteria issued by the Ministry Of Finance, GoI, a second project case was developed with 20% VGF of the Landed Project Cost. Again keeping a DER of 1.5:1, the funding pattern, landed project cost and investment phasing in this scenario will be as shown in the table below.

Financing Pattern	Share	2007	2008	2009	Total
Grant Disbursement		10.0%	90.0%	0.0%	
Grant	20.0%	12.2	110.0	0.0	122.3
Debt	48.0%	105.3	135.4	52.4	293.1
Equity	32.0%	58.8	127.4	9.8	196.0
Equity Disbursement	100.0%	30.0%	65.0%	5.0%	611.4

The outputs for the financial indicators are shown in the table below:

Financial Indicator	Value
Pretax Project IRR	6.6%
Post tax Project IRR	6.1%
Equity IRR	7.7%
Average DSCR	1.17
Minimum DSCR	1.05

The following ay be noted in this scenario:

➢ There has been a reduction in the debt component from Rs 373 million to Rs 293 million. This will result in reduction in interest during construction and other debt related costs and consequently the Landed Project Cost has reduced from Rs 622 million to Rs 611 million.

➢ A slightly higher Minimum DSCR of 1.05 (>1.0) will improve the comfort level of the lenders.

➢ Equity IRR of 7.7% will improve the comfort level of the stakeholders to invest in the project, as they will be strategic stakeholders. This however is still below the normally accepted levels of 10% or more ROI.

➢ As the total amount of grant envisaged is only Rs 12.2 crores, it may be assumed at this stage that procuring the mentioned amount should not be a problem.

It may be observed that even with maximum permissible VGF of 20% from GoI, the project economics do not give comfort at least on the IRR criteria as a project with an Equity IRR of 7-8% is generally not financially viable and attractive. However in view

of the fact that all the stakeholders will be strategic investors, this can be considered otherwise. Another way to increase the IRR and strengthen the investor confidence is to request GOI for a higher VGF than 20% because in terms of actual value it will not change the picture much but make the project more financially attractive. It is understood that on a case-to-case basis, if there is a genuine case, GOI, Ministry of Finance, Dept of Economic Affairs is not totally averse to such requirements.

The detailed Financial Model (with 20% VGF scenario) is given in Annexure 5.

9.7 Sensitivity Scenarios

The sensitivity of the key financial parameters of the project to changes in traffic, O&M costs, project cost and interest rates in the scenario with VGF have also been studied in order to assess the robustness of the project to risks.

9.7.1 Freight Traffic Sensitivity

0%	Post-Tax IRR	Equity IRR	M-DSCR	A-DSCR
30.0%	11.8%	18.2%	1.7	2.0
20.0%	10.1%	15.1%	1.5	1.8
10.0%	8.3%	11.7%	1.3	1.5
0.0%	6.1%	7.7%	1.1	1.2
-10.0%	3.4%	3.0%	0.8	0.9
-20.0%	-0.4%	#DIV/0!	0.5	0.5
-30.0%	#NUM!	#DIV/0!	0.1	0.2

From the above table it can be concluded that there is a high sensitivity to traffic. A 10% downfall in traffic will result in Min DSCR less than 1.00 (0.8) which will be uncomfortable. E-IRR will also reduce by about 60% to 3.0% only.
The traffic estimates considered in the present analysis are on the conservative side and with fast increase in foreign trade, greater containerization form existing low levels for export & domestic traffic as well as increase in the traffic from the northern hinterland, expected traffic on the project line is most likely to increase.
Although the freight traffic estimates have been on a very conservative side, still the possibility of low traffic in the initial years cannot be completely ruled out owing to abysmally low pace of development of industries in Jhagadia Industrial Estate.

9.7.2 O&M Cost Sensitivity

	Post-Tax IRR	Equity IRR	M-DSCR	A-DSCR
-30.0%	9.8%	14.6%	1.5	1.7
-20.0%	8.7%	12.5%	1.4	1.5
-10.0%	7.5%	10.3%	1.2	1.4
0.0%	6.1%	7.7%	1.1	1.2
10.0%	4.5%	4.9%	0.9	1.0
20.0%	2.5%	1.6%	0.7	0.8
30.0%	0.1%	#DIV/0!	0.5	0.6

It can be observed from the above tables that the returns can be significantly improved by keeping the O&M costs low, which is possible and in any case will be the effort of the SPV to do so.

A 10% increase in the O&M costs will result in about 36% reduction in the E-IRR to 4.9% and the Min DSCR to 1.0. This will be below the acceptable limit of 1.3 and make the investors wary. It can be seen that the project does not have the capacity to bear fluctuations in O&M cost.

9.7.3   Project Cost Sensitivity

	Post-Tax IRR	Equity IRR	M-DSCR	A-DSCR
-30.0%	9.5%	12.3%	1.9	2.3
-20.0%	8.1%	10.7%	1.6	1.7
-10.0%	7.0%	9.1%	1.3	1.4
0.0%	6.1%	7.7%	1.1	1.2
10.0%	5.3%	6.3%	0.9	1.0
20.0%	4.4%	4.8%	0.8	0.9
30.0%	3.7%	3.4%	0.7	0.8

On the Project Costs side, a 10% increase would make the project all the more unattractive but since a 5% escalation factor has already been taken into account while computing project costs, this may provide some cushion. The return on equity improves significantly with reduction in project costs. However, in Indian context, 10-15% cost overruns owing to delays in final project sanction from competent authorities and delays in construction are common in infrastructure projects, especially in the rail domain.
The Min DSCR would be a concern in the initial years if the project costs escalate up to or beyond 10%, and additional debt would have to be taken to improve the DSCR levels.

