

**Project preparation and Consultancy Services for preparation of
Detailed Project Report (DPR) for various road improvement works
Under Tamil Nadu Road Sector Project – II (TNRSP II)
Contract PPC 02**

**ENVIRONMENTAL MANAGEMENT PLAN
for 2 Laning of Madapattu- Thirukovilur Section of
SH-09 and Construction of a New Link Road between
SH 09 and SH 137**



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SHELADIA Associates, Inc., USA

Flat No. F1, Subam Castle, Plot No. 27-B, 7th Street
Extension, Ram Nagar, Valachery, Chennai 600 042,
Phone No. +91-44-2499 0576/ 0595,
Fax No. +91-44-2499 1465,
E-mail: tnrs2.ppc02@sheladia.co.in



Tamil Nadu Road Sector Project - II

Highways Department,
Government of Tamil Nadu,
TNMB Building, 1st Floor, No. 171, Kesavaperumal Puram,
Greenways Road, R. A. Puram,
Chennai - 600 028

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CHAPTER 1 : INTRODUCTION

1.0 BACKGROUND

Road transport plays an important role both from the point of view of enhancing employment potential and all-round economic development of a State. Besides providing a safe and efficient transport system, construction of a well-planned road can open up the entire area through which it passes, to myriad development opportunities. Tamil Nadu is a fast developing state owing to the large coastal length. In order to utilize the full potential of state for economic development a good road network is also a primary requirement. The Government of Tamil Nadu has taken up road sector development with the financial assistance of the World Bank. The project has been named as TNRSP II. The first phase of the project is already implemented. In TNRSP II about 1800 km road length is being taken up for up gradation and strengthening. This length has been divided into five packages with about 400 km road length. The project environmental assessment is being taken up to meet World Bank safeguard requirements and to meet country environmental framework requirements. The work of feasibility and DPR preparation for package -2 has been entrusted to M/s Sheladia Associates Inc., USA. The Tamil Nadu Highway Department is Executing Agency and TNRSP Divisional Office is the Implementing Agency (IA). The Environmental Assessment is being taken up as per the Terms of Reference (ToR) of the consultants, The ToR specifies environmental assessment to be taken up in two stages namely Environmental Screening and scoping and Environmental Impact Assessment. In TNRSP II, (Package -02) two roads have been taken up for Phase-I implementation on priority basis. These roads are:

- (a) Vridhachalam (km 0+000) - Bhuvangiri (km 35+800) section of SH-70 and
- (b) Madapattu (km 41+700) to Thirukovilur (km 66+190) plus link road between SH-09 and SH-137 (link road chainages km 66+190 to km 71+147). The link road starts at km 66+190 of SH-09 and ends at km 124+460 of SH-137. The entire improved road will be part of SH-09.

This volume of reports covers Environmental Management Plan for Madapattu (km 41+700) to Thirukovilur (km 66+300) including link road between SH-09 and SH-137. This EMP report has been prepared as part of Detailed Project Report (DPR).

1.1. ENVIRONMENTAL ASSESSMENT (EA) PROCESS

The Environmental Assessment process for the project corridor is based on the Terms of Reference (ToR) provided by TNRSP and consultants' past experience on similar projects. The scope has been devised so as to meet host country statutory requirements and the World Bank Safeguard Policy requirements.

1.2. OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The objectives of the Environmental Management Plan (EMP) are to:

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels.
- Identify measures that could optimize beneficial impacts.
- Create management structures that address the concerns and complaints of all the stakeholders with regards to the development.
- Establish a method of monitoring and auditing environmental management practices during all phases of development.

- Describe the practical mitigation measures that should be implemented on road improvement works and ancillary sites (quarry and borrow areas) to prevent or mitigate any negative environmental impacts and to enhance the positive issues.
- Ensure that the construction and operational phases of the project continue within the principles of Integrated Environmental Management.
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project.
- Ensure that the safety recommendations are complied with.
- Propose mechanisms for monitoring compliance with the EMP and reporting thereon.
- Specify time periods within which the measures contemplated in the draft environmental management plan must be implemented, where appropriate.
- Establish the roles and responsibilities of all parties which includes TNRSP, Contractor, Construction Supervision Consultants (CSC) involved in the implementation of environmental controls;
- Establish monitoring and reporting system for facilitating appropriate implementation of the EMP.

1.3. ENVIRONMENTAL REGULATIONS APPLICABLE TO THE PROJECT

Summary of environmental clearances/ permits/ approvals required for the sub-project is presented in Table 1.1. During the pre-construction stage, the responsibility of obtaining clearances from concerned authority lies with TNRSP. Those clearances need to be obtained during the construction phase before work initiation lies with the contractor.

Table 1.1: List of Environmental Regulations Applicable to the Project Road

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage	Responsibility
01.	EIA Notification, 2006 issued under the Environment (Protection) Act, 1986	Ministry of Environment, Forests and Climate Change (MoEFCC). Government of India (Gol); Department of Environment (DoE) State Govt. Central Pollution Control Board (CPCB); Tamil Nadu Pollution Control Board (TNPCCB)	Not Applicable	Pre construction	TNRSP
02.	An explosive license under The Explosives Act (& Rules), 1884 revised in 1983) for storage of fuel and POL products on site	Chief Controller of Explosives, Petroleum Products & Explosive Safety Organization	Applicable (For Safe transportation, storage and use of explosive material)	Construction (Prior to work initiation)	Contractor

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage	Responsibility
03.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013	District Collector, Villupuram	Applicable	Construction (Prior to work initiation)	TNRSP
04.	Tree felling permission	District Collector, Villupuram	Applicable (Felling of avenue trees)	Construction (Prior to work initiation)	Contractor
05.	Air (Prevention and Control of Pollution) Act, 1981	TNPCB	Applicable (To control air pollution Pollutants)	Construction (Prior to work initiation)	Contractor
06.	Water Prevention and Control of Pollution) Act1974	TNPCB	Applicable (To control water pollution by controlling the discharge of pollutants as per the prescribed standards)	Construction (Prior to work initiation)	Contractor
07.	Consent to Establish (CTE) and Consent to Operate (CTO) under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	TNPCB	For operating hot mix plants, crushers and other construction camp facilities	Construction (Prior to work initiation)	Contractor
08.	Minor Mineral and concession Rules	District Collector, Villupuram	For opening a new quarry	Construction (Prior to work initiation)	Contractor
09.	Central Motor Vehicle Act 1988 and Central Motor Vehicle Rules1989	State Transport Authority, Government of Tamil Nadu	To check vehicular air & noise pollution	Construction stage	Contractor
10.	Quarry lease deeds and license under The Mines Act, 1958, CTO and CTE from TNPCB and Environmental Clearance (EC) from State Level EIA Authority	Mining and Geology Department of Tamil Nadu	Quarrying and borrowing operations	Construction (Prior to work initiation)	Contractor
11.	Extraction of sand from rivers	District level Expert Committee under	Extraction of Sand from	Construction (Prior to work	Contractor

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage	Responsibility
		district collector and local Govt. Body	rivers	initiation)	
12.	Building & Other construction workers (Regulation of Employment and condition of service) Act 1996	Chief Labor Commissioner, Chennai	Labor's Safety, health and welfare measure	Construction (Prior to work initiation)	Contractor

1.4. METHODOLOGY OF PREPARING EMP

The methodology (Figure 1.1) adopted for the preparation of EMP is based on the MoEFCC's EIA Notification, dated 14th September 2006 and subsequent amendments, World Bank's OP and GoI Guidelines. The report is based on Environmental and Social Policy Procedures (ESPP) adopted by TNRSP, Training Manual in preparation of EMP and previous project reports. The project was carried out through various defined activities as detailed in this section of the report. The following activities were carried out to prepare the EMP:

Activity 1: Kick-off Meeting with Environmental Specialist & Highway Engineers from TNRSP and Environmental Consultant from the World Bank. The following points were discussed:

- Walkover survey by DPR consultant and Environmental Specialist of TNRSP;
- Identification of location(s) for monitoring activities
- Environmental features along the project road.

Activity 2: Collection of relevant information for the project road. Relevant primary and secondary information/ data collected prior to site visit included:

- Relevant topographical sheets of the proposed alignment;
- Information regarding various road alignment alternatives
- Proposed upgrading and bypass along the project road.

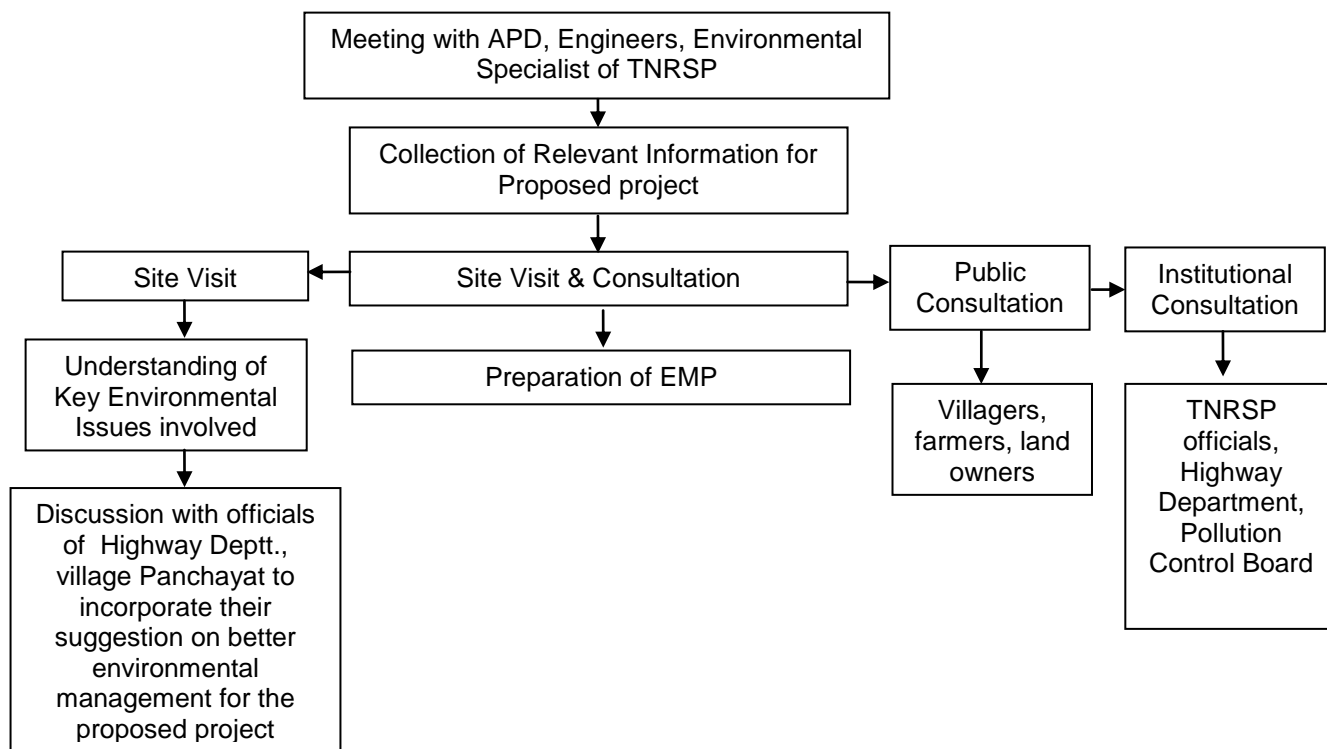
Activity 3: Site visit and Consultations (Two levels – Institutional and Community/ Public Level along the project road)

- Meeting with Panchayat Officials and elderly citizens
- Village level consultations along the Project Road and carrying out Focused Group Discussions involving women

Activity 4: Preparation of EMP

- Preparation of EMP based on EIA and information collected via site visit, stakeholder/public consultations.

Figure 1.1: Methodology



The Environmental Management Plan (EMP) has been prepared suggesting various mitigation measures to avoid or minimize the impacts of the project on the environment during the pre-construction, construction and operation phases. Two sets of guidelines were prepared and incorporated in the Generic EMAP to enable the contractor to implement the project with the minimum adverse impact on the environment (i) Guidelines for entire project stretch, including the project facilities like camps and sites and (ii) Guidelines exclusively for siting, management and restoration of project facilities like camps and sites. Table 1.2 gives the list of these guidelines:

Table 1.2 Guidelines in Generic EMAP

S No	Title
A.	GUIDELINES FOR ENTIRE PROJECT STRETCH
1.	Guidelines for preparing comprehensive waste management plan
2.	Guidelines for top soil conservation and reuse
3.	Guidelines for Provision of Noise Barriers
4.	Guidelines to Ensure Workers' Safety during Construction
5.	Guidelines for Preparation of Traffic Management Plan
6.	Guidelines for Storage, Handling, Use and Emergency Response For Hazardous Substances
7.	Environmental monitoring plan
B.	GUIDELINES FOR PROJECT FACILITIES
1.	Guidelines for siting, management and redevelopment of construction camps
2.	Guidelines for siting, management and redevelopment of labor camps
3.	Guidelines for siting, management and redevelopment of quarrying and stone crushing operations

4.	Guidelines for siting, management and redevelopment of borrow areas
5.	Guidelines for siting and management of debris disposal site

The guidelines for project facilities have been structured with the following objectives:

- It facilitates the selection of a site with the least environmental impact,
- It looks into the satisfaction of the landowner in the case of leased out / rental out lands,
- It guides the contractor with step by step measures in setting up of an efficient and environment friendly camp / site,
- It ensures smooth, safe and efficient functioning of these camps and sites
- It guides the contractor in preparing a camp / site management and restoration plan to be submitted to the CSC (prior to setting up of the camp/site)
- It facilitates restoration of the site at the closure stage in a very environmentally friendly manner.

EMP assigns the responsibilities for various actions identified to limit the adverse impacts of the project. An environmental monitoring plan and an institutional framework have been proposed as part of the EMP for proper implementation and monitoring of mitigation measures. The cost for implementing the proposed environmental mitigation measures and carrying out the environmental monitoring has been worked out and is presented as part of the EMP for necessary budgetary allocations as part of the project cost. In order to implement various environmental requirements during pre construction, construction and operational phases, all mitigation and enhancement measures have been clearly built into the Environmental Management Plan. All necessary mitigation and enhancement costs are part of the BOQ.

1.5. DEFINITION OF TERMS USED IN THE PROJECT

Project Influence Area (PIA): 15 km on either side (30 km corridor) of project road according to guideline of MoEFCC. Since the Gol has only one definition for all landform throughout India, the same terminology is being used in all cases without any discrimination¹. In reality the PIA should have been the ridge line (water divide) to ridge line on both sides. This distance is generally within five kms from the center line of the project road. However, for some environmental parameters this is not sufficient and hence much bigger areas such as district (transport accessibility by air, road or rail) in certain cases and the state (population, literacy etc.) as a whole in certain other cases were considered.

Project Influenced District (PD): In general, the district through which the project road passes. In the current case project influenced district is Villupuram.

Corridor of Impact (Col): It is the area/zone where in the construction work takes place. Width of corridor required for the construction of road, service lane, drain, footpath, access, tree plantation and for a safety zone. The corridor of impact for the project will be 8m on either side of the centerline in built up areas and 11.5m on either side of the centerline in rural and open areas.

Environmental Impact Assessment (EIA): EIA for convenience and clear understanding, in this project the relationship of EMP to EIA is taken as $EIA=EA+EMP$. In this case, both EA and EMP are two separately bound volumes.

¹ EIA Guidance Manual- Highway, Ministry of Environment, Forest and Climate Change, Government of India

Right of way (RoW): It is the actual land area legally available to Government i.e. Highway Department.

Realignment: It refers to increase in the horizontal curve radius, but may be generally applied to any change in the vertical or horizontal alignment of a road.

Private Trees: These are trees situated in the private property within the required corridor, which will have to be compensated for in monetary terms according to the RAP. This is also to be compensated in the tree planting scheme of the project.

Public trees and avenue trees: Public trees are those that are located within the available corridor of Highway department land.

Impact corridor (IC): The environmental strip plan has considered 15 m on either side from road centerline.

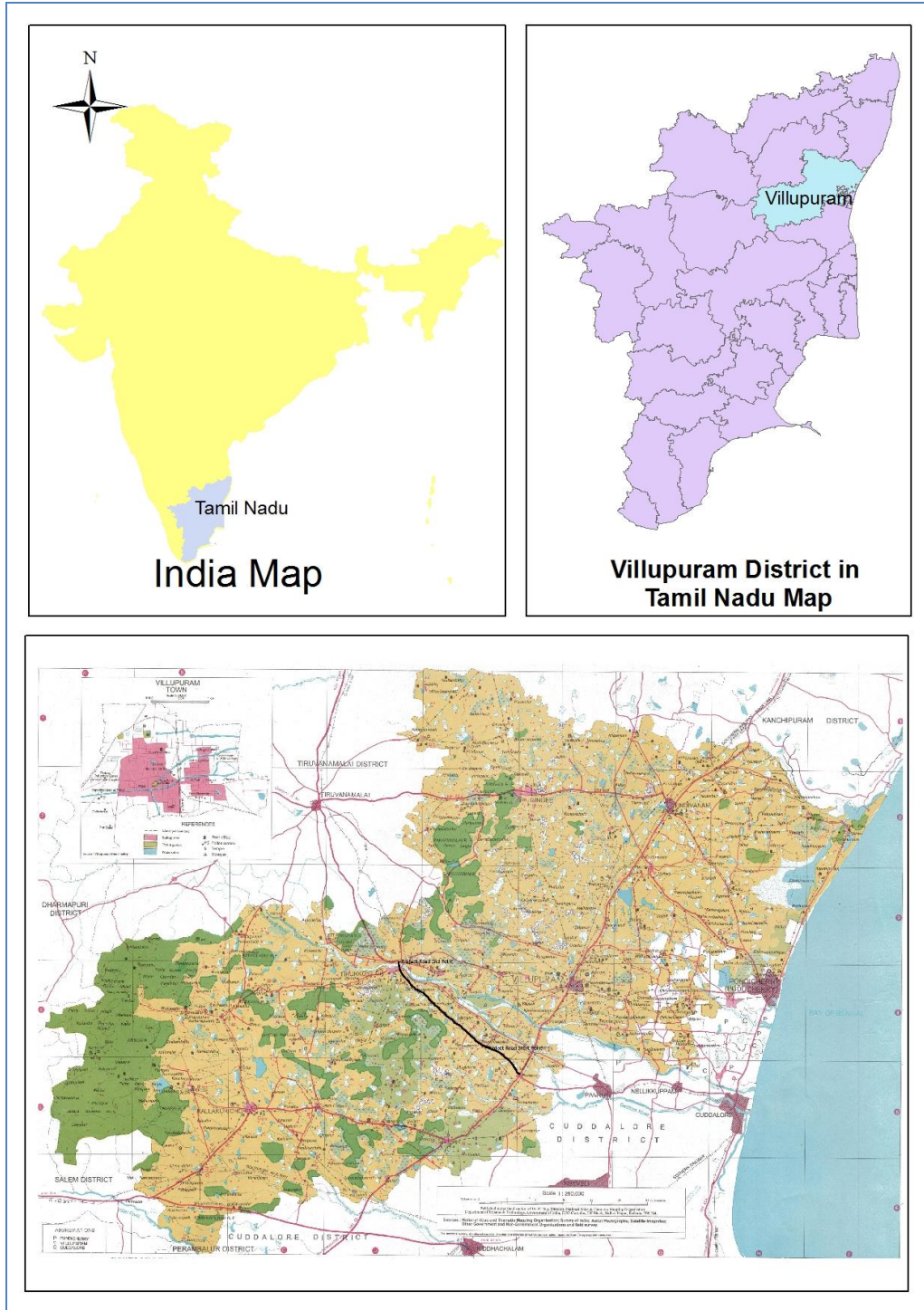
Bypass: A bypass is the term usually applied to a road, which provides an alternate route around a congested urban area. This normally helps to divert through traffic away from using urban center. In the current project road no bypass is planned.

CHAPTER 2 : PROJECT DESCRIPTION

2.1. REGIONAL SETTING OF THE PROJECT ROAD

The project road is located in Villupuram district of Tamil Nadu. The location and regional setting of the project road is shown in Figure 2.1. The latitude and longitude of the start and end points of the project road are 11°47' 49.00" N and 79°24'17.18" E and 11°55'44.44"N, and 79°11'28.90"E respectively.

Fig 2.1: Regional Setting of the Project Area



The roadside features have been shown in strip plans in Annexure 2.1.

2.2. PROJECT DESCRIPTION

The Government of Tamil Nadu has applied for financing from the International Bank for Reconstruction and Development (IBRD) in the form of a loan towards part of the cost of Tamil Nadu Road Sector Project II (TNRSP II). The TNRSP has appointed consultant for preparation of Detailed Project Report for various road improvement works under it.

The sub projects under package-02 (PPC-02) identified under Phase-I implementation is corridor no. 1 connecting Madapattu (km 41+700) to Thirukovilur (km 66+300) plus link road between SH-09 and SH-137 (link road chainages km 66+190 to km 71+147). The link road ends at km 124+460 of SH-137.

This project road is well connected to important places and economic centers of the State, namely Madapattu, Irundhai, Arumpattu, Madhampattu, Gopulapuram, Saravanapakkam, Pennaivalam, Ammavasappayam, T.Kunnathur. Edapalayam, Mudhalur and Thirukovilur. This road traverses in plain terrain passing through rural areas as well as many intermittent semi-urban settlements. In rural areas the land use on both sides is agricultural land/open spaces interspersed with small structures. The abutting land use in the built-up areas is predominantly residential and commercial. There are three ponds located close to the road while Educational institutions and worshipping places scattered all along the project road.

2.3. PROPOSED PROJECT IMPROVEMENTS

Depending on the present condition of the selected roads, different levels of improvement/ up gradation measures will be required for different sections of road stretches. The improvement works mainly consist of:

- Raising the formation level where ever required
- Upgrading/improving road geometrics
- Widening to two-lane/four lane from existing double lane/intermediate lane/single lane width
- Pavement strengthening
- Improving cross drainage
- The road stretches crossing urban areas may also require alternative new alignments or realignments or provision for drains, sidewalks, bus bays and parking along existing road.

Widening of the project road to two-lane/four lane

The project highway shall be widened to 2-lane (7.0 m wide carriageway) with 1.5 m wide Paved Shoulders on both sides. The widening schedule for the project road has been given below in Table-2.1.

Table 2.1: Widening Schedule of Madapattu to Thirukovilur Road (SH 09)

Sl. No.	Design Chainage (km)		Length (m)	Widening
	From	To		
1	41+700	44+000	2,300	2-lane with Paved Shoulders
2	45+000	66+190	21,190	2-lane with Paved Shoulder

The stretch between Design Chainage km 44+000 to km 45+000 does not form part of this contract because an ROB has been proposed by Highways Department over level crossing at km 44+482. This portion including the ROB shall be executed and implemented by Highways Department.

Replacement of culverts and construction of new culverts

The general repairs and rehabilitation works of culverts will include, but not limited to, general cleaning of the culvert and the area around culverts, restoration of slopes and protective works, repair and replacement of drainage spouts where required, construction/repair of damaged parapets and repair and rehabilitation of damaged concrete/masonry of any component, etc. All the repair and rehabilitation works shall be carried out as per the Manual and Specifications.

This replacement/rehabilitation of culverts will accommodate two full lanes for the full formation width. The Project road has the 36 culverts which include 2 no of CS Slab type culvert, 14 number of pipe culverts and 20 number of RCC slab type culverts between chainage km 41+700 to km 66+300. Out of these 5 pipe types, 1 RCC slab type and 2 CS slab type culvert will be upgraded to box size culvert. Apart from this, all existing culverts which are not to be reconstructed shall be widened to the roadway width of the Project Highway as per the typical cross section given in section 7 of the Manual. Repairs and strengthening of existing structures where required shall be carried out in 19 RCC box type culvert.

Improvement of the Existing Road Geometrics

A total of 550 m of improvement of existing road geometry at two locations has been planned and these locations have been shown in Table 2.2.

Table 2.2: Locations of Curve Geometry Improvement

S. No	Design Chainage (km)		Existing Curve Radius (m)	Improved Curve Radius (m)
	From	To		
1	48+951	49+141	310	360
2	64+537	64+719	240	450

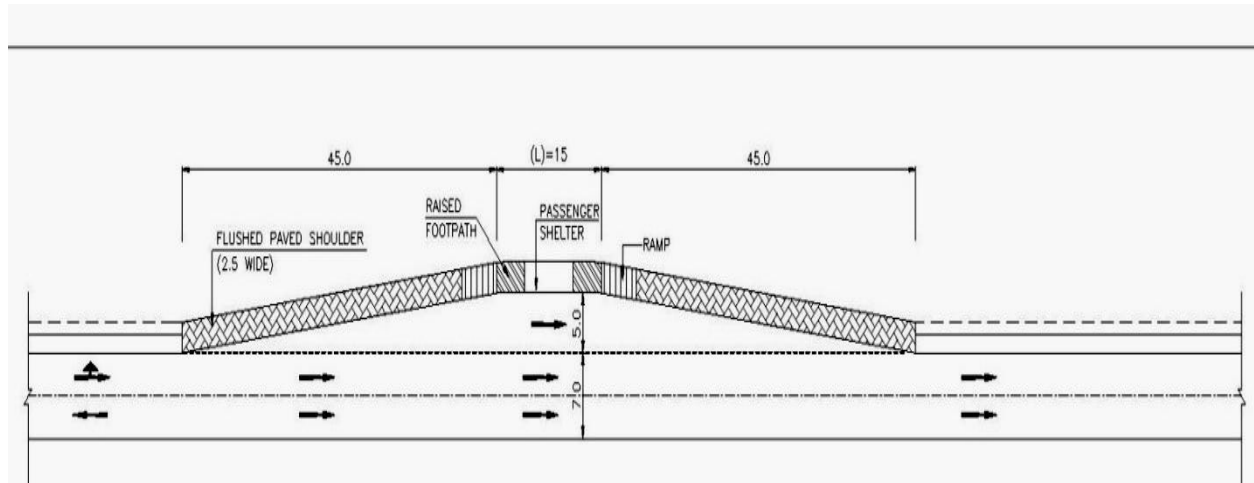
Embankment Height

As per MoRTH & IRC guideline, the bottom of sub grade is generally 1.0 m above the high flood level/high water table. However, in the case of existing old roads where it may be difficult to fulfill this criterion without needing reconstruction or raising in substantial length, the criteria may be relaxed depending on site conditions, ensuring that the bottom of sub grade is 0.6 m above High Flood Level (HFL). The HFL should be decided by intelligent inspections, local observations, inquiries and studying the past records. Keeping in view of stakeholders (Highway Department Villupuram, local people along the road) suggestion, the Proposed FRL is kept as 1.0m from the top of existing FRL

Bus Bays and Passengers Shelters

With various road improvement works, 20 numbers of new bus bay and passenger shelters have been proposed along the project road. These bus bays are located on the LHS and RHS of the villages along the project road such as Madapattu, Kothanur, Periyasevalai, Pavandhur, Pennaivalam, Ammavasai palayam, T. Kunnattur, Edapalyam, Muthalur and Kolapakkam. Typical layout of bus bay is presented in Figure 2.2.

