

CHAPTER - 5 ANALYSIS OF ALTERNATIVES

This chapter presents a comparative analysis of various alternatives considered to avoid or minimise impacts that would be inevitable if technically (based on design speed and geometrics) best-fit alignment is followed. Cross-sections adopted for the upgradation component as presented in Chapter -1 are flexible in design to avoid most of the impacts within RoW. An analysis of various alternatives is attempted to arrive at the technically and environmentally best-fit alternative.

There are large settlements as seen in the baseline environmental scenario along the corridors, where there is constricted RoW and traffic is higher leading to congestion, delay as well as various environmental impacts. Such locations are identified for bypassing the through traffic. Several alternatives are analyzed for avoiding localized environmental impacts & arriving at the best-fit alignment. Screening procedure for road links & alignments are presented in the following sections.

5.1 SCREENING OF STUDY ROADS

At feasibility stage of the project, 24 corridors (**Figure. 5.1**) were screened for their environmental and social impacts using screening methodology involving the following steps:

- i. Determining evaluation criteria for screening
- ii. Weighting the evaluation criteria
- iii. Evolving evaluation matrix by screening all corridors for the identified criteria and
- iv. Ranking corridors in descending order of sensitivity

The evaluation criteria considered are under three sensitive issues as construction issues, social issues and ecological issues. The scoring system for the screening is given in **Table 5.1**.

Table 5.1: Scoring Systems for Road Links Screening

Item	Score				
	0	1	2	3	4
Construction issues (10 points)					
Level of construction	Simple overlay	Minor re-alignments	Major works		
Amount of re-alignment	Negligible	Minor	Major		
Height of embankment	0-5 m	0.5 m to 1.5 m	> 1.5 m		
Embankment widening necessary	No widening	Moderate widening	Substantial widening		
New bridges or bypasses	Less than 1 new bridge per 10 km	1 to 2 new bridges per 10 km	Bypass or more than 2 new bridges per 10 km		
Social issues (10 points)					
Resettlement or land acquisition— numbers of dwellings and businesses affected	0	0 - 50	50 - 100	100 - 200	>200
Noise and air pollution—size of urban centre	> 60,000	60,000 - 200,000	> 200,000		
Religious sites	0	Small sites	Major site		
Heritage sites	0	Minor site	Major site		
Ecological issues (10 points)					
Impact on drainage	Negligible	Minor	Significant		
Erosion	Negligible	Minor	Significant		
Protected flora	Negligible	Minor	Significant		
Avenues of trees	Negligible	Minor	Significant		
Protected fauna	Negligible	Minor	Significant		

Source: Feasibility Report Revision 2, 1998.

Screening of corridors indicates majority of corridors in TNRSP01 (N&S) needs a detailed environmental assessment. However, impacts would not be severe in magnitude to the extent of warranting analysis for alternative alignments. Scores obtained in screening the corridors as part of feasibility study are indicated in **Table 5.2** below.

Table 5.2 Scores Obtained on Screening the Corridors

	Corridor/Section	Length (km)	Score				Sensitive areas
			Construction	Social	Ecological	Total	
1	Cuddalore to Tarangambadi	104	8-10	4-7	5-6	18-22	Dense urban
	Karaikal-Devipattinam	213	6-10	0-7	4-8	12-21	CRZ-1
	Kilakkari-Tuticorin	95	8	2-3	8-9	18-20	Gulf of Mannar, CRZ-1
3	Arcot-Polur	53	6-7	4-6	5-7	17-18	Dense urban, Reserved Forest
	Chengam-Gingee	70	6-8	3-4	6-7	16-18	Reserved Forest
	Tiruvannamalai-Ulundurpettai	75	5-9	4-6	7	18-20	Reserved Forest, dense urban
	Tirukkovilur-Sankarapuram	38	8	6	5	19	Dense urban, Reserved Forest
4	Vridhachalam-Kumbakonam	113	8-9	4-5	7	10-21	Reserved Forest
6	Harur-Polur	106	7-8	0-5	5-7	13-18	Reserved Forest
7	Attur-Veppur	59	7	4	8	19	Reserved Forest
8	Namakkal-Perambalur	86	8	4-6	6-7	18-21	Reserved Forest
9	Ariyalur-Lalgudi	43	10	6	5	21	
10	Srirangam-Thiruvaivaru	87	6-10	6-7	6	18-20	
11	Viralimalai-Arantangi	75	9	3-6	5	17-20	Reserved Forest
14	Pottalpur-Tirunelveli	37	10	7	7	24	
15	Rayakottai-Hosur	35	7	0	6	13	Reserved Forest
19	Mettupalayam-Udagamandalam	47	7	5	9	21	Reserved Forest
20	Srirangam-Malliyakarai	87	7-9	6-7	4-5	18-20	Reserved Forest
22	Karaikuddi-Melur	84	5-10	0-10	3-7	9-20	Reserved Forest
23	Tuticorin-Tiruchendur	37	8	5	6	19	CRZ-1, Gulf of Mannar
	Ovari Parivamattam-Vijayapatti	19	8	0	4	12	CRZ-1
	Udankudi-Ovari Parivamattam	22	8	2	5	15	CRZ-1
24	Gudiyattam-border	8	5	5	7	17	Reserved Forest

Source: Feasibility Report Revision 2, PCC, 1998.

The evaluation matrix concluded that four corridors Nos. 1 (Cuddalore to Tuticorin), 2 (Arcot – Marakkanam), 14 (Kulattur – Palayankottai – Tenkasi) and 23 (Tuticorin – Anjugramam) (**Figure. 5.1**) require detailed environmental assessments with focus on fauna, flora, coastal resources and public sites. Remaining corridors would require limited environmental and social assessment. The outputs of screening study were seen in conjunction with economic feasibility to derive the feasible corridors for detailed design. Final corridors selected for detailed design out of the above four corridors is part of Corridor 1 starting from Nagapattinam upto Tuticorin. However environmental assessments are carried out for TNRSP01 (N&S) due to their proximity to rescue forests.

Figure. 5.1 Corridors subject to screening

5.1.1 WITH OR WITHOUT PROJECT SCENARIO

The 'with' and 'without' project scenarios are analysed with respect to the development of the state by the backdrop of requirement of reliable quality infrastructure for sustained growth economy and consequent well-being of its citizens.

Providing better connectivity will ensure that goods and people from areas covered by the road can move in and out of the areas quicker and save time. Increased trade and commerce activity are expected. Accounting just for the savings in the Vehicle Operating Costs makes the project viable. The packages TNRSRSP 02, 03 and 04 have been designed to connect the important ports such as Cuddalore, Nagapattinam, and Tuticorin. It provides greater impetus to trade through minor ports in the coastal region. It has a very good tourism potential due to famous religious and tourist places like Velankkani, Nagur, Sikkal, Ettukkudi, Manora and several religious spots in Thanjavur delta. The industrial activity will be getting a good boost due to this road to ONGC and IOC facilities in Nagapattinam and Karaikkal belt. The industrial activity will give rise to employment potential for people in and around the region. However, there would be an increase in the vehicular pollution-air and noise, in the vicinity of the road. Some agricultural land will have to be diverted for road use to construct bypasses at 13 locations. In other settlements, some people will lose their properties close to the road to accommodate the proposed widening.

If the project is not implemented, there is every likelihood that the project roads will deteriorate further. Only certain roads may be maintained regularly. There is every likelihood of deterioration of the existing pavements. In the absence of the project, the highway department will also find it extremely difficult to generate funds for such a massive improvement of the road infrastructure from its own resources. Increased air pollution, due to slow moving traffic and congestion, will follow. Noise levels will rise due to deterioration of the pavement as well as increased honking. Without the bypasses, the traffic would continue passing through the settlements and continue to pose a safety risk for the residents in these already congested towns.

Therefore, the "with" project scenario, with its minor adverse impacts is more acceptable than the "without" project scenario which would mean an aggravation of the existing problems. Potential benefits of the proposed road improvements are substantial and far-reaching both in terms of the geographical spread and time. Hence, it is clear that the implementation of the project will be a definite advantage to Tamil Nadu in order to achieve all-round development of its economy and progress for its people.

5.1.2 ROUTE ALTERNATIVES FOR EASTERN CORRIDOR

Objective of selection of eastern corridor is to provide connectivity to the coastal villages as they are deprived of the quality road infrastructure. Consequently, the region is backward and affected by calamities, which warrants improved connectivity to aid in speedier evacuation. Incidentally the corridor provides connectivity to southern portions of Tamil Nadu as well. Alternatives for improving connectivity to southern portions of Tamil Nadu are evaluated and alternative for providing connectivity to coastal villages is evaluated subsequently.

5.1.2.1 *Route alternatives for improving connectivity to Southern Portions of Tamil Nadu*

Three alternative routes are evaluated for improving connectivity to the southern portions of Tamil Nadu. The three alternative corridors are shown in **Figure 5.2**. Description of the alternatives is given below.

Corridor – 1

This corridor is 458 km from Cuddalore to Tuticorin via Kattumavadi and Ramanathapuram. The entire length is within 25km of the coast, with 378km less than 10km from the coast. The road passes through the districts of Cuddalore, Nagappattinam, Thiruvavur, Thanjavur, Pudukkottai, Ramanathapuram and Tuticorin. Northern portion of the corridor beyond Cuddalore is connected to Chennai by the ECR and NH45-A.

Corridor – 4

Corridor-4 connects Ulundurpettai on NH-45 with Ramanathapuram on NH-49. The corridor runs parallel to Corridor-1, at an approximate distance varying between 5.0 km at the closest point to a maximum of 50.0 km at the farthest point. The corridor passes nearer to tourist attraction sites of Kumbakonam, Gangaikondacholapuram, Avadaiyarkovil, Karaikkudi and Ramanathapuram.

Corridor – 13

Corridor-13 connects Madurai on NH-45 with NH-7 at Tiruchchirapalli. The stretch between Madurai and Tiruchchirapalli is 42 km shorter than the route along NH-45. It is likely to carry the most long distance traffic because of its national highway links, direct route and towns that it serves. Between Madurai and Tiruchchirapalli, Corridor-13 is a two-lane road carrying high proportion of heavy vehicles.

All the three corridors are evaluated and compared for their feasibility considering factors as traffic, planning, engineering and environment. Comparison of alternatives considering environmental indicators is presented in the **Table 5.3**.