9.7.4   Interest Rate Sensitivity

	Post-Tax IRR	Equity IRR	M-DSCR	A-DSCR
7.5%	6.1%	8.3%	1.1	1.3
8.0%	6.1%	8.0%	1.1	1.2
8.5%	6.1%	7.7%	1.1	1.2
9.0%	6.1%	7.4%	1.0	1.1
9.5%	6.1%	7.1%	1.0	1.1
10.0%	6.0%	6.8%	1.0	1.1

Interest rates does not have a very significant bearing on the Equity IRR of the project, in spite of a high share of the total project cost due to a low total project cost and long repayment period. Non-recourse financing at 8.5% pa should not be a problem and the scenario of higher interest rates on debt is not likely to arise and the project is capable of accommodating debt at higher interest rates.

9.7.5   The combined effect scenario
In real life scenario, there can be simultaneous fluctuations in all the project parameters which affect the project financials. A scenario evaluation was also carried out to assess the likely impact of changes in these parameters as under:
- Reduction in project traffic by 5%: likely due to slow pace of development of industries in Jhagadia Industrial Estate
- Escalation in project cost by 10%: likely due to delays in project sanction and construction
- Rate of interest revised to 10%pa: likely due to the ongoing market trends of increase in debt interest rates across all sectors of economy

> Revenue escalation rate revised to 2%pa from 3%pa: likely due to very slow rate of increment in Railway earnings

The effect on project financials consequent to these changes is presented in the table below:
> The construction cost will be Rs 477 million
> Cost escalation during construction period will be Rs 96 million and owing to increase in cost of debt and other associated expenses, the landed cost will be Rs 677 million.

Financing Pattern	Share	2007	2008	2009	Total
Grant Disbursement		10.0%	90.0%	0.0%	
Grant	20.0%	13.5	121.9	0.0	135.5
Debt	48.0%	114.7	149.1	61.2	324.9
Equity	32.0%	65.1	141.1	10.9	217.0
Equity Disbursement		30.0%	65.0%	5.0%	**677.4**

Financial Indicator	Value
Pretax IRR	2.8%
Postax IRR	2.5%
Equity IRR	0.9%
Average DSCR	0.75
Minimum DSCR	0.68

It thus becomes evident that the project will become undoable even if it gets moderate combined shocks and such a scenario is not unrealistic based on the market trends and the facts of the case.

9.8 Scenario suggested by Jhagadia Industrial Association

Having evaluated the project viability and bankability as a gauge conversion exercise form Ankleshwar staion to Jhagadia station which has been presented in the previous sections of the report; the consultants have also analyzed another scenario wherein the following were incorporated:
> Siding to individual establishments in Jhagadia Industrial Estate in the form of a ring rail type arrangement around the estate to further improve the rail connectivity of large industrial establishments within the estate.

The following assumptions have been considered for estimation of the project cost in this scenario:
> About 17km of ring rail can be laid on the periphery of the estate
> A 30m wide ROW will have to be set aside for the rail alignment from within the estate's land
> Land cost for the 30m wide ROW has been estimated using the same rates as used in the original estimates for additional land cost
> Unit rates for construction cost components (civil, electrical, mechanical and S&T) were derived form the original cost estimates and used to arrive at the additional construction cost estimates for the ring rail type siding arrangements
> Unit rates for O&M cost components (staff, material & variable) were derived form the original cost estimates and used to arrive at the additional O&M cost estimates for the ring rail type siding arrangements
> Debt – equity ratio of 1.5:1 was considered
> VGF grant at 20% of the project landed cost was considered

➢ No changes were assumed in project revenues

The project cost arrived at in this scenario is presented below:
➢ The total construction cost, including the additional land cost will be Rs 892 million.
➢ The additional land cost of the 30m wide ROW will be Rs 139 million.
➢ The cost escalation during construction will be Rs 179 million.
➢ It may be noted that the project landed cost will be Rs 1225 million as against Rs 611 million in the previous case as follows:

Financing Pattern	Share	Rs. Million
Landed Cost		1225
Debt Funding	48.0%	588
Equity Funding	32.0%	392
Grant	20.0%	245

➢ The O&M cost will be Rs 81.5 million at 2006 prices on start of operations.

The project financials arrived at in this scenario are presented below:

Financial Indicator	Value
Pretax IRR	#DIV/0!
Postax IRR	#DIV/0!
Equity IRR	#DIV/0!
Average DSCR	-0.25
Minimum DSCR	-0.29

➢ The project will not have any positive net cashflows resulting in measurable IRRs.

It may also be noted that dedicating about 17km long 30m ROW for the ring rail type siding arrangement form the estate land which is under the ownership of GIDC will be a difficult proposition.
Although the additional construction cost for the ring rail type siding has been included in the project cost, this might not be the case in light of Indian Railways policy for sidings to individual establishments. Refer annexure 13 for details of the same.
Rail line projects have very specific standards of construction especially pertaining to alignment geometrics and constructing a ring rail type siding facility within the estate will be a more challenging than assumed for financial evaluation.