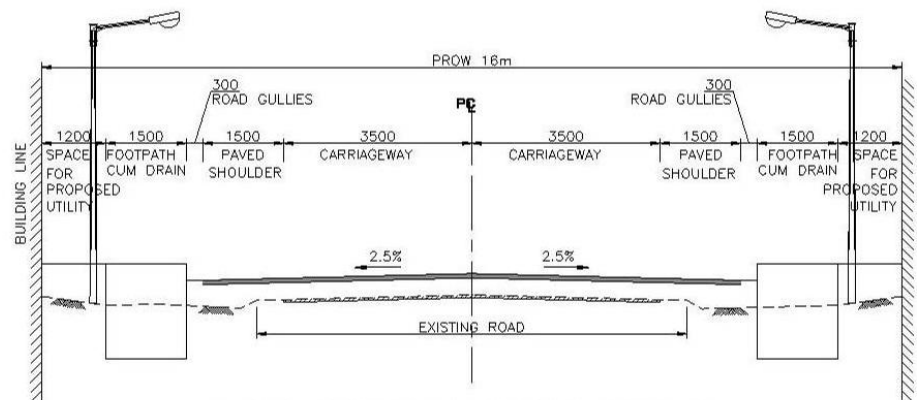
Figure 2.2: Typical Layout of Bus Bay and Passenger Shelter



Design Cross Section

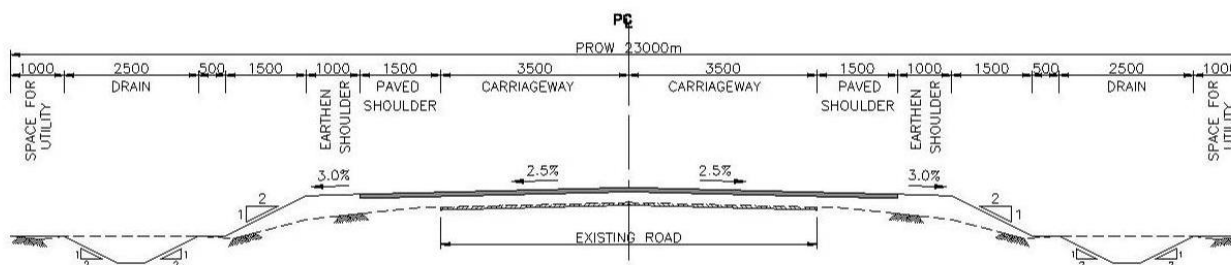
In the project road corridor, a major portion (22.716 km) in three stretches of rural sections has two lane configuration having 23 m PROW. In built up portion project road configuration has 16 m PROW (km 48+000 to km 48+800) and 28.7 m PROW at intersection (SH-09 and SH-69 from km 49+150 to km 50+000). Typical cross section of the road in built up and rural sections has been shown in Figure 2.3 while the typical cross section for Road for the junction improvement at crossing with SH-69 has been shown in Figure 2.4.

Figure 2.3: Typical Road Cross Section in Built up and Rural Area



TCS No.1 : 2-LANE BUILT-UP SECTION - 16m PROW

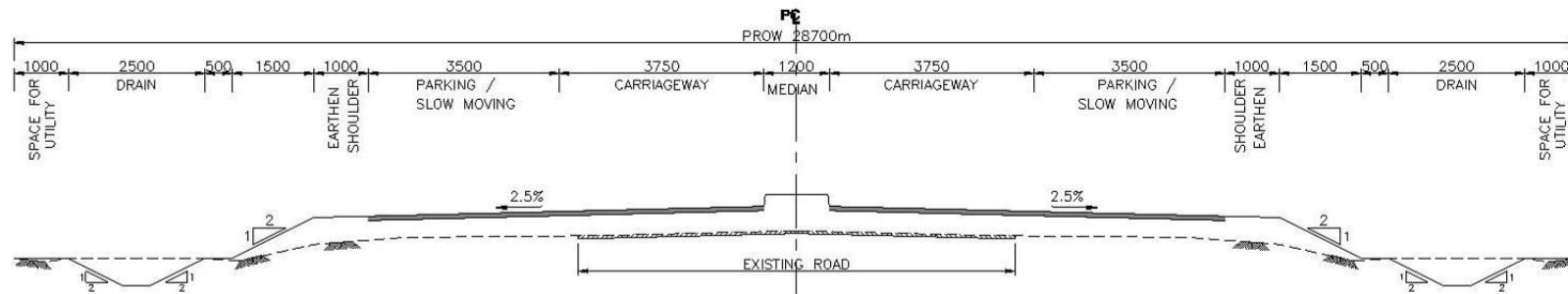
TCS No. 1				
S.No.	Design CH		Length (m)	Village/Town Name
	From	To		
1	48000	48800	800	KOTHNAPUR (BUILT UP)



TCS No.2 : 2-LANE RURAL SECTION

TCS No. 2				
S.No.	Design CH		Length (m)	
	From	To		
1	41700	48000	6300	
2	48800	49150	350	
3	50000	66066	16066	

Figure 2.4: Typical Road Cross Section at Approach to Junction with SH-69



TCS No. 3 CROSS SECTION AT THE APPROACH TO JUNCTION WITH SH-69
 (This is to provide additional space for vehicles, queing up for sugar factory on SH-69)

TCS No. 3			
S.No.	Design CH		Length (m)
	From	To	
1	49150	50000	850

2.4. ENVIRONMENTAL ENHANCEMENT MEASURES ADOPTED IN THE PROJECT

The various environmental Enhancement measures adopted in the project aims to increase the aesthetics and safety of project road. These include beautifying the selected water bodies along the project road. If sufficient width available, rest spots or even bio park or tiny parks could be constructed. Paintings on walls of temples and worship places paying attention to enhancement measures viz. selecting materials that adopt local colors and textures, etc. can increase the beauty of the surrounding places.

Rain Water Harvesting Pit

The storm water during rainy season causes the drainage problem and often the roads are damaged by rainfall runoff. The water on roads during rains remains stagnant for hours together due to poor storm water management and results into erosion of the road. In India, industries and cities are facing water crisis due to over exploitation of underground water and no provision for recharge of aquifers. Solution of managing storm water on roads is channelizing the same to the ground water system in a hygienic manner. This method will not only help in controlling the devastating effects of storm water, but would also improve the ground water regime both in terms of rising of water levels and increase in ground water availability. The techniques will also increase the life of roads and reduce cost of maintenance and repairs. Besides, better plant growth is envisaged with less water requirement due to moist conditions of surface soil through percolation structures. These rain water harvesting pit will be along both the sides of roads with the help of suitable, simple structures, would not only control storm water hazards, but will enhance ground water availability 8 to 10 times compared to the natural process of rainfall infiltration. Detail drawing of the water harvesting pit is shown in Annexure 5.45.

Enhancement of Cultural Properties

Alignment has been worked out to minimize impacts on cultural/religious properties and important tourist spots. At locations where this was unavoidable, and where the community was willing to relocate the religious property, relocation has been proposed. Detailed discussions with the community and various stakeholders had been conducted for relocation or shifting of cultural properties.

The cultural property enhancement in the project has been planned for the impacted religious structures and public water bodies due to proposed road improvement. These ponds will be properly rehabilitated and enhanced for better public use, such as plantation; seating arrangement will be provided in available space. Detail drawings & plan of the individual pond enhancement features have been provided in Annexure 5.49.

Use of Hollow Interlocking Tiles at footpaths and Junction Improvement Locations

Hollow interlocking tiles will be used at the footpath and junction improvement locations in the construction works.

Roadside Tree Plantation

Ornamental plantings or avenue plantation is a means to blend the stark utility of roadways with their surroundings by improving the aesthetic and environmental qualities of the roadside. Roadside plantings are also an effective way to improve community relations. Trees will be planted on either side of the road to provide shade and shelter for road users, especially for pedestrians or slow moving traffic. The tree plantation will be taken up in the available clear

space which will serve the purpose of compensatory plantation due to felling of existing trees along the road, taking into consideration IRC:SP:21 for detailed guidelines for road plantation. Guidelines for selection of tree species, avenue plantation, transplantation of poles (<30 cm girth size) has been presented in Annexure 5.52 to 5.56.

Landscaping at Major Junction Locations & Realignment Locations

Apart from offsetting the loss of trees along the project highway, landscaping is proposed along the major junction and realignment location to enhance the aesthetics of the highway corridor from all possible angles. This will involve the grass turfing and planting of trees and shrubs in these places. It will enhance the surroundings and act as service facilities for rest, recreation, etc. for the road travelers.

Apart from this, public utilities such as construction of bus shelters at bus bays locations, providing parking facilities for auto rickshaws in an urban center, taxis, jeeps and tempos, signboards indicating prominent locations & distance along the project road, improvement of parks and gardens will be undertaken along the project road corridor.

CHAPTER 3 : ENVIRONMENTAL MANAGEMENT ACTION PLAN

3.1. INTRODUCTION

Environmental Management Plan Action (EMAP) is the key to ensure that the environmental quality of the direct project influence area and indirect project influence area does not deteriorate beyond the expected levels due to the construction and operation of the project. The EMAP comprises a set of measures to be taken in different stages like the design, construction and operation to eliminate, offset or reduce adverse environmental impacts to acceptable levels. Elimination/prevention is possible through the elimination of impacts or by avoiding the action. This can also be achieved by reducing the scale of action. Remediation is repairing or restoring particular features of the environment adversely affected by the activity. Offsetting actions mean compensating for impacts by providing additions to or substitutes for the affected environment. In case of widening of Madapattu- Thirukovilur road (SH-09), prevention is limited only to scaling down the magnitude of operations in environmentally sensitive stretches of the project road. Mitigation plans generally evolve around remediation and offsetting.

The institutional arrangement made under the project will look into the implementation of the project as well as EMAP and the various legal settings applicable to the project are briefly stated in chapter 3 of the Environmental Assessment report.

The avoidance, mitigation & enhancement measures for protection of the environment along highways have been discussed in detail in EA report. Despite the social, environmental impacts, its mitigation and management are an essential component of the EMAP. This chapter excludes it for the purpose of clarity and procedural requirements. Social environmental elements have been separately dealt with in a separate volume, namely, Resettlement and Rehabilitation Action Plan (RAP).

EMAP as the Table 3.1 called 'Generic EMAP' lists those measures, which are for Madapattu to Thirukovilur road (SH-09) for the improvement work lists those measures which are specific to this link. The EMAP can also be classified based on the responsibility of implementation of mitigation measures such as EMAP for PIU-TNRSP, CSC & contractor. EMAP includes stakeholders comprises of the planning department, local police & fire station, state motor vehicle department and other organizations which are directly or indirectly associated with the project. EMAP for the contractor will be monitored by the CSC / PIU-TNRSP.

The role and responsibility of the responsible organizations are mentioned below.

Tamil Nadu Pollution Control Board (TNPCB) The Tamil Nadu Pollution Control Board will be responsible for all matters related to air, water and noise pollution during construction and operational stages. Any matter related to this may be brought under their notice for a solution.

Forest Department Any matter related to social forestry, forests, wildlife and trees, etc. should be consulted with the local DFO or Forest Range Officer, Forest Department depending upon the advice required.

PIU-TNRSP: TNRSP will be available only in the State headquarters in Chennai. Most of the work at the local level will be taken care of at the local Project Implementation Unit through the Highway Department of Government of Tamil Nadu.

Design Consultant: Preparation of final road designs and contract documentation based on the preliminary road designs and the formulation of the Environmental Management Plan and Environmental Management Action Plan recommendations.

Environmental Engineer (EE) of PIU: EE will be responsible for all matters of environmental monitoring and inter Governmental coordination.

Traffic Police and State Police any matters related to traffic and violation of traffic and other law and order issues may be taken up with the traffic police and State Police.

Water Resources Department: The water resources department will be responsible for all matters relating to rivers, canals, waterways and irrigation canals.

Local bodies (Panchayat and Municipal Authorities): Panchayat and Municipal authorities will be responsible for local bus waiting sheds, Panchayat and municipal public wells, ponds, etc.

Motor Vehicle Department: The motor vehicle department will be responsible for the issue and matters relating to Pollution under Control (PUC) Certificates, driving licenses etc.

Fire Force and Fire Station: the matters relating to safety, especially relating to fire safety may be taken up with the Fire force.

Department of Geology & Mining: All matters relating to the quarry and sand materials may be referred to the State Mining and Geology Department.

3.2. OBJECTIVE OF EMAP

The EMAP is a plan of action for mitigation / management / avoidance of the negative impacts of the project and enhancement of the project corridor. For each measure to be taken, its location, timeframe, implementation and overseeing / supervision responsibilities are listed. These components of the EMAP have been given in **Table 3.1** which explains the environmental issues and the avoidance/ mitigation/ minimization or enhancement measures adopted and/or to be adopted during different phases of the project. It also provides the references for the suggested measures, responsible agency for its implementation/ management as well as its time frame.

3.2. COMPLIANCE WITH THE EMP

A copy of the EMP must be kept at the construction site office during the construction period at all times. The EMP will be made binding on contractor operating on the site and must be included as Contractual Clauses in any contractual agreement for the Contractor.

- All persons employed by the contractor or his sub-contractors will abide by the requirements of the EMP.
- Contract conditions to include measures to be taken.
- The Contractor will not direct a person to undertake any activity which would place them in breach of the specifications contained within the EMP.
- Should the Contractor be in breach of any of the specifications contained in the EMP, the CSC will in writing, instruct the Contractor responsible for the incidence of non-compliance regarding corrective and/or remedial action required, specify a timeframe for implementation of these actions, implement a penalty and/or indicate that work could be suspended should non-compliance continue.
- Should non-compliance continues, further written notification will be forwarded to the contractor responsible for the incident of non-compliance outlining the required corrective and/or remedial action, the timeframe for implementation, penalties and/or work could be suspended as specified previously.
- Contracts with contractor to include clauses to hold the contractor responsible for the cost of any delays, corrective or remedial actions required as a result of non-compliance with the specifications and clauses of the EMP.
- An appropriate reporting schedule for frequent reporting (of compliance with the EA/EMP) to the CSC/PIU will be developed. The process to be followed for the auditing of the EA conditions / EMP, as well as the reporting procedure to be followed, will be outlined in this document.

- The CSC must notify the TNRSP and any other relevant authority, in writing, within a timeframe thereof, if any condition of the EA is not adhered to.
- CSC and other stakeholders will be given access to the EA for the purpose of assessing and/or monitoring compliance with the conditions contained in the EA, at all reasonable times.

3.2. NON-CONFORMANCE AND CORRECTIVE ACTION

The Contractor is deemed not to have complied with the EMP if:

- Within the boundaries of the site, site extensions and haul/ access roads there is evidence of a contravention of clauses.
- If environmental damage ensues due to negligence.
- The contractor fails to comply with corrective or other instructions issued by the TNRSP/CSC within a specified time.
- The Contractor fails to respond adequately to complaints from the public.

3.3. PENALTY CLAUSE FOR NONCONFORMITY TO EMP

The duration over which the Contractor's controls shall be in place to cover the construction period of the project as well as the limited time after the contract completion in terms of the contract as the defects liability period. The Contractor shall implement all mitigation measures for which responsibility is assigned to him as stipulated in the EMP Report.

Application of a penalty clause to the contractor will apply to incidents of non-compliance. The penalty imposed will be per incident and will be deducted from the contractor's payment. Unless stated otherwise in the project specification, the penalties imposed per incident or violation will be determined in consultation with the CSC and/or TNRSP and depending on the severity and/or regularity of the incidence occurring. Any lapse in implementing the EMP will attract the penalty clause as detailed below:

- All lapse in obtaining clearances/permissions under statutory regulations and violations of any regulations shall be treated as a major lapse.
- Any complaints of public, within the scope of the Contractor, formally registered with the CSC, or with the PWD complaint cell and communicated to the contractor, which is not properly addressed within the time period intimated by the CSC / PIU shall be treated as a major lapse.
- Non-conformity to any of the mitigation measures stipulated in the EMP Report (other than stated above) shall be considered as a minor lapse.
- On observing any lapses, CSC shall issue a notice to the Contractor, to rectify the same.
- Any minor lapse for which notice was issued and not rectified, first and second reminders shall be given after one month from the original notice date and first reminder date respectively. Any minor lapse, which is not rectified shall be treated as a major lapse from the date of issuing the second reminder.
- If a major lapse is not rectified upon receiving the notice, CSC shall invoke the penalty clause, in the subsequent interim payment certificate.
- Penalty for major lapses shall be with-holding of 10% of the interim payment certificate, subject to a maximum limit of Rs. 30 Lakhs.
- If the lapse is not rectified within one month after withholding the payment, the amount withheld shall be forfeited.

The environmental expert of CSC will issue each notice of non compliance to the contractor in triplicate with a copy to the TNRSP and CSC Team Leader. The notice for invoking penalty clause will also be issued in triplicate.

3.4. PUBLIC CONSULTATIONS AND PARTICIPATION

The stakeholder consultations have been carried out (June 28, 2014) during design phase and following suggestions were made by the stakeholders:

- Minimisation of tree cutting (specially giant Tamarind tree cutting should be avoided) and compensatory tree plantation should include Tamarind tree plantation
- Additional lane near Sugar Mill (km 46+600) to relieve congestion during Sugar Cane Crushing season
- Provisions for Bus stops with Shelters along project road
- Minimisation of land acquisition and concentric widening for minimisation of assets acquisition
- Timely payment of compensation
- Measures for minimisation of accidents

The above suggestions have been given due consideration in the highway design and following mitigation measures planned:

- Tree cutting minimised by adjusting the widening schedule (km 43+000 to 43+850, RHS and km 58+300 to 59+050,RHS, 59+050 to 60+300, LHS) and provision for transplantation (to the extent possible) of poles (Trees<30 cm girth size, chainagewise list prepared and included in EMP)
- Covered rectangular drains cum footpath planned in habitations to address drainage issues
- 20 new road side bus stops (in a staggered manner) with passenger shed planned along the road
- TNRSP policy is to utilise available Right of Way (RoW) to the extent possible to minimise land and other road side assets acquisition. In order to follow the policy concentric widening is planned. This also ensures equal and fare treatment to the population residing along the project road.
- For timely payment of compensation Resettlement Action Plan (RAP) prepared and compensation will be paid in advance before acquisition of assets
- To minimise accidents curves improvement (2), intersection development(3 major and 44 minor), metal beam crash barrier at water bodies (4 locations) and steep slopes, pedestrian guardrails at habitation (km 48+000 to 48+800), rumble strips at approaches to major and minor junctions(15 locations), and signages as per IRC planned

During construction phase consultations will be taken up for relocation of common property assets being impacted (drinking water sources, religious structures) and finalisation of debris disposal sites.

3.5. GOOD INTERNATIONAL PRACTICES FOR CONSIDERATION DURING EMP IMPLEMENTATION

The contractor while implementing the EMP will follow 'General Environmental, Health and Safety Guidelines' of IFC and develop procedures to achieve the following:

- Minimum air emissions from construction activities to maintain better levels of ambient air quality in the surroundings of construction sites and construction camps
- Minimise energy consumption in construction activities
- Minimise waste water generation at camp and construction sites
- Use of optimum natural resources
- Effective reutilisation of waste and proper disposal of waste which can not be reused/recycled
- Minimum disturbance to the population on account of noise generation
- Minimise/avoid pollution to water sources
- Safe working environment to the construction crew through safe operating procedures and encouraging use of personal protective equipment by the work force. For this contractor will procure adequate personal protective equipment.

- Effective traffic management on the project road to achieve better safety of construction crew and road users
- Prevention of communicable diseases through awareness campaign for STD and Hepatitis

Further, the contractor will prepare an 'On Site Emergency Plan' to deal with any mishap such as fire, explosion, spillage of hazardous materials at camp and construction sites.

Table 3.1: The Environmental Management Action Plan (EMAP)

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
DESIGN PHASE					
General consideration of Cross section Alternatives	Standard cross section alternatives were used for the Project road design depending on the traffic requirement and economic indicators, type of surroundings (rural, urban, semi urban, etc.)	During Design	TNRSP	DPR Consultant(Design Consultants)	DPR Document
Geometric Design	The proposed alignment is selected/adjusted (within IRC/MoRTH specifications) - To minimize land disturbance - To avoid culturally & environmentally sensitive areas – cultural properties, water bodies, educational institutes etc.	During alignment design	TNRSP	DPR Consultant	DPR Document
Issues from stakeholder Consultations	Various issues raised were examined & suitably incorporated based on merit & other road safety measures.	During Design	TNRSP	DPR Consultants, Contractor	Stakeholder Consultations (Chapter-5)
Avoidance of Cultural Properties	- Cultural properties along the alignment were identified. - Religious Structures were avoided to the extent possible. Twelve temples are coming in the proposed right of way which needs to be relocated due to proposed road improvement.	During alignment design	TNRSP	DPR Consultants, Contractor	
Preservation of tree	A significant number of trees have been saved by planning a schedule of widening of the project road No trees to be cut beyond the toe line. The tree cutting will be minimised during implementation also. The detailed Avenue plantation scheme is prepared, for plantation all along the project corridor, cost is considered in the Budget.	During alignment design	TNRSP	DPR Consultants, Contractor	MoRTH clause 201.5 Clause
Design Discharge & Drainage design	Minor Bridges planned for reconstruction have been designed for the 50-year flood frequency. All culverts have been designed for the 25 year flood frequency. The	During Design	TNRSP	DPR Consultants, Contractor	Volume of Hydrology report

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	fill height has been designed for 50-year flood.				
Monitoring at critical locations	The monitoring of air, land, water and noise has been carried out at critical locations along the project corridor. This will serve as a benchmark for monitoring during construction and operational phases. (Table-5.3 in Chapter-5 of this document on Monitoring Plan)	During Design	TNRSP	DPR Consultants, Contractor	Chapter 4: Baseline Environment in EIA report
Orientation of Implementing Agency	A comprehensive training/orientation schedule has been prepared in different stages for TNRSP.	During Design	TNRSP	DPR Consultants	Annexure-5.57 Training Schedule
External Influence of construction camp	Location and basic facilities on site are suggested in a way to cause minimum interference with the local system, for details refer Annexure 5.1: Guidelines for siting & layout of construction camp	During Design	TNRSP	DPR Consultants, Contractor	Annexure -5.1
Road safety issues due to poor geometric.	Geometric improvement has been incorporated as per IRC codes and MoRTH specifications. Four realignments planned for geometric improvements	During alignment design	TNRSP	DPR Consultants	Not Applicable
Diversion of Traffic	Appropriate diversion of traffic schemes to ensure smooth traffic flow, minimize accidents during construction, design of diversionary signage	During Design	TNRSP	DPR Consultants, Contractor	Annexure-5.10 of EMP
Accident black spot	Improved road surface with improved road geometry, Pedestrian facilities and Bus shelters is planned. Total 40 bus bays and passenger shelters are planned. Lining and signing are given a high priority for all road junctions. Safety Audits completed on the final design drawing and corrective measures undertaken.	During design Stage.	TNRSP	DPR Consultants Traffic Police, Contractor	Not Applicable
PRE-CONSTRUCTION PHASE					
Permissions/ Approvals	Tree felling permission will be obtained from District Collector Office Villupuram	After centerline marking at the site.	TNRSP and Revenue Authorities	DPR Consultants	MoRTH clause 201.5

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
Land Acquisition	The land acquisition will be carried out as per provisions of Land acquisition Act 2013.	After marking the proposed centerline at the site	TNRSP, Revenue Department	TNRSP Officer (LAO), Design Consultants	Resettlement Action Plan
Property Acquisition	- Compensation has been paid to Project Affected Peoples based on the Resettlement Action Plan.	Post design to Pre-construction.	TNRSP and LAO and appointed NGO	TNRSP	Resettlement Action Plan, and DPR
Relocation of Utilities	All community underground and overhead utilities are to be shifted as per <u>utility shifting plan</u> , prior permission should be obtained from regional offices of Electricity, Telecommunications, OFC, Waterworks, etc.	Post design to Pre-construction	TNRSP, DPR Consultants	TNRSP, CSC Contractor, Design Consultants	Utility Relocation Plan
Loss of drinking water source (Overhead storage tank)	Private drinking water source replaced according to RAP and public water sources replaced according to EMAP. Two water overhead tanks at km 9+450 (LHS) and 10+900 (LHS) likely to be impacted.	Post design to Pre-construction.	TNRSP	TNRSP, CSC, Design Consultants, Contractor	
Loss of drinking water source (Ground water)	Private drinking water sources shall be relocated or compensation shall be paid as per Resettlement Action Plan. No ground water source within RoW to be impacted.	Post design to Pre-construction.	TNRSP /PHED	TNRSP CSC, Contractor, Design Consultants	Refer RAP
Tree Felling	A total of 5,011 trees is to be felled for this permission will be obtained from revenue authorities. Tree list for girth < 30 cm has been prepared separately shown in Annexure 5.51 and these trees shall be transplanted depending upon feasibility of transplantation in consultation with CSC environmental expert and TNRSP Environmental Specialist.. No endangered species of tree have been observed, however, if any, found during implementation it will be transplanted.	Post design to Pre-construction.	TNRSP Revenue Department Villupuram	TNRSP, CSC Contractor, Design Consultants	MoRTH clause 201.5 (Page42)

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
Cultural Properties	Total 27 cultural properties exist out these 12 are to be relocated and 4 are partially impacted. Relocation plan will be prepared with the help of the NGO. Relocation plan will be prepared with the help of the NGO/Consulting Organisation helping in RAP implementation (Annexure-5.46).	Pre Construction	PIU TNRSP	CSC, Contractor, DPR Consultants	
Loss of existing bus stops and Waiting shed facilities	There is proposal for construction of 20 bus stops with passenger shelters along the project road in lieu of 41 being impacted.	During design stage.	PIU – TNRSP	DPR Consultants	Not Applicable
CONSTRUCTION PHASE					
Clearances, Approvals and Permits	<p>List of clearance Required prior to start of construction Activity</p> <p>Type of Clearance</p> <p>Consents under Air, Water & Environment Act and noise rules from TNPCB</p> <p>Consents under Air, Water & Environment Act and noise rules from TNPCB</p> <p>Explosive License from Chief Controller of Explosives,</p> <p>Permission for storage of hazardous chemical from CPCB</p> <p>Borrow Area, approval from Villupuram district</p>	<p>Construction stage (Prior to initiation of any work</p> <p>Time period in getting the permission is 2-3 months.</p>	<p>TNRSP, TNPCB, CPCB, Chief Controller of Explosives, District Collector State Department of Mines and Geology, State Ground Water Board, State Irrigation Department, Labor commissioner officer</p>	<p>Contractor</p>	<p>General Conditions of Contract</p> <p>Clause 111.3, MoRTH</p>

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	<p>collectors, Consent letter, lease agreement with the owner of land.</p> <p>Quarry Lease Deed and Quarry License from State Department of Mines and Geology</p> <p>Permission for extraction of ground water for use in road construction activities from State Ground Water board</p> <p>Permission for use of water for construction purpose from irrigation department</p> <p>Labor license from labor commissioner's office</p> <p>Quarry operation (for new quarry)</p> <p>Extraction of ground water</p> <p>Use of surface water for construction</p> <p>Engagement of Labor</p> <p>Provide copy of all necessary clearances to the CSC / PIU</p> <ul style="list-style-type: none"> ▪ Adhere to all clearance terms and conditions ▪ Obtain written permission from private landholders to conduct construction activities on their land prior to commencing works. 				
Environmental Management and Monitoring Facility Equipment for EMP (Meters, Vehicles and Buildings)	Monitoring is to be carried out regularly as per the frequency and locations mentioned in monitoring plan (Table-5.3) and results will be compared with relevant Standards (Table-5.3 -Refer Annexure-5.57 for National Ambient Air Quality Standards, Ambient Noise Standards and Water Quality Standards).	During and after construction (Two Years)	TNPCB, PIU - TNRSP	Contractor	As a Project specific action this will have to be incorporated.
Asphalting	Asphalt mixing plants should be located over 1000 m	During	PIU- TNRSP	Contractor	MoRTH

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	(refer CPCB/TNPCB, Consent Conditions) from any communities. Mixing equipment should be well sealed, and be equipped with a dust-removal device. Operators should wear dust masks, ear protection and hard hats.	Construction	CSC, Design Consultants TNPCB		Specification 111, 111.5
AIR					
Gaseous Emissions	Vehicles and machinery are to be maintained so that emissions conform to National Ambient air quality standards (Ref ;Annexure-5.57 for National Ambient Air Quality Standards). All vehicles and machineries should obtain <u>Pollution Under Control Certificates</u>	Beginning with & throughout construction	PIU -TNRSP, TNPCB	Contractor	MoRTH Specification 111.1, 111.5
Dust Generation	<ul style="list-style-type: none"> ▪ Vehicles delivering materials should be covered to reduce spills and dust blowing off the load. ▪ Clearing and grubbing to be done, just before the start of next activity on that site. In case of time gap, water should be sprinkled regularly till the start of next activity. ▪ Water to be sprayed during the construction phase, at mixing sites, approach roads & temporary roads. ▪ In laying sub-base, water spraying is needed to aid compaction of the material. After the compaction, water spraying should be carried out at regular intervals to prevent dust generation. ▪ Road surface should be cleaned with air compressor and vacuum cleaners prior to the construction works. Manual labor using brooms should be avoided, if used labor to be provided masks. ▪ Embankment slopes to be covered with turfing/stone pitching immediately after completion 	Beginning with & throughout construction until asphalting is completed and side slopes are covered.	PIU – TNRSP, Design Consultants CSC,	Contractor	MoRTH Specification 111.1, 111.5, 111.8, 111.9, 111.10