National Highways Authority of India is developing the Corridor 13 from Chennai upto Madurai to four-lane configuration, and remaining part of the corridor is developed to national highway standards. It is four laned upto km. 67/0 and work is in progress for the section from 67/0 – 123/0. This corridor can serve major urban centers and backward blocks indicated in the alternatives above. Corridor 1 serves more number of backward blocks than Corridor 4 and also the tourism potential is high for this corridor. Moreover, Corridor 1 links district head quarters of Nagapattinam, Tiruvavur, Ramanathapuram and Tuticorin as well as fishing villages like Muthupet, Manora, Mimisal, Tondi, Devipattinam, Kilakkarai and Vembar, which can aid their economic development.

Figure. 5.2 Three Alternative Corridors for Connecting Southern Portions of Tamil Nadu

Table 5.3 Comparison of Alternatives for Connecting Southern Portions of Tamil Nadu

Indicators	Alternative I (Corridor 1)	Alternative II (Corridor 4)	Alternative III (Corridor 13)
Distance (km), Chennai – Tuticorin	568	575	545
Natural Environment			
Reserved forests	None	None	None
CRZ-I	Passes through CRZ-I at two streams	None	None
Induced Development	Risk of Induced development exists	Exists in certain patches close to the coast	Not Sensitive
Impact on Roadside Trees	30 trees/km	NA	42 trees/km
Tourism Potential	Has good potential	Highest Potential	Lower than Corridor 1
Social Environment			
Resettlement	20 persons/km	14 persons/km	4 persons/km
Land Acquisition	0.36 ha/km	0.19 ha/km	0
No. of Backward Blocks served	45	29	59
Urban centers Served	1039 people/km	1078 people/km	4108 people/km

5.1.2.2 *Route alternatives for improving connectivity to coastal villages along east coast*

The eastern corridor (Nagapattinam – Tuticorin) is envisaged to provide connectivity to backward coastal villages. An alternate connectivity to these coastal villages, which is thought to be environmentally benign, is suggested by NGOs. The alternative (referred henceforth as inland alternative) suggested involves two parts as: a) provision of an inland route parallel to the coast and b) improving the existing connecting roads to the individual villages from the inland route. The inland route option suggested is an existing road connecting NH-45 nearer to Villupuram and joining the NH-45B near Kurukkuchalai. A reconnaissance survey of the inland route was carried out. A windshield survey, interactions with stakeholders, communities and truck operators were conducted for assessing its viability as an alternate corridor. Observations based on the reconnaissance survey are as follows:

- v The corridor runs inland and parallel to the coast at an aerial distance of 30-50km upto Paramakkudi (end of corridor 4). It crosses the NH-49 just above Paramakkudi, touches Mudukulattur and from here it deviates to the west to Kamudi. Since there is no direct route to Tuticorin from here it has to join the NH-45 B, by moving south-east before joining, greatly increasing the distance. Distance from Mudukulattur upto Tuticorin is found to be 103km via inland route whereas the distance from Uttarakosamangai (located parallel to Mudukulattur on the coast) is found to be 90 km. Therefore; the inland route will be lengthier than Corridor 1.
- v A major portion of the route suggested is already in a good condition with 5.5 m wide carriageway. Also, 50.75 km is being included in the TNRSP01 as upgradation corridor.
- v The road passes predominantly through fertile agricultural tracts, and is continuously inhabited upto Karaikkudi. Any improvements to the highway would involve significant resettlement impacts. Also, significant felling of roadside trees will be required, much higher than the eastern corridor.

Observations on improvement of connecting routes from the inland route (part b of the inland alternative) are as follows.

The objective of the project, to provide connectivity to the coastal communities will be lost as there are not many roads connecting the inland road to the coastal villages. The connecting roads are presented in the **Table 5.4**. As can be seen in the **Table 5.4**, if the above option is to be adopted,

about 589km of connecting roads have to be improved. This involves enormous cost expenditure for developing both the 238km inland route and 589 km connecting roads to coastal villages. Still another 103km has to be traversed to reach Tuticorin from Mudukulattur. The existing connecting roads are providing access to 14 villages out of 140 villages in the east coast. In order to fulfill the project objective all these villages are to be provided better connectivity to the inland route. A Cost comparison for both the route options is carried out. The costing does not include length of connecting roads other than the 589 km. It is necessary to maintain the existing eastern corridor atleast to a motorable standard. Hence this cost is included along with the upgradation of the existing intermediate lane configuration of inland corridor to present design standard. Since the cost of environmental and resettlement cannot be judged accurately, the EMP and RAP components are deleted from consideration in both the alternatives. Cost comparison of both the alternatives is presented in **Table 5.5**. It is evident that the cost of inland alternative is higher than the upgradation of eastern corridor by INR. 745.6 million.

Table 5.4: Roads Connecting Inland Route with Corridor 1

Distance from Nidamangalam (km)	Start of Connecting Road on Inland Route	End of Connecting Road on Corridor 1	Length of Connecting Road	Distance Between Intersections
0	Nidamangalam	Nagappattinam	53 KM	14
13	Mannargudi	7KM south of Tiruppundi	38 KM	13
13	Mannargudi	Thiruthuraiipundi	27 KM	0
13	Mannargudi	Muthupet	37 KM	0
33	Modakkur	Adiramapatnam	14 KM	20
47	Pattukkottai	Rejanandam	15 KM	14
72	25 km South Pattukkottai, between Pattukkottai & Aranthangi	Sethubava Chattram (near Manora)	16 KM	25
95	Aranthangi	Kattumavadi	27 KM	23
95	Aranthangi	Mimisal	32 Km	0
104	9 km south of Aranthangi between Aranthangi and Sakdottai	Near Tirupunavasal	39 KM	9
129	Karaikkudi	3 km north of Vattanam	47 KM	25
129	Karaikkudi	Tondi	50 KM	0
163	Kalaiyarkovil	Tondi	47 KM	34
191	Iyayankudi	Ramanathapuram	49 KM	28
198	Paramakkudi	Ramanathapuram	44 KM	7
210	South of Paramakkudi	Ramanathapuram Road goes straight Project road at meet the 7 km North of Sayalkudi	38 KM	12
238	Mudukulattur	Sayalkudi	16 KM	28
Total Length of Access roads to be developed for giving connectivity to coastal villages			589 km	19.8*
* Average distance between connecting roads on the inland alternative Beyond Mudukulattur, inland route takes detours inland, increasing the distance to Tuticorin, hence not considered for analysis. Another 103 km is to be traversed to reach Tuticorin (Refer fig. 5.2).				

OD survey conducted by the PCC for determining feasible corridor indicates greater usage of the eastern corridor by the local traffic than through traffic. Consultation with the truck owners all along the inland route indicated that there would be no major preference to use coastal road even after improvements for trucks plying between Chennai and Tuticorin due to the availability of a shorter NH-45/45B trunk route connecting the two ports.

Though Corridor - 1 is close to the coast, impact on the coastal ecology would not be severe enough to opt for no project alternative. Risk of secondary impacts due to induced development - especially on the ground water salinity exists along the Corridor - 1 but is not totally absent along the inland alternative. Risk of salinity intrusion exists along the inland alternative as well, since heavy ground water withdrawal within 30-40 km from the coastline also tend to have significant influence on salinity intrusion.

For clear reasons of the policy of improving direct connectivity, priority and in light of above discussed advantages, it is considered to improve Corridor 1 instead of inland alternative.

Table 5.5 Cost Comparisons of Route Options for Eastern Corridor

Sl. No.	Item	Unit Cost INR/km	Length, km	Amount, Million INR
Cost of Inland Alternative				
1	Cost of Maintaining 589km of connecting roads from inland corridor to eastern corridor	2000000	589	1,178.0
2	Cost of improving 341 km of Inland route to reach Tuticorin	9600000	341	3,273.6
3	Cost of maintaining the eastern corridor	2000000	337	674.0
	Total Cost of Inland Alternative (Excluding EMP and RAP Costs)			5,125.6
Cost of Eastern Corridor Upgradation				
4	Cost of upgrading eastern corridor, TNRSPO2, 03 and 04(Excluding EMP and RAP costs)			4,390.0
	Difference in Costs, Million INR.			745.6

5.1.3 REALIGNMENT ALTERNATIVES

Apart from engineering considerations of improving the curves along corridor to IRC specifications, specific options of realignments that can improve the corridor's environmental performance, especially along the eastern corridor (TNRSPO2, 03 and 04) are evaluated. Realignment alternatives evaluated at such locations are discussed below.

5.1.3.1 *Redignment Alternative at Vedaranniyam, TNRSPO2*

Vedaranniyam is a ecologically sensitive area where tidal influence of sea extends upto 17km from the coast. The corridor if taken via Vedaranniyam would pass within CRZ and near Muthupet RF. Moreover, the roads already serve this area from Tiruppundi, Tirutturaipondi and Muthupet. A railhead also connects Vedaranniyam with Tirutturaipondi, specially laid for transporting salt manufactured in Vedaranniyam. There is a cost reduction if the corridor is taken via Kilayur and Veppanseri by about INR 17.8 crores. Both the above alternatives are shown in **Figure 5.3**. Considering the advantages involved in latter alternative, it has been selected for the final alignment.

5.1.3.2 *Redignment Alternative at Kilaiyur, TNRSPO2*

The alignment diverted from Vedaranniyam, passes through Kilaiyur, Idaiyur, Tirutturaipundi, Veppanseri and Muthupet. Two alternatives are envisaged at Kilaiyur. One alternative is widening along the existing corridor and another is laying a new alignment on the eastern side of the existing alignment. Both the alternatives are compared for the environmental, engineering and economic indicators as presented in the **Table 5.6**.

Table 5.6: Comparison of Alternatives at Kilayur

Criteria	New Alignment	Existing Alignment
Length (km)	7.5	8.3
Length of 30 m right-of-way	7.5	6.4
Length of 10 m right-of-way	-	1.3
Cost (Rs lakhs)	1122	1272
Land acquisition (ha)	22.5	4.6
Involuntary resettlement (h'holds)	22	152
Trees affected (no.)	75	932

Though the new alignment has its advantages in terms of minimum impact on trees and minimum resettlement, the alignment does not serve the local population. On consultation with local people it was finalized to upgrade the existing alignment.