9.9 An alternate approach

As an alternate approach to gauge conversion of Ankleshwar – Jhagadia rail link to improve connectivity of Jhagadia Industrial Estate with the broad gauge national rail network, the same can also be achieved by improving the road connectivity to the existing facilities at Ankleshwar viz BG station, goods yard and CONCOR ICD by four laning of SH-64 and improvement of internal roads within the estate. The consultants have also estimated the approximate cost for the same which is presented in the table below.

Details
Road Length (Km)   16
Old Road Width (m)   7.5

Details

Median Width (m)   4
New Road Width (m)   7.5
Hard Shoulders (m)   2
Soft Shoulders (m)   3

SI No	Component	Unit	Rate/Unit (Rs)	Thickness (mm)	Quantity	Cost (Rs Million)
1	Clearing/ grubbing	Ha	35,000	-	26	0.92
2	Excavation (soft soil)	cu-m	50	500	132,000	6.60
3	Embankment	cu-m	150	500	24,000	3.60
4	Subgrade	cu-m	170	500	132,000	22.44
5	GSB	cu-m	1,400	200	52,800	73.92
6	WMM	cu-m	1,600	250	50,000	80.00
7	DBM	cu-m	4,400	160	24,320	107.01
8	BC	cu-m	5,500	50	13,600	74.80
9	Prime coat	sq-m	15		272,000	4.08
10	Tack Coat1	sq-m	5		272,000	1.36
11	Tack Coat2	sq-m	6		272,000	1.63
					Total	**376.36**

The total construction cost including strengthening of existing pavement will be about Rs 380 million. The cost of maintaining the 4 lane road facility will however be much lesser than sustaining rail operations on the converted section.

It has been assumed that SH-64 has sufficient ROW earmarked to enable 4 laning without the requirement of additional land acquisition and the associated costs involved.

10. CONCLUSIONS AND RECOMMENDATIONS

➤ Based on the present traffic, medium term future projections, past track record of less than optimal development of Jhagadia Industrial Estate and operational practices of Indian Railways; there is not enough case for an immediate gauge conversion of the study link.

➤ The project financials evaluated under different development scenarios (base case, VGF grant as 20% of the landed cost, ring rail type siding arrangement) do not make the case any better.

➤ The total railable traffic estimated for 2010 and 2014 comes to about 3.7 and 5.2 freight trains per day which will result in only 24% line capacity utilization as a single line section has a line capacity of about 22 trains per day per direction.

➤ Even as of now, none of the likely users are in a position to confirm 'traffic guarantees' for the project to reflect strategic interest in the project.

➤ With NH-8 barely at a distance of 13km and a now operational ICD at Ankleshwar, it is recommended that gauge conversion be deferred to a future date when there is a greater comfort from the traffic perspective.

➤ If Jhagadia Industrial Estate develops fast, in any case if found necessary, the rail line conversion can be carried out in 1.5 to 2 years from 'Concept to Commissioning' based on recent experiences.

ANNEXURE

1.DETAILS OF THE EXISTING FEATURES OF THE EXISTING NG ALIGNMENT

Details of Existing Gradients

Sr. No.	From KM – To KM	Total length (in Km)	Gradient facing Jhagadia	Remarks
1	0.00 to 0/7	1.900	Level	Ankleshwar Yd take off
2	0/7 to 3/0	1.100	Rise 1 in 1000	
3	3/0 to 4/3	1.400	Rise 1 in 500	
4	4/4 to 6/0	1.600	Fall 1 in 1000	
5	6/0 to 6/5	0.500	Fall 1 in 200	
6	6/5 to 7/12	1.300	Level	
7	7/12 to 7/14	0.120	Rise 1 in 400	
8	7/14 to 8/00	0.120	Rise 1 in 200	
9	8/00 to 8/2	0.120	Level	
10	8/2 to 8/4	0.120	Fall 1 in 200	
11	8/4 to 8/10	0.400	Level	
12	8/10 to 9/5	0.700	Rise 1 in 200	
13	9/5 to 10/2	0.800	Rise 1 in 500	
14	10/2 to 11.00	0.850	Fall 1 in 300	
15	11/00 to 11/7	0.450	Fall 1 in 1000	
16	11/7 to 12/5	0.800	Level	
17	12/5 to 12/11	0.400	Fall 1 in 1000	
18	12/11 to 13/5	0.700	Rise 1 in 400	
19	13/5 to 14/4	0.900	Rise 1 in 200	
20	14/4 to 15/8	1.300	Fall 1 in 150	Ruling gradient
21	15/8 to 15/10	0.120	Level	
22	15/10 to 17/7	1.800	Rise 1 in 150	Ruling gradient
23	17/7 to 19/2	1.700	Level	
24	19/2 to 21/1	1.900	Rise 1 in 150	Ruling gradient
25	21/1 to 22/11	1.700	Fall 1 in 500	Jhagadia Yard