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
Equipment Selection, maintenance and operation	Construction plant and equipment will meet accepted international standards for emissions and will be maintained and operated in a manner that ensures that relevant air, noise, and discharge regulations are met	During construction	PIU – TNRSP, CSC, Design Consultants	Contractor	MoRTH Spec 106, IRC: 72-1978; IRC: 90-1985, 111.5, 111.9, 111.10, 201.3
LAND					
Soil Erosion and Sedimentation control	<p>Main reason of soil erosion is rains/monsoon, contractor should plan the activities so that NO bare/ the loose earth surface is left out before the onset of monsoon, for minimizing the soil erosion following preventive measures to be taken such as</p> <ul style="list-style-type: none"> ▪ Embankment slopes to be covered, soon after completion ▪ Next layer/activity to be planned, soon after completion of, clearing and grubbing, laying of embankment layer, sub grade layer, sub base layer, scarification etc. ▪ Top soil from borrow area, Debris disposal sites; borrow area, construction site to be protected/covered for soil erosion. ▪ Debris due to excavation of foundation, dismantling of the existing cross drainage structure will be removed from the watercourse immediately. ▪ Diversions for the bridges will be removed from the water course before the onset of monsoon. 	<p>Upon completion of construction activities at these sites.</p> <p>During construction</p>	PIU – TNRSP, CSC, Design Consultants	Contractor	MoRTH Specification 306, 307, 308
Loss of agricultural topsoil	<p>All areas of cutting & to be permanently covered will be stripped to a depth of 150mm and stored in stockpiles. Top soil will be safeguarded from erosion and will be reused as follows.</p> <ul style="list-style-type: none"> ▪ Covering all borrow areas after excavation is over. 	During construction	PIU – TNRSP, CSC, Design Consultants	Contractor	MoRTH Specification 301.3.2, 305.3.3

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contr actual Clause
	<ul style="list-style-type: none"> ▪ Dressing of slopes of road embankment ▪ Agricultural field, acquired temporarily. 				
Compaction of Soil and Damage to Vegetation	Construction vehicles should operate within the Corridor of Impact avoiding damage to soil and vegetation. Diversions, access road used will be redeveloped by the contractor, to the satisfaction of the owner/villagers.	During construction	PIU – TNRSP, CSC, Design Consultants	Contractor	MoRTH Specification 201.2
Contamination of soil	<p>Guidelines of “Hazardous Waste (Management and Handling) Rules, 1989 will be enforced.</p> <ul style="list-style-type: none"> ▪ Plant to be set up 500m away from surface water bodies (Vellar River and Irrigation canal). ▪ Oil interceptor will be installed at construction camp sites. ▪ The septic tank will be constructed for safe disposal of waste at construction camp as well as Workers' camp. 	During Construction	PIU – TNRSP, CSC, Design Consultants	Contractor	
Borrow pits	<p>No borrow pit will be opened without the permission of supervision consultant.</p> <ul style="list-style-type: none"> ▪ Written approval from the owner to be submitted to PIU. ▪ Eleven Borrow pits have been identified outside the RoW (Refer- Annexure-5.51) . Before opening additional borrow pits, operating pits shall be closed, according to IRC specifications. 	During Construction	PIU – TNRSP, CSC, Design Consultants	Contractor	IRC: 10 1961 MoRTH Spec. 111.2, 305.2.2 Appendix on borrow area management
1) Quarrying 2) Material sources	<ol style="list-style-type: none"> 1. Quarrying will be carried out at approved and licensed quarries only. Copy of licenses to be submitted to the CSC and PIU. 2. As far as possible contractor will use the material from the Material sources as stated in the EIA report. In case of new quarry the instruction in Annexure-5.3 titled: 'Guidelines for Sitting, Management and Redevelopment of Quarrying and Stone Crushing 	During Construction	PIU –TNRSP, CSC, Design Consultants	Contractor	MoRTH Specification 111.3, 302, 305.2.2 and Annexure-5.3

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contr actual Clause
Operations' will be applicable.					
WATER					
Loss of water bodies (Surface/Ground)	<ul style="list-style-type: none"> ▪ No excavation from the bund of the water bodies. ▪ No debris disposal near any water body. ▪ Prior written permission from authorities for use of water for construction activity should be submitted to the CSC. ▪ Construction labors should be restricted from polluting the source or misusing the source. ▪ Shifting of source to be completed prior to the disruption of the actual source. ▪ Source to be replaced immediately, in case of accidental loss. ▪ Alternate measures to be taken/ ensured during disrupted period. 	During Construction	PIU, CSC, Contractor Design Consultants		MoRTH Specification 111.4, 201.2, 301, 304, 306
Alteration of drainage	<ul style="list-style-type: none"> ▪ Diversions should be constructed during dry season, with adequate drainage facility, and will be completely removed before the onset of monsoon. ▪ Debris generated due to the excavation of the foundation or due to the dismantling of existing structure should be removed from the water course. ▪ Silt fencing has to be provided on the mouth of the discharge into natural streams. ▪ Continuous drain (lined/unlined) is provided, obstruction if any, to be removed immediately. 	Whenever encountered during construction.	PIU – TNRSP, CSC Irrigation Dept, . Design Consultants	Contractor	MoRTH Specification 201.2,301, 304, 306, 312
Runoff and drainage	<ul style="list-style-type: none"> ▪ Throughout continuous drain is planned (In habitations covered lined drain cum footpath and open areas earthen drain) ▪ Lined drain is provided at built-up locations for quick drainage. ▪ Increased runoff due to increased impervious 	During Construction	PIU – TNRSP, CSC, Design Consultants	Contractor	

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	surface is countered through the increased pervious surface area through soak pits.				
Water required for project	<ul style="list-style-type: none"> ▪ The contractor has to provide a list of sources (surface/ground) for approval from CSC ▪ Prior to the use of source contractor should obtain the written permission from authority, to use the water in construction activity, and submit a copy to CSC. ▪ During construction only permitted quantity (permission taken) from approved sources should be used in construction activity. ▪ Contractor to ensure optimum use of water; discourage labor from wastage of water. 	During Construction	PIU – TNRSP, Contractor CSC		
Silting/sedimentation	<ul style="list-style-type: none"> ▪ The measures suggested under “Soil Erosion and Sedimentation control” have to be enforced. ▪ Silt fencing should be provided around water bodies. ▪ Construction activities should be stopped near water bodies during monsoon. 	Throughout construction period.	PIU – TNRSP CSC Irrigation Dept.,	Contractor	MoRTH Specification 111.4, 306
Contamination of water	<ul style="list-style-type: none"> ▪ The measures suggested under “Contamination of soil” have to be enforced. ▪ Construction work close to water bodies should be avoided during monsoon. ▪ Labor camps are to be located away from water bodies. ▪ Car washing/workshops near water bodies are to be avoided. 	Throughout construction period.	PIU TNRSP, CSC, TNPCB, Irrigation Dept	Contractor	MoRTH Specification 111.1, 111.4, 111.9, 111.13, 122, 201.2, 201.4, 301.1.3.10, 304.3.3, 306
NOISE					
Noise	<ul style="list-style-type: none"> ▪ Noise standard at processing sites, e.g., aggregate crushing plants, batching plant, hot mix plant are to be strictly monitored to prevent exceeding of Gol 	Beginning and throughout	PIU TNRSP , Contractor CSC , TNPCB		MoRTH Specification 111, 111.5.

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	<p>noise standards(Ref; Annexure-5.57 for Ambient Noise Standards). .</p> <ul style="list-style-type: none"> Workers in the vicinity of strong noise to wear protectors and their working time should be limited as a safety measure. In construction sites within 150 m of sensitive receptors, construction to be stopped from 22:00 hr to 06:00 hr. Machinery and vehicles should be maintained to keep their noise to a minimum. 				
FLORA & FAUNA					
Loss of trees and Avenue Planting	<ul style="list-style-type: none"> Avenue plantation has to be taken up soon after completion of civil works. All the realignment sections are to be enhanced with landscaping and peripheral tree plantation. Identified ponds have to be enhanced with plantation. The contractor has to make sure that no trees/branches are felled by laborers for fuel, warmth during winter. Enough provision of fuel for cooking to be ensured. 	After completion of construction activities	PIU, TNRSP, Contractor, CSC, Design Consultants		MoRTH Specification, 111, 111.5, 201.5, 306, 308
Vegetation clearance	<ul style="list-style-type: none"> Clearing and grubbing should be avoided beyond that which is directly required for construction activities. Next activity to be planned/ started immediately, to avoid dust generation and soil erosion during monsoon. Turfing / re-vegetation to be started soon after completion of the embankment. 	During cleaning operations during construction	PIU, TNRSP, Contractor, CSC, Design Consultants, Forest Dept.		MoRTH Specification 201.2

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contr actual Clause
Fauna	<ul style="list-style-type: none"> Construction workers must protect natural resources & wild animals. Hunting will be prohibited. Nesting grounds & migratory paths will be protected. 	During construction	PIU – TNRSP, CSC	Contractor	MoRTH Specification 111.1, 111.6
SOCIO-ECONOMIC ENVIRONMENT					
General IssuesFear of uncertainties regarding future	Public participation sessions will be conducted in different stages of project construction.	During Construction	PIU TNRSP, CSC, Design Consultants	Contractor	MoRTH Specification 111, 111.5, 111.6, 112, 201.2, 201.3 & 201, 302, 306
Public Health and Safety	Debris, so generated will be disposed to the satisfaction of the Engineer. Monitoring of air, water, noise and land during construction and operation phase.				
Labor Camps	Contractors should recruit the local people as laborers at least for unskilled and semi-skilled jobs. Hygiene and basic facilities should be ensured at the labor camp to prevent the spread of disease.				
Allied activities	Detailed traffic control plans shall be prepared and submitted to the engineer for approval 5 days prior to commencement of work on any section of road.				
Accidents and Safety	The contractor should provide, erect and maintain barricades, including signs marking flags, lights and flagmen as required by the Engineer.				
Sensitive Community Structures	<ul style="list-style-type: none"> A comprehensive mitigation/enhancement plan is prepared for each of the existing community properties along the project corridor 	During construction	PIU –TNRSP, CSC, Design Consultants	Contractor	

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contr actual Clause
	<ul style="list-style-type: none"> ▪ Precautions should be taken during construction, for accidental loss/damage of any communal property. ▪ Any loss during construction will be the sole responsibility of the contractor and the damage will be repaired immediately up to the satisfaction of people, at contractor's own cost. ▪ Through access/identification should be maintained during construction. 				
Roadside amenities	<ul style="list-style-type: none"> ▪ Passenger shelter has proposed at all built-up locations, in case already existing; the same will be repaired and rehabilitated. ▪ Pedestrian crossing is provided at major pedestrian crossings, providing zebra crossing, sign posts and speed breakers. 	During construction	PIU TNRSP, Contractor CSC, Design Consultants		
ROAD SAFETY					
Accident hazardous materials	<p>with COMPLIANCE with "Rules" as defined in Environmental (Protection) Act, 1986, including:</p> <ul style="list-style-type: none"> ▪ For delivery of hazardous substances, three certificates issued by transportation department are required permit, license, driving license, and guarding license. ▪ Vehicles delivering hazardous substances will be printed with standard signs. ▪ Public security, transportation and fire fighting departments will designate a special route for these vehicles. ▪ These vehicles can only be parked in designated parking lots. ▪ In case of spills of hazardous materials, relevant departments will be informed at once & dealt with it 	During Construction	TNRSP, State Police & Fire Station, TNPCB,	Contractor, local bodies	EMP

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause	
	in accordance with spill contingency plan.					
OPERATIONAL PHASE						
AIR						
Dust Generation	<ul style="list-style-type: none"> ▪ Dust generation due to vehicle wheel will be reduced due to increased/widened paved surface. ▪ Avenue plantation to be maintained, casualties to be replaced. ▪ Avenue plantation includes species having dust absorption characteristic. ▪ Community properties and realignment locations have been proposed for peripheral plantation and landscaping. ▪ Maintenance of roads to be ensured. 	After completion of construction activity	Forest dept. , contractor	Local Office of Highway Department, Forest Dept	EMP	
Air Pollution	<ul style="list-style-type: none"> ▪ With the reduction in journey time, idle engine running time air pollution will reduce. ▪ Avenues plantation is proposed throughout the corridor, casualties to be replaced. ▪ Avenue plantation includes species having air purifying characteristic. ▪ Enforce Pollution Under Control (PUC) Programs. The public will be informed about the regulations on air pollution of vehicles. ▪ An air pollution monitoring program has been devised for checking pollution level and suggesting remedial measures. The air pollution monitoring results will be compared with National Ambient Air Quality Standards (Refer - Annexure-5.57). 	After completion of construction activity	TNPCB Forest Dept, State Transport Dept., Police, Contractor	Local Office of Highway Department, Forest Dept	Environmental Management Plan (EMP)	
LAND						
Temporary acquisition	land	<ul style="list-style-type: none"> ▪ Borrow area redevelopment plan to be completed/enforced. 	After completion of	TNPCB, Contractor	Local Office of Highway	EMP

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	<ul style="list-style-type: none"> All temporary acquired land for construction of diversion, transportation of material, etc. should be redeveloped to the satisfaction of the owner. Affected productive area to be poured with top soil. 	construction		Department	
Soil erosion	<ul style="list-style-type: none"> Embankment slopes to be re-vegetated, casualties to be replaced. Residual spoils to be disposed properly. 	After completion of construction	TNPCB, Contractor	Local Office of Highway Department	EMP
Soil Contamination	<ul style="list-style-type: none"> Accidental spills are potentially disastrous, but its probability is quite low as one of the objectives of this project is to enhance road safety. The public should be informed about the regulations on land pollution. Monitoring of Land pollution to be done regularly as per frequency and location mentioned in monitoring plan and suggesting remedial measures. 	After completion of construction	TNPCB, State Police, State Transport Dept, Contractor	Local Office of Highway Department	EMP
WATER					
Silting/ sedimentation	<ul style="list-style-type: none"> The measures suggested under “soil erosion” to be enforced. De-silting of existing water bodies to be taken up. Silt fencing to be provided. 	After completion of construction	TNPCB, Contractor	Local Office of Highway Department	EMP
Contamination of water	<ul style="list-style-type: none"> Accidental spills are potentially disastrous, but its probability is quite low as one of the objectives of this project is to enhance road safety. Discouraging local people from establishing workshops and car wash near public drinking water source. The public to be informed about the regulations on water pollution. Monitoring of water pollution to be done regularly as per frequency and location mentioned in Monitoring plan (Table-5.3) and suggesting remedial 	After completion of construction	Contractor of TNPCB, State Police, State Transport Dept. respective Municipal Agency	Local Office of Highway Department	EMP

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	measures. The water quality monitoring results will be compared with drinking water standards (IS: 10500) for Ground Water quality and IS: 2296 standards for surface water quality (Refer: Annexure-5.57 for standards).				
Maintenance of Storm Water Drainage System	<ul style="list-style-type: none"> The urban drainage systems should be maintained to accommodate storm water flow. Cleaning/removing of spoils should be ensured before/during the monsoon rains. 	Especially at the start & end of rains	Respective Municipal Agency, Contractor	Local municipal corporation	EMP
NOISE					
Noise	<ul style="list-style-type: none"> HORN PROHIBITED sign post will be enforced. Maintenance of noise barriers. Discouraging local people from establishing sensitive receptor near the road. The public to be informed about the regulations on noise pollution. Monitoring of noise pollution to be done regularly and suggesting remedial measures. The monitoring results will be compared with Ambient Noise Standards(Reference: Annexure-5.57). 	After completion of construction	TNPCB, State Police, State Transport Dept.	Local Office of Highway Department, Forest Dept	EMP
FLORA & FAUNA					
Loss of trees and Avenue Planting	<ul style="list-style-type: none"> The avenue plantation should be completed, maintained and casualties to be replaced. Discouraging local peoples from cutting tree/branches for fuel, cattle food etc. Educating people about the usefulness of trees. The poles identified within RoW shall be transplanted in the available RoW if feasible in 	After completion of construction	Contractor	Contractor	

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	consultation with CSC Environmental Expert and TNRSP Environmental Specialist. Feasibility may be decided depending on site conditions and productivity of pole species.				
SOCIO-ECONOMIC ENVIRONMENT					
General issues	<ul style="list-style-type: none"> Public consultation to be organized after completion of construction to access the people opinion/grievances from the project intervention. Remedial measures to mitigate the impact due to project intervention to be incorporated in the operation phase. 	Operation phase	Contractor	Maintenance unit	
Sensitive Communal Structures	<ul style="list-style-type: none"> The mitigation/enhancement measures to be completed, and trees survival rate to be maintained and casualties to be replaced. 		Contractor through Forest Department	Local Highway Department Office	
ROAD SAFETY					
Protection of high road embankments	<ul style="list-style-type: none"> Stabilization of slopes at locations of raising and on the approaches of minor bridges 	Immediately after construction	Local Highway department		Design standard requirement
Safety and noise disturbance	<ul style="list-style-type: none"> New buildings are prohibited within 50 m of the edge of the carriageway. No new schools and hospitals are allowed within 200 m of the carriageway. Wherever required appropriate noise barrier should be constructed. 	Throughout and after project development period	Local Bodies	Local Bodies	IRC 35-1971 IRC 79-1981 IRC 93-1995
Accident black spot	<ul style="list-style-type: none"> Road surface to be maintained, potholes to be filled immediately. Regular maintenance of the signpost, painting/removal of bills. The road marking to be maintained. People to be educated about the safety in following 	During Operational stage.	Local Highway Department, Local Bodies	PIU, Contractor	EMP

Environmental Impact & Issues	Mitigation/Enhancement measures	Time frame	Implementing Organization	Responsible Organization	Reference/Contractual Clause
	<p>traffic rules.</p> <ul style="list-style-type: none">▪ Speed limit to be enforced at sensitive locations.▪ Lighting of major junctions near settlements.▪ Mitigative /preventive measures for accident black spots, like traffic calming devices.				

CHAPTER 4 : ARRANGEMENTS FOR THE IMPLEMENTATION OF EMAP

The Environmental Management Action Plan (EMAP) (Provided as Table 3.1), which is an integral part of the Environmental Management Plan, identify the detailed impacts, propose the mitigation actions, and mention the implementing organization and monitoring organization.

- Project Implementation Unit (PIU) that represents TNRSP, Government of Tamil Nadu and is directly responsible for implementing the project
- Construction Supervising Consultant (CSC), who will be in charge of supervising the Contractor,.
- Construction Contractor, who is in charge of undertaking road construction work,.

This chapter looks into the organization and staffing of each of these stakeholders along with their responsibilities.

4.1. ORGANIZATIONAL FRAMEWORK

The project will be implemented by TNRSP through the project implementation unit. This unit will comprise of Project Director, Safeguard Experts (Social and Environmental), Deputy Project Director and Executive Engineers. The local office of Highway Department will facilitate clearance. Roles and responsibilities of important officials are mentioned below.

Table 4.1: Roles and Responsibilities of Officers

Officer	Responsibility
Project Director TNRSP	<ul style="list-style-type: none"> ▪ Overall responsible for EMP implementation ▪ Reporting to various stakeholders (World Bank, Regulatory bodies) on the status of EMP implementation ▪ Coordination with PIU Staff (Safeguard Officers, Deputy project Director, executive engineers, etc.) ▪ Responsible for obtaining regulatory Clearances (Tree cutting permissions) ▪ Review of the progress made by contractors ▪ Ensure that BOQ items mentioned in EMP are executed as per Contract provisions.
Environmental Specialist (PIU)	<ul style="list-style-type: none"> ▪ Assisting, Project Director in the overall implementation of the EMP and will be in charge of the Environmental Management Unit (EMU) within the PIU ▪ To guide the Assistant Environmental Specialists (AES) within the EMU for effective field inspections and in preparation of compliance reports for the statutory undertakers. ▪ Review of periodic reports with the assistance of AES in EMU on EMP implementation and advising Project Director in taking corrective measures. ▪ Conducting periodic field inspections of EMP implementation ▪ Assisting, Project Director to reporting various stakeholders (World Bank, Regulatory bodies) on the status of EMP implementation ▪ Preparing environmental training program and conducting the same for field officers and engineers of the contractor. ▪ Interacting with the Environmental Engineer of Construction Supervision Consultants (CSC) on EMP implementation aspects ▪ Sending environmental compliance/status report for issuance of

Officer	Responsibility
Environmental Engineer (Construction Supervision Consultant)	<p>completion certificate for constructed road works for payment.</p> <ul style="list-style-type: none"> ▪ Environmental Engineer of Construction supervision consultants acts as an “Engineer” for supervising EMP implementation ▪ Responsible for maintaining quality of EMP envisioned in detail Project Report ▪ Maintaining progress reports on EMP implementation ▪ Periodic reporting to PIU-TNRSP (EMU) about the status of EMP implementation ▪ Work in close coordination with Executive Engineers, EMU of PIU and Environment & Safety Officer of Contractors.
Executive Engineer	<ul style="list-style-type: none"> ▪ Conducting need-based site inspection and preparing compliance reports and forwarding the same to the PIU ▪ Programming necessary training program on environmental issues.
Assistant Engineer (AE)	<ul style="list-style-type: none"> ▪ Working as site-representative of Executive Engineer ▪ Conducting regular site inspections to all on-site and off-site works ▪ Maintaining records of all necessary statutory compliance, to be obtained from the contractor. ▪ Maintaining records of EMP implementation, including photographic records ▪ Attending environmental and social training programs ▪ Preparing periodic reports on EMP implementation and forwarding to EE
Environmental and Safety Engineer of Contractor	<ul style="list-style-type: none"> ▪ As detailed below

ORGANISATIONAL FRAMEWORK OF PIU - TNRSP

Environmental Management Plan (EMP) is the key to ensure that the environmental quality of the proposed project under consideration does not deteriorate beyond the expected level due to the construction and operation of the project. The EMP comprises a set of measures to be taken in different stages like the planning, construction and operation to eliminate, offset or reduce adverse environmental impacts towards effective environmental management, including pollution prevention and control, waste minimization and management and residual attenuation for the proposed project to acceptable levels. The institutional set up for EMP implementation as given in Figure 4.1 and Figure 4.2 shows a very flexible and practical Environmental Management Unit (EMU). The detailed structure of TNRSP II is separately captured in Figure 4.3.

Figure 4.1: Institutional Organization for TNRSP EMP

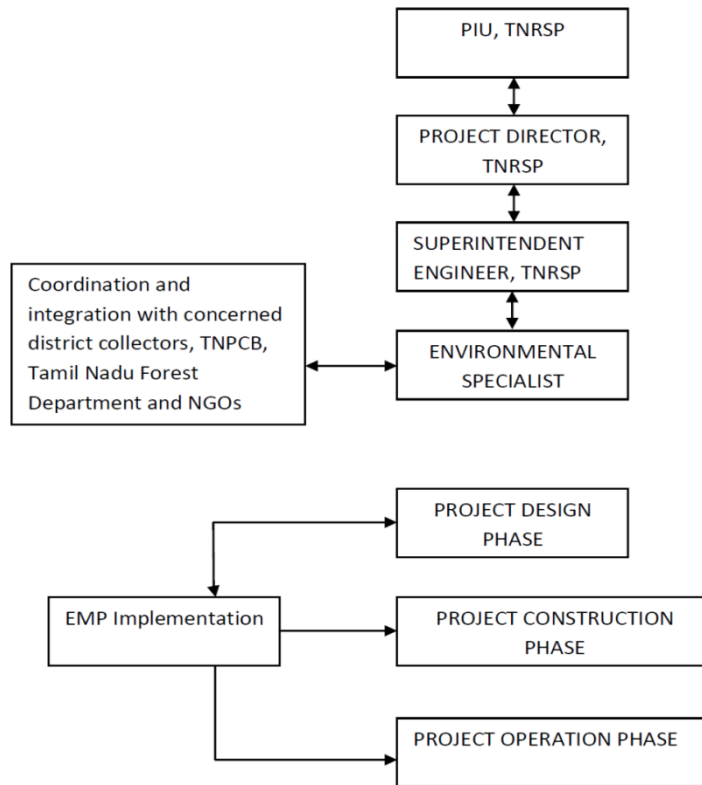


Figure 0.1: Environmental Management Unit (EMU)

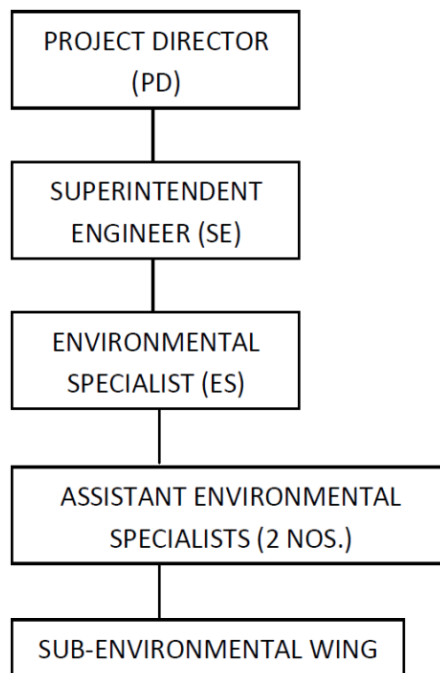
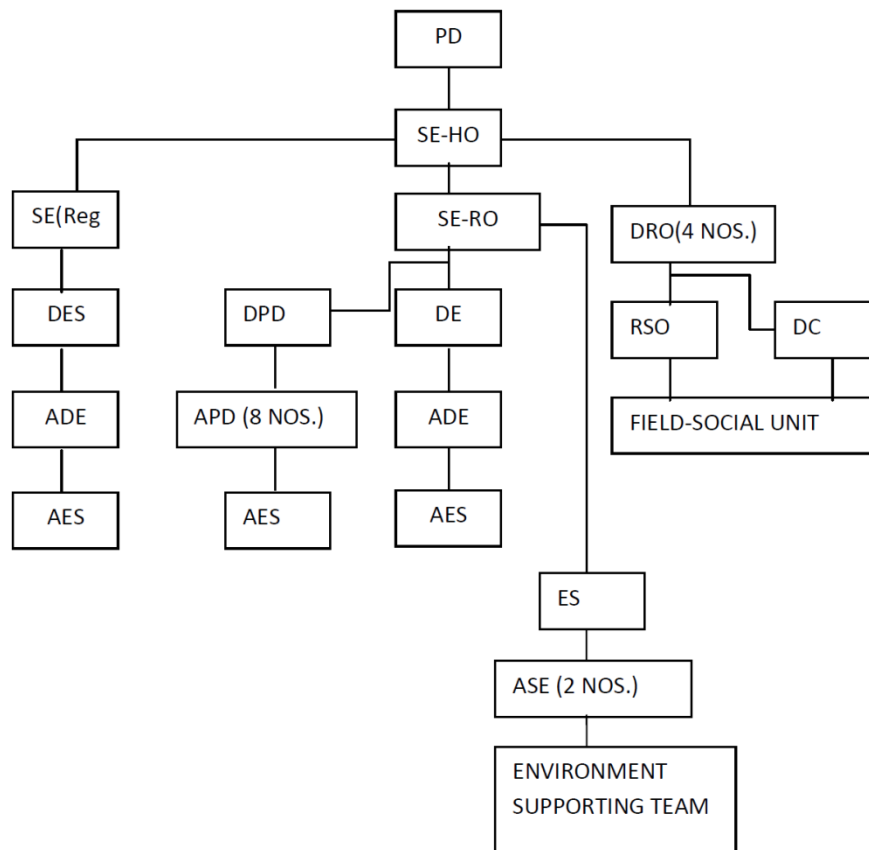


Figure Error! Bookmark not defined..2: Organisation Structure, TNRSP



For ensuring that EMP is implemented as per provision in the document, the Contractor shall nominate a qualified and experienced person as Environmental and Safety Engineer from the commencement to completion of the project.