5.1.3.3 *Redignment Alternative at Idaiyur, TNRSPO2*

The corridor between Mayiladuthurai – Muthupet road passes through Idaiyur and has a RoW varying between 8m – 10m for a stretch of 200m. Additionally, the road passes close to Udayamarthandapuram Bird Sanctuary (about 500m). Road through the settlement is also bad in geometrics. Alternative suggested is on the eastern side of the existing road, it is a direct and shorter alignment. Comparison of alternatives is presented in **Table 5.7**.

Table 5.7: Comparison of Alternatives at Idaiyur

Criteria	New Alignment	Existing Alignment
Length (km)	8.8	10.4
Length of 30 m right-of-way (km)	-	-
Length of 10 m right-of-way (km)	3.1	10.4
Cost (Rs lakhs)	1628	1778
Land acquisition (ha)	22.5	6.3
Involuntary resettlement (h'holds)	22	130
Trees affected (no.)	36	404

Though the new alignment has cost benefits, local people will be deprived of the facility. Though the existing alignment passes close to the Bird sanctuary, discussions with the local forest officials and wild life warden of Gulf of Mannar confirm that there will be no impacts on the migratory birds due to road and increased traffic. Hence, widening of existing alignment upto 9m is taken up.

5.1.3.4 *Redignment alternatives at Atirampattinam & Rajamatam, TNRSPO2*

Atirampattinam and Rajamatam are small fishing villages, which used to rear pearls earlier now are major fishing grounds of the district. Project corridor passing through Atirampattinam. Though alignment is straight, it has a very narrow width. Section of the road passing through Rajamatam also has narrow width and numerous bends. Three alternatives are considered for both the settlements. The alternatives consist of deviations at the settlement location, passing along the existing alignment and laying a new alignment from Vadakadu-Pattukottai road starting from Palakulakottai and joining the project road after Rajamatam. These alternatives are compared as presented in the **Table 5.8**. The alternatives are shown in **Figure 5.4**.

Fig. 5.3 Alternatives at Vedaranniyam

Fig. 5.4 Alternative alignments at Adirampattinam & Rajamadam

Table 5.8: Comparison of Route Alternatives: Adirampattinam & Rajamatam

Criteria	New Alignment (I)	Deviations	Existing Alignment
Length (km)	13.3	15.4	16.1
Length of 30 m right-of-way (km)	13.3	10.8	16.1
Length of 10 m right-of-way (km)	-	-	-
Cost (Rs crores)	18.6	23.4	20.1
Land acquisition (ha)	39.9	27.8	13.2
Involuntary resettlement (h'holds)	40	80	156
Trees affected (no.)	600(2)	150	372

Consultations with the local community are held for arriving at a consensus on the alternatives. Further to the consultations it is proposed to improve the corridor along existing alignment.

5.1.3.5 *Redignment Alternatives at Tondi and Nambutulai (Ramanathapuram District), TNRSPO3*
The project corridor passes through Tondi and Nambutulai at km. 0.000 and km. 1.400 respectively. Available clear RoW varies from 12 m to 16 m. Two alternatives have been worked out. Alternative one is a realignment section to the west of the existing alignment and alternative two is widening along the existing alignment. The analysis on the two alternatives is presented in **Table 5.9**.

Table 5.9: Comparison of Alternatives at Tondi and Nambutulai

Criteria	New Alignment	Existing Alignment
Length (km)	3.9	4.2
Length of 30 m right-of-way (km)	3.9	2.6
Length of 10 m right-of-way (km)	-	1.6
Cost (Rs lakhs)	66.3	63.0
Land acquisition (ha)	11.7	2.8
Involuntary resettlement (h'holds)	12	107
Trees affected (no.)	30	99

The two alternatives are indicated in **Fig. 5.5**. On comparison alternative one is found to have more advantages. But community prefers widening along the existing alignment. Hence alternative two is proposed for improvement.

5.1.3.6 *Alternatives at Daipattinam TNRSPO3*
Existing corridor passing through Devipattinam (a former port town and pilgrimage center) is having a narrow width varying from 8 m to 12 m. Geometrics are also poor leading causing safety hazards. Two alternatives at this location are evaluated. Alternative one is realigning the road on western side of the existing alignment and alternative two is widening along the existing alignment. Length of the realignment section will be about 2km linking Devipattinam – Tiruppalakkudi road to the Devakottai – Devipattinam road, bypassing the town (**Fig. 5.6**).

Table 5.10: Comparison of alternatives at Devipattinam

Criteria	New Alignment	Existing Alignment
Length (km)	2.7	2.5
Length of 30 m right-of-way (km)	2.7	2.5
Length of 10 m right-of-way (km)	-	-
Cost (Rs lakhs)	32.3	36.1
Land acquisition (ha)	4.5	1.7
Involuntary resettlement (h'holds)	5	15
Trees affected (no.)	27	52

Local consultations, revealed a strong desire for improving the existing alignment against the provision of new alignment. Hence, improvement of the existing alignment is proposed as part of the project.

Fig. 5.5 Alignment alternatives at Tondi

Fig. 5.6 **Alignment alternatives at Devipattinam**

5.1.3.7 *Alignment alternatives at Vembar, TNRSPO4*

Vembar is a small coastal village (1991 population 1,665) in Tuticorin district, just inside the border of Ramanathapuram district, and the junction of the Vilathikulam—Vembar and Vembar—Sayalgudi roads (**Fig. 5.7**). At Surangudi the Tharalkudi—Surangudi road leads to Tuticorin. An ODR between Surangudi and Sayalgudi is an alternative route for Corridor 1 to the route via Vembar.

Traffic considerations

The direct route between Surangudi and Sayalgudi is 2.2 km shorter. The route via Vembar is in better condition and carries more traffic. If the Project selects the direct route, about 50 per cent more traffic will use the route because of the distance saving.

This would mean that the majority of traffic on the road would be medium distance traffic rather than local traffic.

Planning considerations

With the direct route, Vembar will be 5.5 km from the main road. It is likely that some of the buses currently serving Vembar will bypass the village, especially if the bridge at Vembar is not improved. Gradually, towns and villages on the main road, especially Sayalgudi (1991 population 10,182) and Surangudi (1991 population 2,085) will grow faster than Vembar. For tourists, the Vembar route is more attractive, offering more trees, attractive landscape, glimpses of water, and old buildings at Vembar.

Engineering considerations

The direct route is substantially cheaper than the route via Vembar (Rs 1844 lakhs compared with Rs 2395 lakhs). The cost savings mainly derive from the shorter distance and lower bridge costs. The Feasibility Study Report calculated the EIRR for upgrading the Sayalgudi—Vembar road to 2 LMR standard at 11.5 per cent, and the Vembar—Kulattur section at 4.2 per cent.

Environmental considerations

Vembar lies on the Gulf of Mannar. The coast is here low, sandy and covered with palm trees. The Vembar route passes through the CRZ but not through CRZ-I. The beach at Vembar provides excellent structural support for nesting of turtles. However, corridor is at a distance of 0.5 km to 1.0 km from the coast and no turtle habitat is reported along the corridor. Hence no impacts are anticipated.

Fig. 5.7 Alternative alignments at Vembar & Sayalkudi

Table 5.11: Comparison of options at Vembar & Sayalkudi

Criteria	Direct route	Via Vembar
Length (km)	16.5	19.3
Length of 30 m right-of-way	16.5	19.3
Length of 10 m right-of-way	-	-
Cost (Rs lakhs)	1844	2395
Land acquisition (ha)	15.3	15.6
Involuntary resettlement (h'holds)	16	194
Trees affected (no.)	90	110

The direct route is much preferable by virtue of greater economic benefits and lesser environmental impact. However, the Vembar community has argued strongly that the road should pass through Vembar. Key issues for the community are the bus services and the replacement of the causeway by a bridge. Accordingly, GoTN propose to adopt the Vembar route rather than the direct route.

5.1.3.8 *Alignment alternatives at Tuticorin, TNRSPO4*

Tuticorin is one of the closest Indian ports to the global container shipping routes. Container traffic started in 1979 and has grown rapidly. Throughput has risen from 88,767 twenty-foot equivalent units (TEUs) in 1996/97 to 102,464 TEUs in 1997/98.

Traffic considerations

Four major roads serve Tuticorin. In decreasing order of importance to the port, the roads are:

- v from the south-west, NH7A coming from Tirunelveli and NH7;
- v from the north-west, the Tuticorin(Madurai Road, an MDR;
- v from the south, the Tuticorin(Tiruchendur Road, an MDR;
- v from the north-east, the Tuticorin(Tharavaikulam Road (Corridor 1), an MDR (but beyond the Tharavaikulam(Surangudi road is an ODR).

Being a port and center for the basic chemical industry and power generation, there are large volumes of heavy traffic. The port facilities are on the south side of the city. A bypass provides good access from the port to NH-7A and the Tuticorin (Madurai road. These two roads are the most important links to the port.

Planning considerations

The Tuticorin (Tharavaikulam route has no particular merit from an economic development perspective. The local salt and aquaculture industries would benefit from the project, but their traffic would be insufficient to sustain an upgrading to the existing road.

Engineering considerations

Upgrading the Kulattur (Tuticorin road to 2LMR standard is expensive (Rs 1778 lakhs) because most of the road of ODR or PUR classification and single carriageway. The Feasibility Study Report data indicated an EIRR for this section of 12.2 per cent.

Environmental considerations

Two bridge locations along the Kulattur—Tuticorin road passes through CRZ-I. There is no mangrove species observed immediate vicinity of the bridge. Species like *Prosopis* and *Acacia* are observed at a distance of more than 50m.

Evaluation

The alternative to the Kulattur- Tuticorin alignment is the Kulattur-Kurukuchalai sector on the Madurai road. While this route would have lesser potential environmental impacts since it is away from the coast, and also has greater economic benefits in view of the large volume of traffic, its most serious drawback is the fact that the small coastal communities between Kulattur and Tuticorin would be deprived of an upgraded road and consequently suffer economic and other hardships. Consistent with the project objective of providing connectivity to local communities, it is decided to upgrade the alignment Kulattur-Pannaiyur, Tharavaikulam, Surangudi and Tuticorin.

5.2 ANALYSIS OF CROSS SECTION ALTERNATIVES

Cross sections considered for the project include Two Lane Sealed Shoulders (2LSS), Two Lane Gravel Shoulders (2LGS), Two Lane Rural Realignment (2LRR) and Two Lane Minimum Realignment (2LMR). Sections that are already two lanes shall be maintained under Enhanced Periodic Maintenance (EPM). A detailed description of the sections discussed above is given under Project description, Chapter - 1. The cross sections are sub-categorised into Rural, Village and Urban sections to suit the landuse and minimize resettlement and number of structures affected.