Details of Existing Curves

Curve No	Between stations	Kilometers From	Kilometers To	Degree	SE in mm	Length in Meters	Transition Length in Meters South end	Transition Length in Meters North end	Gradient	Remarks
1	AKV-JGI	0/3	0/11	4	25	495.6	35.4	35.4	Level	To be retained in BG
2	AKV-JGI	7/3	7/10	4	25	424.8	35.4	35.4	Level	
3	AKV-JGI	11/10	12/4	2	15	330.4	23.6	23.6	Level	
4	AKV-JGI	12/6	12/10	1	5	259.6	11.8	11.8	F 1000	
5	AKV-JGI	13/2	13/5	2	15	188.8	23.6	23.6	F 400	
6	AKV-JGI	13/5.5	13/8	4	25	82.6	35.4	35.4	R 200	
7	AKV-JGI	15/8	16/2	3	15	342.2	23.6	23.6	R 150	
8	AKV-JGI	18/8	19/2	3	15	566.4	23.6	23.6	Level & F200	
9	AKV-JGI	21/9	22/1	4	25	354	35.4	35.4	F 500	

Details of Existing Level Crossings

Sr. No.	LC No.	Class	Location (Km)	Manned / Unmanned	If interlocked with cabin or station	Proposed for BG
1	1	C	0/4-5	Manned *	No	No approaches. Proposed for removal.
2	1A	Spl	0/12-13	Manned *	No	On old NH in City.
3	2	A	2/4-5	Manned *	No	Proposed for ROB
4	3	C	3/8-9	Unmanned	No	As per BG standards.
5	4	C	4/2-3	Unmanned	No	As per BG standards.
6	5	C	5/7-8	Unmanned	No	As per BG standards.
7	6	C	6/0-1	Unmanned	No	As per BG standards.
8	7	C	6/7-8	Manned *	No	As per BG standards.
9	8	C	7/4-5	Manned *	No	As per BG standards.
10	9	C	8/14-15	Unmanned	No	As per BG standards.
11	10	C	9/12-13	Unmanned	No	As per BG standards.
12	13	C	13/1-2	Unmanned	No	As per BG standards.
13	14	C	13/4-5	Unmanned	No	As per BG standards.
14	15	C	13/11-12	Unmanned	No	As per BG standards.
15	16	C	14/4-5	Unmanned	No	As per BG standards.
16	17	A	15/1-2	Manned *	No	As per BG standards.
17	18	C	15/13-14	Unmanned	No	As per BG standards.
18	19	C	16/3-4	Unmanned	No	As per BG standards.
19	20	C	17/1-2	Unmanned	No	As per BG standards.
20	21	C	17/11-12	Unmanned	No	As per BG standards.
21	22	C	19/2-3	Unmanned	No	As per BG standards.
22	23	C	20/7-8	Unmanned	No	As per BG standards.
23	24	C	21/14-15	Manned *	No	As per BG standards.

Note:

1.　　As per Station Working Order of AKV station, LC Nos. 1/A, 2, 7, 8, 17, 24 are operated by Traveling Points Man on train.

2.　　As per CRS/ Mumbai (Western Circle)'s inspection note No R/13011/417 dated 03/9/2003; stop boards are to be erected on approaches of the following level crossings and Trains are required to stop and proceed.
Manned LC Nos. 1A, 2, 7,8, 11, 17 and Unmanned LC Nos 3, 4, 15, 23

Details of Existing Bridges

Sr. No.	Km	Between stations	Span (Meters)	Type	Major/ Minor	Prop. Foundations	Prop. Sub structure	Prop. Super structure
1	0/4-5	AKV- JGI	1/3.05	Girder	Minor	Raft		RCC slab M 30
2	1/9-10	AKV- JGI	1/3.05	Girder	Minor	Raft		
3	2/3-4	AKV- JGI	4/1.20	Hume pipe	Minor	Raft		
4	2/12-13	AKV- JGI	1/3.35	Girder	Minor	Raft		
5	3/10-11	AKV- JGI	1/1.82	Girder	Minor	Raft		
6	4/4-5	AKV- JGI	1/1.52	Girder	Minor	Raft		
7	4/10-11	AKV- JGI	1/3.45	Girder	Minor	Raft		
8	5/4-5	AKV- JGI	1/1.52	Girder	Minor	Raft		
9	5/8-9	AKV- JGI	2/6.10	Girder	Minor	RCC piles		
10	6/5-6	AKV- JGI	1/1.83	Girder	Minor	Raft		
11	6/10-7/1	AKV- JGI	5/18.29, 1/6.10	Girder	Major	RCC Piles		PSC slab
12	7/9-10	AKV- JGI	1/1.83	Girder	Minor	Raft		RCC slab M 30
13	8/1-2	AKV- JGI	2/18.29	Girder	Major	RCC piles		PSC slab
14	8/7-8	AKV- JGI	1/3.79	Girder	Minor	Raft		RCC slab M 30
15	9/2-3	AKV- JGI	4/0.91	Hume pipe	Minor	Raft		
16	9/7-8	AKV- JGI	1/3.35	Girder	Minor	Raft		
17	10/3-4	AKV- JGI	4/0.91	Hume pipe	Minor	Raft		
18	10/9-10	AKV- JGI	1/3.35	Girder	Minor	Raft		
19	11/1-2	AKV- JGI	1/3.35	Girder	Minor	Raft		
20	11/5-7	AKV- JGI	1/0.76	CI Pipe	Minor	Raft		
21	11/8-9	AKV- JGI	1/6.10	Arch	Minor	Raft		
22	12/3-4	AKV- JGI	1/ 2.44	Girder	Minor	Raft		
23	12/10-11	AKV- JGI	1/1.52	Girder	Minor	Raft		
24	13/3-4	AKV- JGI	1/3.35	Girder	Minor	Raft		
25	13/5-6	AKV- JGI	1/6.10	Arch	Minor	Raft		
26	15/4-5	AKV- JGI	4/0.61	Rail Girder	Minor	Raft		
27	15/7-8	AKV- JGI	2/18.29	Girder	Major	RCC piles		PSC slab
28	15/11-12	AKV- JGI	1/3.35	Girder	Minor	Raft		
29	16/9-10	AKV- JGI	1/3.35	Girder	Minor	Raft		
30	17/5-6	AKV- JGI	1/1.67	Girder	Minor	Raft		
31	17/8-9	AKV- JGI	1/1.82	Girder	Minor	Raft		
32	18/1-2	AKV- JGI	1/5.79	Girder	Minor	Raft		
33	18/8-9	AKV- JGI	3/0.61	Girder	Minor	Raft		
34	19/1-2	AKV- JGI	3/0.61	Girder	Minor	Raft		
35	19/3	AKV- JGI	1/'2.70 Canal	RCC Pipe	Minor	Raft		
36	19/5-6	AKV- JGI	1/5.79	Girder	Minor	Raft		
37	19/5-6	AKV- JGI	1/0.61	Girder	Minor	Raft		
38	20/1-2	AKV- JGI	4/0.61	Rail opening	Minor	Raft	Mass concrete	RCC slab M 30
39	20/2-3	AKV- JGI	1/4.57	Girder	Minor	Raft		
40	20/8-9	AKV- JGI	2/6.10	Girder	Minor	RCC piles		
41	21/2-3	AKV- JGI	2/0.76	CI pipe	Minor	Raft		