The responsibilities of Environmental Engineers of Contractor will include the following:

- Directly reporting to the Project Manager of the Contractor;
- Discussing various environmental/social issues and environmental/social mitigation, enhancement and monitoring actions with all concerned directly or indirectly;
- Prepare Contractor’s Checklist, traffic management plan and safety plan as part of their Work Program;
- Ensure Contractor’s compliance with the EMAP stipulations and conditions of statutory bodies;
- Assisting his project manager to ensure social and environmentally sound and safe construction practices;
- Conducting periodic environmental and safety training for contractor’s engineers, supervisors and workers along with sensitization on social issues that may be arising during the construction stage of the project;
- Preparing a registers for material sources, labour, pollution monitoring results, public complaint/grievance redressal and as may be directed by the Engineer;
- Assisting the R&B in various environmental monitoring and control activities including pollution monitoring;
- Preparing and submitting monthly / bios-monthly reports to R&B on the status of implementation safeguard measures.

- Will be responsible for getting and maintaining the approvals or clearance for various departments and Environmental Engineer as per various application formats attached as Annexure.
- Assistance with the road safety components and issues related to the effects of the roadside environment on road safety and non-motorised traffic.
- Liaison with the Environmental Engineer of CSC and report to Superintending Engineer on all matters related to implementation of the Environmental Management Plan.

4.2 ISO REQUIREMENTS OF CONTRACTOR

All construction sites of the Contractor shall comply with Environmental Management System - ISO 14001:2004 requirements within six months from the award of the contract based on the Environmental Health & Safety Management System and obtain ISO 14001 certificate. The Contractor shall have a documented quality management system (QMS) for all construction sites within six months from the award of the contract based on the requirements of ISO 9001: 2008 and obtain the certificate. The Contractor shall also establish and maintain an Occupational Health and Safety Management system complying with ISO 18001 and obtain the certificate for all construction sites within six months from the award of the contract.

4.3 REPORTING REQUIREMENTS OF CONTRACTOR

The Contractor shall undertake regular reporting to CSC, comprising the submission of reports as well as management and redevelopment plans to CSC as detailed in the Chapter -3 of this EMP.

4.4 INFORMATION DISSEMINATION

Information dissemination shall be undertaken by PIU-TNRSP at a macro level and by the Contractor in the project site at micro level. The wide dissemination of information to the public shall be undertaken by PIU-TNRSP through the disclosure of EIA / EMP reports on the website of PIU. At the project site, i.e. the direct impact zone, information boards shall be displayed at critical and pre-identified locations to disseminate the project details. Such information boards shall display project name, contractor's name, concerned official's name in Contractor's office with his designation and contact no., name and contact details of an authorized official in local Highway Department office.

These information boards shall be approximately of size 5' x 5' and shall be designed and put up in such a way that the public can easily read it from a distance. Such boards shall be set up, not only along active project stretches, but also at the sites of construction camps and labor camps and other project facilities like borrow area, quarry and stone crusher site and debris disposal site. These information boards shall also mention the availability of a complaint register with the nearest site office of the Contractor. Under the RTI Act, 2005, Contractor is also duty bound to share any information demanded by the public, pertaining to any aspect of the project, as and when it is demanded.

4.5 GRIEVANCE REDRESSAL MECHANISM

Grievance Redress Mechanism at TNRSP –PIU: The TNRSP will form a Grievance Redressal Cell (GRC) at PIU and it shall be headed by the Superintendent Engineer. The Environmental Specialist (ES) TNRSP will also be a member of this cell to rederess complaints pertaining to environmental issues. The contact details of the members (email and phone numbers) of this

cell will be available at TNRSP Web site and the details will also be available at construction camp of contractors, local PIU offices at Vridhachalam, Trichiraplalli, etc.

This GRC shall discuss the issue/complaint in its monthly meeting and resolve the issues within two weeks' time after receiving the grievance. If the matter is not resolved by GRC at PIU level within stipulated time, it shall be referred to the Chief Engineer who will resolve the complaint within a period of two months.

Complaints register with the Contractor: The contractor shall keep and maintain a complaint register report at his site office along the project road as well as project facilities like construction camp, labor camp etc., for public to register their complaints. The Contractor, after taking necessary action based on the complaint, shall also incorporate the same, in the complaint register. This report shall also be part of the monthly report, for CSC to monitor and take necessary action, if needed. It has to be noted that, inaction upon the complaint of the public shall be considered as a major lapse from the side of the Contractor, leading to invoking of penalty clause, which is given in Chapter 3 of this report as well as the Contract document.

4.6 TRAINING PROGRAMME ON ENVIRONMENTAL ASPECTS

Training is an investment made on the human resource of the organization to provide and tone the competencies, required to do an existing job well and also to perform for future needs. Targeted and monitored training can set up an environment of good morale and productivity and contributes in creating a powerhouse of competencies for the organization. This section deals with the training to be imparted to the contractor's staff by the Environmental Engineer and Construction Safety Specialist for ensuring effective implementation of the EMP. The training requirement could be broadly identified as given in Table 4.2 below.

Table 4.1: Training Program to the Contractor's Staff

Program	Particulars	Duration	Participants
Awareness program for Laborers	General Awareness on workplace Environment and Safety aspect	One day	Skilled and unskilled laborers
Awareness program for Engineers and Supervisors	General Awareness on Environment and Safety	One day	Engineers, supervisors and office staff
Orientation program	Contractor's Responsibilities as per bid document and EMP Reporting System as per EMP	One day	Engineers, Environmental and Safety Engineer

The need for additional and specialized training shall be examined and appropriate training will be undertaken as required. The training attendance record will be kept in the EHS department for CSC verification. The advance training calendar should be provided to CSC for approval. Training program and content of the training module is discussed in **Annexure 5.58**.

CHAPTER 5 : ENVIRONMENTAL MONITORING AND REPORTING REQUIREMENTS

5.1 MONITORING AND REPORTING OF ENVIRONMENTAL MANAGEMENT MEASURES

A robust monitoring and reporting system is mandatory to ensure compliance to EMAP by the contractor. The monitoring and reporting system evolved for TNRSP-II is shown in Table 5.1 and is integrated into EMAP table. It comprises following three parts:

- (A) Monitoring and reporting of environmental management measures for project related facilities like construction camp, labor camp, quarry area, borrow area and debris disposal site,
- (B) Monitoring and reporting of environmental management measures for the overall project, and
- (C) Monitoring and reporting of quality of environmental parameters like air, water and noise.

This monitoring and reporting system attempts to avoid many of the environmental issues created during construction and post construction stages and provides the necessary feedback for CSC / PIU to make sure that EMAP is implemented in full spirit. Instead of a linear reporting system, this system works on a two way basis – initial reporting by contractor followed by monitoring by CSC based on contractor's reports. Responsibilities for monitoring will rest with the Environmental Engineer of the Supervising Consultant reporting to the TNRSP.

The detailed procedure of reporting and monitoring system is as follows:

- (A) Monitoring and Reporting of Environmental Management Measures for Project Related Facilities

Sage I – Site Identification:

It is anticipated there will be a single camp for construction equipment, machinery and material storage and the same camp site will have the accomodation of labour and staff of the contractor also. While initiating the project, the Contractor needs to identify suitable sites for project related ancillary facilities like construction camp, labor camp, quarry and stone crusher units, borrow area, debris disposal sites and sources of water for construction. The same shall be undertaken adhering to the criteria given in the respective guidelines for each of these sites given in Annexure 5.1 to 5.5. Once the site is identified by the Contractor, he shall prepare a site identification report furnishing all the details pertaining to the identified site using the reporting format given in Annexure 5.12 to 5.17 and submit it to the CSC. Subsequently, the Environmental Engineer of CSC has to visit each site and approve / reject the site with reasons. The Environmental Engineer of CSC has to give a copy of this format to the contractor after his approval / rejection with remarks. This reporting procedure needs to be undertaken for each and every parcel of land identified for any of the project related ancillary facility.

Stage II – Setting up of Sites:

On approval of a site, the contractor has to prepare the Management and Redevelopment Plan for this site as per the relevant Guidelines given in Annexure 5.1 to 5.5 of the EMP and submit to CSC for approval. In addition to the Management and Redevelopment Plans for sites, the Contractor has to prepare a Comprehensive Waste Management Plan, Occupational Health and Safety Management Plan, Traffic Management Plan and Hazardous Substances Management Plan for all sites together, as per the Guidelines given in EMP Annexure 5.6, 5.9, 5.10 and 5.11 respectively.

Subsequently, the Environmental Engineer of CSC needs to visit each site and approve the Environment Management Plan. The Environmental Engineer of CSC has to give a copy of this Environment Management Plan to the contractor after his approval with remarks / suggestions for additional mitigation measures. Any kind of activity could be initiated in a site only after getting approval from CSC for the Management and Redevelopment Plan for that site. These plans need to be prepared for each and every parcel of land identified as described above.

Stage III –Operation of Sites:

Once the Contractor receives approval from CSC for the Management and Redevelopment Plan, s/he can initiate activities on the site. All the activities shall be undertaken strictly in line with the approved plan. CSC shall monitor the implementation of management plan monthly, once, through site visits and the Checklists for Monitoring the Environmental Management of Sites / Camps given in Annexure 5.20 to 5.24. Corrective actions with specific time frame should be proposed for each environmental management measure, which is not implemented satisfactorily. A copy of the filled up checklist should be given to the Environment & the Safety Engineer of the Contractor. CSC has to attach this format to the Monthly Report to be submitted to PIU-TNRSP, with details of corrective action taken by the Contractor.

A Register of Sites Opened and Closed in the format given in Annexure 5.19 should be maintained by the contractor (preferably in A3 size paper) for each road. Details of each site opened should be entered in this register in chronological order. Whenever a site is closed, it should be recorded in this register with a status of redevelopment. Clearances applicable for each site and the status of clearances should also be entered in this register. This same format shall be used to report the details of sites opened and closed to the CSC along with the Monthly Report of the Contractor. Environmental Engineer of CSC has to visit the sites, verify the details and approve the report with instruction to the contractor if any clearance is pending for any site or redevelopment is not done satisfactorily for any closed site. A copy of the approved report with CSC's remarks should be given to the ESE of the Contractor. The Environmental Engineer of CSC has to attach this format to the Monthly Report to be submitted to PIU-TNRSP, with details of corrective action taken by the Contractor.

Stage IV – Closure of Sites

Upon completion of the operation in any particular project ancillary facility site, the Contractor shall undertake redevelopment of the same, in line with the redevelopment plan which was already approved by CSC and intimate to CSC through the format for the Register of Sites Opened and Closed. The Environmental Engineer of the CSC shall monitor the same through site visit and the Checklists for Monitoring the Redevelopment of Sites / Camps provided in Annexure 3.25 to 3.29 as and when a site is closed and reported by the Contractor. Corrective actions with specific time frame should be proposed for each environmental management measure, which is not implemented satisfactorily. A copy of the filled up checklist should be given to the Environmental & the Safety Engineer of the Contractor. CSC has to attach this format to the Monthly Report to be submitted to PIU-TNRSP, with details of corrective action taken by the Contractor.

As described above, the reporting tasks for project facilities have been split and shared among contractor and CSC and its summary is given in **Table 5.1** below:

Table 5.1: Monitoring and Reporting Plan for Entire Project

Reporting / Monitoring Format	Applicable Project Site	Frequency of Reporting by Contractor	Frequency of Reporting /Action to be Taken by CSC	Applicable Annexure No.
A. FOR PROJECT RELATED FACILITIES AND SITES				
STAGE-I. SITE IDENTIFICATION				
Reporting Formats for Identification of Sites	Construction camp	One time reporting to CSC for each site, as and when it is identified.	Visit each site and approve the site as and when it is reported	Annexure No. 5.12
	Labor camp			Annexure No. 5.13
	Quarry and stone crusher unit			Annexure No. 5.14
	Borrow area			Annexure No. 5.15
	Debris disposal site			Annexure No. 5.16
	Water Sources			Annexure No. 5.17
STAGE-II. SETTING UP OF SITES				
Management and Redevelopment Plans for Sites / Camps	Construction camp	One time reporting to CSC for each site, as and when it is identified.	Visit each site and approve the management plan as and when it is submitted	Annexure No. 5.1
	Labor camp			Annexure No. 5.2
	Quarry and stone crusher unit			Annexure No. 5.3
	Borrow area			Annexure No. 5.4
	Debris disposal site			Annexure No. 5.5
Comprehensive Waste Management Plan	All Sites	One time reporting to CSC for all sites together	Visit each site and approve the management plan as and when it is submitted	Annexure No. 5.6
Occupational Health and Safety Management Plan	All Sites	One time reporting to CSC for all sites together	Visit each site and approve the management plan as and when it is submitted	Annexure No. 5.9
Traffic Management Plan	All Sites	One time reporting to CSC for all sites together	Visit each site and approve the management plan as and when it is submitted	Annexure No. 5.10
Hazardous Substances Management Plan	All Sites	One time reporting to CSC for all sites together	Visit each site and approve the management plan as and when it is submitted	Annexure No. 5.11

Reporting / Monitoring Format	Applicable Project Site	Frequency of Reporting by Contractor	Frequency of Reporting /Action to be Taken by CSC	Applicable Annexure No.
STAGE-III. OPERATION OF SITES				
Format for Register of sites opened and closed and its reporting	All sites / camps	Details to be recorded in chronological order as and when a site is opened / closed. To be submitted to CSC monthly.	Check the status of clearances and redevelopment status of each site and approve the report monthly.	Annexure No. 5.19
Checklists for Monitoring Environmental Management of Sites /Camps	Construction camp	Nil	Monitor the implementation of management plan monthly, once, through site visits and checklists.	Annexure No. 5.20
	Labor camp			Annexure No. 5.21
	Quarry and stone crusher unit			Annexure No. 5.22
	Borrow area			Annexure No. 5.23
	Debris disposal site			Annexure No. 5.24
STAGE-IV. CLOSURE OF SITES				
Checklists for Monitoring Redevelopment of Sites / Camps	Construction camp	Nil	Monitor the implementation of the redevelopment plan through site visits and checklists as and when a site is closed and reported through the register of sites.	Annexure No. 5.25
	Labor camp			Annexure No. 5.26
	Quarry and stone crusher unit			Annexure No. 5.27
	Borrow area			Annexure No. 5.28
	Debris disposal site			Annexure No. 5.29
B. FOR OVERALL PROJECT				
Format for Register of complaints and its reporting	All project sites	Monthly	Monitor the implementation of management measures through site visits and approve the reports monthly.	Annexure No. 5.18
Reporting Format for Work Force Management	All project sites	Monthly		Annexure No. 5.30
Reporting Format for Occupational Health and Safety Measures	All project sites	Monthly		Annexure No. 5.31

Reporting / Monitoring Format	Applicable Project Site	Frequency of Reporting by Contractor	Frequency of Reporting /Action to be Taken by CSC	Applicable Annexure No.
Reporting Format for Top Soil Conservation	All project sites	Monthly	Monitor the implementation of management measures through site visits and approve the reports monthly.	Annexure No. 5.32
Reporting Format for Water Sprinkling for Dust Suppression	All project sites	Monthly		Annexure No. 5.33
Reporting Format for Road Safety Measures During Construction	All project sites	Monthly		Annexure No. 5.34
Reporting Format for Register of Accidents and it's Reporting	All project sites	Monthly		Annexure No. 5.35
Reporting Format for Enhancement and Mitigation of Cultural Properties	All project sites	Monthly		Annexure No. 5.37
Reporting Format for Noise Barrier Construction	All project sites	Monthly		Annexure No. 5.38
Reporting Format for Enhancement Measures Other than Cultural Properties	All project sites	Monthly		Annexure No. 5.39
Reporting Format for Tree Plantation	All project sites	Monthly		Annexure No. 5.40
Reporting Format for Monthly Report from Contractor to CSC	All project sites	Monthly		Annexure No. 5.41
Reporting Format for Monthly Report from CSC to PIU	All project sites	Nil		Annexure No. 5.42

Reporting / Monitoring Format	Applicable Project Site	Frequency of Reporting by Contractor	Frequency of Reporting /Action to be Taken by CSC	Applicable Annexure No.
C. FOR ENVIRONMENTAL QUALITY MONITORING				
Reporting Format of Environmental Quality Monitoring	All project sites	Monitoring is to be conducted as per Environmental Quality Monitoring plan in Table 5.3. To be submitted to the CSC along with the Monthly report.	Verify the details through site visits and approve the reports monthly	Annexure No. 5.36

5.2. ENVIRONMENTAL QUALITY MONITORING PLAN FOR THE PROJECT

The monitoring program is devised to ensure that the envisaged purpose of the project is achieved and results in the desired benefit of the target population. To ensure the effective implementation of the EMP, it is essential that an effective monitoring program be designed and carried out. The broad objectives of the monitoring program are:

- To evaluate the performance of mitigation measures proposed in the EMP
- To suggest improvements in the management plans, if required
- To satisfy the statutory and community obligations

The monitoring program contains a monitoring plan for all performance indicators, reporting formats and necessary budgetary provisions. Plan for monitoring performance indicators and reporting system is presented in the following sections.

5.2.1 Performance Indicators

Physical, biological and environmental management components identified as of particular significance in affecting the environment at critical locations have been suggested as Performance Indicators (PIs). The Performance Indicators shall be evaluated under three heads as:

- Environmental condition indicators to determine efficacy of environmental management measures in the control of air, noise, water and soil pollution;
- Environmental management indicators to determine compliance with the suggested environmental management measures
- Operational performance indicators have also been devised to determine efficacy and utility of the mitigation/enhancement designs proposed

The Performance Indicators and monitoring plans prepared for *Project Implementation* are presented in **Table 5.2**.

Table 5.2: Performance Indicators for Project Implementation

Sl. No.	Indicator	Details	Stage	Responsibility
A	Environmental Condition Indicators and Monitoring Plan			
1	Air Quality	The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared	Pre Construction	Contractor through approved monitoring agency
			Construction	
			Operation	PIU- TNRSP through approved monitoring agency and contractor maintaining the road
2	Noise Levels	The parameters to be monitored, frequency and duration of monitoring as well	Pre Construction	Contractor through approved monitoring agency
			Construction	

Sl. No.	Indicator	Details	Stage	Responsibility
		as the locations to be monitored will be as per the Monitoring Plan prepared	Operation	PIU- TNRSP through approved monitoring agency, contractor maintaining the road
3	Water Quality	The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared	Pre Construction	Contractor through approved monitoring agency
			Construction	
			Operation	PIU- TNRSP through approved monitoring agency, contractor maintaining the road
4	Soil Quality	The parameters to be monitored, frequency and duration of monitoring as well as the locations to be monitored will be as per the Monitoring Plan prepared	Pre Construction	Contractor through approved monitoring agency, contractor maintaining the road
			Construction	
			Operation	PIU- TNRSP through approved monitoring agency, contractor maintaining the road
B	Environmental Management Indicators and Monitoring Plan			
1	Construction Camps	Location of construction camps has to be identified and parameters indicative of the environment in the area have to be reported	Pre-construction	PIU- TNRSP, Contractor, CSC
2	Borrow Areas	Location of borrow areas has to be identified and parameters indicative of the environment in the area have to be reported. (<i>Refer: Borrow Area Management Guidelines</i>)	Pre-construction	PIU- TNRSP, CSC and Contractor
3	Tree Cutting	Progress of tree removal marked for cutting is to be reported	Pre-construction	Revenue Authorities to PIU- TNRSP
4	Tree Plantation	Progress of measures suggested as part of the Strategy is to be reported	Construction	Forest Department, Contractor
C	Management & Operational Performance Indicators			
1	Survival Rate of Trees	The number of trees surviving during each visit will be compared with the number of saplings planted	Operation	Forest Department/ PIU- TNRSP, Contractor
2	Status Regarding Rehabilitation	The PU will undertake site visits to determine how many borrow areas have been	Operation	The PIU- TNRSP will be responsible for a period of 3 years.

Sl. No.	Indicator	Details	Stage	Responsibility
	of Borrow Areas	rehabilitated in line with the landowner's request and to their full satisfaction.		
3	Soil Erosion	Visual monitoring and operation inspection of embankments will be carried out once in three months.	Operation	The PIU- TNRSP will be responsible for a period of three years.

5.2.2 Monitoring Plans for Environment Condition

For each of the environmental components, the monitoring plan specifies the parameters to be monitored; location of the monitoring sites; frequency and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for the various environmental condition indicators of the project during construction and operation stages is presented in **Table 5.3**.

Monitoring plan does not include the requirement of, arising out of Regulation Provision such as obtaining NOC/ consent for the plant site operation.

Table 5.3: Environmental Monitoring Plan

Attribute	Project Stage	Parameter	Special Guidance	Standards	Frequency	Duration	Location	Implementation
Air	Construction	CO, PM ₁₀ , and SO ₂ NOx, PM _{2.5} ,	Respirable volume sampler with suitable arrangement for CO monitoring to be located 50 m from the plant in the downwind direction. Use method specified by CPCB for analysis	Air (prevention and Control of Pollution) Rules, CPCB, 1994 (Ambient Air quality standards published in 2009).	Three seasons (Except Monsoon) per year	24 hours Sampling	Along the road Hot mix / batching plant	Contractor
	Operation				Three seasons in a year for 2 years		Along the road at locations of baseline monitoring	Contractor
Water	Construction	All essential characteristics and some of the desirable characteristics as decided by the Environmental Engineer of the CSC and TNRSP	Grab sample collected from source and analyze as per Standard Methods for Examination of Water and Wastewater	Indian Standards for Inland Surface Waters (IS: 2296, 1982) and for Drinking Water (IS: 10500 - 2012)	Three seasons per year for 2.5 years	Grab Sampling	Along the road at locations of baseline monitoring	Contractor
	Operation				Three seasons for two years		Surface water sources (at locations of baseline monitoring)	Contractor
Noise	Construction	Noise levels in dB (A) scale	Equivalent noise level using an integrated noise	MoEFCC Noise Rules, 2000 (Ambient Noise	Three seasons per year for 2 years	Leq in dB(A) of day time	Along the road and Hot mix / batching plant	Contractor

Attribute	Project Stage	Parameter	Special Guidance	Standards	Frequency	Duration	Location	Implementation
	Operation		level meter kept at a distance of 15 from edge of pavement Equivalent noise level using an integrated noise level meter kept at a distance of 15 from edge of pavement	Standards)	Three seasons per year for two years.	and night time	Along the road at locations of baseline monitoring	Contractor
Soil	Construction	Monitoring of Pb, SAR and Oil & Grease	Sample of soil collected to be acidified and analyzed using an absorption spectrophotometer	Threshold for each contaminant set by the IRIS database of USEPA until national standards are promulgated	Four seasons per year for 3 years contract duration	Grab Sampling	Along the road And near Hot mix / batching plant	Contractor
	Operation				Three seasons for 2 years		Along the road at locations of baseline monitoring	Contractor
Borrow area	Construction	As per Guidelines	Visual Observation	-	Once in a month	-	Borrow area locations	Contractor
Tree plantation	Operation stage	As per Tree Plantation Survival Plan			Quarterly for five yeras	-	Areas where the plantation is being done	Contractor

5.2.3 Environmental Monitoring Locations

In addition, of the critical locations selected during the design stage, the environmental monitoring will also be done at the construction camp site and any other plant site during the construction stage. A list of critical locations for carrying out monitoring is presented in **Chapter 4: Baseline environment of the Environmental Assessment report.**

CHAPTER 6 : ENVIRONMENTAL BUDGET

6.1 COST ESTIMATE FOR ENVIRONMENTAL MANAGEMENT

Mitigation measures proposed in the EMAP will be implemented by the Contractor. The works to be undertaken by the Contractor have been quantified and the quantities included in the respective BOQ items such as earthworks, slope protection, noise barriers, road safety features, and shrub plantation.

Provisional quantities have also been included for additional measures that may be identified during construction and for silt fencing which will depend on the Contractors work methods and site locations. Items and quantities have also been included in enhancement measures.

More general environmental management measures to be followed by the contractor have been included in the specifications and this EMAP. These cannot be quantified and are to be included in the contract rates.

The budgetary provisions for the implementation of the environmental management plan of the Project are presented in **Table 6.1** while the cost summary is presented in **Table 6.2**.

Table 6.1: Cost Estimates for Environmental Management

S. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)	
A	PRE CONSTRUCTION PHASE					
1	Tree Felling Permission	Number		2,267		Covered in Engineering Cost
2	Utility Shifting		Covered under regulatory clearance, Engineering cost.			
B	CONSTRUCTION PHASE					
1	Mitigation Measures other than Good Engineering practices					
1.1	Oil Interceptors at construction camp (Two numbers oil interceptors)	Number	_____	2	_____	
1.2	Silt Fencing for three ponds @ 50m of each	Length, m	_____	150	_____	
1.3	Rainwater harvesting cum recharge pits @ 1 structure per km	Number	_____	60	_____	
1.4	Relocation of Over Water tanks 2 nos.	Numbers	_____	2	_____	
1.5	Relocation of Ground Water tanks (17 numbers).	Numbers	_____	17	_____	
1.6	Relocation of Irrigation Water tank (1 numbers).	Numbers	Covered under RAP Budget	NA	0	
1.7	Relocation of hand Pump (24 umbers).	Numbers	_____	24	_____	

S. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)	
1.8	Relocation of Public Taps (47 numbers).	Numbers	_____	47	_____	
1.9	Desilting/Deepening of Ponds 3 numbers partially affected	Number	_____	3	_____	
2	Tree Plantation and Protection					
2.1	Avenue Plantation including Compensatory Plantation					
2.1.1	Plantation & maintenance of Saplings for 5 years in the ratio of 1: 10 (10 trees for every tree to be cut) including tree guards	Number	_____	22,670	_____	
2.2	Plantation in Realignment Locations					
2.2.1	Plantation & maintenance of Saplings for 5years	Number	_____	600	_____	
3	Landscaping					
3.1	At major Junction locations (2 numbers)	Sq meter	_____	1,000	_____	
3.2	Realignment Locations (2 numbers)	Sq meter	_____	450	_____	
4	Monitoring of Environmental Attributes during Construction Phase (2.5 Year Construction Period)					
4.1	Air Quality					
4.1.1	Monitoring of Air Quality near Hot mix plants at construction camp	Per Samples	_____	8	_____	Three seasons in a year for 2.5 years
4.1.2	Monitoring of Air Quality at Critical Locations (4 locations at construction sites)	Per Samples	_____	32	_____	Three seasons in a year for 2.5 years
4.2	Noise Levels					
4.2.1	Monitoring of Noise Level at construction camp	Per Samples	_____	8	_____	Three seasons in a year for 2.5 years

S. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)	
4.2.2	Monitoring of Noise Levels at Critical Locations at construction sites (minimum 4 locations)	Per Samples	_____	32	_____	Three seasons in a year for 2.5 years
4.3	Water Quality					
4.3.1	Monitoring of Water Quality at location of construction (total 4 samples, 2 surface and 2 ground in road portion under construction)	Per Samples	_____	32	_____	Three seasons in a year for 2.5 years
4.4	Soil Quality					
4.4.1	Monitoring of Soil Quality at 3 locations (one near camp site and two near construction works along the road)	Per Samples	_____	24	_____	Three seasons in a year for 2.5 years
4.4.2	Additional Soil Monitoring during Spills	Per Samples	_____	9	_____	
5	Orientation of CSC agency staff	Per Session	Deemed to be included in Consultancy fee.			
6	Mitigation/Enhancement Measures					
6.1	Cultural Properties & sensitive receptor (Specific Enhancement as per Appendix 8.14)					
6.1.1	Temples relocation for 3 religious structures impacted totally	LS per temple	_____	3	_____	
6.1.2	Religious Structures restoration & beautification works for 12 religious structures	LS per structure	_____	12	_____	
6.1.3	School (Noise Barrier Wall)	LS per school	_____	7	_____	
6.2	Cultural Properties (Generic Enhancement)					
6.3	Surface Water Bodies (Ponds enhancements) - Total 3 ponds selected for	Numbers	_____	3	_____	

S. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)	
	enhancement					
C	GOOD ENGINEERING PRACTICES					
1	Dust Suppression					Covered under Engineering Costs
2	Erosion Control Measures (Turfig / Pitching / Seeding & Mulching)					
3	Provision of Cross drainage & side drainage structures					
4	General Borrow area management and maintenance of haul roads related to borrow areas					
5	Air/noise pollution control measures in construction equipments					
6	Management and disposal of scarified waste bituminous material					
7	Provision of Informatory Signs					
8	Bus shelters					
9	Construction of Speed Humps					
10	Cattle Crossings					
11	Management of quarries					Deemed to be included in contractor's quoted rates
12	Redevelopment of Borrow Areas					
13	Construction Camp Management Costs					Will form a part of the Contractor's costs
14	Safety measures for workers					
D	ITEMS COVERED UNDER THE RAP BUDGET					
1	Relocation of private Properties					Covered under RAP Budget
2	Relocation of private Water points (wells, tanks, water taps and hand pumps)					
3	Relocation of graveyards, statues, motor sheds					
4	Relocation of Other Community Assets (private)					
E	OPERATION PHASE					
1	Monitoring of Environmental Attributes during Operation Phase					
1.1	Monitoring of Air Quality at Critical Locations	Per Sample	_____	24	_____	Three seasons in a year for 2 years
1.2	Monitoring of Noise Levels at Critical Locations	Per Sample	_____	24	_____	Three seasons in a year for 2 years

S. No.	Item	Unit	Rate (in INR)	Quantity	Cost (in INR)	
1.3	Monitoring of Water Quality	Per Sample	_____	24	_____	Three seasons in a year for 2 years
1.4	Monitoring of Soil Quality	Per Sample	_____	18	_____	Three seasons in a year for 2 years
1.5	Additional Soil Monitoring during Spills	Per Sample	_____	9	_____	Throughout operation phase.
2	Information Dissemination	-	-	-		Covered under RAP
	Environmental Budget During Operation Phase				_____	

Table 6.2: Cost Summary for Environmental Management

Summary of cost		
A.	PRE CONSTRUCTION PHASE	Covered in Engineering Cost
B.	CONSTRUCTION PHASE	
1	Mitigation Measures other than Good Engineering practices	_____
2	Tree Plantation and Protection	_____
3	Landscaping	_____
4	Monitoring of Environmental Attributes during Construction Phase (2.5 Year Construction Period)	_____
5	Orientation of CSC, contractor & PIU staff	Deemed to be included in Consultancy fee.
6	Mitigation/Enhancement Measures	_____
C.	GOOD ENGINEERING PRACTICES	Covered in Engineering Cost
D.	ITEMS COVERED UNDER THE RAP BUDGET	Covered under RAP Budget
E.	OPERATION PHASE	
	Sub Total (B+E) (in INR)	_____
	Contingency (5%) (in INR)	_____
	Total EMP Cost Including contingency (INR)	_____
	GRAND TOTAL US\$ @ INR 60.00/\$	_____

6.2 BASIS OF COSTING

(A) COSTS DURING PRE-CONSTRUCTION STAGE

ITEM 1.0 UTILITY SHIFTING AND TREE Felling Cost

The cost of tree felling is taken separately in engineering costing, under the Non civil cost Head while existing utility shifting is covered under regulatory clearance, engineering cost.