5.3 ANALYSIS OF BYPASS ALTERNATIVES

The proposed project includes bypasses at nine towns, in TNRSP – 01 namely Arani, Polur, Tiruvannamalai, Tirukkovilur, Vriddhachalam, Ariyalur, Tiruvarur, Chidambaram, and Sirkhazi and three town i.e. Nagapattinam, Tirutturaippundi and Muthupet in TNRSP-02. The selection of the alignment for each bypass followed reconnaissance and field survey investigations, consideration of alternatives and consultation with the local communities. The design standards for these bypasses will generally be the typical cross section for rural roads, which is a 7m pavement width two 1.5 m paved shoulders and two 1m-gravel shoulders, while some sections will have 2.5 m gravel shoulders. The details of analysis of bypass is given below:

5.3.1 ARANI, TNRSPO(N)

Arani is an important town on the southern side of the Kamandalanaga Nadhi in Tiruvannamalai district. It has a population of 54,898 (1991 census). The main features of congestion are due to narrow right-of-way, parking, vending activities and encroachments. Other than that there are a number of rice mills in and around Arani, which generates large volumes of truck traffic. The following major road networks mainly serve the town:

- i. Arcot—Villupuram MDR

- ii. Arani—Kalambur MDR
- iii. Tiruvettipuram—Arani MDR
- iv. Arani—Vandavasi MDR
- v. Arani—Devikapuram MDR
- vi. Kannamangalam—Arani MDR

5.3.1.1 *Analysis of Alternatives*

Three alignments have been considered.

- v Eastern Route-along existing road alignment
- v Eastern Alternative – a new alignment
- v Western route

5.3.1.2 *Eastern Route- existing roads alignment*

The eastern alignment starts at km 30/4 where Tiruvettipuram—Arani MDR meets the Arcot—Villupuram SH and runs along the Tiruvettipuram—Arani MDR up to km 28/6 and then deviates towards Kamandalanaga Nadhi approach. The MDR is wide and can be improved to rural standard type design with 27m right-of-way. The 120m river bridge will be roughly 1700 m downstream of the existing bridge.

For 600 m Paiyur road has dwellings on both sides and an average right-of-way of only 18m, within which there is also a low-tension transmission line. This road meets Arani—Valapandal road at km 0/6 and for a length of 600m this portion of the route is built-up area. Further acquisition may be possible on the eastern side. The total length of the bypass would be 4.8 km, out of which the new formation will be 4 km.

5.3.1.3 *Eastern alternative- new alignment*

To provide a bypass with a minimum 30m right-of-way, a new alignment is more practicable than utilizing existing roads. A new alignment would follow the same route as the existing road alignment as far as the southern end of the Kamandalanaga Nadhi bridge. It would then cross paddy fields to Paiyur Eri and run along the embankment. It crosses open land and an ODR to reach the Arani—Vandavasi MDR. It will be necessary to demolish 15 buildings to reach the Arcot—Villupuram road and the bypass must necessarily pass through a residential area.

5.3.1.4 *Western route*

The western route starts at km 24/8 of Arcot—Villupuram SH, and cuts across to the intersection of the Tiruvettipuram—Arani road. The route would then cross Kamandalanaga Nadhi about 1200 m upstream of the bridge at km 26/6 of Arcot—Villupuram SH. After crossing the river the route continues in a southwesterly direction across open land to join the Arani—Kalambur (project) MDR.

A 45 m right-of-way is possible right through one Junction designs need to be made at km 24/2 of Arcot—Villupuram SH (T-junction), km 0/6 of Rathinamangalam road, km 16/2 of Kannamangalam—Arani MDR and km 2/4 of Arani—Kalambur MDR (**Fig. 5.9**). The depth of

flooding during the monsoon is about 0.3 to 0.5 m. Hence, the road embankment needs to be up to 1.5 m to top of subgrade. The gradient is flat.

5.3.1.5 Selection of Alignment

The Arcot – Arani – Kalambur route carries the most through traffic. This, together with the much lower cost and greater travel distance savings, make the western route the best in terms of transport economics. A comparative analysis of all the alternatives is given below. Western route is selected for the bypass.

Table 5.12: Comparison of all Alternatives of Arani Bypass

Criteria	Units	Western Route	Eastern Route-along existing alignment	Eastern Alternative - New alignment
General				
Start Point	Km	Km 24.8 of Arcot-Villupuram SH	2.4	Km 30.4 of Arcot-Villupuram SH
End Point	Km	Km 2.4 of Arani-Kalambur MDR		Junction of Arani-vandavasi MDR and Arcot-Villupuram SH
Length along existing road	Meters	200	800	1500
Length of new alignment	Meters	3700	4000	7500
Total Length	Km	5.3	4.8	9.0
RoW	Meters	27	Varying (18-30)	27
Environmental				
Principal Landuse	TYPE	Paddy and Sugarcane fields	Paddy fields	Paddy fields
Soil Type	Type	Silty clay and Sandy clay	Silty clay or Sandy clay	Silty clay or Sandy clay
Ponds Affected	Number	2	2	3
Trees Affected	Number	33	36	-
Tanks	Name	Ananthapuram	Chitter Eri	Tirumalaisamudram Eri
Rivers	Name	Kamandalanaga	Kamandalanaga	Kamandalanaga
Social				
Structures Affected	Number	0	20	15
Land Acquisition	Hac.	14.0	10.8	20
Land Cost	Rs. (Million)			
Engineering				
EIRR	%	19.8	< 0	-
Bridges	Number	1 (River)	1 (River)	1 (River)
Costs	Rs. (Lakhs)	1132	2045	2100
Intersections	Number	3	5	6
Utilities	Types	Alignment runs parallel to HT Line for major part	Alignment runs parallel to HT Line to a shorter length	Alignment runs parallel to LT Line for a distance of about 600m
Selected Alignment		1		

Comment: Same as previous

Comment: Same as previous

5.3.2 POLUR, TNRSPOI(N)

Polur is a taluka headquarters in Tiruvannamalai District, with a population of 23,046 (1991 census). The need for the bypass mainly relates to the high proportion of through traffic and the rail crossing on the Vellore – Villupuram line, which carries 10 trains a day. Major roads serving Polur are:

- Cuddalore – Chittoor SH
- Vandavasi – Polur MDR
- Polur – Pilasurpadagam ODR
- Polur – MDR
- Polur – Jannamarudur ODR

Fig. 5.8 Bypass Alternatives at Arani

5.3.2.1 *Analysis of Alternatives*

The following alignments have been considered.

- v Western route
- v Eastern Route

5.3.2.2 *Western Route*

The bypass cannot run on the western side of Polur because of greater route length and the presence of hills. There are, however, possible variations to the eastern bypass in terms of intersections and separation from, or crossings of, the high-tension transmission lines.

5.3.2.3 *Eastern Route*

The alignment starts at km 142/8 of Cuddalore – Chittoor SH and traverses the foreshore areas of Pappambadi and Venmani tanks and after that it crosses the Vandavasi – Polur MDR at km 53/4. The alignment then runs parallel to high-tension power lines on the western side across paddy and sugarcane fields.

The alignment crosses Polur – Pilasurpadagam ODR and then (by mean of an over-bridge) the Katpadi – Villupuram metre-gauge railway. Beyond the railway line, the alignment passes through fertile paddy and sugarcane fields on the north side of high-tension transmission lines before re-joining Cuddalore – Chittoor road at km 139/0. **Fig. 5.9** shows the alignment option of Polur bypass.

The total route is 3.5 km long, mostly across paddy and sugarcane fields and along the fringe of tank foreshores. A 45m of right-of-way is possible right through. The gradient is flat.

5.3.2.4 *Selection of Alignment*

Out of the two proposals the later one is considered in terms of economic criteria. In the initial section of the alignment between km 142/8 of Cuddalore – Chittoor SH and km 53/4 of Vandavasi—Polur MDR, mostly runs on the fringe of tank foreshore. The embankment needs to rise at a height of at least 2m, with cross-drainage structures. The following **Table 5.13** shows comparative analysis of the alternatives at Polur bypass. Community acceptance was also obtained on the selection of eastern route for the bypass.

Fig. 5.9 Bypass Alternatives at Polur

Table 5.13 Comparison of Alternatives of Polur Bypass

Criteria	Units	Eastern Route	Western Route
General			
Start Point	Km	Km 142.8 of Cuddalore-Chittoor SH	Km 142.8 of Cuddalore-Chittoor SH
End Point	Km	Km 139.0 of Cuddalore-Chittoor SH	Km 139.0 of Cuddalore-Chittoor SH
Total Length	Km	4.9	6.5
RoW	Meters	27	27
Environmental			
Principal Landuse	Type	Paddy and Sugarcane field	Paddy, Sugarcane field
Forests	Name	-	Kelur RF
Soil Type	Type	Silty clay and sandy clay	Silty clay and sandy clay
Hillocks	Name		Hillocks are present leading to increase in length
Tanks	Name	Foreshore areas of Pappanbadi & Venmani tank	One Tank
Social			
Structures Affected	Number		
Land Acquisition	Hac.	13.2	17.6
Land Cost	Rs. (Million)	13.2	17.6
Engineering			
EIRR	%	36	-
Bridges	Number	1 (Railway) at km 1.0 on Polur – Pilasurpadagam ODR	1 RoB
Costs	Rs. (Lakhs)	1180	1550
Intersections	Number	4	6
Utilities	Types	Three HT power lines running parallel to new alignment on eastern side between Vandavasi – Polur road and Polur – Pilasurpadagam road	
Selected Alignment			

Comment: Same as previous

Comment: Same as Eastern route

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5.3.3 TIRUVANNAMALAI, TN RSP01(N)

Tiruvannamalai (1991 population 109,196) is the headquarters of Tiruvannamalai district. Two main routes passing through the town are:

- i. Pondicherry – Krishnagiri NH
- ii. Cuddalore – Chittoor SH

Some other roads that serve the town:

- iii. Tiruvannamalai – Chetpet MDR;
- iv. Tiruvannamalai – Vettavalam MDR;
- v. Tiruvannamalai – Tandarampattu MDR;
- vi. Tiruvannamalai – Kanji MDR;
- vii. Tiruvannamalai – Manalurpettai ODR;

5.3.3.1 Analysis of Alternatives

Three alignments have been considered for Tiruvannamalai are

- v Southern Bypass
- v Eastern Bypass

v Integrated Eastern option

5.3.3.2 Southern Bypass

The town plan includes a southern bypass road for the Pondicherry – Krishnagiri NH. For northern and southern routes round Arunachala hill, each has their own characteristics (advantages and disadvantages). Arunachala, a holy large conical hill rises from the West Side of the town, and dominates it. The Arunachaleshwara temple here is one of the grandest temples in the south with a 61m, 11-storeyed *gopuram*. Every full moon, thousands of people walk in *Girivalam* (sacred circumambulation) around the hill to perform *Giriprabhshira*. Year by year the numbers of people and vehicles using the roads has been increasing causing congestion and accidents. The sanctity of the place would also be lost. A complete ring road all around would be prohibitively expensive and not economical.