List Of Electric Overhead Wires Crossing NG Track

Sr. No.	KM From Ankleshwar	Height Of Wires Above Rail	Voltage
1	7.50	6.870	11 KV
2	7.85	6.503	11 KV
3	1.20	6.022	11 KV
4	1.20	5.918	11 KV
5	1.2	5.932	11 KV
6	1.225	10.479	11 KV
7	1.275	10.477	11 KV
8	1.30	10.262	11 KV
9	5.45	7.486	66 KV
10	6.09	8.17	66 KV
11	9.410	21.21	800 KV
12	9.90	12.903	220 KV
13	10.30	11.740	132 KV
14	11.62	5.668	11 KV
15	12.64	15.097	220 KV
16	13.02	14.825	220 KV
17	13.70	16.456	220 KV
18	14.40	13.678	66 KV
19	14.45	9.971	66 KV
20	15.01	11.069	66 KV
21	17.61	6.50	11 KV
22	20.46	5.62	11 KV
23	20.46	5.629	11 KV

List Of Telephone Overhead Wires Crossing NG Track

Sr. No.	KM From Ankleshwar	Height Of Wires Above Rail
1	20.45	5.529

List Of encroachments along the existing NG track

SR NO	CHAINAGE	AREA IN HECTARE
1	0 KM TO 1 KM	0.0000
2	1 KM TO 2 KM	0.0152
3	2 KM TO 3 KM	0.1931
4	3 KM TO 4 KM	0.0166
5	4 KM TO 5 KM	0.0069
6	5 KM TO 6 KM	0.3004
7	6 KM TO 7 KM	0.0591
8	7 KM TO 8 KM	0.0343
9	8 KM TO 9 KM	0.0578

SR NO	CHAINAGE	AREA IN HECTARE
10	9 KM TO 10 KM	0.1871
11	10 KM TO 11 KM	0.0000
12	11 KM TO 12 KM	0.0995
13	12 KM TO 13 KM	0.5796
14	13 KM TO 14 KM	0.2358
15	14 KM TO 15 KM	0.1848
16	15 KM TO 16 KM	0.0464
17	16 KM TO 17 KM	0.0439
18	17 KM TO 18 KM	0.1694
19	18 KM TO 19 KM	0.0082
20	19 KM TO 20 KM	0.0000
21	20 KM TO 21KM	0.0000
22	21 KM TO 22 KM	0.0000
23	22 KM TO 23 KM	0.0000
24	TOTAL	2.2382