(B) COSTS DURING CONSTRUCTION PHASE

ITEM 1.0 MITIGATION MEASURES OTHER THAN GOOD ENGINEERING PRACTICES

This section includes the costs of the mitigation measures during the construction other than those included in the Engineering Budget. It covers the following items:

Item 1.1 Oil Interceptors

The unit cost of Single Chamber Gravity Separation Type Oil & Grease Interceptors (Influent handling capacity 1000 L/hr) as per prevalent market rates is INR _____.

Item 1.2 Silt Fencing

The per unit length cost of silt fencing as per market rate is INR _____/meter. This silt fencing will be placed on the bank of an irrigation canal and three roadside ponds.

Item 1.3 Rainwater harvesting structure cum recharge pit

The unit cost of Rain water harvesting cum Recharging Pit for roadside drains with Geo synthetic filter fabric (2 m below the bottom of the catch pit) has been worked out as INR _____.

Item 1.4 Relocation of Water tanks

The relocation cost of water tanks has been estimated at INR _____per tank

Item 1.5 Relocation of Ground Water tanks

The relocation cost of ground water tanks has been estimated at INR _____per tank. These are the water tanks (Syntex Tank) kept on a platform along the project highway.

Item 1.6 Relocation of Hand Pump

The relocation cost of each Hand pump has been estimated at INR _____. There are 24 hand pump impacted due to road upgradation.

Item 1.7 Relocation of Public Water Tap

The relocation cost of public water tap has been estimated at INR _____per tap

Item 1.8 Pond deepening/desilting

A lump sum cost of INR _____/- has been provided for deepening/desilting of the pond. The unit rates for earthwork excavation from ponds have been obtained from the Schedule of Rates as Rs.62/- per cum.

ITEM 2.0 TREE PLANTATION AND PROTECTION

Item 2.1 Avenue plantation including Compensatory afforestation

This item includes costs for the tree plantation, protection and maintenance for 3 years as a part of compensatory plantation and environmental enhancement (Avenue Plantation). For tree plantation along the corridor, the unit cost of 1.5 m height saplings is calculated, as per discussion with the TNRSP local unit and forest department officials has been taken as INR _____. This cost includes 3 years maintenance cost also. It includes the cost of the seedling, manuring plantation and replacing of casualties for 5 years.

The afforestation will be done by TNRSP through Forest department. The MoU will be signed between TNRSP and TN State Forest Department.

Similarly the provision of tree plantation and landscaping is proposed for the road sections abandoned due to realignments. Cost for this plantation has also been taken, INR 1000.

ITEM 3.0 LANDSCAPING

It includes the costs involved in landscaping apart from tree plantations. Landscaping is planned at three junctions and at locations of realignment. The area estimated for landscaping is 1450 m² for junctions and realignment locations. The cost per sq m has been taken as INR 1000 per sq m.

ITEM 4.0 MONITORING OF ENVIRONMENTAL ATTRIBUTES DURING CONSTRUCTION ACTIVITY

Item 4.1 Air Quality

The cost of continuous 24 hour monitoring for PM₁₀, PM_{2.5}, SO₂, NO_x, and CO as per prevalent market rates is INR _____/sample.

Item 4.2 Noise Level

The cost of noise level monitoring of dB (A) scale (readings to be taken at 6 second intervals for 15 minutes every hour for a total period of 24 hours) as per prevalent market rates is INR _____/location.

Item 4.3 Water Quality

Water quality will be monitored for the following parameters:

- pH, BOD, COD, TDS, Pb, Oil & Grease and Detergents for surface water
- pH, TDS, Total Hardness, Sulphate, Chloride, Fe, Pb and Coliform count for ground water

The cost for one time monitoring of water quality as per prevalent market rates is INR _____/sample.

Item 4.4 Soil Quality

The cost for one time monitoring of soil quality for all baseline parameters as per prevalent market rates is INR _____/sample. Provisions have also been included in the budget to monitor the soil quality in the event of any major accident/spillage during bulk transport of hazardous material. Costs are incorporated for monitoring at such locations.

ITEM 5.0 ORIENTATION OF IMPLEMENTING AGENCY STAFF

This item includes the costs to be incurred for training sessions involving the PIU staff. The training program will be attended by PIU staff, Engineer – Construction Supervision Consultant and Contractor representative. The cost is included in the consulting fee of Engineers.

ITEM 6.0 ENHANCEMENT MEASURES

The environmental enhancements are planned at the Ponds. The environmental enhancements will include stepped access, tree plantation, and seating arrangement around trees. The details of these will be worked out finalization of the design. The excavation cost for ponds has been taken separately for the partially impacted ponds. Other enhancement measures include the noise barrier for the safeguard of sensitive receptor such as academic institution and hospitals.

(C) COSTS DURING OPERATION STAGE

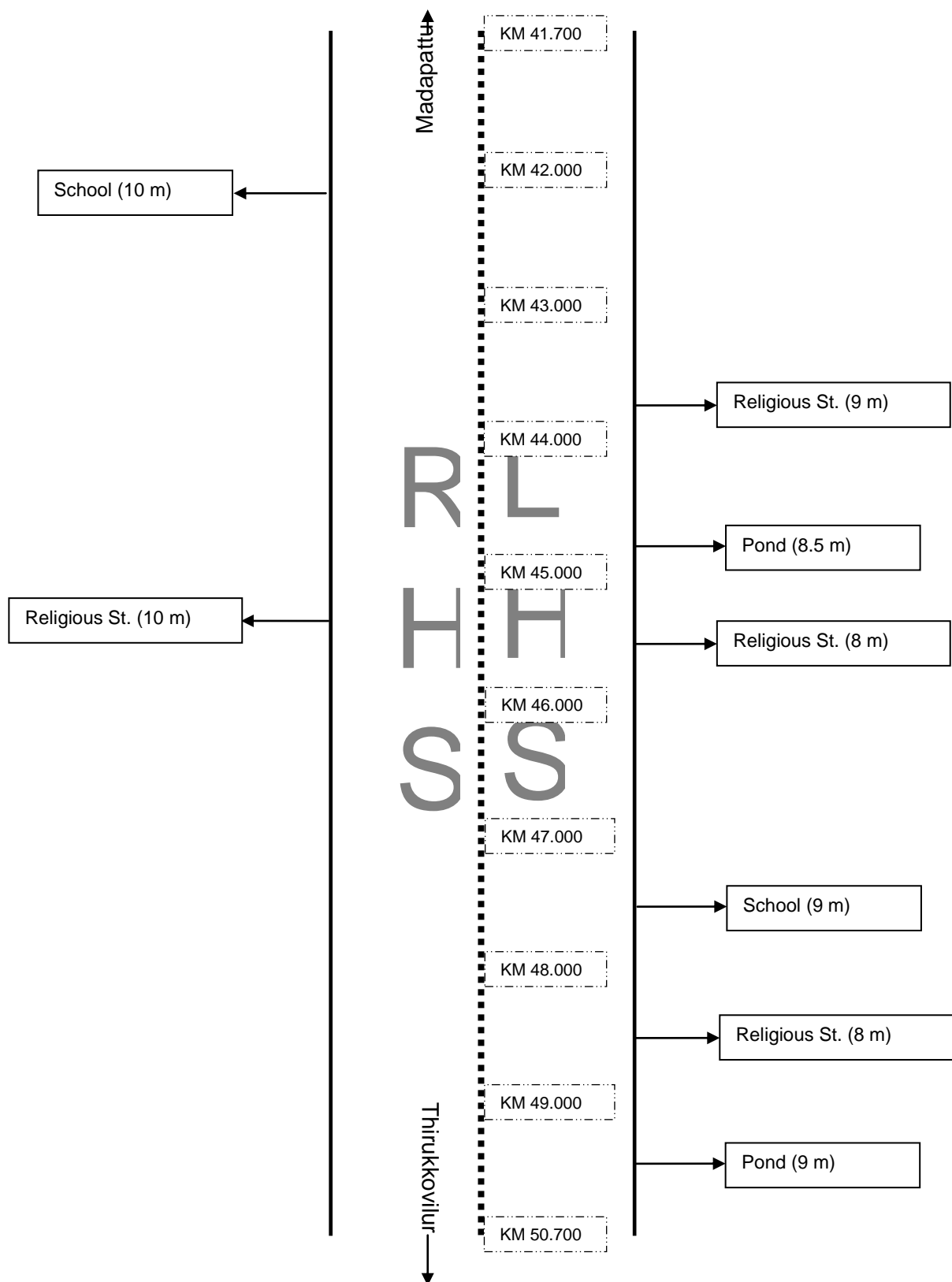
ITEM 1.0 MONITORING OF ENVIRONMENTAL ATTRIBUTES DURING OPERATION PHASE

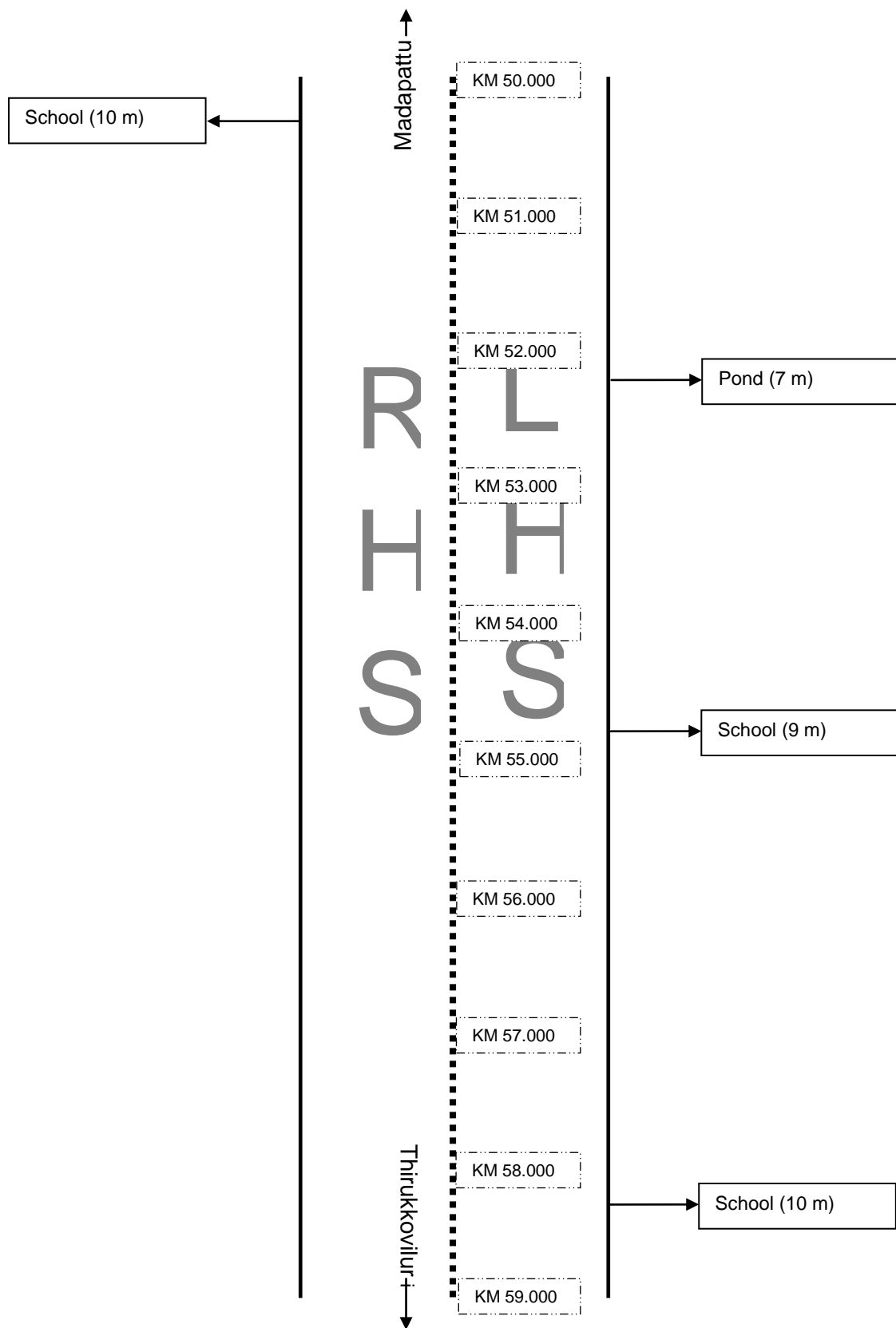
The rates for monitoring of quality are same as those mentioned in the construction stage. Provisions have been made in the budget to monitor each year up to 2 years from completion of construction.

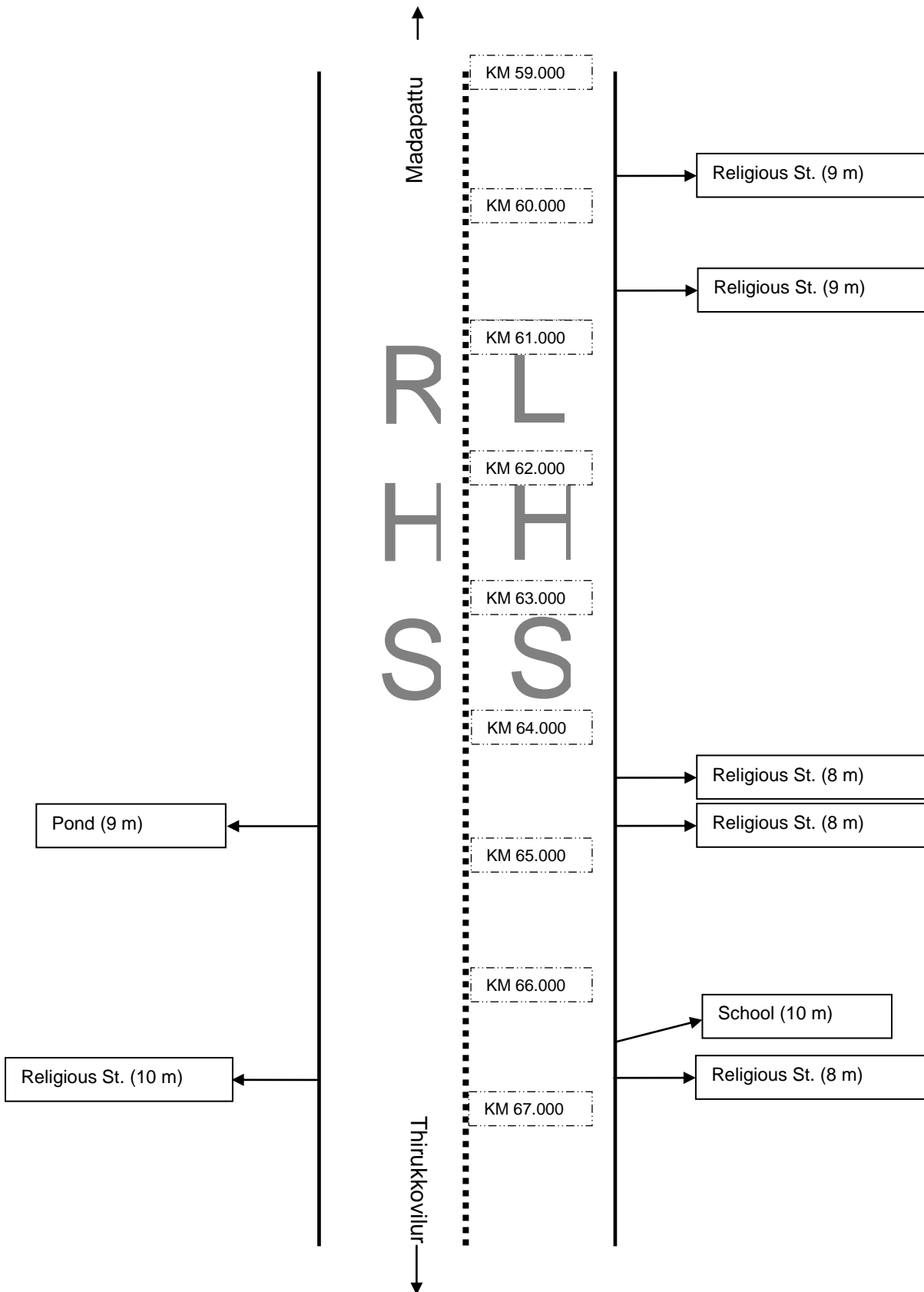
ITEM 2.0 INFORMATION DISSEMINATION

This item includes the costs to be incurred for information dissemination during in RAP towards the cost of the NGO.

ANNEXURE 2.1 STRIP PLAN







ANNEXURE 5.1 GUIDELINES FOR SITING, MANAGEMENT AND REDEVELOPMENT OF CONSTRUCTION CAMPS

A. OVERVIEW

Construction camp accommodates a mix of activities, which are highly polluting in nature causing considerable environmental impact and its proper siting, management and redevelopment is crucial to avoid, minimize and mitigate those impacts. The EMAP clearly distinguishes between various impacts that may occur at various stages of the camp like

- Siting,
- Setting up,
- Operation and
- Closure / redevelopment and provide respective mitigation measures to some extent.

In addition to that, this guideline has been prepared to provide the Contractor with comprehensive and systematic information on the various steps to be undertaken during these four stages, so that s/he can execute his/her role in an environmentally sound manner. Various mitigation measures have been synthesized into this guideline so that it serves as a single and stand alone document for the Contractor.

B. CRITERIA FOR SITING THE CAMP

To the extent, possible barren land or wastelands shall be preferred during site selection and fertile land and agricultural land shall be avoided. All such sites must be above the HFL with adequate drainage facility. In areas prone to floods, cyclones, cloudbursts or heavy rainfall, selection of the site should be made keeping in mind the safety of the camp and the workers. In addition, the Contractor should take care of the following criteria for locating the site:

- A minimum of 250 m away from any major settlement or village in downwind direction.
- A minimum of 200 m of any major surface water course or body
- Not within 500 m from ecologically sensitive areas like wildlife sanctuary, mangroves etc.
- Sufficiently wide access roads (at least 5.5 m Wide) for heavy vehicle movements

After identification of the site the Contractor should fill up the prescribed reporting format and submit the same for approval to the CSC without which any activity shouldn't be started on the site.

C. FINALIZATION OF SELECTED SITE/S

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMAP and submit the same for approval to the CSC. Environmental Engineer of CSC shall approve the selected site/s, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the landowner/s prior to receipt of a written approval from the CSC. Any consequence of rejection prior to the approval shall be the responsibility of the contractor and shall be made good at his own cost. After obtaining a written approval from the CSC for the selected site, the contractor has to enter into an agreement with

² In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the CSC.

the landowner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D. DESIGNING OF CAMP / PREPARATION OF LAYOUT PLAN

The contractor should design a layout plan of the camp with adequate space for (i) site office along with store room, rest area and sanitary facilities, (ii) plants, machineries, (iii) workshops, (iv) vehicle washing area, (v) fuel handling area, (vi) room for raw material unloading and stocking, (vii) space for storage and handling of solid wastes (viii) security cabin etc. The laying out of these should be undertaken in such a manner that it facilitates smooth functioning of both man and machine. Fuel pumps, storage facility for inflammable and hazardous chemicals/materials shall be provided inside the camp, but at a safe distance from office. Electric safety practices shall be integrated/ incorporated during the lay-out plan preparation.

Prevailing wind direction shall be kept in mind while planning out the lay-out of internal facilities. Cutting of trees should be minimum and the existing ones need to be integrated into the lay-out plan with proper planning. The roads within the camp should be well planned with adequate space for movement of vehicles and their parking.

E.SETTING UP OF CONSTRUCTION CAMP

(i)Site preparation: The stripping, stacking and preservation of top soil will be mandatory in case of farm lands and fertile areas and absolutely no material stacking or equipment installment or vehicle parking or any other activity should be allowed prior to the satisfactory completion of this activity as per guidelines in EMP. Thereafter, the site should be graded and rendered free from depressions such that the water does not get stagnant anywhere. A compound wall of 2.4 m height should be constructed all around the camp to prevent the trespassing of humans and animals. Green belt should be provided along the boundary and as detailed in the EMP, it should be integrated with storm water drain and sedimentation trenches as given in annexure in EMAP. No. of trees planted should not be less than ten times the number of trees cut. The approved layout plan should be strictly adhered to while setting up the camp.

(ii)Setting up of plants and machineries: Adequate arrangements should be made for avoiding fugitive emissions from plants and camp premises. This will include (i) control of air pollution through provision of in-built dust extraction systems like bag filter, damper and cyclone filter for bitumen hot mix plant, (ii) a chimney of appropriate height (as per TNPCB guideline) from ground level attached with dust extraction system and scrubber for the hot mix plant, (iii) a chimney of appropriate height for the DG set (iv) water sprinkling facilities for the concrete batching plant, wet mix macadam plant as well as in the camp premises and (v) garden net to prevent fugitive emissions from storage place of cement and aggregates. It has to be also ensured that effluent from the sludge tank of the scrubber is recycled and reused and the sludge is used for land filling with top soil spread on it.

To ensure that noise levels are within the limit, all plants and machineries should have their own silencers or any other noise control devices. All pollution control devices should be provided with backup power. Following conditions should be complied regarding the sound level conditions:

The sound level (Leq) measured at a distance of 1 m from the boundary of the site shall not exceed 55dB (A) during day time (6am - 6pm) and 45 dB (A) during night time (6 pm - 6am).

The total sound power level of the DG set shall be less than $96+10 \log_{10}(kava)$ dB(A) where kVA is the nominal power rating of DG set.

The DG set shall be provided with acoustic enclosure/acoustic treatment with an insertion loss of minimum 25 dB (A).

The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).

A proper, routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer.

Concrete flooring with slope drains and oil interceptors should be proposed for hot mix plant area and workshop, vehicle washing and fuel handling area as per EMP, so that oil and lubricants that may spill on the floor does not contaminate any soil or water body. In case of any oil spills, it should be cleaned properly. There shall also be provisions for storage of used oil until it is disposed as per comprehensive waste management plan prepared by Contractor and approved by CSC.

(iii) Sanitation Facilities: Adequate no. of toilets shall be provided separately for males and females (depending on their strength), screened from those of men and provided with markings in vernacular language. All such facilities must have adequate water supply with proper drainage and effluent treatment system like septic tank with soak pit. Soak pit should have a sealed bottom, honey comb wall and 75 cm. thick, 2 mm sand envelope around that. The sewage system for the camp must be properly sited, designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

Portable toilets may be brought to use and the night soil from such units has to be disposed through designated septic tanks so as to prevent pollution of the surrounding areas. In the construction camp, no night soil or sewerage shall be disposed of at any place other than the septic tanks constructed at the site.

(iv) Waste Disposal: While preparing the layout plan, the Contractor should allocate adequate space for storage and handling of various wastes generated until they are disposed off in pre-identified disposal sites. The Contractor should provide separate garbage bins for biodegradable, non-biodegradable and domestic hazardous wastes in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor. The disposal of any biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling. POL (petroleum, oil and lubricants) waste shall be disposed off by transfer only to recycler/ re-refiners possessing valid authorization from the Tamil Nadu Pollution Control Board and valid registration from the Central Pollution Control Board. Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.

(v) First aid / safety facilities: At every camp site, a readily available first-aid unit including an adequate supply of sterilized dressing materials, appliances and basic medicine should be provided. Workplaces which are remote and far away from regular hospitals should have indoor health units with one bed for every 250 workers. Details of nearest clinics as well as major hospitals like their location, distance from camp, phone nos. facilities offered by the hospital should be displayed in the camp office at clearly visible location in a legible manner. Suitable transport should be provided to facilitate taking injured and ill persons to the nearest hospital. Adequate personal protective equipments and fire fighting equipments as detailed out in EMP should be made available in the camp and provided to the staff / workers. Operation manuals and training should be provided to machine operators. Warning signs should be placed at accident prone areas as well as at the entrance of the site.

(vi) Training to workers: Workers shall be trained in smooth operation of plants and machines, their regular maintenance and various safety measures to be followed as well as about the need for adherence to these measures.

(vii) Information dissemination: There should be a sign board of size 6' x 4' mentioning the project details and Contractor's details to disseminate the information to the public. There should be a second sign board displaying the latest air and noise monitoring data against the standards specified.

Warning signboards should be set up at the entrance gate for the public as well as at other required places for the workers to alert them about the nature of operation being undertaken at those respective places.

Once the construction camp is set up, the date of commissioning of the camp should be intimated to the Head Office and concerned District Office of the TNPCB.

F. OPERATION OF CONSTRUCTION CAMP

During the operation phase of the camp it is important to ensure that all vehicles and machineries are maintained regularly and their PUC certificates are renewed at regular intervals. All pollution control devices should be monitored and maintained properly at regular intervals. In case of process disturbance/ failure of pollution control equipments, the respective units should be shut down and should not be restarted until the control measures are rectified to achieve the desired efficiency. All units should operate only between 6 am and 10 pm. or as specified by TNPCB in the consent letter.

Oil and grease waste generated from garages in construction camps should be drained out through oil interceptors and they should be maintained properly. Necessary arrangements should be made for regular sprinkling of water for dust suppression. Raw materials and products should be transported with proper cover to prevent spreading of dust.

Hygienic environment must be ensured by (i) provision of safe drinking water, (ii) proper maintenance of toilets including daily cleaning and disinfection using proper disinfectants, (iii) regular cleaning of drains by removing the silt and solid waste, (if any) and iv) appropriate waste management practices. While it is of utmost importance to ensure that fire fighting equipments like fire extinguishers are in working condition, it should also be monitored that construction workers use the personal protective equipments provided to them and they are replaced when necessary. All these facilities should be inspected on a weekly basis to achieve the desired levels of safety and hygiene standards.

Environmental monitoring should be undertaken by the Contractor as stipulated in the EMP. If any standard is set by TNPCB for hot mix plant emissions, the Contractor should collect samples of emission from all the chimneys and analyze for the parameters at least once in a month. The Consent to Operate (CTO) certificate from TNPCB should be renewed at regular intervals and the same should be intimated to CSC.