5.3.3.3 Eastern Bypass

For the Arcot – Cuddalore SH the eastern bypass is the only sensible one. But a complete ring road of high standard would be prohibitively expensive and not economical. Even also the western route would be far too long, and pass nowhere nearer to the bus and rail stations on the northern side of the town.

5.3.3.4 Integrated Eastern Bypass

This proposal is integrating either option with the eastern bypass for the Arcot – Cuddalore route. The bypass starts at km 104/6 of the Cuddalore – Chittoor road, near Vennamalai Eri. The alignment will convert the sharp bend at this point into a Y-junction with the bypass continuing in a north-easterly direction to cross the Katpadi Branch of the Southern Railway on an over-bridge at km 64/5. The bypass will pass to the east of Kumman Eri and cross the Pondicherry – Krishnagiri NH at km 131/2 (**Fig. 5.10**). It will continue in a northwesterly direction to cross Nochchimalai Eri and then Avarlurpet ODR at km 1/0. Finally, the bypass will cross the railway again at km 68/5 on an over-bridge and rejoin the Cuddalore – Chittoor SH at km 110/0. The total length will thus be about 7.3 km.

5.3.3.5 Selection of Alignment

Out of all the options the integrated option is taken into consideration. Integrated eastern bypass has the disadvantage of not connecting directly with the Tiruvannamalai – Kanji MDR and the compensating advantage of providing a more direct route for the Arcot – Cuddalore SH traffic. Further it helps in removing Arcot – Cuddalore SH traffic from the Arunachala Girivalam circumambulation route and thus reducing vehicular traffic on the pilgrimage route around Arunachalam. For about 2 km the route crosses open land not under cultivation. The bypass would cross the agriculture land that could otherwise be used for growing sugarcane or rice. The bypass would facilitate the growth of the town by improving access to fringe area. The **Table 5.14** shows comparative analysis of the alternatives at Tiruvannamalai bypass. Due to the above-mentioned advantages, integrated eastern route is selected as bypass.

Fig. 5.10 Bypass Alternatives at Tiruvannamalai

Table 5.14: Comparison of Alternatives of Tiruvannamalai Bypass

Criteria	Units	Southern Bypass	Eastern Bypass
General			
		For Pondicherry – Krishnagiri NH, a complete ring road of high standard would be prohibitively expensive but not economical	Eastern Option integrating either options
Start Point	Km	113/6	113/6
Total Length	Km	17.5	10.9
RoW	Meters	27	27
Environmental			
Principal Landuse	Type	Paddy and Sugarcane field	Paddy and Sugarcane field Crosses 2 km on open land
Soil Type	Type	Silty clay and sandy clay	Silty clay and sandy clay
Ponds Affected	Number	2	1
Tanks	Name	Edappalayam Tank	Nochchimalai Eri Kumman Eri
Social			
Structures Affected	Number		
Land Acquisition	Hac.	47	29.5
Land Cost	Rs. (Million)	47	29.5
Engineering			
Bridges	Number	Nil	2 (Railway)
Costs	Rs. (Lakhs)	3000	2130
Intersections	Number	4	3
Utilities	Types	Crosses a Power line	LT Line transmission north ward from the ROB till Tiruvannamalai-Vettavalam MDR at km. 98.2
Selected Alignment			
			1

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5.3.4 TIRUKKOVILUR, TN RSP01(N)

Tirukkivilur is the headquarters of a taluk bearing the same name on the southern bank of the Ponnaiyar river. Now it is a small town with population 23,636 as per 1991 census. Tirukkivilur is a sacred place for both Saivites and Vaishnavites, and attracts many pilgrims. River Ponnaiyar is the mainstay of the region for irrigation of agriculture. The principal road serving Tirukkivilur are:

- Arcot – Cuddalore SH4;
- Tirukkoyilur – Vettavalam ODR;
- Tirukkoyilur – Viluppuram ODR;
- Tirukkoyilur – Thiyagadurgam MDR;
- Tirukkoyilur – Kallakurichi MDR.

The SH4 carries the most traffic.

5.3.4.1 Analysis of Alternatives

The following alignments have been considered for Tiruvannamalai:

- v Eastern Alternative
- v Western Bypass

5.3.4.2 Eastern Alternative

Any bypass must necessarily cross the Ponnaiyar river upstream or downstream of the present bridge. The downstream or eastern alternative is not practicable because it would have to cross an additional river and a railway line twice. So it would be prohibitively expensive.

5.3.4.3 Western Bypass

The proposed alignment starts at km 75 of the Arcot – Cuddalore SH and crosses the river immediately to the east of HT power lines. It then runs eastwards parallel to the power lines until crossing the Tirukkoyilur – Thiyagadurgam road at km 1/0. The route continues parallel to the high-tension line for about a kilometre before diverging to join the Old Arcot – Cuddalore road. It then follows this ODR for about 3 km before rejoining the Arcot – Cuddalore SH at km 66/2 (**Fig. 5.11**). The total length of the bypass is about 5.8 km.

5.3.4.4 Station of Alignment

The western bypass route is selected as the best fit option for the project. Further the bypass will shorten routes for most through traffic by at least 3 km. As the proposed site for the new bus station also lies on the bypass, it is also likely that most of the through traffic will divert to the bypass. The bypass will therefore greatly alleviate the congestion in the town. It will be necessary to rehabilitate or resettle about 30 households that have encroached on the Old Arcot—Cuddalore road. This road has a right-of-way of 30 m, so land acquisition along this part of the route is not essential. Acquisition of about 6 ha of agriculture land is necessary. To minimize impacts on agricultural land, the alignment is to cross two rock outcrops. The following Table shows the details of bypass at Tirukkoyilur.

Table 5.15: Comparison of Alternatives of Tirukkoyilur Bypass

Criteria	Units	Western Bypass	Eastern Alternative
General			
Start Point	Km	Km 75/8 of Arcot – Cuddalore SH	The Eastern Alternative is not practicable
End Point	Km	Km. 3/8 of Elavanasur road	Km. 3/8 of Elavanasur road
Total Length	Km	4.4	15
RoW	Meters	27	27
Environmental			
Principal Landuse	Type	Agricultural land (Wet)	Residential, Commercial and Agriculture land
Soil Type	Type	Silty clay	Silty clay
Hillocks	Name	To minimize the impacts on agricultural	-
Ponds Affected	Number	1	2
Tanks	Name	Agriculture land (acquisition of about 6 Ha	
Rivers	Name	Ponnaiyar	Ponnaiyar
Social			
Structures Affected	Number		
Land Acquisition	Hac.	11.2	40
Land Cost	Rs. (Million)	11.2	40
Structures	Number	30	
Engineering			
Bridges	Number	1 (River)	1 (River) wider than at the western bypass
Costs	Rs. (Lakhs)	1170	6500
Intersections	Number	3	6
Utilities	Types	Parallel to HT Lines till crossing of	Has to cross railway line twice
Selected Alignment		1	

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Fig. 5.11 Bypass Alternatives at Tirukkovilur

5.3.5 VRIDHACHALAM, TN RSP01(S)

Harboring a population of 52,898 as on 1991 census Vriddhachalam lies on the bank of Manimukta river. It lies a short distance west of the major industrial center at Neyveli. The major road serves through Vriddhachalam are:

- i. Cuddalore – Salem MDR;
- ii. Vriddhachalam – Bhuvanagiri MDR;
- iii. Vriddhachalam – Rajendrapattinam MDR
- iv. Vriddhachalam – Ulundurpettai MDR.

5.3.5.1 *Analysis of Alternatives*

The following alignment options are considered for the project road.

- v Northern alignment
- v Southern Bypass

5.3.5.2 *Northern Alignment*

The Cuddalore—Salem road is aligned east west and many trucks ply on the Cuddalore—Salem MDR (mostly through traffic) carrying coal from Neyveli to the steel plant at Salem. Traffic on this route is likely to grow substantially with the commencement of new projects at Neyveli. The most disadvantage of any alignment other than southern route is that the bypass picks up the through traffic on the Vriddhachalam—Bhuvanagiri MDR. Northern alignment will be longer in length and not cost effective.

5.3.5.3 *Southern Bypass route*

The proposed alignment commences at km 64 of the Cuddalore—Salem MDR and runs alongside the Memattur Main Canal (on the south side of the canal) as far as the Villupuram—Tiruchchirapalli Chord line of the Southern Railway. It crosses the line on a rail over-bridge and continues southeastwards across Vriddhachalam Eri, Sattakkudal PUR, and Vriddhachalam—Rajendrapattinam road to reach the river just south of Chavadikuppam village (**Fig. 5.12**). The route then follows the high-tension transmission line (on the north side of it) to the Vriddhachalam—Bhuvanagiri MDR and thence to rejoin the Cuddalore—Salem MDR at km 57/5. The total length of the bypass is about 6.5 km.

5.3.5.4 *Station of Alignment*

The southern bypass is selected as it connects Vriddhachalam—Bhuvanagiri MDR. The eastern half of the bypass will affect between 30 and 45 dwellings, some of them pucca structures. In the case of the other half of the bypass there are no such impacts on buildings. There will be one railway over-bridge on high embankments. The following **Table 5.16** shows the alternatives selected for Vriddhachalam bypass.