2. CAPITAL COST ESTIMATION

3.O&M COST: FDC METHOD

4. O&M COST: SPV METHOD

5.FINANCIAL MODEL

6. PROPOSED INDUSTRIAL INVESTMENTS IN GUJARAT

CHEMICAL & ALLIED INDUSTRIES

Sr. No.	Item	Capacity	Investment (Rs. in lakhs)
1.	Alkyd Resin	500 MTA	63
2.	Alpha Phenyl Glycerine	300 MTA	2,100
3.	Anti-Corrosive Pipe Coating (PU based coating)	3000 MTA	180
4.	Benzeldehyde	5000 MTA	270
5.	Benzoic Acid	250 MTA	50
6.	Benzophenone (Di-phenyle Methanone)	600 MTA	250
7.	Benzyl Acetate/Benzoate/Alcohol	120 MTA	39
8.	Benzyl Chloride	120 MTA	29
9.	Bisphenol-A	3000 MTA	200
10.	Bituminious Felts	125000 sq.mt. PD	110
11.	Bituminious Products	18000 MTA	200
12.	Bromine and Derivatives	300 MTA	150
13.	Castor Oil Derivatives	9000 MTA	1,100
14.	Chlorinated Paraffin Wax	300 MTA	40
15.	Cypermethrin	300 MTA	350
16.	Diketene and Derivatives	2300 MTA	1,530
17.	Diphenyl Oxide	1000 MTA	455
18.	Detergent Grade Zeolite	10000 MTA	2,000
19.	Epichlorohydrin	4500 MT	190
20.	Ethanol for Blending in Petrol	10,000 KLA	2,000
21.	Ethylene Glycols	15000 MTA	15,000
22.	Gasahol Manufacturing	100 KL/day	1,400
23.	Glycine	450 MTA	150
24.	Glycol Ethers	3000 MTA	800
25.	Magnesium based Chemicals	1000 MTA	350
26.	Micro Crystalline Waxes	3000 MTA	200
27.	Molasses-Alcohol based Chemicals	1000 MTA	1,000
28.	Natural Food Colours	400 MTA	1,500
29.	Perfumery Chemicals	1200 MTA	250
30.	Phenolic Resins	3000 MTA	200
31.	Phenyl Acetic Acid	200 MTA	80
32.	Phthalate Plasticisers	3500 MTA	300
33.	Powder Coating	250 MTA	55

Sr. No.	Item	Capacity	Investment (Rs. in lakhs)
34.	Re-refining of used Lubricating Oil	1800 LTPD	71
35.	Silicon Metal and Calcium Silicide	2500 MTA	3,100
36.	Sodium Benzoate	6000 MTA	400
37.	Solid Waste Management	1000 TPD	1,200
38.	Stable Bleaching Powder	10000 MTA	500
39.	Waste Oil Reclamation	3000 KLPA	185
40.	Wax Emulsions	1500 MTA	200
41.	Zinc Oxide	5000 MTA	850
42.	Zirconium Salts	370 MTA	320

Source: http://www.gujaratindustry.gov.in/inv-ind.html

MINERAL BASED ALLIED INDUSTRIES

Sr. No.	Item	Capacity	Investment (Rs. in lakhs)
1	Agate Articles	18000 No. PA	50
2	Alumina Chemical Complex	6000 MTA	351
3	Benefication of China Clay		200
4	Blended Cement	1 Lakh MTA	530
5	Catlitter	1500 MTA	230
6	Ceramic Grinding Media	50 MTA	120
7	Ceramic IC Substrates	100 million PA	2,200
8	Ceramic Liners	1000 MTA	800
9	Ceramic Water Filter (Flyash based)	1 Lakh Nos. PA	112
10	Clay Laboratory	1000 Samples PA	170
11	Clinker Grinding Unit	5 Lakh Tons PA	1,510
12	Decorative Paint	200 MTA	45
13	Dimethyl Sulphate	1200 MTA	90
14	Dimension Stone Sizing	5000 sqmtr/day	35
15	Electrolytic Manganese Dioxide	1800MTA	600
16	Glass Grade Silica	30000 MTA	360
17	Fire clay washing	15000 MTA	60
18	Granite Cobbles	15000 MTA	36
19	Graphite Benefication	6000 MTA	180

Sr. No.	Item	Capacity	Investment (Rs. in lakhs)
20	Iodised Salt	20000 MTA	5
21	Lamellar China Clay	9000 MTA	150
22	Light Weight Aggregate (Exfoliated)	3000 MTA	50
23	Lignite Chemicals	1000 MTA	850
24	Low Grade Bauxite Upgradation	15000 MTA	120
25	Marine Gypsum Washing	3000 MTA	30
26	Sheet Glass	19500 MTA	525
27	Silica Fumed	1.5 lakh/pa	70
28	Slip House	1000 TPD	260
29	Whitening	30000 MTA	300

Source: http://www.gujaratindustry.gov.in/inv-ind.html

TEXTILE INDUSTRIES

Sr. No.	Item	Capacity	Investment (Rs. in lakhs)
1	Cotton/Synthetic Blended Suiting Fabric on Sulzer	8 Lakhs M PA	300
2	Denim Fabric	10 MTA	10,000
3	Home Textile Manufacturing Unit	70,000 Cushion covers and 40,00 pieces of curtains per annum	100
4	Integrated Knitwear Unit	150 TPD	25,000
5	Knitted Fabrics for Made-ups and Garments	300 Lakhs pieces PA	300
6	Lingerie as Ladies Apparel	2 Lakhs Pieces Per Annum	80
7	Manufacturing of Kids Wear	2 Lakhs Sets Per Annum	80
8	Modern Ginning and Pressing	5990 MTA	180
9	Non-Woven Fabrics	3600 MTA	340
10	Readymade Knitted Garments	60 Lakh Pieces Per Annum	1200
11	Readymade Shirts	1,65,000 Shirts Per Annum	100
12	Woven Label	2 Lakhs Sets Per Annum	160