A register should be maintained at the site office which provides (i) a one page format for each migrant laborer which will give their personal profile (including name, age, sex, educational qualification, address, blood group and any major illness), along with a copy of any ID proof and an original photograph, (ii) a copy of the ID card of local laborers. A copy of the details of the migrant laborers should be submitted to the local police station.

G. PREPARATION OF CONSTRUCTION CAMP MANAGEMENT AND REDEVELOPMENT PLAN

After the site for the construction camp has been finalized and approved by CSC, the Contractor should prepare a construction camp management plan to be submitted to CSC for approval prior to setting up of the camp and it should comprise the following details:

Section-1: Details of site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance from the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.

Section-2: Site preparation: Activities that will be undertaken for preparing the site based on EMP and this guideline.

Section-3: Arrangements/ facilities within the camp: List of plants / machineries to be set up within the camp like hot mix plant, batching plant, DG set etc., and other facilities to be provided like site office, store room, rest room, toilet room, material stocking yard etc, layout plan showing all these details along with vehicular movement path, green belt etc. Species wise no. of trees to be cut shall be provided.

Section-4: Mitigation measures that will be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out here.

Section-5: Other details: Any other relevant detail like list of trainings to be provided to workers, details of information dissemination, date of CTE certificate from TNPCB, its validity, additional conditions laid down in it etc. should be included.

Section 6: Re-development plan, which should indicate the following points: (i) List of structures to be demolished and list of the cleanup activities that needs to be undertaken, (ii) Proposed use of the land after demobilizing and (iii) Presence of facilities that could be put in use by the land owner if it is a leased out private land or community in case of a public property.

Section-7: Annexure-(a) Working drawings: Electrical plan showing the electrical network planned for the site, location of plants, generators, master switch boards etc. and plumbing drawing showing the network of water supply lines, sewerage line and drainage line, (b) Copy of certificates / permissions obtained from regulatory authorities / local governing body /community etc. as applicable, (c) Copy of agreement entered with the owner of the site if it is a leased out land.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The construction camp management plan should be submitted to the CSC for a written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site. The CSC shall carefully examine the proposals considering the specific conditions of each site as well as various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who shall incorporate it in the management plan.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures depending on the site and as demanded by the features of the specific site.

H.DEMOBILIZATION AND REDEVELOPMENT OF THE SITE

The Contractor should clear all temporary structures; dispose all building debris, garbage, night soils and POL waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. All the areas within the camp site should be leveled and spread over with stored top soil. Residual topsoil, if any will be distributed or spread evenly in plantation sites, on adjoining/near-by barren land or affected agricultural land adjacent to the RoW that has been impacted on account of any accidental spillage. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor's expense, to the entire satisfaction of landowner and CSC.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site

has been re- developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSC by the Contractor:

Copy of approved site identification report

Photographs of the concerned site 'before' and 'after' setting up the camp.

Certificate from the owner stating his/her satisfaction about status of re-development of the site.

CSC shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PIU shall ensure through site inspection that the Contractor and CSC have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor, Construction Supervision Consultant and PIU.

ANNEXURE 5. 2 GUIDELINES FOR SITING, MANAGEMENT AND REDEVELOPMENT OF LABOUR CAMPS

A. OVERVIEW

Staff-quarters include accommodation for Engineers / Supervisors and labor camp include accommodation for workers / laborers along with other basic amenities such as kitchen, potable water supply, sanitation (toilets, bathrooms, washing areas and water supply for such needs), first aid room as well as garbage collection and disposal facility. Staff quarters shall be provided with additional facilities of drawing room. The guidelines outlined here aims to facilitate the Contractor in implementing the measures in the EMP there by reducing the impact on the environment.

B. FINALIZATION OF SELECTED SITE/S

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMAP and submit the same for approval to the CSC. The selected site/s shall be approved by Environmental Engineer of CSC, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the land owner/s prior to receipt of a written approval from the CSC. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval from the CSC for the selected site, the Contractor has to enter into an agreement with the landowner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

C. DESIGNING AND SETTING UP OF LABOUR CAMP

Following facilities should be provided in a labor camp to ensure safe, clean and hygienic accommodation for the workers.

(i)Site preparation: The site should be graded and rendered free from depressions such that the water does not get stagnant anywhere. Fencing should be constructed all around the camp to prevent the trespassing of humans and animals. Green belt should be provided along the boundary and as detailed in the EMP, it should be integrated with storm water drain and sedimentation trenches. No. of trees planted should not be less than ten times the number of trees cut. The approved layout plan should be strictly adhered to while setting up the camp.

(ii)Accommodation: Contractor will follow all relevant provisions of the Factories Act, 1948 and the Building and the other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 for construction and maintenance of labor camp. The height of the worker's and labor accommodation shall not be less than 3mt. from floor level to the lowest part of the roof. The camps shall be floored with concrete, shall be kept clean with proper cross ventilation and the space provided shall be on the basis of one sq.mt per head or as per the relevant regulation, whichever is higher. Fire and electrical safety pre-cautions shall be adhered to. Cooking, sanitation and washing areas shall be provided separately. The Contractor will maintain necessary living accommodation and ancillary facilities (including provision of clean fuel to prevent damage to forests and to prevent fuel wood cutting and burning by labor) in functional and hygienic manner.

The site must be graded and rendered free from depressions such that water does not get stagnant anywhere. The entire boundary of the site should be fenced all around with barbed wire so as to prevent the trespassing of humans and animals. Green belt should be provided

along the boundary and it should be integrated with storm water drain and sedimentation trenches to reduce the surface run off as per clauses in EMAP. No. of trees planted should not be less than ten times the number of trees cut.

(iii) Drinking Water: The Contractor should provide potable water within the precincts of every workplace in a cool and shaded area, which is easily accessible as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996. All potable water storage facilities will be on a safely raised platform that is at least 1m above the surrounding ground level. Such facilities shall be regularly maintained from health and hygiene point of view. If necessary water purifier units shall be installed for providing potable water.

As far as possible shallow wells should not be used as potable source of water. However, if water is drawn from any existing well, irrespective of its location from any polluting sources, regular disinfection of the water source (which may include application of lime, bleaching power and potassium permanganate solution) has to be ensured at weekly/fort nightly interval. All open wells will be entirely covered and will be provided with a trap door to prevent accidental fall and contamination from dust, litter etc. The trap door will be kept locked and opened only for cleaning or inspection, which will be done at least once in a month. A reliable pump will be fitted to each covered well. A drain shall be constructed around the well to prevent flow of contaminated water into the well from road, camp or other sources. Water quality testing of all potable water sources will be done every six months as per parameters prescribed in IS 10500:2012.

(iv) Sanitation Facilities: Adequate no. of toilets shall be provided separately for males and females (depending on their strength), screened from those of men and provided with markings in vernacular language. All such facilities must have adequate water supply with proper drainage and disposal facility.

They shall be maintained, cleaned and disinfected daily using proper disinfectants. Location and design of soak pit should be in such a way that it doesn't pollute the ground water. Drains and ditches should be treated with bleaching powder on a regular basis. The sewage system for the camp must be properly designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

Portable toilets may be brought to use and the night soil from such units has to be disposed through designated septic tanks so as to prevent pollution of the surrounding areas. In the main camp, no night soil or sewerage shall be disposed of at any place other than the septic tanks constructed at the site. All these facilities shall be inspected on a weekly basis to check the hygiene standards.

(v) Waste Disposal: The Contractor should provide garbage bins in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor. Separate bins shall be provided for biodegradable, non-biodegradable and domestic hazardous wastes. The disposal of kitchen waste and other biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. The Contractor may use the compost from such wastes as manure in the plantation sites. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling.

(vi) Day Crèche Facility: At every construction site, provision of a day crèche shall be made so as to enable women to leave behind their children while going to work. At least one attendant shall be provided to take care of the children at the crèche. At construction sites where 20 or more women are employed, there shall be at least one shelter for use of children under the age of 6 years belonging to such women.

Shelters shall not be constructed to a standard lower than that of thatched roof, mud walls and floor with wooden planks spread over mud floor and covered with matting. Such areas shall be safely barricaded (no sharp sheets or barbed wires that may injure a child) from rest of the camp for the safety of children. Shelters shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision to keep the place clean. The size of a crèche may vary according to the number of children on a camp site.

(vii) Mess and Kitchen Facilities: The Contractor shall adhere to the sanitary/hygiene requirements of local medical, health and municipal authorities at all times. Adopt such precautions as may be necessary to prevent soil and water pollution at the site while operating mess or kitchen facilities.

(viii) First aid facilities: At every workplace, a readily available first-aid unit including an adequate supply of sterilized dressing materials and appliances should be provided. Workplaces remote and far away from regular hospitals should have indoor health units with one bed for every 250 workers. Suitable transport should be provided to facilitate taking injured and ill persons to the nearest hospital. Adequate personal protective equipments and fire fighting equipments as detailed out in EMP should be made available in the camp and provided to the staff / workers.

(ix) Health Care Facilities: Health problems of the workers should be taken care of by providing basic health care facilities. If there is no hospital or clinic, which can be accessed in half an hour's time, then a temporary health center should be set up for the construction camp. The health centre should have at least a doctor and a nurse, duty staff, medicines and minimum medical facilities to tackle first aid requirements or minor accidental cases, linkage with nearest higher order hospital to refer patients of major illnesses or critical cases.

The health centre should have MCW (Mother and Child Welfare) units for treating mothers and children in the camp. Apart from this, the health centre should be provided with regular vaccinations required for children. The health centre should carryout quarterly awareness programme of HIV – AIDS with the help of AIDS control society as well as about community living and hygiene practices in day to day living. Posters should be exhibited in the health care clinic. For finalising the facilities for the labour camp the contractor will also refer EBRD /IFC Guidelines on Workers' Accomodation and Standards'.

D. OPERATION OF LABOUR CAMP

Throughout the functioning period of the camp, hygienic environment must be ensured by (i) provision of safe drinking water, (ii) proper maintenance of toilets including daily cleaning and disinfection using proper disinfectants, (iii) regular cleaning of drains by removing the silt and solid waste, (if any) and iv) appropriate waste management practices. While it is of utmost importance to ensure that fire-fighting equipments like fire extinguishers are in working condition, it should also be monitored that construction workers use the personal protective equipments provided to them and they are replaced when necessary. All these facilities should be inspected on a weekly basis to achieve the desired levels of safety and hygiene standards.

E. PREPARATION OF LABOUR CAMP MANAGEMENT AND RE-DEVELOPMENT PLAN

After the site for the labor camp has been finalized and approved by CSC, the Contractor should prepare a labor camp management and redevelopment plan to be submitted to CSC for approval prior to setting up of the camp and it should comprise the following details:

Section–1: Details of site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, and distance from the project stretch, surrounding features and land use like residences, agricultural

land, water bodies etc., photograph of the site showing the topography and other existing features.

Section-2: Site preparation: Activities that should be undertaken for preparing the site based on EMP and this guideline.

Section-3: Arrangements/ facilities within the camp: List of facilities to be provided along with its details like area, no of people to be accommodated and a layout plan showing the plan of the site with all the facilities planned like quarters, labor camps, mess, common facilities, toilet facilities and the vehicular and pedestrian movement paths.

Section-4: Mitigation measures that should be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out here.

Sectoin-5: Other details: Any other relevant detail like list of awareness camps to be provided to workers, details of information dissemination etc. should be included.

Section 6: Re-development plan: which should indicate following points: (i) List of structures to be demolished and list of the cleanup activities that needs to be undertaken, (ii) Proposed use of the land in the post construction phase, if it is a public property, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property.

Section-7: Annexure-(a) Working drawings: Electrical plan showing the electrical network planned for the site, location of generators, master switch boards etc. and plumbing drawing showing the network of water supply lines, water tank, drainage facilities etc. (b) Copy of permissions obtained from local governing body / community etc. as applicable, (c) Copy of agreement entered with site owner, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The labor camp management plan should be submitted to the CSC for a written approval before any physical work is undertaken on a particular site. The CSC will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who shall incorporate it in the management plan. Contractor shall be responsible for satisfactory and timely completion of these EMP requirements.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures depending on the site and as demanded by the features of the specific site.

F. RE-DEVELOPMENT OF THE LABOUR CAMP

The Contractor should clear all temporary structures; dispose all building debris, garbage, night soils and any other waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. Residual topsoil, if any will be distributed or spread evenly in plantation sites, on adjoining/near-by barren land or affected agricultural land adjacent to the RoW that has been impacted on account of any accidental spillage. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor's expense, to the entire satisfaction of landowner and the CSC.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re- developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSC by the Contractor:

Copy of approved site identification report

Photographs of the concerned site 'before' and 'after' setting up the camp.

Certificate from the owner stating his/her satisfaction about status of re-development of the site.

CSC shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PIU shall ensure through site inspection that the Contractor and CSC have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor, Construction Supervision Consultant and PIU.

ANNEXURE 5. 3 GUIDELINES FOR SITING, MANAGEMENT AND REDEVELOPMENT OF QUARRYING AND STONE CRUSHING OPERATIONS

A.OVERVIEW

A quarry is a type of open-pit mine from which rock or minerals are extracted for building materials, such as dimension stone, construction aggregate, sand, and gravel. Quarrying causes lot of environmental damages like air and noise pollution, water logging etc and requires permission from regulatory authorities like mining department. It requires a careful approach in the site selection process, scientific method of quarrying and appropriate measures to redevelop it.

B.CRITERIA FOR LOCATING THE SITE/S

The selection of a quarry is sole responsibility of the Contractor and should be undertaken in adherence to the rules & regulations of the authorities. Following criteria should be followed while selecting a quarry site:

To the extent possible barren land or waste lands shall be preferred during site selection and fertile land and agricultural land shall be avoided.

There shall be no quarrying of sand in any river bed or adjoining area or any other area which is located within 500 meters radial distance from the location of any bridge, water supply system, infiltration well or pumping installation of any of the local bodies or Central or State Government Department or any area identified for locating water supply schemes by any of the Government Department or other bodies.

Quarry site shall be located at a minimum distance of: 500 m from any human settlements, public road, railway line, national highway, state highway or major district road.

Stone quarry shall be located at a minimum distance of 50 m from any water body.

Locate the quarry and crusher at a min. distance of 500 m. away from forests / wildlife habitats / mangroves / ecologically sensitive areas.

The minimum distance between two stone crushers should be 1 km to avoid dust pollution influence of one over the other.

Stone crushing unit should be distanced for 500 m from the NH or SH or residential area or places of public and religious interests.

Access roads to quarry sites must be wide enough for heavy vehicle movement without inconvenience to local traffic.

After identification of the site, Contractor should fill up the prescribed reporting format and submit the same for approval to the CSC without which any activity shouldn't be started on the site.

C.FINALIZATION OF SELECTED SITE/S

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMAP and submit the same for approval to the CSC. The selected site/s shall be approved by Environmental Engineer of CSC, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the land owner/s (in case of a leased or rented out land) prior to receipt of a written approval from the CSC. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval from the CSC for the selected site, the

Contractor has to enter into an agreement with the land owner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D.SETTING UP OF QUARRYING AND STONE CRUSHER

Quarrying involves not only extraction of material (rock) but also crushing and screening that makes the rock suitable for use as construction material. Following are the major parameters to be considered before the start of quarrying and stone crushing operations:

(i)Site preparation: The stripping, stacking and preservation of top soil will be mandatory and absolutely no activity should be allowed prior to the satisfactory completion of this conservation measure as per guidelines in EMAP. The boundary of the quarry should be demarcated using barbed wire fencing in order to avoid the future dispute over land as well as to avoid accidental trespassing of people. There should be recorded documents of exact no of trees cut. Green belt should be provided all along the quarry site to function as both noise attenuators and dust collectors and number of trees planted should not be less than ten times the number of trees cut. Contour trenches should be dug along the borrow area boundary and at any other appropriate places considering the topography to reduce the surface run off and conserve soil and water. Side slopes shall be constructed with slope drains at applicable locations, to provide drainage and avoid any landslides. All the drainage constructed should be linked to existing drainages in order to avoid flooding and water logging.

(ii)Setting up of a quarry site: The layout of a quarry should provide a gravity flow of material from the face to the crusher, from the crusher to the storage bin and from the bin to the hauling equipment. Adequate arrangements should be made for avoiding fugitive emissions from quarry and crusher premises. This will include (i) housing the noise and dust producing units of the crusher unit in a building with wall of minimum 23 cm thickness and with suitable roofing, (ii) control of air pollution through provision of in-built dust extraction systems in the crusher unit and all transfer points, (iii) a chimney of appropriate height for the DG set (as specified by TNPCB), (iv) water sprinkling facilities for the camp premises, (v) facilities to store water required for 3 days use.

Consent to operate the crusher unit should be obtained from TNPCB under Air (Prevention and Control of Pollution) Act, 1981 before starting the operation.

(iii) Safety aspects: Blasting timings in quarry should be fixed avoiding the rush hours and these timings should be adhered to in order to avoid the conflict between the surrounding communities or population. Provide warning sirens 10 before each explosion as a warning alarm to people in and outside the quarry. Damaged explosives must be disposed off in a safe manner away from the operational area. Speed of the vehicles around the quarry should be restricted to a low speed in order to reduce the noise pollution and dust generation. Workers should not be exposed to sound of more than 85 – 90 dB (A) for more than eight hours a day and shall be provided with adequate safety wears and personal protective equipments like ear muffs / plugs etc as detailed out in EMP. Fire extinguishers should be provided in the site office.

Traffic movements should be restricted along the access road around times that children walk to and from school. Proper first aid facilities should be provided within the site office and in case of an accident, quick access to nearby hospital /clinic should be provided.

(iv) Facilities for workers: Potable drinking water should be provided in the site office in a hygienic environment sufficient for all the people. Adequate no. of toilets shall be provided for the workers with adequate water supply, proper drainage and effluent treatment system like septic tank with soak pit. Soak pit should have a sealed bottom, honey comb wall and 75 cm. thick, 2mm sand envelope around that. The sewage system for the camp must be properly

sited, designed, built and operated so that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.

(v) Waste Disposal: The Contractor should provide separate garbage bins for biodegradable, non- biodegradable and hazardous wastes in the camps and ensure that these are regularly emptied and disposed off in a hygienic manner. No incineration or burning of wastes shall be carried out by the Contractor. The disposal of any biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site. Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipe scrubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or sold /given out for recycling. POL (petroleum, oil and lubricants) waste shall be disposed off by transfer only to recycler/ re-refiners possessing valid authorization from the Tamil Nadu Pollution Control Board and valid registration from the Central Pollution Control Board. Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.

Quarry areas should be protected from illegal dumping of waste by third parties. The overburden should be kept as minimum to maximize the commercial efficiency of the quarry, it can be utilized for creating earth bunds to mitigate the noise and visual impacts and also for the site rehabilitation process. No quarry waste shall be dumped within a 100 m on either side of the road. The overburden should be reused or disposed properly. Site for overburden disposal should be planned within the quarry site or any other appropriate site.

(vi) Training to workers: Workers shall be trained in smooth and safe operation of plants and equipments, their regular maintenance and various safety measures to be followed as well as about the need and importance for adherence to these measures. All the drivers should be trained about safe driving and should be made aware about the need to observe caution while plying through access roads, especially during the time when children walk to and from school. Conduct education programs with the locals regarding the potential impacts of blasting, blasting warning systems, schedules etc.

(vii) Information dissemination: There should be a sign board of size 6' x 4' mentioning the project details and Contractor's details to disseminate the information to the public. There should be a second sign board displaying the latest air and noise monitoring date and data against the standards specified. Warning sign boards should be set up at the entrance gate for the public as well as at other required places for the workers to alert them about the nature of operation being undertaken.

Other mitigation measures: The quarry should not damage any building, work, property or rights of other persons. The quarry should not alter any right of way, well or tank. Roads inside the crusher premises should be tarred or concreted. Water course, if any, from a higher slope should be properly drained out. Storm water drainage shall be provided to prevent water logging and flooding in and around the area. The possibility of collecting the storm water in a pit or a tank should be explored so that it can be reused for dust suppression and the dependence on other water sources could be reduced. If this is not possible, the water should be safely channeled out of the quarry without disturbing any nearby human settlement. A register should be provided in the camp site for public to record their grievances if any. Environmental monitoring should be conducted as per suggested frequency.

The concerned authority – CSC/ PIU should regularly review the environmental, health and safety aspects. If any adverse effect on environment, habitat and concern of safety is noticed, appropriate measures should be taken as suggested by CSC or should arrange an alternative for road construction materials. In the case of existing quarries and additional quarries, the Contractor has to ensure that all actions in these quarries are in compliance with EMP.

E. OPERATION OF QUARRY SITE AND STONE CRUSHING UNIT

No quarrying operation shall be done without the approval from the concerned authority. The equipment used in quarry should be wear faced, which extends the equipment life and reduce the demand for spare parts. Adopt controlled blasting techniques and conduct quarrying in a skillful, scientific and systematic manner. All units should operate only between 6 am and 10 pm. or as specified by TNPCB in the consent letter.

Accessory facilities to be provided in the quarry includes sprinklers to spray water for dousing the dust generation, noise suppressers and rubberized mounting to reduce noise and vibration and tarpaulins or covers over material transporting vehicles. Provide sufficient water storage facility for 2 days' use. Measures have to be taken to reduce the dust generation during drilling operation. Deep wetting of drilling zones also to be done by water sprinkling and drilling machine shall be fitted with dust suppression, collection and disposal arrangements. In case of blasting, the storage and the operation should be as per the regulations. To avoid spillage of fuel and lubricants, the vehicles and equipment should be properly maintained and repaired. Maintenance should be carried out on impervious platforms with spill collection provisions.

Following conditions regarding sound generation should be complied with in a quarry / crusher unit:

The sound level (Leq) measured at a distance of 1 m from the boundary of the site shall not exceed 55 dB (A) during day time (6am - 6pm) and 45 dB (A) during night time (6 pm - 6am).

The DG set shall be provided with exhaust muffler /acoustic enclosure/acoustic treatment with an insertion loss of minimum 25 dB (A) and its emission levels should be within relevant TNPCB guidelines.

A proper, routine and preventive maintenance procedure for the DG set shall be set and followed in consultation with the DG set manufacturer.

F. PREPARATION OF QUARRY MANAGEMENT AND REDEVELOPMENT PLAN

The Contractor after getting approval from the competitive authority for the selected site should submit a detailed Quarry Management Plan comprising the following details:

Section-1: Details of site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, and distance from the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.

Section-2: Site preparation: Activities that should be undertaken for preparing the site based on EMP and this guideline.

Section-3: Arrangements/ facilities within the camp: List of facilities to be set up within the site like site office, store room, rest room, sanitation facilities etc. and a layout plan showing all these details along with vehicular movement path, green belt, locations where digging of contour trenches should be undertaken etc.

Section-4: Mitigation measures that will be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out.

Section-5: Other details: Any other relevant detail like list of awareness camps to be provided to workers, details of information dissemination etc. date of quarry license obtained from Dept of Mines, its validity, additional conditions laid down in it etc. should be included in the quarry management plan. Species wise no. of trees to be cut and the details of top soil to be removed and conserved like quantity, location of storing etc. shall also be provided.

Section 6: Re-development plan: which should indicate following points: (i) List of structures to be demolished and list of the cleanup activities that needs to be undertaken, (ii) Proposed use of the land in the post construction phase, if it is a public property, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property.

Section-7: Annexure-(a) Working drawings: Electrical plan showing the electrical network planned for the site, location of generators, master switch boards etc. (b) Copy of permissions obtained from local governing body / community etc. as applicable, (c) Copy of agreement entered with site owner, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The quarry and crusher unit management plan should be submitted to the CSC for a written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site. The CSC will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who will implement it within the stipulated time period.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures depending on the site and as demanded by the features of the specific site.

G.REDEVELOPMENT OF QUARRY AREA

The main objective of the redevelopment of quarries is to make the area a safe and secure place and adapt it to a suitable land use like leisure place or fishing place etc. which is suitable for the physical environment as well as for the community around. Along with the preparation of quarry and crusher management plan the Contractor should also prepare a re-development plan, which will be submitted for approval to CSC who in turn will be responsible for approving and monitoring these plans. The redevelopment plan should indicate following points:

List of structures to be demolished and list of the cleanup activities that needs to be undertaken.

Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or community in case of a public property.

The proposed use of the quarry site with a layout plan showing the proposed facilities / improvement measures, list of local plant species that could be planted etc.

Photographs of the site before, during and after the quarrying process.

Possible re-development options include the following:

Re-vegetation of the quarry to merge with surrounding landscape with reuse of top soil mixed together with farm yard manure.

Development of exhausted quarries as water bodies, where the quarry pit is developed into pond or a rainwater harvesting structure.

Pits created as a result of blasting could be filled with over burden which are removed and stockpiled in other areas or with construction debris. Top soil should be spread back and trees should be planted along the boundary.

Tree plantation where ever possible depending on the proposed use, erosion control measures etc should be taken up as part of the redevelopment plan.

The Contractor should clear all temporary structures; dispose all debris, garbage, night soils and any other waste as per the approved debris management plan. All disposal pits or trenches should be filled in, disinfected and effectively sealed off. Residual topsoil, if any will be distributed or spread evenly in plantation sites, on adjoining/near-by barren land or affected agricultural land adjacent to the RoW that has been impacted on account of any accidental spillage. Entire camp area should be left clean and tidy, in a manner keeping the adjacent lands neat and clear, at the Contractor's expense, to the entire satisfaction of land owner and the CSC.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re-developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSC by the Contractor:

Copy of approved site identification report

Photographs of the concerned site 'before' and 'after' setting up the camp.

Certificate from the owner stating his/her satisfaction about status of re-development of the site, this is applicable only in the case of a site to be returned to the owner.

CSC shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PIU shall ensure through site inspection that the Contractor and CSC have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor, Supervision Consultant and PIU.

ANNEXURE 5.4 GUIDELINES FOR SITING, MANAGEMENT AND REDEVELOPMENT OF BORROW AREAS

A. BORROW AREA SELECTION

A borrow describes an area where material (usually soil or sand) has been dug for use at another location, for example, soil might be excavated to fill an embankment for a highway. In some cases, the borrow pits may become filled with ground water posing a danger to the surrounding community. If properly redeveloped, it can be turned into recreational areas or sustainable wildlife habitats. In other cases, borrow pits may be used for landfill and waste disposal also.

B. CRITERIA FOR SITE SELECTION

The Contractor in addition to the established practices, rules and regulation shall also use the following criteria before finalizing the locations of borrow areas:

The borrow area should not be located in agriculture areas especially in paddy fields unless unavoidable i.e. barren land is not available. In case borrowing needs to be done on an agricultural land, top-soil stripping, stacking and preservation is a must.

Borrow pits shall not be located within a distance of 100m from any NH, SH or other roads.

Site shall be located 30m away from toe of the embankment along road side.

Site should be located not less than 30m from the toe of the bank along the river side or irrigation tank bund.

Borrow area shall be located at a minimum distance of 30m from the toe of the irrigation tank bund.

Borrow site shall be located at a minimum distance of 500 m in down-wind direction of villages and settlements.

No borrow pits shall be located within 250 m. from schools, colleges, playgrounds, religious structures and health centers.

No borrow area shall be opened within 500 m. from a reserved or protected forest area/sites, wildlife movement zone and cultural heritage site.

Loss of vegetation shall be almost nil or minimum.

Borrow area near any surface water body will be at least 100 m. away from the toe of the bank or high flood level, whichever is maximum. After identification of borrow area location/s, the Contractor will fill the prescribed reporting format and submit the same for approval to the "Site Engineer" at least 7 working days before commencement of earth works. A written approval from CSC shall be necessary before any activity/work is commenced.

Borrow pit location shall be located at least 0.8 km from villages and settlements. If unavoidable, they should not be dug for more than 30 cm and should be drained.

C. Finalization of the selected area

After identification of the site, the Contractor should fill up the prescribed reporting format provided in EMAP and submit the same for approval to the CSC. The selected site/s shall be approved by Environmental Engineer of CSC, after considering the compliance with the EMP clauses. No agreements or payments shall be made to the land owner/s (in case of a leased or rented out land) prior to receipt of a written approval from the CSC. Any consequence of

rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost. After obtaining a written approval from the CSC for the selected site, the Contractor has to enter into an agreement with the land owner to obtain his/her consent before commencing any operation / activities in the land. The agreement should also mention its type, duration, amount and mode of payment as well as the preferences of the owner regarding site maintenance and redevelopment.