Fig. 5.12 Bypass Alternatives at Vriddhachalam

Table 5.16: Comparison of Alternatives of Vriddhachalam Bypass

Criteria	Units	Southern Bypass	Northern alignment
General			
Start Point	Km	Km 64 of Cuddalore-Salem MDR	Km 64 of Cuddalore-Salem MDR
End Point	Km	Km 57.5 of Cuddalore-Salem MDR	Km 57.5 of Cuddalore-Salem MDR
Total Length	Km	9.2	11.0
RoW	Meters	27	27
Environmental			
Principal Landuse	Type	Paddy and Sugarcane field	Paddy and Sugarcane field
Soil Type	Type	Silty clay and sandy clay	Silty clay and sandy clay
Ponds Affected	Number	1	
Tanks	Name	Vriddhachalam Eri	Vadakuppam Eri
Rivers	Name	Mudikondan	Manimuktar
Social			
Structures Affected	Number	30-45	-
Land Acquisition	Hac.	24.8	29.7
Land Cost	Rs. (Million)	24.8	
Engineering			
Bridges	Number	1 (Railway) 1 (River)	3 (Railway) 1 (River)
Costs	Rs. (Lakhs)	1890	3090
Intersections	Number	Cuddalore-Salem MDR Vriddhachalam – Bhuvanagiri MDR Vriddhachalam – Rajendrapattinam MDR Vriddhachalam – Ulundrupet MDR	4 Road Intersections 3 Rail Intersections (RoB)
Utilities	Types	HT Lines on north side of Vriddhachalam – Bhuvanagiri MDR	
Selected Alignment		1	

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5.3.6 ARIYALUR, TN RSP01(S)

Ariyalur lies on (Perambalur District) the Perambalur—Manamadurai SH with a population of 24,191 (1991 census). This is well known as an industrial town with several cement factories (Tancem, Tharani, Dalmia, Alagappa, Sakthi, Sun and Nilgiris) near Ariyalur. Heavily laden cement trucks and multi-axle vehicles have to pass through the narrow roads within Ariyalur to reach Chennai—Trichy—Dindigul road (NH45) and proceed to their destinations.

Other than that the congestion inside the town with growing activities calls for construction of a bypass for truck and bus traffic, so as to decongest the roads within Ariyalur town. The main routes meeting at Ariyalur are:

- Perambalur—Manamadurai SH, which starts at km 264/4 of NH45, passes through Ariyalur and ends at Manamadurai on NH49 in Sivaganga district;
- Ariyalur—Senthurai ODR
- Ariyalur—Govindapuram ODR

- iv. Ariyalur—Ayyanathur MDR
- v. Ariyalur—Vilangudi MDR
- vi. Ariyalur—Subbarayapuram ODR

5.3.6.1 *Analysis of Alternatives*

Objective of the bypass at the end of the project corridor is to decongest the town and provide connectivity to the major roads. The following alignment options are considered for the project road.

- v Western Route
- v Eastern Bypass

5.3.6.2 *Western Route*

Most of the through traffic is on the Perambalur—Manamadurai SH, and a western bypass route would be the most convenient for this traffic. However, this route would be of no benefit to any of the traffic on the other roads serving Ariyalur. It would also not pass anywhere near the bus stand. This alternative does not provide required connectivity from the project corridor to the major traffic carrying roads unless it forms a complete ring road.

5.3.6.3 *Eastern route*

The route alignment starts at km 25/2 (**Fig. 5.13**) of Perambalur—Manamadurai SH, just north of warehousing corporation, godown and traverses east across scrub jungle skirting the fencing of the Godown compound. The alignment crosses Southern Railway at its junction with the TANSEM line and forms a four legged junction at km 2/6 of Ariyalur—Senthurai ODR (at km 2/4 + 85 m) about 110 m north of existing level crossing. The road cuts across dry lands and scrub jungle to km 1/6 of Ariyalur—Ayyanathur MDR, and it crosses this road 800 m east of Tamil Nadu State Transport Corporation (Trichy) Bus Depot and west of TANCEM Cement Factory (at km 3/8 of Ariyalur—Ayyanathur MDR). The route then cuts across scrub jungle skirting two cremation sheds located on the left side, but well away and an open play ground to the east of Industrial Training Institute to meet at km 1/4 of Ariyalur—Vilangudi MDR. Further ahead it traverses two high-tension transmission towers across scrub jungle to reach km 1/0 of Ariyalur—Subbarayapuram ODR.

This proposed alignment pass across generally flat terrain on the east. The approximate length of the route is 7.0 km. Except for minor field channels, there are no rivers or canals to cross. The roadside drains will have to be provided with adequate gradients to lead them to natural drainage courses nearby. A famous temple (Kaliaperumal temple) at km 5/6 of Ariyalur—Ayyanathur MDR attracts huge crowds during festivals. The bypass will serve as an easy access road to the temple. There will be two railway crossings across the proposed alignment of bypass viz.,

- i. Just west of km 1/6 of Ariyalur—Govindapuram road - Southern Railway Villupuram Trichy chord line.
- ii. Just east of existing level crossing at km of 2/6 of Ariyalur—Senthurai ODR - TANCEM railway siding track.

Selection of Alignment

The eastern bypass is selected as it links maximum number of other routes. The main potential environmental impact of an eastern bypass is direct disturbance and destruction of fossil beds (fossil limestone) in the area. Some of the proposed measures to mitigate the impact on road improvement of bypass construction in the area are:

- v To engage the services of an archaeologist to monitor the proposed works; and
- v For the government to establish "no go zones" or fossil reserve parks in certain areas to preserve representative examples of this archaeological resource.

The bypass road to meet Perambalur—Manamadurai SH at km 28.8. The number of trees to be uprooted is negligible. There are no temples, churches, mosques, burial grounds or cremation sheds within the proposed right-of-way. The bypass runs mostly across dry lands and scrub jungle and hence cost effective. Land acquisition is hassle free and least burden of rehabilitation and resettlement procedures. **Table 5.17** shows the features of Ariyalur bypass.

Table 5.17: Features of Ariyalur Bypass

Criteria	Units	Eastern Bypass
General		
Start Point	Km	Km 25.2 of Perambalur-Manamadurai SH
Total Length	Km	7.6
RoW	Meters	27
Environmental		
Principal Landuse	Type	Dry Land and Scrub Jungle
Soil Type	Type	Laterite, Gravel and Clay
Ponds Affected	Number	1
Sensitive Ecological Area	Name	Direct disturbance and destruction of Fossil beds at Ariyalur The alignment cuts across scrub jungle skirting two cremation sheds on Ariyalur - Vilangudi ODR
Social		
Structures Affected	Number	
Land Acquisition	Hac.	20.5
Land Cost	Rs. (Million)	20.5
Community Properties	Number	Two cremation sheds nearby on Ariyalur - Vilangudi ODR (not within the RoW)
Engineering		
EIRR	%	25.5
Bridges	Number	1 (Railway)
Costs	Rs. (Lakhs)	1880
Intersections	Number	Major roads Perambalur - Manamadurai SH Ariyalur - Govindpuram ODR Ariyalur - Senthurai ODR Ariyalur - Ayyanathur ODR Ariyalur - Vilangudi ODR Ariyalur - Subbrayapuram ODR Zamin - Athur road Alathur - Karaikolakanatham road
Selected Alignment		}

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Fig. 5.13 Bypass Alternatives at Ariyalur

5.3.7 KUMBAKONAM, TNRSPOI(S)

Kumbakonam had a population of 139,500 in 1991. There are four large temples in the town. The following MDRs serve Kumbakonam:

- i. Grand Anicut—Kumbakonam—Cauvery Pattinam
- ii. Chennai—Kumbakonam—Thanjavur
- iii. Kumbakonam—Sirkazhi
- iv. Kumbakonam—Karaikal
- v. Kumbakonam—Mannargudi
- vi. Kumbakonam—Neelathanallur

The government approved an alignment for a 6.2 km bypass (**Fig. 5.14**) in 1989 and subsequently acquired the land. Analysis of the origin and destination traffic data indicates that an additional link of 0.8 km to the Chennai—Kumbakonam MDR is highly desirable to encourage traffic to use the bypass by providing a shorter route.

5.3.7.1 *Selection of Alignment*

Kumbakonam is of a size that there will still be congestion after completion of the bypass. Most of the land along the bypass route is agricultural land in use for paddy cultivation. The existing bypass alignment of length 8km is extended further by another 4 km to meet the project road. Alternative alignment if taken on western side would not connect Thanjavur and Tiruvarur roads, which carry heavy traffic. Hence, no other practicable alternative exists for the bypass as impacts would be higher if completely new alignment is provided.

5.3.8 THIRUVARUR, TNRSPOI(S)

Thiruvarur is the District headquarters of Thiruvarur district, which was carved out of old Thanjavur and Nagapattinam districts in 1997. Its population as per 1991 census was 24,768.

However, it has gained importance of late and its population growth rate per annum has been increasing phenomenally. The Thyagaraja Temple in the middle of the town is one of the landmark in the region. The following major routes meet at Thiruvarur:

- i. Kumbakonam—Kodavasal—Thiruvarur MDR
- ii. Mayiladuthurai—Muthupet MDR
- iii. Nagapattinam—Karur NH67
- iv. Mannargudi—Thiruvarur MDR

Of these, the National Highway is provided with a bypass on the southern side of Thiruvarur, which provides through traffic facilities between Thanjavur and Nagapattinam/Velanganni without passing through congested areas of Thiruvarur town. The traffic within the town is highly congested due to pilgrim traffic mixing with local traffic, narrow right of way, vending and parking activities. There is need for decongesting the traffic within the town, by way of providing a link between Kumbakonam—Kodavasal—Thiruvarur road and NH67, on the western outskirts of Thiruvarur, so as to segregate bypassable traffic from local traffic.

Fig. 5.14 Bypass Alternatives at Kumbakonam

5.3.8.1 Analysis of Alternatives

Objective of the alignment is to decongest Tiruvarur town lying at the end of project corridor and provide connectivity to heavy traffic carrying corridors. The following alignment options are considered for the project road.

- v Alternate Route to western Route
- v Western Bypass

Alternate Route to western Route

The most traffic is to be diverted on the Nagapattinam—Karur NH67. So there is only one practicable option left is an extension of the existing Kumbakonam—Kodavasal—Thiruvarur MDR to NH-67. No practicable alternatives other than in terms of the alignment, intersections and other aspects of detail design.