Source: http://www.gujaratindustry.gov.in/inv-ind.html

PLASTIC AND ALLIED INDUSTRIES

Sr. No.	Item	Capacity	Investment (Rs. in lakhs)
1	Air Bubble Film	1584 MTA	515
2	Black HD Polyethylene Film	7200 MTA	190
3	Deep Freeze Packing	3600 MTA	200
4	Drip Irrigation System	3600 MTA	620
5	Fibrillated PP Ropes	2000 MTA	550
6	Flexible Intermediate Bulk Container	1800 MTA	817
7	Jumbo Bags	3 lakh Nos. PA	450
8	LDPE/LLDPE Film for Green House	3600 MTA	180
9	Master Batches – Plastic Raw Material	2500 MTA	175
10	Medical Disposable Products	25 lakh Nos. PA	200
11	Non-Toxic PVC Soft Tubing	1500 MTA	120
12	Plastic Pencil	15 Mln. PA	90
13	Plastic Waste Recycling	15000 MTA	300
14	Polyamide Resins	6000 MTA	250
15	Polymer Alloys & Blends	1600 MTA	670
16	Polythylene Garbage Bags	3600 MTA	200
17	Polyurathane (PU) Moulded Automobile Parts	15000 Nos. PA	400
18	PP Thermoformed Cups	230 MTA	154
19	P T F E Components	40 MTA	100
20	PVC Free From Board	3000 MTA	1300

Source: http://www.gujaratindustry.gov.in/inv-ind.html

7.SURVEY QUESTIONNAIRE

Pre Feasibility for Gauge Conversion of Ankleshwar – Jhagadia NG Rail Section to BG

TRAFFIC SURVEY QUESTIONNAIRE

Nodal Agency – GIDB
Consultant – Feedback Ventures (P) Ltd, New Delhi

Name of Unit	
Address	
Phone	E mail ID
Location of head quarters	
Name & address of MD/CEO/Chairman	Phone E mail ID
Description of Industry	
Established	
Raw materials required	
Main finished products	
Production capacity (Tons/ Truckloads per day/annum)	
Name of nearest Railway Station	
Distance from nearest Railway Station	

Production achieved during last 5 years

Year	Commodity	Qty ('000 tons)
2001-02		
2002-03		
2003-04		
2004-05		
2005-06		

Receipts of raw materials during the last 5 years

Year	Commodity	Qty ('000 tons)	Major Origins	Mode (Road/Rail)	Transportation cost per unit
2001-02					
2002-03					
2003-04					
2004-05					
2005-06					
2001-02					
2002-03					
2003-04					
2004-05					
2005-06					
2001-02					
2002-03					
2003-04					
2004-05					
2005-06					

Dispatch of finished products during the last 5 years

Year	Commodity	Qty ('000 tons)	Major Destinations	Mode (Road/Rail)	Transportation cost per unit
2001-02					
2002-03					
2003-04					
2004-05					
2005-06					
2001-02					
2002-03					
2003-04					
2004-05					
2005-06					
2001-02					
2002-03					
2003-04					
2004-05					
2005-06					

Future forecasts for raw material requirement and finished product production

Year	Commodity (RM/ FP)	Qty ('000 tons)	Major Origins/ Destinations	Mode (Road/Rail)
2006-07				
2007-08				
2008-09				
2009-10				
2010-11				
2006-07				
2007-08				
2008-09				
2009-10				
2010-11				
2006-07				
2007-08				
2008-09				
2009-10				
2010-11				

Opinion of company regarding utilization of converted BG Line	
Preferred wagon type for Rail	
Containers Covered Wagons Tank wagons	
Preferred location of Rail service Ankleshwar Boridra Gumandev Jhagadia	
Would the factory require a private siding	
Power source of the unit GEB CPP	
Whether it is a water intensive industry (Yes/ No)	

If yes, do they expect to get adequate water supply in Jhagadia if they wish to set up a unit here.	
Does the unit get its raw materials from a nearby port e.g. Dahej	
Dos the unit presently or in the future plans to transport its raw materials through pipeline from their sources.	
Any other suggestion/ remarks	
Name of contact person	
Designation	
Contact no	

8.STUDY TEAM

Technical and Managerial Staff

SI No	Name	Position	Task
1.	Akhileshwar Sahay, ex IRAS and Masters in Management, Asian Institute of Management Manila	Project Director, Railway Infrastructure Development Expert and Financial Analyst	Overall Delivery of Assignment and Guidance to the Team
2.	H.S Duggal, ex IRTS	Railway Traffic Expert	Estimates of the railways and traffic flow/volumes.
3.	Surendra Kumar, ex IRSTE	Railway Signal and Telecomm Engineer	Technical assessment and analysis.
4.	Sudheendra Bajpai, Transport Planner	Financial Analyst and Traffic Analyst	Technical review of the project feasibility, O&M arrangements and analysis of overall traffic, financial analysis.
5.	S.K Singh	Social Expert	Social assessment of the project

Support Staff

SI No	Name	Position	Task
1.	Vivek Jha	Engineer and Financial Analyst	Assistance in developing the Financial Model, analysis and interpretation of traffic survey
2.	A B Solanki	Engineer	Analysis and interpretation of topography survey
3.	B S Sharma	Traffic Analyst	Collection of traffic data and analysis

9. NEWS PAPER ARTICLE ON SEZ FOR CERAMIC INDUSTRIES

10. CONTACT DETAILS OF INDUSTRIES SURVEYED

11. OTHER RELEVANT ARTICLES

12. COMMUNICATION FROM GIDC

13. INDIAN RAILWAYS POLICY ON SIDINGS TO INDIVIDUAL ESTABLISHMENTS

Freight Marketing Circular No. 10 of 2006
Government of India, Ministry of Railways, Railway Board
No: 99C/TC (FM)/26/1 dated 13.03.2006
Ref: Board's letter No. 99C/TC (FM)/26/1 dated 31.03.2005

Revised Liberalized Siding Policy is as under:

1. The capital cost of all traffic facility works such as 'Y' connect ion, yard remodeling, additional lines at t he serving station, crossing stat ions, patch doubling of the section etc. shall be fully borne by t he railway.