D.BORROW AREA MANAGEMENT

Before the start of operations, the area to be borrowed shall be marked by the Contractor with wooden or stone pegs to ensure that the land required for slope stabilization or bund creation is maintained. Construction Supervision Consultant has to ensure that this marking is done on the ground to avoid issues at a later date. Any disregard of this condition shall be made good at the Contractor's and/or consultant's own expense.

After receiving the approval, the Contractor will begin operations keeping in mind the following points.

Top soil conservation is to be undertaken only if its reuse is envisaged for the proposed activity in the borrow area rehabilitation. Top soil that cannot be re-used in rehabilitation of borrow areas shall be used in the plantation belt/zone along the road.

Damage to productive and fertile areas has to be minimum. This includes appropriate planning of haul roads.

No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from the site to suit his operational procedure, and then he shall make good any consequent deficit of material arising there from.

Where the excavation reveals a combination of acceptable and un-acceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.

The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

The following principles shall be adhered to during borrow area operations:

A 15 cm topsoil layer will be stripped off from the borrow pit and this will be preserved in stockpiles in a designated area with a height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).

Borrowing of earth will be allowed up to a depth of 1.5 m from the existing ground level only.

Ridges of not less than 8m width will be left at intervals not exceeding 300m. Small drains will be cut through the ridges, if necessary, to facilitate drainage.

The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).

Rehabilitation shall be satisfactorily undertaken immediately after the use has ceased and at least three weeks prior to monsoon.

If the rehabilitation plan envisages re-use of top soil, then preserved top soil has to be spread uniformly over the land used as a borrow area.

Bunds and temporary fencing (using barbed wire) along with plantation should be provided in case the borrow area is developed as a pond to ensure safety of the residents and the cattle. However, the depth shall not exceed 1.5 m.

E. Preparation of Borrow Area Management and Redevelopment Plan

The Contractor after getting approval from the competitive authority for the selected site should submit a detailed Borrow Area Management and Redevelopment Plan comprising the following details:

Section-1: Details of site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, distance from the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.

Section-2: Site preparation: Activities that should be undertaken for preparing the site based on EMP and this guideline.

Section-3: Layout plan: A layout plan showing all these details along with vehicular movement path, green belt locations where digging of contour trenches should be undertaken etc.

Section-4: Mitigation measures that will be undertaken as per the EMP and this guideline while setting up of the camp and operation of the camp should be separately listed out.

Section-5: Other details: Any other relevant detail like list of awareness camps to be provided to workers, details of information dissemination etc. date of quarry license obtained from Dept of Mines, its validity, additional conditions laid down in it etc. should be included in the quarry management plan. Species wise no. of trees to be cut and the details of top soil to be removed and conserved like quantity, location of storing etc. shall also be provided.

Section 6: Re-development plan: which should indicate following points: (i) proposed use of the land in the post construction phase, (ii) preferences of land owner with respect to redevelopment, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property, (iv) Extent of community involvement.

Section-7: Annexure-(a) Copy of permissions obtained from local governing body / community etc. as applicable, (b) Copy of agreement entered with site owner, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The management plan should be submitted to the CSC for a written approval before any physical work (includes storage of materials, equipment etc.) is undertaken on a particular site. The CSC will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who will implement it within the stipulated time period.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures as demanded by the features of the specific site and its surroundings.

F. REHABILITATION OR RE-DEVELOPMENT OF BORROW AREAS

The objective of the borrow area rehabilitation is to return the borrowing sites to a safe and environmentally sound condition. The concept entails enhancing benefits (including those linked to livelihood) for the community and individuals. Top soil preservation (and its re-use) and proper stabilization of slopes are the fundamental requirements of the rehabilitation process. Re-development plan shall be prepared and submitted along with reporting format by

the Contractor before the borrowing operation is permitted by the CSC. The redevelopment is to be prepared in consultation with land owner/s (whether public, private or institutional) and by within the environmental and safety requirements of the EMP. Some key points on borrow area rehabilitation are presented in the table provided below. However, the Contractor is free to prepare other rehabilitation scheme/s subject to the approval by the Environmental Engineer of the Supervision Consultant

Type/Form of Rehabilitation	Re-Use of Top Soil	Actions Required for Rehabilitation
Farm land	Yes	Leveling Slope Stabilization along the edges if there is a level difference
Ponds including creation of new ones and enhancing capacity of existing ones (for irrigation; pisciculture and general uses by people and/or cattle)	No	Slope Stabilization (angle/benching) Access / Approach Ramp Bund creation and Temporary Fencing Plantation in the periphery
Water recharging areas/percolation tanks (depth up to one meter)	No	Slope Stabilization Small bund creation
Leveled lands that can be developed later for various uses (such as residential areas, parking lots, community grounds etc.)	Generally no	Leveling Top soil re-use depends on the type of developmental work envisaged
Construction waste disposal sites (for non-toxic/non-hazardous wastes) (reinstated with top-soil with plantation over the rehabilitated site)	No	Depression after filling-in of wastes to be leveled-up Top soil re-use depends on the type of developmental work envisaged
Plantation Zones	Yes	Leveling Selection of Species as per TNRSP Project Guidelines
Water holes for animals and birds (outside forest and protected areas)	No	Gentle Slopes on all sides Plantation in the periphery Depth up to 1.5 m.

Rehabilitation works shall be undertaken immediately upon the exhaustion of the approved quantity and shall not be delayed. The Supervision Consultant shall take appropriate action in case delays are observed.

These activities should be completed by the Contractor prior to demobilization. Once the Contractor finishes his job, he needs to obtain a certificate from the owner, stating that the site has been re-developed to his/her satisfaction and in tune with the agreement. Then following documents needs to be submitted to the CSC by the Contractor:

Copy of approved site identification report

Photographs of the concerned site 'before' and 'after' setting up the camp.

Certificate from the owner stating his/her satisfaction about status of re-development of the site.

CSC shall ensure, through site verification that all clean-up and restoration operations are completed satisfactorily and a written approval should be given to the Contractor mentioning the same before the 'works completion' certificate is issued/recommended. The PIU shall ensure through site inspection that the Contractor and CSC have complied with all these provisions. The site can then be handed over to the concerned owner or local bodies or for local communities as the case may be.

Certification/documentation pertaining to approval for clean-up and restoration operations and thereafter handing-over to the owner shall be properly maintained by the Contractor, Supervision Consultant and PIU.

ANNEXURE 5.5 GUIDELINES FOR SITING AND MANAGEMENT OF DEBRIS DISPOSAL SITE

A.OVERVIEW

Construction of highways generates huge quantity of debris, which needs to be disposed off in previously identified sites suitable for such an activity. This process entails close scrutiny of the sites with respect to their location and this section details out the criteria to be followed in doing so. Moreover, it also guides the Contractor as to how to prepare the site without causing much impact on the surrounding environment.

B.CRITERIA FOR LOCATING THE SITE/S

The locations of waste disposal have to be selected such that:

- The said site shall be selected preferably from barren, infertile lands. In case agricultural land needs to be selected, top-soil stripping, stacking and preservation should be undertaken prior to initiation of any activities.
- Debris disposal site shall be at least 200 m away from surface water bodies³.
- No residential areas shall be located within 100 m downwind side of the site.
- The site is minimum 250 m. away from sensitive locations like settlements, ponds/lakes or other water bodies, wetlands, protected areas, forests, wildlife habitats / Mangroves / Ecologically sensitive areas, seasonal streams, rivers, canals, flood plains, educational institutions, medical centers, religious sites, cultural or heritage sites and play grounds.
- The local governing body and community shall be consulted while selecting the site.
- The selected site shall meet with the local regulatory requirements (including those of TNPCB, Municipalities etc).
- The site shall preferably be owned by government so that there is no need to acquire the land for the same.

After identification of the site the Contractor should fill up the prescribed reporting format and submit the same for approval to the CSC. Any activity on the site can be initiated only after obtaining permission from the CSC.

C.FINALIZATION OF SELECTED SITE/S

The selected site/s shall be approved by CSC and PIU, after considering compliance with the EMP clauses and this guideline. No agreements or payments shall be made to the land owner/s prior to receipt of a written approval from the CSC and PIU. Any consequence of rejection prior to the approval shall be the responsibility of the Contractor and shall be made good at his own cost.

D. SETTING UP OF DEBRIS DISPOSAL SITE

Following steps has to be undertaken while setting up a debris disposal site:

³ In the absence of site meeting the stipulated criteria, an alternate site can be selected specifying the reasons. In such a case, the construction camp management plan should incorporate additional measures specific to the site as suggested by the CSC.

- Top soil conservation has to be undertaken as per the guidelines given in EMP.
- Considering the topography of the site contour trenches as detailed in EMP should be made along the site boundary to prevent soil erosion.
- Fencing should be provided for the debris disposal site to prevent trespassing of humans and animals into the area as well as to prevent spread of the waste material through action of wind, water, scavengers or rag pickers.
- No of trees cut should be recorded and ten times the same should be planted as green belt development or elsewhere as part of the project.
- Provide proper drainage facility so that the runoff from the site doesn't contaminate any nearby water sources or rivers.

E. PREPARATION OF DEBRIS DISPOSAL SITE MANAGEMENT AND REDEVELOPMENT PLAN

The Contractor after getting approval from the competitive authority for the selected site should submit a detailed Debris Disposal Site Management and Redevelopment Plan comprising the following details:

- Section-1: Details of site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the site, its survey no., access road, project stretch, and distance from the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.
- Section-2: Site preparation: Activities that should be undertaken for preparing the site based on EMP and this guideline.
- Section-3: Arrangements within the site: A layout plan showing the existing trees, green belt, locations where contour trenches should be dug etc.
- Section-4: Mitigation measures that will be undertaken as per the EMP while preparing the site and dumping the waste should be separately listed out.
- Section-5: Other details: Any other relevant details like copy of approvals / clearances obtained, species wise no. of trees to be cut and the details of top soil to be removed and conserved like quantity, location of storing etc. shall also be provided.
- Section 6: Re-development plan: which should indicate following points: (i) species wise no of tree to be planted, (ii) Proposed use of the land in the post construction phase, if it is a public property, (iii) Presence of existing facilities that could be put in use by the land owner if it is a leased out private land or by the community in case of a public property and (iv) Other site specific mitigation measures to be undertaken as recommended by the CSC.
- Section-7: Annexure-(a) Copy of permissions obtained from local governing body / community etc. as applicable, (c) Copy of agreement entered with site owner, in case of leased out sites.

All the drawings should have north direction marked in it along with prevailing wind direction. Necessary dimensions and specifications should be provided where ever necessary. The debris site management plan should be submitted to the CSC for a written approval before any physical work is undertaken. The CSC will carefully examine the proposals in light of the various EMP and regulatory provisions and provide suggestions, as necessary to the Contractor who will implement it within the stipulated time period.

Contractor needs to prepare this document for each different site identified and CSC shall undertake a thorough analysis of the said management and redevelopment plan through a site investigation and suggest additional mitigation measures as demanded by the features of the specific site and its surroundings.

F. REDEVELOPMENT OF WASTE DISPOSAL SITES

Along with the format seeking permission/approval for the disposal site/location from the Engineer/Supervision Consultant, the Contractor shall also submit a rehabilitation plan for the area. Following points have to be kept in view while undertaking the rehabilitation measure:

- The dump sites shall be suitably rehabilitated by planting local species of shrubs and other plants. The species (region specific) shall be chosen from the list suggested in the EA/EMP. Local species of trees should be selected so that the landscape is coherent and is in harmony with the surrounding environment.
- Rehabilitation can also include conversion into farm land, playground, parking area, block plantation area, etc.
- Some of the dumpsites could be used either for plantation or for growing agricultural products such as ginger, turmeric or oranges etc.
- Care should always be taken to maintain the hydrological flow in the area.

ANNEXURE 5.6 GUIDELINES FOR PREPARING COMPREHENSIVE WASTE MANAGEMENT PLAN

A.OVERVIEW

A comprehensive waste management plan shall be prepared by the Contractor prior to initiation of any works. The purpose of the plan is to provide standardized procedures for the clearance, removal and disposal of debris caused by major debris / waste generated during the construction work as well as to establish the most efficient and cost effective methods to resolve debris disposal issues.

B.PREPARATION OF COMPREHENSIVE WASTE MANAGEMENT PLAN

The Contractor should prepare a Comprehensive Waste Management Plan to be submitted to CSC for approval prior to setting up of construction and labor camp and it should comprise the following details:

- Categorization of waste into degradable, biodegradable and hazardous categories and list of different types of waste that falls in each of these categories.
- Estimates about the quantity of waste generated in each category and type of storage units required.
- Detail the provisions for storage and handling of waste until disposed. A plan of the respective camps / areas like construction camp, labor camp etc. to be attached indicating in it the space allocated for storage and handling of wastes.
- Detail the precautions to be taken while storing, handling and disposing each type of waste, trainings to be imparted to workers to create awareness about waste management.
- Details of each debris disposal site: Copy of approved site identification report along with location plan on a village map or an FMB, showing the debris disposal sites, site, its survey no., access road, project stretch, distance from the project stretch, surrounding features and land use like residences, agricultural land, water bodies etc., photograph of the site showing the topography and other existing features.

C.TRAINING FOR PROJECT STAFF AND WORKERS

All staff and workers involved in the highway construction should be imparted training about comprehensive waste management plan including the need for such a plan, its components and measures adopted by the Contractor for implementing it. In addition, all personnel involved should be made aware about various steps and measures each of them has to follow so as to ensure the compliance to the comprehensive waste management plan.

D. PRECAUTIONS TO BE ADOPTED DURING DISPOSAL OF DEBRIS/WASTE

MATERIAL

The Contractor shall take the following precautions during transportation and disposal of debris/waste material:

- A register should be kept for recording the details of the waste generated and their disposal.

- The pre-designated disposal sites should be a part of Comprehensive Solid Waste Management Plan and should be identified as per the EMP clauses prior to initiation of any work on a particular section of the road.
- The Contractor will take full care to ensure that public or private properties are not damaged/ affected during the site clearance for disposal of debris and the traffic is not interrupted.
- All arrangements for transportation during dismantling and clearing debris, considered incidental to the work, will be implemented by the Contractor in a planned manner as approved and directed by the CSC.
- In the event of any accidental spill or spread of wastes onto adjacent parcels of land, the Contractor will immediately remove all such waste material/s and restore the affected area to its original state to the satisfaction of CSC.
- Contractor should ensure that any spoils/materials unsuitable for embankment fill shall not be disposed off near any water course; water body; agricultural land; natural habitats like grass lands, wet lands, flood plains, forests etc. pasture; eroded slopes; and in ditches, which may pollute the surrounding including water sources.
- Contractor should ensure effective water sprinkling during the handling and transportation of materials where dust is likely to be created.
- Materials having the potential to produce dust will not be loaded beyond the side and tail board level and will be covered with a tarpaulin in good condition.
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after discussion with the local body and as approved by CSC.
- During the debris disposal, contractor will take care of surrounding features and avoid any damage to trees and properties.
- Surplus fly ash, bottom ash and lime, if any, transported for use on this corridor shall not be left open and dumped at any disposal site. Contractor shall take care of such residual materials for use at any other location/s of new embankment construction work with proper protection measures
- No hazardous and contagious waste material shall be disposed at such locations.

E.WASTE DISPOSAL IN CONSTRUCTION CAMP

- Concrete flooring and oil interceptors should be provided for hot mix plant area, workshops, vehicle washing and fuel handling area.
- POL (petroleum, oil and lubricants) waste shall be stored safely in separate containers and should be disposed off by transfer only to recycler/ re-refiners possessing valid authorization from the Tamil Nadu Pollution Control Board and valid registration from the Central Pollution Control Board.
- Used lead batteries, if any, should be disposed as per the Batteries (Management and Handling) Rules 2001.
- Water separated and collected from oil interceptor should be reused for dust suppression.
- There should be a register to record the details of the oil wastes generated at the workshops and oil storage areas.
- The Contractor will provide separate garbage bins in the camps and ensure that these are regularly emptied and disposed off in safe and scientific manner as per the Comprehensive Solid Waste Management Plans approved by the CSC.

- No incineration or burning of wastes shall be carried out.
- Discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipes, rubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or will be sold /given out for recycling.
- Septic tank must be provided for toilets and the sludge should be cleared by municipal exhausters.

F.WASTE DISPOSAL IN LABOUR CAMP

- The Contractor should provide separate garbage bins in the camps for bio-degradable, non- degradable and domestic hazardous waste and ensure that these are regularly emptied and disposed off in safe and scientific manner.
- The disposal of kitchen waste and other biodegradable matter shall be carried out in pits covered with a layer of earth within the camp site to avoid smell and pests. The Contractor may use the compost from such wastes as manure in the plantation sites.
- Non-biodegradable waste like discarded plastic bags, paper and paper products, bottles, packaging material, gunny bags, hessian, metal containers, strips and scraps of metal, PVC pipes, rubber and poly urethane foam, auto mobile spares, tubes, tires, belts, filters, waste oil, drums and other such materials shall be either reused or should be sold /given out for recycling.
- No incineration or burning of wastes should be carried out.
- Effluent treatment system like septic tank with soak pits provided for toilets should be sited, designed, built and operated in such a way that no health hazard occurs and no pollution to the air, ground or adjacent watercourses takes place.
- Soak pits must be provided to collect waste water from bathrooms and kitchen.

G.DISPOSAL OF BITUMINOUS WASTE

- The bituminous waste should be used for development of roads inside the construction camps, haul roads or for filling pot holes in rural roads.
- At locations identified for disposal of residual bituminous wastes, the disposal will be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water.
- The contractor will suitably dispose off unutilized non-toxic debris either through filling up of borrows areas located in wasteland or at pre-designated disposal sites, subject to the approval of CSC.
- Debris generated from pile driving or other construction activities along the rivers and streams drainage channels shall be carefully disposed in such a manner that it does not flow into the surface water bodies or form puddles in the area.

H.DISPOSAL OF NON BITUMINOUS WASTE

- Non-bituminous wastes other than fly ash may be dumped in borrow pits (preferably located in barren lands) where such borrow pits are not suitable to be re-developed as an economic source like pisciculture or a source of irrigation. Such borrow pits can be filled up with non-bitumen wastes and then covered with a minimum 30 cm layer of the soil,

where plantation of trees and shrubs will be taken-up by the Contractor as a part of site rehabilitation.

- Local tree species suitable for such re-habitation work shall be selected in consultation with local community.

I.REUSE OF DEBRIS GENERATED FROM DISMANTLING STRUCTURES AND ROAD SURFACE

- Debris generated due to the dismantling of existing road will be suitably reused in the proposed construction as follows
- Eighty percent (80%) of the sub-grade excavated from the existing road surface, excluding the scarified layer of bitumen, shall be reused in the civil works after improving the soil below the sub grade through addition of sand and suitable cementing material for qualitative up-gradation.
- The dismantled scraps of bitumen will be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes, parking areas along the corridor or in any other manner approved by the Environmental Engineer of CSC.

ANNEXURE 5.7 GUIDELINES FOR TOP SOIL CONSERVATION AND REUSE

The top soil from all sites including road side widening and working area, cutting areas, quarry sites, construction camps, labor camps, haul roads in agricultural fields (if any) and areas to be permanently covered shall be stripped to a specified depth of 15 cm and stored in stock piles for reuse. A portion of temporarily acquired area and/or RoW edges will be earmarked for storing top soil. The locations for stacking will be pre-identified in consultation and with approval of environmental engineer of CSC. The following precautionary measures will be taken by the Contractor to preserve the stock piles till they are re-used:

Stockpiles will be such that the slope doesn't exceed 1:2 (vertical to horizontal), and height is restricted to 2 m.

- To retain soil and allow percolation of water, the edges of pile will be protected by silt fencing.
- Multiple handling kept to a minimum to ensure that no compaction occurs.
- Such stockpiles shall be covered with empty gunny bags or will be planted with grasses to prevent the loss during rains.

Such stockpiled topsoil will be utilized for:

- Covering reclamation sites or other disturbed areas including quarry areas.
- Top dressing and raising turfs in embankment slopes
- Filling up of tree pits
- For developing compensatory afforestation plantation
- In the agricultural fields of farmers, acquired temporarily that needs to be restored.

Residual top soil, if there is any, shall be utilized for the plantations works along the road corridor. The utilization as far as possible shall be in the same area from where top soil was removed. The stripping, preservation and reuse shall be carefully inspected, closely supervised and properly recorded by the CSC.

ANNEXURE 5.8 GUIDELINES FOR PROVISION OF NOISE BARRIERS

Mitigating the impact of increased noise levels at the sensitive receptor locations such as schools, hospitals includes posting of signs prohibiting the use of horns, constructing a sound insulating wall and to the extent possible, planting appropriate trees to serve as green noise barriers. Attenuation of sound can be achieved considerably by the combined effect of sound insulating walls and green barriers. Nevertheless the putting of green barriers requires at least 2-5m additional space between the solid barrier and the receptor. Principle of the designed barrier is explained in the design sections. Proposed project mitigation actions are cost effective when compared to the generally recommended expensive double glazed windows.

A.SOUND INSULATING WALLS FOR SILENCE ZONES

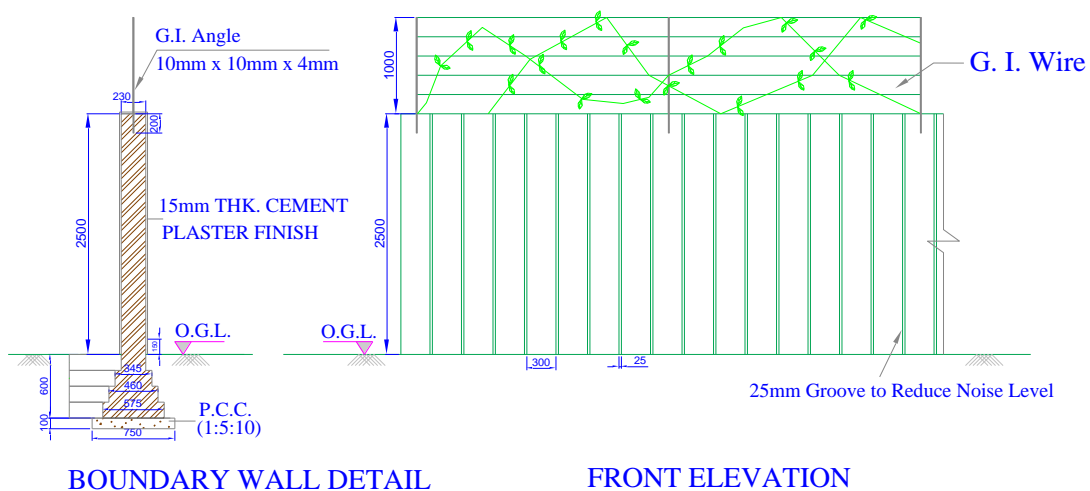
The design of a sound insulating wall comprises 23 cm thick brick wall which will act as a sound barrier. The typical cross section for the same is given in Figure 5.8.1. This can be provided adjacent to the road corridor where hospitals, medical centre, schools and other educational institutions are affected by the traffic noise.

B.GREEN BARRIERS FOR SILENCE ZONES

These are simply a thick layer of green plantation with limited foliage (e.g. Ashoka Tree) acting as noise absorbers. These trees may be planted just inside and adjacent to the wall. While Contractors will be responsible for the implementation of the civil work, tree plantation will be carried out under the tree-planting scheme of the project. The implementation aspects are provided in the EMP. In addition to the noise mitigation, the thick green layer will act as an air quality filter for traffic emission. A typical green barrier of 100m lengths will have 200 trees in 4 rows.

Noise mitigation techniques will be employed as may be warranted at each of the sensitive receptor sites. Definitive noise levels will be empirically determined at each site and selection of the mitigation technique will be made on a site- specific basis in consultation with property owners. Co-ordination and implementation will be the responsibility of the Environmental Engineer of the Construction Supervision Consultant (CSC). Mitigation cost has been estimated as a part of the environmental costs of the project.

Figure. Typical Cross Section of a Noise Barrier



ANNEXURE 5.9 GUIDELINES TO ENSURE WORKER'S SAFETY DURING CONSTRUCTION

In order to ensure worker's safety while undertaking various operations / stages of construction many safety measures needs to be followed, which are listed down below:

A.TREE FELLING

- Use hard hats during tree felling
- Ensure safe use and storage of tools such as axes, power chain saw, and hand saw of different types, HDPE ropes of approved thickness to drag felled trees and logs.
- Keep the saw blades in proper lubrication and sharpened state for efficient workability.
- Determine proper foot and body position when using the implements for felling, cutting and dragging.
- Wear appropriate foot protection Avoid cutting branches overhead. Keep first aid kits ready at the site.
- Determine possible hazards in the area, e.g. electrical or telephone or other utility lines, buildings, vehicles and domestic cattle that may create unsafe work situations.
- Prior to felling, determine the safest direction of fall and orient fixing of ropes and Cutting positions accordingly.
- Determine the proper hinge size before directing the fall.
- Keep machineries and workers ready for speedy removal of the tree from the main traffic movement area.
- Keep flag men and warning signal signage at either end of felling area to control movement of traffic and warn passers-by.
- Use loud noise signals for warning by-standers and workmen about the impending fall, so as they move away from the direction of fall.

B.PLANT SITES, CONSTRUCTION CAMP AND QUARRY AREAS

- Install perimeter fencing.
- Ensure good visibility and safe access at site entrances.
- Provide adequate warning signs at the entrance and exit, as necessary.
- Provide adequate space/area for loading and unloading, storage of materials, plant and machinery.
- Display emergency procedure and statutory notices at conspicuous locations.
- Provide areas for collecting garbage and other waste material, and also arrange for their regular/periodic disposal.
- Arrange appropriate storage, transportation and use of fuel, other flammable materials and explosives in line with the license requirements obtained from concerned authorities.
- Provide defined access roads and movement areas within the site.

- Ensure availability of first aid facilities and display notices at various work places showing the location of first aid facilities and emergency contact numbers. Provide and enforce use of PPE at plant and quarry sites.

C.HOUSE KEEPING PRACTICES

- Provide proper slope in kitchen, canteens, washrooms, toilets and bathrooms for easy and immediate draining of water.
- Keep all walkways and circulation areas clear and unobstructed at all times.
- Ensure that spillages of oil and grease are avoided and in case of accidental spills, these are immediately collected.
- Use metal bins for collection of oily and greasy rags. Stack raw materials and finished products out of walkways.
- Do not leave tools on the floor or in any location where they can be easily dislodged. Keep windows and light fittings clean.
- Maintain the workplace floors dry and in a non-slippery condition
- Provide and maintain proper drainage system to prevent water logging and unhygienic conditions.
- Ensure that protruding nails in boards or walls are moved or bent over or removed so that they do not constitute a hazard to people.
- Store all flammable materials in appropriate bins, racks or cabinets with proper cover and labels – as required for various products.
- Make sure that hazardous/dangerous chemicals are kept in the goods stores with the appropriate labeling, display of the material-safety-data-sheet (MSDS) and other precautionary measures.
- Display 'no smoking' signs in areas with high risks of fire (e.g. near fuelling areas, diesel/oils/lubricant/paint storage area, hessians, rubber, wood and plastic etc.) in and around working area.

D.TRAFFIC SAFETY AND ROADS WORKS

- Delineate advance warning zones, transition zones and construction zones at both ends of a work front. Use devices such as regulatory signs, delineators, barricades, cones, pavement markings, lanterns and traffic control lights, reflectors and signal men in appropriate manner round the clock.
- No work front should be 'touched' without putting appropriate safety measures in place. CSC will be responsible to ensure that the permission for any activity is not given without the required safety plan and practices in place.
- Put signage at appropriate locations as per the road construction activity plan to warn the road users, construction vehicles/equipment operators, pedestrians and local residents about the work in progress, speed controls, hindrances/ blockages, diversions, depressions etc. in lines with contract requirements and IRC guidelines.
- Express a regret signage for the inconvenience caused and alert about the dangers ahead on account of construction activity.
- Signage has to be: (i) simple, easy-to-understand and should convey only one message at a time; (ii) has florescent and reflective properties of the paints; (iii) broad, prominent and with appropriate size of letters and figures; (iv) placed at the appropriate 'point/s' as

specified in the IRC guidelines to allow proper stoppage/reaction time to approaching vehicles.