Western Bypass

The bypass proposal is an extension of the Kumbakonam—Kodavasal—Thiruvarur MDR. The route will have T-junctions at either end viz. at km 27/0 of Nagapattinam—Karur road (NH67) and at km 2/8 of Thiruvarur—Kodavasal road (**Fig. 5.15**). One minor bridge across Odambokkai river running parallel to NH67 needs to be constructed and the approximate length of linear waterway is 50 m. The approximate length of the route is 750m and a 45 m right-of-way is proposed right through except at Odambokkai river bridge location, where the bridge width will be kept as 7.5 m between kerbs. The gradient is flat. The alignment is straight a low. A Low-Tension line crosses the proposed alignment between the river and Thiruvarur—Kodavasal road.

Selection of Alignment

The preferred alignment for the bypass of Tiruvarur is western option. The gradient is flat and the alignment is straight. The alignment cuts across paddy and sugarcane fields, a number of irrigation culverts will be required to be provided. The standing water level during monsoon period is about 0.3 m above field level. Hence, the road embankment up to the top of subgrade needs to be raised up to 1.5 m. The roadside drains on either side have to be provided to drain away the storm water towards Odambokkai river and other natural drainage channels. **Table 5.18** shows the features of Thiruvarur bypass.

Table 5.18: Features of Thiruvarur Bypass

Criteria	Units	Western Bypass
General		
Start Point	Km	Km 2.8 of Kodavasal - Thiruvarur road
End Point	Km	Meets with NH-67 at km 27.0 after crossing the Odambokkai river
Total Length	Km	0.75
RoW	Meters	27
Environmental		
Principal Landuse	Type	Paddy and Sugarcane Field
Soil Type	Type	Silty clay and Silty sand
Rivers	Name	Odambokkai

Criteria	Units	Western Bypass
Social		
Structures Affected	Number	
Land Acquisition	Hac.	2.3
Land Cost	Rs. (Million)	2.3
Engineering		
EIRR	%	25.2
Bridges	Number	1 (River)
Costs	Rs. (Lakhs)	345
Intersections	Number	2
Utilities	Types	LT Lines crosses the proposed alignment between the river and Thiruvapur-Kodavasal road
Selected Alignment		1

5.3.9 CHIDAMBARAM, TN RSP01(E)

Chidambaram once was the capital of Chola dynasty is a place of major tourist attraction. The population of the town is 67,900 in 1991 census. Traffic passing through the town in a north south direction has to negotiate four right angle turns, and several sections of road are narrow. The heritage value of the center of Chidambaram makes property acquisition for road widening most unlikely. There is thus no easy alternative to a bypass for alleviating the long-term traffic congestion.

5.3.9.1 Analysis of Alternatives

Two alignment options proposed for the project road are

- v Eastern Alignment
- v Western Alignment

5.3.9.2 Eastern Alignment

This alignment would deviate at Mutlur and bypass Bhuvanigiri, saving 5.3 km travel distance. This was the alignment was chosen when the bridge over the Vellar River collapsed during floods.

In 1982 H&RWD undertook preliminary investigations for the bridge site on this alignment. The investigations included 8 bores and identified very low bearing capacity silts to a depth of 12 m below still water level. There would also be a requirement for river training works to protect the northern abutment. The bypass would affect nearly 150 buildings all along its length. Nevertheless, the eastern route would greatly improve the access of coastal communities to Chidambaram, and has wide public support. On the southern side of the river the approach to the bridge will be on a high embankment. This bypass on the east side would be closer to the coast with a consequent risk of encouraging development near the sensitive Pichchavaram mangroves.

5.3.9.3 Western Alignment

H&RWD undertake the engineering details as commissioned by Institute of Hydraulics and Hydrology, Pondicherry, 1985, which revealed the following facts. They concluded that from an engineering point of view the Mutlur site was not a desirable one for a bridge, and that a site about 1.7 km upstream, closer to Bhuvanigiri, was preferable and it would be much less costly.

Fig. 5.15 Bypass Alternatives at Thiruvarur

It also does not affect any buildings. The eastern bypass would have to cross the railway line twice, which would cause extensive delays at at-grade crossings or have major cost implications and land use impacts if grade-separated crossings were provided. But the western alignment does not have such complications. The through traffic in Chidambaram is about 1950 vehicles a day, and an western bypass would also attract some traffic from the Mannargudi Road and some local Chidambaram traffic for which the bypass offers a more direct route (**Fig. 5.16**).

5.3.9.4 *Selection of Alignment*

A combination of eastern and western option is selected and it is highly recommended also. The bypass thus has several components

- i. A 7 km eastern link with a new bridge over the Vellar River that will provide a direct connection into the town from the north;
- ii. A 8 km southern link that bypasses the town to the west and ultimately connects northwards through Bhuvanagiri to Vriddhachalam;
- iii. A 2 km link road from the western bypass into the northern end of Chidambaram to service a proposed new bus station.

Table 5.19: Comparison of Alternatives of Chidambaram Bypass

Criteria	Units	Combination of Eastern and Western Alignment	Western Alignment
General			
Start Point	Km	km 34/2 at B. Mutur Cuddalore to Vriddhachalam road	34/0 Old Chidambaram road
End Point	Km	km 4/4 of Chidambaram - Sirkazhi road	km 4/4 of Chidambaram Bhuvanagiri road
Total Length	Km	16.9	16.25
RoW	Meters	27	27
Environmental			
Principal Landuse	Type	Agricultural Land	
Ponds Affected	Number	1	1(relocation of pond by acquisition of nearby available land)
Trees Affected	Number	84	50
Canals	Number	2 (Khan Sahib Canal and its branch)	
Rivers	Name	Vellar	
Social			
Structures Affected	Number	119	20
Land Acquisition	Ha	36.1	32.0
Land Cost	Rs. (Million)	36.1	32.0
Schools/Hospitals	Number	-	1
Sacred Groves	Number	2	
Temples	Number		1(possible to shift with consent of local people)
Engineering			
EIRR	%	39.9	35.8
Bridges	Number	3	2
River training (rock groin)	Mt	1350	0
Costs	Rs. (Lakhs)	4740	3548
Intersections	Number	9	4
Selected Alignment		1	

Fig. 5.16 Bypass Alternatives at Chidambaram

The Table 5.16 shows the alternatives selected for Chidambaram bypass. Community perception provided inputs in finalizing the alignment. They preferred to construct the bypass at elevated location so as to avoid flooding. It is acceptable to the community to lay the bypass as there will be a reduction of travel distance to the town by more than 7km due to the construction of new bridge across the river.

5.3.10 SIRKAZHI, TN RSP01(E)

Sirkazhi situated about 22 km on the south of Chidambaram on a MDR with a 1991 population of 28,980. The routes from Chidambaram to Kumbakonam and from Chidambaram to Pompuhar branch just to the south of the town. On the Kumbakonam—Sirkazhi road the nearby Vaithisvarankoil is a popular tourist and pilgrim destination. The Chidambaram - Sirkazhi Road crosses a railway line just north of Sirkazhi.

5.3.10.1 Analysis of Alternatives

The alignment options considered are

- v Eastern Alignment
- v Western Alignment

5.3.10.2 Eastern Alignment

H&RWD proposed a bypass for 3.2 km on eastern side. This proposal derives in turn from the 1987 Draft Town Plan (Sirkazhi Local Planning Authority, 1987) and is no longer practicable. As a result another option is carried out which is western bypass proposal.

5.3.10.3 Western Alignment

The western bypass proposal offers several advantages over an eastern bypass. There are three practicable alignments for a western bypass. All starts from the Chidambaram—Sirkazhi Road at 60/8 km on the north side of the town (near the village of Olaiyamputtur) and follow the same alignment as far as a bridge over the railway lines (**Fig. 5.17**). The three options are:

- i. Terminate at km 54/8 on the Kumbakonam—Sirkazhi road, the initial proposal by the PCC;
- ii. Terminate at km 54 on the Kumbakonam—Sirkazhi road, an alternative recommended by a public meeting on 20 September 1998 (see *Public Consultation Report*);
- iii. Terminate at both km 53 and km 54 on the Kumbakonam—Sirkazhi road, a variation on the km 54 option.

5.3.10.4 Selection of Alignment

The western bypass with third option is considered for the project as decided in the public meeting. This will produce better economic returns (because more traffic travels towards Mayiladuturai and Kumbakonam than towards Karaikal). There is no significant difference in property impacts. Other than these this proposal have the following advantages.

- v shorter distance;

Fig. 5.17 Bypass Alternatives at Sirkhazi

- v serves both the Kumbakonam and the Karaikal routes whereas the eastern route serves only the Karaikal route, which carries less traffic;
- v eliminates two right angle bends (eastern route only one);
- v closer to the bus station.
- v Serving more villages

Table 5.20 shows the alternatives selected for Sirkhazi bypass.

Table 5.20: Comparison of Alternatives of Sirkhazi Bypass

Criteria	Units	Western side (km 53 and 54)	Other options on Western Side
General			
			RWDH&RWD proposed a bypass for 3.2 km on eastern side. This proposal derives in turn from the 1987 Draft Town Plan (Sirkhazi Local Planning Authority, 1987) and is no longer practicable. As a result another option is carried out which is western bypass proposal. However, the other two alternate realignment of western bypass details is given below.
Start Point	Km	km 60/8 of Kumbakonam- Sirkhazi road	km 60/8 of Kumbakonam- Sirkhazi road
End Point	Km	km 53 and 54 of Kumbakonam- Sirkhazi road	54/8 above the bridge across Uppanagar river
Additional Length	Km	1.145	
Total Length	Km	8.8	6.9 (in case of alternative km 54/8) 6.2 (in case of alternative km 54)
RoW	Meters	27	27
Environmental			
Principal Landuse	Type	Agricultural Land	Agricultural Land
Ponds Affected	Number	1 (could be saved by realignment)	-
Trees Affected	Number	138	120 (in case of alternative km 54/8) 133 (in case of alternative km 54)
Rivers	Name	Uppanar	
Social			
Structures Affected	Number	11	11 (in case of alternative km 54/8) 9 (in case of alternative km 54)
Boundary wall	Number	1 (house)	1 (house)
Land Acquisition	Ha.	24	18.6 (in case of alternative km 54/8) 15.9 (in case of alternative km 54)
Land Cost	Rs. (Million)		
Graveyard	Number		2 (28 m, 37m from C/L towards right)
Engineering			
EIRR	%	27.6	29.2 (in case of alternative km 54/8) 26.5 (in case of alternative km 54)
Bridges	Number	2 (1 road over bridge, 1 river Uppanar)	0 (in case of alternative km 54/8) 1 (in case of alternative km 54)
Costs	Rs. (Lakhs)	2130	1670 (in case of alternative km 54/8) 1500 (in case of alternative km 54)
Intersections	Number	6	
Selected Alignment		1	

5.3.11 NAGAPATTINAM, TNRSPO2

From the eleventh century, Nagappattinam was the imperial port city of the Cholas. This is the headquarters of Nagappattinam District with a 1991 population of 99,700. The northern portion of the municipality is the formerly separate town of Nagore, an important pilgrim centre for Muslims. Nagore became an important centre for Marakayars (Tamil-speaking Muslim merchants). The mosque has a beautiful 27.4m minaret, a local landmark.