2. Regarding expenditure t o be incurred on account of construct ion of the new siding, the private entrepreneur shall get detailed estimate of his siding vetted by the division concerned. The detailed estimate will include a break up of his share as also railway's share of the total expenditure. The detailed estimate of railway's share will be according to the standardized cost of super structure per km of track as issued by Civil Engineering department. Separate cost will be laid down f or steel girder s and PSC girders in case of bridges.

3. No super vision, inspect ion or establishment charges will be payable by t he siding owner for the above work, since in that case the expenditure incurred f or these aspects would have t o be paid back t o him by railways.

4. The detailed estimate will be approved by t he DRM keeping the GM duly informed. Thereafter, t he private entrepreneur will under take construct ion of the siding entirely at his cost.

5. After completion of the siding, the actual expenditure incurred by the siding owner on behalf of railways will be verified by the division. This verification will be based on the certified audited account s of t he siding owner. Railways will bear the actual cost incurred on the construct ions if it is found to be less than the estimated cost otherwise the estimated cost will be borne by railways.

6. Meanwhile, division will analyze t he projected out ward traffic volumes estimated t o emanate annually from t he siding after commissioning. This analysis will be based on the traffic volumes projected by t he siding owner in his application for Rail Transport Clearance (RTC) clearance submitted t o Planning Directorate of Railway Boar d.

7. Based on t he project ed out war d traffic volumes, OD flows, and commodity wise freight charges per rake, division will work out t he approximate duration for which a freight discount of 10% is required t o be given.

8. The f r eight discounts will remain fixed at 10%.

9. The duration during which t his discount is t o be given will depend on t he time period of repayment of the expenditure incurred by t he siding owner on behalf of railways. However , such discount shall be admissible f or a maximum period of 10 year s only, irrespective of whet her t he investment made on behalf of railways are recovered or not. The duration of f r eight discount will be f or less than 10 year s in case t he expenditure incurred is recovered in less time.

10. The above f r eight discount is actually a repayment of investment made on behalf of railways, and is not really a f r eight rebate in t he strictest sense of t he term. As such this f r eight discount will be admissible in addition t o allot the rebates t hat t he siding owner may become eligible f or such as lean season policy, empty flow direct ion, increment al loading et c.

11. Once t he approximate duration of discount f or a new siding has been worked out and approved by t he division, t his discount will be admissible on out war d traffic booked from t he siding.

12. All out war d traffic loaded from t he siding will be 'paid' traffic.

13. For out war d traffic originating from new sidings t his discount will be given up front in freight charges at t he time of booking.

    a. The Goods Clerk will maintain a separate register containing details of all out ward traffic moved along with discount given, and the balance amount of repayment due to the siding owner. TIA and sectional CMI will conduct post checks regarding t his account keeping on a quarterly basis.

14. Discount will be automatically discontinued and normal f r eight charged once t he siding owner has been repaid t he entire amount spent, or 10 year s whichever is earlier.

15. Liberalized Siding Policy will be applicable for :

    a. New siding of a new plant being set up.

    b. New siding of an existing plant that was earlier getting their inward & out ward traffic dealt with at a near by railway goods shed. However, since the traffic being offered is not altogether new t he discount will be given only for incremental out ward traffic t hat is handled at t he new siding over and above what was earlier being dealt with at railway's goods shed during the previous year. The incremental traffic mentioned above will be calculated in terms of money value of freight paid during the previous year after indexing f or increase in freight charges, if any.

16. This discount will be given up front in f r eight charges at t he time of booking. The goods clerk will maintain details of all such out war d traffic along wit h discount given in a separate register as mentioned in Par a 13 above.

17. Liberalized Siding Policy will be applicable t o all sidings which are commissioned after 1.4.2005. This should apply t o both categories falling under 15 (a) and (b) above.

18. Siding owner will provide all facilities f or provision of FOI S terminal in t he siding. Apart from t he above aspect of sharing of cost f or such sidings, all other rules pertaining t o private sidings will apply with respect to maintenance charges, engine hire charges, demurrage rules etc.

19. Division will sign an Agreement wit h t he siding owners stipulating details of removable super structure whose expenditure has been charged t o railway and which railways will remove and take away in case of closure of siding for any reason what so ever .

20. The Agreement will also stipulate commodity-wise projected level of out war d traffic, duration of freight discount etc. The format of the Agreement will be circulated by Railway Board.

Source:http://www.indianrailways.gov.in/railway/deptts/commercial/freight-marketing-2k6/fm_10.pdf