5.3.11.1 Analysis of Alternatives

The geographical location of Nagappattinam reveals that between the existing road and the coast, and the environmental sensitivity of the coast itself, the only option for a bypass is to the west of the town. Hence the alignment option considered is

- v Western Alignment

5.3.11.2 Western Alignment

In both Nagore and Nagappattinam there are long stretches of narrow road. Because of extensive tidal areas along the Vettar River at Nagore, a single bypass for both Nagore and Nagappattinam is appropriate (**Fig. 5.18**). The 9 km bypass proposal for Nagappattinam diverts from the existing road just to the south of Karaikal (Pondicherry). After crossing the Vettar river, it passes to the west of the town through largely rural land although it skirts close to the town at the southern end. It would require a bridge over two watercourses (the Vettar River at the northern end) and a grade-separated crossing of the railway line just before it rejoins the existing road to Tirutturaipundi. A link road would be provided back into the northern end of Nagappattinam to facilitate access to Nagore. The bypass will cross the east west NH67, which links Nagappattinam with Thiruvarur at an at-grade intersection, controlled by traffic signals.

5.3.11.3 Selection of Alignment

The western bypass is the only option considered for the project as because a single bypass can serve both Nagore and Nagappattinam. However, this would be a major project requiring substantial land acquisition. Although the study roads carry only a small proportion of through traffic, the bypass would allow traffic on other roads to avoid Nagore and Nagappattinam. The following Table 5.21 shows the alternatives selected for Nagappattinam bypass.

Table 5.21: Comparison of Alternatives of Nagappattinam Bypass

Criteria	Units	Western Alignment	Other Option
General			
		This will be single bypass, which will serve both town Nagore, and Nagappattinam. A link road would be provided to northern end of	In both there are long stretches of narrow road. Because of extensive tidal areas along the Vettar river at Nagore a
Start Point	Km	Diverts from the existing road just to the south of Karaikal (Pondicherry)	
End Point	Km	The bypass will cross the east west NH67 and meets at Thiruthuraiipundi road.	
Total Length	Km	10.2	
RoW	Meters	27	
Environmental			
Soil Type	Type	Silty clay and sandy clay	
Ponds Affected	Number	1	
Rivers	Name	Vettar and Uppanar	
Sensitive Ecological Area	Name	-	Close to sea
Social			
Land Acquisition	Ha	6.45	22.95
Land Cost	Rs(million)	6.45	22.95

Criteria	Units	Western Alignment	Other Option
Engineering			
Bridges	Number	1 (Railway), 2 (River)	3 (River), 2 RoBs
Costs	Rs. (Lakhs)	800	2700
Intersections	Number	5	4
Selected Alignment		1	

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5.3.12 TIRUTHURAIPPUNDI, TN RSP02

Tirutturaippundi is a small town in the middle of the Cauvery delta with a population of 23,328 (1991) Although traffic levels are low, routes through the town are narrow, tortuous and congested. The main features of congestion are due to narrow right-of-way, parking, vending activities and encroachments.

5.3.12.1 Analysis of Alternatives

The alignment options considered are

- v Link Road Alignment
- v Extension of Link Road Alignment

5.3.12.2 Link Road Alignment

Although traffic levels are low in Thirutturaipoondi, but the routes through the town are narrow, tortuous and congested. One link road is under construction on Velankani – Thirutturaipoondi - Vedaranniyam MDR. But this does not bypass the Thirutturaipoondi town and as a result there would be an extension of the same route further ahead.

5.3.12.3 Extension Link Road Alignment

An extension of this link would allow traffic on the two study roads to bypass the town, with a saving in travel distance. The bypass starts at km 39.2 of Velankani - Thirutturaipoondi - Vedaranniyam MDR and joins Km 72.4 on Mayiladuturai - Muthupet road (**Fig. 5.19**). The total length of the bypass is 3.1 km.

5.3.12.4 Selection of Alignment

The extension of link road bypass is the best option considered for the project. A public meeting strongly endorsed the bypass proposal with the request for minor adjustments to minimize property impacts. The **Table 5.22** shows the alternatives selected for Tirutturaippundi bypass.

Fig. 5.18 Bypass Alternatives at Nagapattinam

Table 5.22: Comparison of Alternatives of Tiruthuraippundi Bypass

Criteria	Units	Final Alignment (Extension of Link Road)	North-west and South-east alignment
General			
		One link of bypass is constructed. An extension of this link would allow traffic on the two project roads with a saving in travel distance.	
Start Point	Km	At km 39.2 of Velankani - Thirutturaipoondi - Vedaranniyan MDR	At km 38/8 of Velankani - Thirutturaipoondi - Vedaranniyan MDR
End Point	Km	Km 72.4 on Mayiladuturai - Muthupet road	Km 72.4 on Mayiladuturai - Muthupet road
Total Length	Km	3.1	8.5
RoW	Meters	27	27
Environmental			
Principal Landuse	Type	Agricultural Land	Agricultural Land
Soil Type	Type	Silty clay and sandy clay	Silty clay and sandy clay
Rivers	Name	Mulliyar	Mulliyar and Marakkoraiyar
Social			
Land Acquisition	Hac.	8.4	
Land Cost	Rs. (Million)	8.4	
Engineering			
EIRR	%	30.7	
Bridges	Number	1 (River)	
Costs	Rs. (Lakhs)	800	
Intersections	Number	Velankani - Thirutturaipoondi - Vedaranniyan MDR (km 39.2) Thirutturaipoondi - Vedaranniyan road (km 30.2) Mayiladuturai - Muthupet road (km 72.4)	
Utilities	Types		
Selected Alignment		1	

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5.3.13 MUTHUPET, TNRSPO2

Muthupet is a town panchayat in Tirutturaippundi Taluk of Thiruvavur District. The town has a population of 18,826 as on 1991 census. Roads through the town are extremely narrow and congested.

5.3.13.1 Analysis of Alternatives

The alignment options considered are

- v Southern Bypass
- v Northern Bypass

5.3.13.2 Southern Bypass

Low lying ground, urban development and wide tidal rivers preclude a southern bypass. Further environmental implication i.e. proximately to Reserved Forest would have some adverse impact. So there is a consideration of the northern bypass for the town.

Fig. 5.19 Bypass Alternatives at Thiruthuraipundi

5.3.13.3 Northern Bypass

The northern alignment offers three possible legs to the bypass components. All starts from km 66/0 of Thanjavur- Pattukkottai- Muthupet road on the north side of the town and follow the same alignment (**Fig. 5.20**). There are three practicable alignments are:

- i. Pattukkottai—Muthupet Road to Mannargudi - Muthupet Road only;
- ii. Mayiladuthurai—Muthupet Road to Tirutturaippundi Road and then across the Koraiyur river to the Muthupet—Vedaranniyam Road.
- iii. Mayiladuthurai—Muthupet Road to Tirutturaippundi Road

On the other side of the Koraiyur River is the adjoining village of Jambuvanodal. A single lane bridge across the Koraiyur river connects the village. The bypass will only be economically viable if a bus stand is constructed on the north side of the town, near the bypass. Buses account for a third of fast moving vehicles. Jambuvanodal contains famous dargas (tombs of Muslim saints) which have long attracted pilgrims (Hemingway, 1906). There are mosques close to the Major District Road to Vedaranniyam.

5.3.13.4 Selection of Alignment

Two alignment options considered for the northern route makes it more feasible and logical. The route starts at km 66/0 of Thanjavur- Pattukkottai- Muthupet road and joins at the Mayiladuthurai—Muthupet road at km 92/6. The topographical survey of the proposed route revealed that the route would affect a large number of coconut trees and some huts. So there is an alternative to this is shifting the northern section of the bypass commencing at km 92/1 would have fewer impacts on huts and coconut trees. But the question arises is since such an alignment would not connect directly to the proposed southern leg of the bypass, this raises questions as to how important the southern leg actually is. From a traffic point of view, the southern leg is not critical, but it does provide additional alleviation of congestion in the town centre, and shortens some trip lengths for traffic travelling to or from the Jambuvanodal neighbourhood.

On the other side of the Koraiyur river is the adjoining village of Jambuvanodal. A single lane bridge across the Koraiyur river connects the village. The public meetings strongly supported the concept of the new bridge over the Koraiyur river. There are strong equity arguments for inclusion of the bridge because it provides a balance of benefits to the Muslim and Hindu communities in Muthupet. So the northern bypass with bridge over Koraiyur river is considered. **Table 5.23** shows the alternatives selected for Muthupet bypass.

Table 5.23 Comparison of Alternatives of Muthupet Bypass

Criteria	Units	Final alignment (Northern Bypass)	Option 1 (Northern Bypass)
General			
Start Point	Km	Km 92/1 of Mayiladuthurai- Muthupet road	Km 92/1 of Mayiladuthurai- Muthupet road Km 5 of Thillaivilagam - Muthupet road
End Point	Km	Km 66/0 of Thanjavur -Pattukkottai- Muthupet	km 66/0 of Thanjavur- Pattukkottai- Muthupet road
Total Length	Km	4.800	5.240
RoW	Meters	27	27

Criteria	Units	Final alignment (Northern Bypass)	Option 1 (Northern Bypass)
Environmental			
Trees Affected	Number	18	
Social			
Structures Affected	Number		
Land Acquisition	Hac.	13.0	14.1
Land Cost	Rs. (Million)	13.0	14.1
Boundary wall	Number	1 (rice mill)	
Engineering			
EIRR	%	23.1	
Costs	Rs. (Lakhs)	790	
Intersections	Number	3	3
Selected Alignment		1	

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Fig. 5.20 Bypass Alternatives at Muthupet

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