- Different sign boards shall have a mix of pictorial signs and messages in local language, Hindi and English.
- While using barricades, ensure that traffic is kept away from work areas and the road user is guided to the safe, alternative movement track.
- Ensure that excavation sites are provided with effective barriers and reflecting signage to prevent any accidental approach by vehicles during the day or night.
- Prevent entry of cattle and wildlife through proper fencing/barricading around the excavation sites.
- Provide proper uniform (light reflecting garments) to flagmen engaged in traffic control at diversions so that they can be singled out from the moving traffic.
- Provide wide red and green flags or red and green lights to flagmen for controlling traffic.
- In high traffic zones and congested areas, use of wireless communication devices with protective headgear and shoes by flagmen has to be ensured to prevent confusion and minimize the risk of accidents.

E. SAFETY DURING EXCAVATION

- The risk of accidents involving people and vehicles remains high in excavated sites. All pits or excavations shall to be barricaded to warn the road users and residents and to avoid any unauthorized entry of persons, children, domestic cattle or wildlife. For deep excavations and culvert construction sites, painted GI sheets, delineators, lamps (as required) and retro-reflective signage shall be used.
- For excavation in soft loose & slushy soil (above 2.00 m depth where sliding of earth or collapsing of sides may occur)
- Excavation more than 1.5 m. is to be done in steps of minimum 500 mm offsets with plank and stuttering support, as required under contract clauses.
- For excavation in slippery or water logged area (labor or machinery may slip or get caught in slush)
- Try to dewater the area and spread minimum 150 mm thick sand layer to avoid slipping.
- For excavation in rock where chiseling is involved (and hammer or stone pieces may fall and injure the hand, eyes or legs).
- Only experienced and skilled labor should be employed. Chisel should be held with a tight fitting grip. Goggles and leg cover should be provided to protect the labor.
- Excavation in rock where blasting is involved (risk of injury to workers and passer-by)
- Blasting is to be carried out where absolutely necessary following all explosive handling regulations with mines safety principles including use of hooters, signage, protective gear, safety fuse, detonators, ignition coils and wires, exploder dynamo etc. The danger zone has to be vacated at least 20 minutes before the actual firing. Sufficient warning through positioning of red flags, danger signs, painted drums and sirens for safety of men at work and for any passer-by is to be provided. After a lapse of minimum 15 minutes when a clear signal is given by the site-in-charge through use of whistle or horn or light, the blasting charge should be ignited. After blasting a minimum of 30 minutes gap is to be given for the rocks and earth or blocks of loose boulders to fall off so that safety and

security of the staff at the operation zone is ensured. Heavy charges shall not be used in fragile rock systems, where rock disintegrating machinery could be brought to use.

- The entire operation shall be conducted under the strict supervision of qualified staff and in the presence of safety officers.
- For excavation for drain or manhole (risk of a passer-by falling into the excavated portion).
- The area should be properly barricaded with sign boards and illumination/lamps for night time safety. In congested stretches, watchmen/guards can also be placed for vigil.
- Snake bites or Scorpion Stings during excavation
- In areas with vegetation, tall grasses and forest cover, the Contractor shall provide the labor with gum boots and gloves. He shall also make snake antidotes available on site. Emergency vehicles should also be kept ready to rush the patient to the nearest hospital.

F.SAFETY DURING SOME TYPICAL CONSTRUCTION WORK

Centering and scaffolding (risk of framework collapse while construction, concreting or just before concreting especially when wooden bellies are used).

Many a times bellies joined together give away due to weak joints. Use of metal scaffolding and centering plates with metal fasteners are the safest and highly recommended materials for use in all road construction works for ensuring safety, stability and casting of structures. All such scaffolding should be placed on a firm and a level base on the ground for ensuring stability. No wooden scaffolding or bamboo scaffolding is to be used for any casting of heavy (RCC) structural construction as the risk to safety of workers is higher.

Railings are to be provided along working platforms and ladders for better safety. Nets shall be hung below the scaffolding or structures where work is on-going to prevent fall of debris, stones, bricks, equipments and other heavy objects and even workmen, which could be fatal.

Form-work for small/light beams and slabs

The collapse of bottom of the beam that may bring down the slab as well is a risk in such operations, which may injure the labor or supervision staff. Slender bellies without bracing are not to be allowed for such works. No concreting should be allowed without bracing at 300 mm above ground and at mid way for normal beams and slabs. The bracings should be for the support of beams as well as the slabs. Direct bellies support from the ground and the practice of tying planks with binding wire to the steel reinforcement shall not be allowed. A temporary railing and properly based working platforms along the periphery of slab reduces risk to the life of labor and supervision staff.

Dismantling of Scaffoldings

Dismantled materials may fall on passer-by and workers. Workers could also get injured during the removal of such materials. Prior to dismantling of scaffoldings/working platforms, the area of operation should be closed for all outsiders. No one should be allowed within 50 m from the place of demolition. Helmets, safety belts and other PPE must be worn by all the workers engaged in such a work. This work requires careful handling by an experienced supervisor/work force and should be executed with utmost caution. Gradual dislodging and use of PPE is required.

Column Reinforcements

The tendency of bar-benders is to tie the vertical steel with coir rope or 8 mm steel rods as ties on all four sides of the column reinforcements. Reinforcement to columns shall be by welding MS rods with metal scaffolding to keep it in position till the final casting of RCC is done.

Fall of Objects or Debris from a Height

At bridges construction sites (or in work areas at a height above ground level) thick nylon net or hessian barriers shall be used to prevent any splinter, debris, mortar or concrete from falling onto the passersby or workmen around.

Water Storage Tanks (for General Use, Curing, etc.)

A child of a worker or that of a near-by resident falling into the water tank is also a risk associated with construction sites. The water tanks therefore shall be provided with protective cover/lid with locking arrangement at every site of activity to prevent accidental drowning.

Site Cleaning

Throwing of waste materials, broken concrete pieces, brick bats, sand etc. straight from the top of a structure onto the ground can injure a worker or a passerby. Such materials should be brought to the ground with the help of lift or the use of rope over pulley with a bucket.

G.OPERATION OF EXCAVATORS

- Ensure that excavators are operated by authorized persons who have been adequately trained. Prevent any unauthorized use of the excavators.
- Ensure that only experienced and competent persons are engaged in supervising all excavations and leveling activity.
- Check and maintain as per the manufacturer's manual.
- Issue relevant information, including that related to instructions, training, supervision and safe system of work in writing and provides expert supervision for guidance.
- Ensure that the operation and maintenance manuals, manufacturer's specifications, inspection and maintenance log books are provided for the use of the mechanics, service engineers or other safety personnel during periodic maintenance, inspection and examination.
- During tipping or running alongside the trenches, excavators must be provided with stop blocks.
- Excavators must be rested on firm ground after field operation away from the road
- Locate and identify underground services including telephone cables, OFC cables, sewerage and drainage lines, water supply, electrical cables etc. by checking with all concerned underground utility providers.
- When reversing or in cases where the operator's view is restricted, adequate supervision and signaling arrangements shall be provided.
- Ensure that the type and capacity of the excavator are properly chosen for the intended purposes and site conditions. Never use a machine for any purposes other than it is designed for.

- Check and report for excessive wear and any breakage of the bucket, blade, edge, tooth and other working tools of the excavator and ensure replacement/ repair to avoid mishap and break down.
- Check that all linkages/hinges are properly lubricated and ensure that the linkage pins are secured. Never use improper linkage pins.
- Never dismount from or mount on a moving machine.

H. OPERATION OF TRUCKS AND DUMPERS

- Ensure that only trained, authorized and licensed drivers operate the vehicles. Enlist help of another worker before reversing the vehicle.
- Switch-off the engine when not in use to save fuel, prevent accidents and unnecessary noise and air pollution.
- Lower the tipping bodies when the machine is unattended, but if it is necessary to leave them in the raised position they should be blocked to prevent their fall by fixing a sturdy support below.
- Carryout periodic servicing as per the manufacturer's requirements. All records of maintenance and repairs should be in writing and available for verification.
- Keep the vehicle tidy and the cabin free from clumsy utilities, which might obstruct the controls and create hazards.
- Follow safe driving principles including speed limits as per traffic signage.
- Avoid carrying additional passengers in the cabin or on the body of the dumper, while in field operation other than the connected workers.
- Provide stop blocks when the vehicle is tipping into or running alongside excavations or when it is parked.
- Do not overload the vehicle.
- Carry only well secured loads and use proper covers and fasteners.

I. MANUAL HANDLING AND LIFTING

- Avoid manual handling of heavy and hazardous objects and chemicals. Pre-assess the actual requirement of manpower in case of emergency situations.
- The hazardous and poisonous materials should not be manually handled without proper equipments/gears and prior declaration of the risks needs to be made to the involved workers.
- All concerned persons shall be trained in proper methods of lifting and carrying.
- In all manual operations where groups of workers are involved, a team leader with necessary training to handle the entire work force in unison has to be provided for.
- Watch and ward to control/supervise/guide movement of equipment and machineries, loading and unloading operations, stability of the stockpiled materials and irregularly shaped objects have to be provided for safety and security of workers.
- Carriageway used by the workers must be free from objects, which are dangerous. Loading and unloading from vehicles shall be under strict supervision.

J.ELECTRICAL HAZARDS IN CONSTRUCTION AREAS

- Statutory warning leaflets/posters are to be distributed/displayed by the Contractor in the vicinity of work sites for the benefit of all workers, officers and supervisors as well as the public, indicating the do's and don'ts and warning related to electrical hazards associated with operations to be executed/in progress.
- All wires shall be treated as live wires.
- Report about dangling wires to the site-in-charge and do not touch them. Only a qualified electrician should attempt electrical repairs.
- Train all workers about electrical safety.
- Shut down the equipment that is sparking or getting over heated or emitting smoke at the time of operation, if it is not the normal way of working of such machines.
- Inform technical person/s for required maintenance. Never used damaged wires for electrical connection.
- Demolition, tree felling and removal of overhead transmission lines shall be undertaken with strong, efficient and closely monitored arrangements to avoid accidents.

K. USE AND STORAGE OF GAS (LPG)

- Store filled gas/LPG cylinder in a secure area – mark this as a no smoking area. Transport, store, use and secure cylinders in upright position.
- Ensure proper ventilation at the ground level in locations where LPG is in use. Avoid physical damage to the cylinders.
- Never weld near the cylinder.
- Store empty cylinders secured and upright.
- Make sure that the cylinder is closed immediately after use. Investigate immediately if there is the smell of LPG or gas.
- Make sure that there is no other unrelated fire in the vicinity of the cylinder.

L. GAS WELDING

- The welders and welding units should follow all the basic principles of welding for safety and security.
- Use face shield to protect the eyes.
- Use goggles, particularly when chipping slag and cutting strips.
- Use gloves long enough to protect wrists and forearms against heat, sparks, molten metal and radiation hazards.
- Use high-top boots/gum boots to prevent sparks, splinters, sharp edges of metal and hot welded strips, welding rods, electric cables etc. from injuring the legs.
- Avoid inhaling the noxious fumes and gasses from burning electrodes by using gas masks and screen of the work area to prevent the glair moving outside it.
- Keep the key hung from the regulator control for split seconds operations to stop the valve in case of any accidental damage or leakage to supply pipeline that may catch fire and cause accidents in case acetylene or LPG cylinder.

- The welding area should have sufficient openings with fixed exhaust ventilators or adequate air flow openings to remove poisonous fumes and gases.
- Take precautions of wearing hard hats or fiber helmets to prevent injury due to fall of any object and accidental injury from projections while welding.
- Welders operating above ground should have adequate safety belt secured to stable platform to prevent accidental fall or injury from the scaffold. All electrical and gas connection lines up to the welder should be sufficiently insulated and protected from sharp edges and sharp objects. These shall not come into contact with hot metal.
- Do not use gas cylinders for supporting work or as rollers.
- While using LPG or CNG cylinders for welding, follow all safety precautions as has been prescribed by the supplier company.
- Avoid fire hazards and accidents by posting safety supervisors to oversee the activities of workers.
- Do not store explosives, high inflammable materials, loose hanging overhead objects, hot welded strips etc. near gas cylinders.
- Close all valves, switches and circuits while leaving the work place under proper lock and key. In case of mobile units, proper carriage procedure has to be followed for safety and security of men and materials.

M.FIRE SAFETY PRACTICES

- Designate fire officers.
- Store flammable material in proper areas having adequate fire protection systems. Display sufficient warning signs.
- Install fire alarm wherever required and test regularly. Inspect fire extinguishers regularly and replace as necessary. Train selected personal on use of fire extinguishers
- Emergency fire exit route should be kept clear at all times and clearly indicated Display escape route maps prominently on each side.
- Provide sufficient exit signs at prominent locations for directing people to the escape staircases and routes.
- Train workers about the escape route and assembly point/s.
- Carryout fire drill periodically.

When fire breaks out

- Alert all persons through fire alarms or other methods.
- Put off the fire with appropriate fire extinguishers only when you are sure that you are safe to do so.
- Escape if you are in danger through the fire escape route to assembly point.
- Call-up Fire Service.
- Fire officers to carryout head count at the assembly point.

N.NOISE HAZARDS AND ITS CONTROL

- Plan camp lay-out in a manner that ensures barriers/buffers between residential/ office units and high noise generating zones.

- Use sound meters to measure the level of noise and if it exceeds 75 dB (A), then ensure preventive measures.
- Make personnel aware of noisy areas by using suitable warning signs and insist on use of ear protectors/ear plugs to prevent excess noise affecting the workmen.
- Reduce noise at source by: use of improved equipments; regular and proper maintenance of the machinery as per the manufacturer's manual; by replacing rickety and noisy equipments and machineries. Screening locations with noise absorbing material; making changes in the process/equipment; controlling machine speeds; ensuring that two noise-generating machines are not running at the same time close to each other at same location; using cutting oils and hydraulic noise breakers; providing vibration and noise absorbing platform and firm embedding of equipments with fasteners.
- Appoint a competent person to: carryout a detailed noise assessment of the site; designate ear protection zone/s; give training/instructions on the necessary precautionary measures to be observed by site personnel including using suitable type of ear protection equipments.

O.PERSONAL PROTECTIVE EQUIPMENT

General

- Provision of personal protective equipment has to be made over and above all measures taken for removing or controlling safety hazards on a work site.
- Ensure that sufficient personal protective equipment is provided and that they are readily available for every person who may need to use them.
- The contractor's Project Manager shall ensure that all persons make full and proper use of the personal protective equipment provided.
- Provide instruction/s and training for the proper use and care of personal protective equipment.
- Ensure that the personal protective equipments are in good condition.
- Train workers to report unintentional damages for replacement and to always keep the personal protective equipment clean.
- PPE includes, but may not be limited to, hard hats, goggles, ear plugs, gloves, air filters/masks, boots, ropes etc.

Eye Protection

- Road construction work sites, quarries and crushers are full of dust particles, sand, splinter, harmful gases, bright light and welding arc lights, which are injurious for the eyes. Therefore, eye protection and adequate lighting in work areas is required. All workers, supervisors and inspection officers and dignitaries coming over for study of works should be compelled to wear eye protecting glasses/goggles properly fitting the eye sockets to prevent damage due to dust, gases and other particles.

Head Protection

- Hard hats are compulsory for all workers, supervisors and managers/officials while working and/or inspecting a work sites.
- Hard hat areas shall be demarcated clearly.

Hearing Protection

- Provide ear plugs or ear muffs to the workers and to those who need to get in and out of a high noise area frequently. Use re-usable earplugs when the reduction required (15-25 dB (A)) is not excessive. Use earmuffs where a large attenuation of up to 40 dB (A) is demanded.
- Do not use dry cotton wool for hearing protection because it doesn't provide any such protection.
- Provide disposable ear plugs for infrequent visitors and ensure that these are never re-used.
- Replenish ear plugs from time to time for those who need to work continuously for a long period in a high noise area/s.
- Use ear muffs with replaceable ear cushions because they deteriorate with age or may be damaged in use.
- Avoid wearing spectacles with ear muffs.
- Use soap and water or the recommended solvent for cleaning ear muffs.

Respiratory (Protective) Equipment

- Wear suitable masks for protection when there is a potential for small particles entering the lungs, e.g. emptying of cement bags, working at crusher sites etc.
- Provide training to all persons using the masks/respirators for their correct fitting, use, limitations and symptoms of exposure.
- Clean and inspect all respirators before and after use.
- Store respirators properly when not in use.

Safety Footwear

- Wear suitable footwear for work
- Use safety footwear on site or in other dangerous areas.
- Wear suitable safety shoes or ankle boots when working anywhere where there is high risk of foot injuries from slippery or uneven ground, sharp objects, falling objects etc.
- All safety footwear, including safety shoes, ankle boots and rubber boots, should be fitted with steel toecaps.
- Avoid wearing flip flops, high heeled shoes, slippers, light sport shoes in situations where there is a risk of foot injury.
- Keep shoelace knots tight.

Hand Protection

- Wear suitable gloves for selected activities such as welding, cutting and manual handling of materials and equipment.
- Do not wear gloves where there is a risk of them becoming entangled in moving parts of machinery.
- Wash hands properly with disinfectant soap and clean water before drinking or eating.
- Wash hands immediately after each operation on site when the situation warrants.

P.FIRST AID

- Provide first aid boxes at every work site in a cool and shaded place.
- Ensure that training on the use of the first aid box is provided to at least every supervisor on the site.
- Display the list of persons along with their contact numbers who are trained on providing first aid.
- Ensure that every first aid box is marked "First Aid" in English and in local language. Check for expiry dates and replace the contents, as necessary.
- Maintain a register on health records including injuries/accidents.

Q.ACCIDENT INVESTIGATIONS

- Carryout the investigation/s as quickly as possible.
- Investigation should be carried out both internally as well as through third party.
- Conduct interviews with as many witnesses as necessary including the affected persons and supervising officials.
- Do not rely on any one/limited source of evidence.
- Check all the log books, stock registers, issue registers, movement registers on site
- Safety regulations, traffic signals and signal men activities, signage, as well as other field positions and keep a record of all investigations through audio-visual and electronic medium for presenting an evaluation of the incident/s.
- After completion of the investigation/enquiry, a summary of the facts recorded, sequence of happenings, persons-in-charge, persons examined, equipments and machineries tested, follow-up of action as per legal requirements, copy of station diary entry, hospital entry, safety regulations etc. to be prepared with a comparative analysis for proper assessment.

ANNEXURE 5.10 GUIDELINES FOR PREPARATION OF TRAFFIC MANAGEMENT PLAN

The Contractor shall at all times carry out work on the road in a manner creating least interference to the flow of traffic with the satisfactory execution. For all works involving improvements to the existing state highway, the Contractor shall, in accordance with the directives of the CSC, provide and maintain, during execution of the work, a passage for traffic either along a part of the existing carriageway under improvement, or along a temporary diversion constructed close to the state highway. The Contractor shall take prior approval of the CSC regarding traffic arrangements during construction.

A. ENSURING TRAFFIC SAFETY AND CONTROL

Where subject to the approval of the Engineer the execution of the works require temporary closure of road traffic use, the Contractor shall provide and maintain temporary traffic diversions. The diversions shall generally consist of 200 mm thickness of gravel 4.5 meters wide laid directly upon natural ground and where any additional earthworks are required for this purpose that will be provided under the appropriate payment items.

Where the execution of the works requires single-lane operation on public road, the Contractor shall provide and maintain all necessary barriers, warning signs and traffic control signals to the approval of the Engineer.

With the exception of temporary traffic arrangements or diversions required within the first 4 weeks of the Contract, the Contractor shall submit details of his proposals to the Construction Supervision Consultant for approval no less than 4 weeks prior to the temporary arrangement or diversion being required. Details of temporary arrangements or diversions for approval as soon as possible after the date of the Letter of Acceptance.

The color, configuration, size and location of all traffic signs shall be in accordance with the code of practice for road sign. In the absence of any detail or for any missing details, the signs shall be provided as directed by the Construction Supervision Consultant (CSC).

The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, marking, flags, lights and flagmen as may be required by the Engineer for the formation and protection of traffic approaching or passing through the section of the road under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic or closer of traffic on the road shall be drawn up in consultation with the CSC.

At the points where traffic is to deviate from its normal path (whether on temporary diversion or part width of the Carriageway) the lane width path for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device to the directions of the SE. At night, the passage shall be delineated with lanterns or other suitable light source.

One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of temporary traffic signals or flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns/lights.

On both sides, suitable regulatory warnings / signs as approved by the CSC shall be installed for the guidance of road users. On each approach, at least two signs shall be put up, one close to the point where transition of carriageway begins and the other 120 m away. The signs shall be of design and of reflector type.

Upon completion of the works for which the temporary traffic arrangements or diversions have been made, the Contractor shall remove all temporary installations and signs and reinstate all

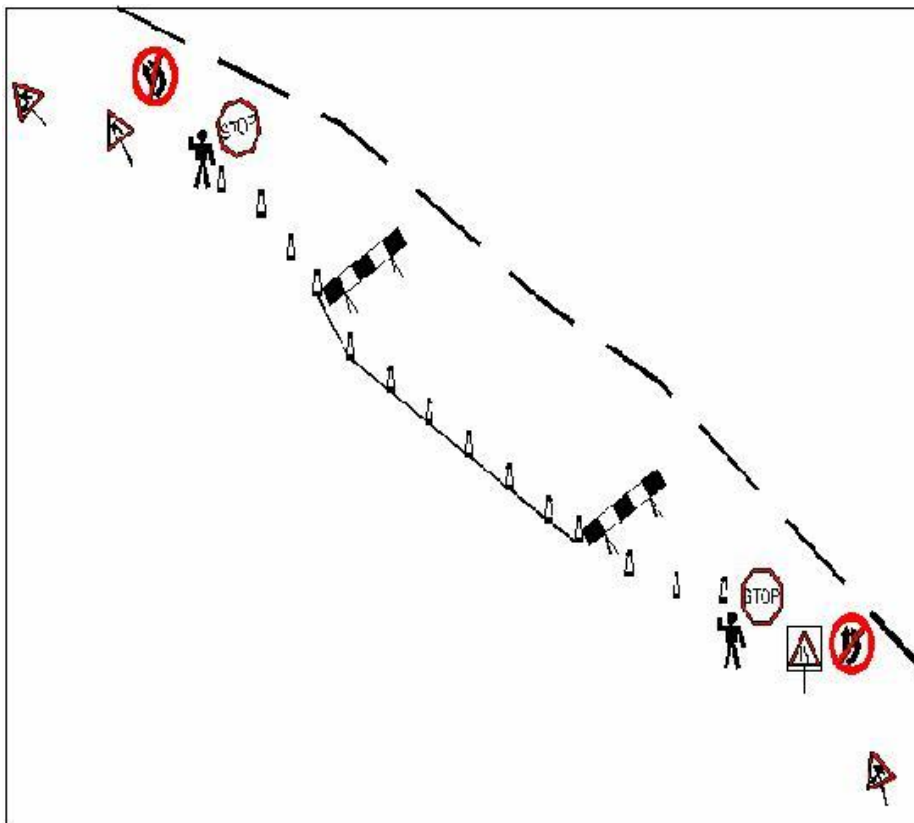
affected roads and other structures or installations to the conditions that existed before the work started, as directed by the Engineer.

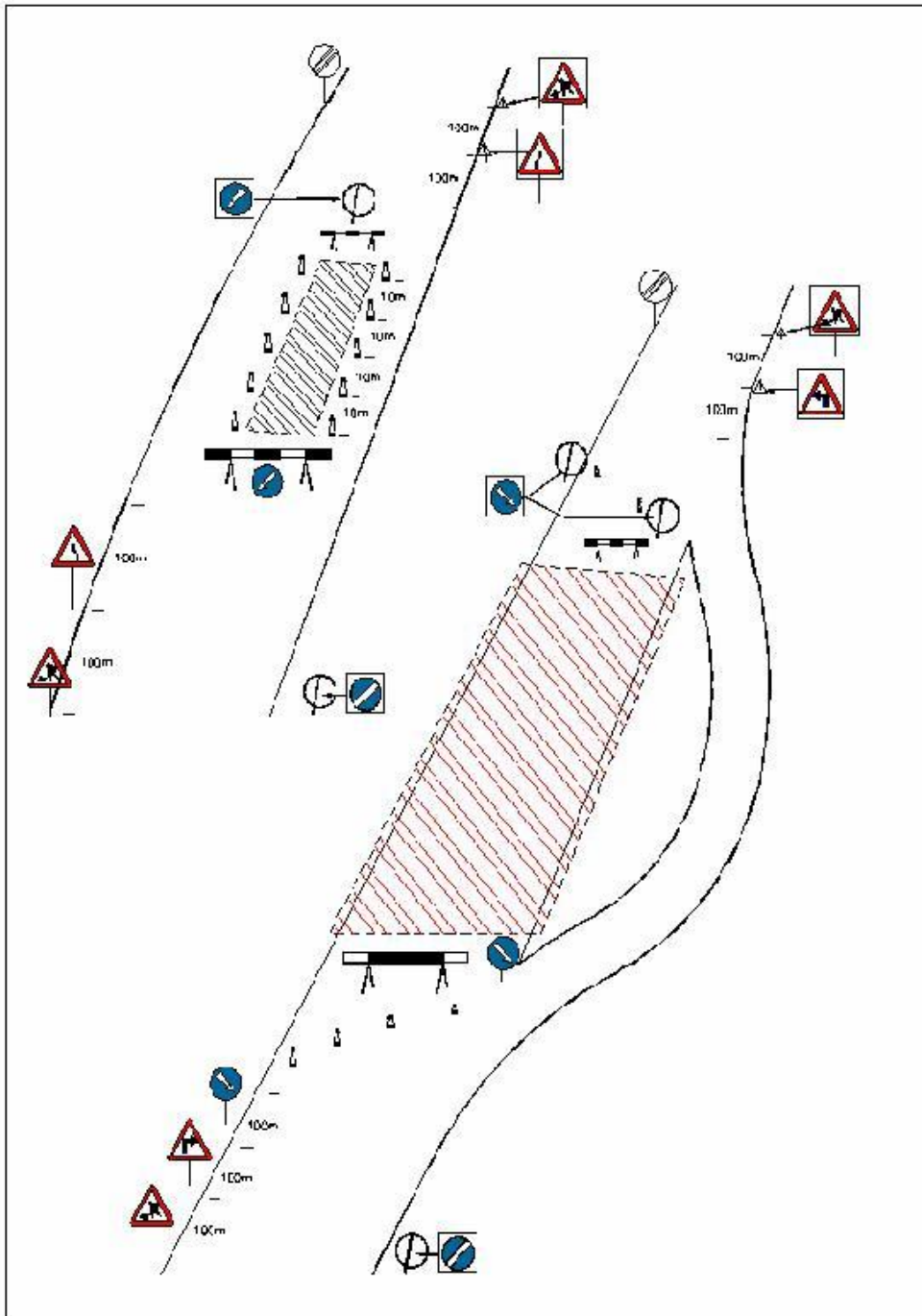
B. MAINTENANCE OF DIVERSIONS AND TRAFFIC CONTROL DEVICES

Signs, lights, barriers and other traffic control devices, as well as the riding surface of diversion shall be maintained in a satisfactory condition till such time they are required as directed by the CSC. The temporary traveled way shall be kept free of dust by water sprinkling, if necessary. The signage and devices required include the following:

- Barricading
- Men at work
- Keep Left
- Go slow
- Flag men
- Narrow signs
- Lantern (Amber Blinker)
- Traffic control Lights
- Cones

Safety jackets and helmets should be provided to all the workers/ Engineers working on the road. Fixed mobile solid barricades must be placed between the workmen and traffic or pedestrian and traffic. All the safety signs should be according to IRC: 67 and IRC: SP: 55: 2001 Examples of some good practice in traffic control during construction are shown in the figures below.





ANNEXURE 5.11 GUIDELINES FOR STORAGE, HANDLING, USE AND EMERGENCY RESPONSE FOR HAZARDOUS SUBSTANCES

A.HANDLING HAZARDOUS SUBSTANCES (INCLUDING CHEMICALS)

- As far as practicable the hazardous materials will be stockpiled under proper mechanical loading, unloading and stacking aided by manual labor where necessary.
- Exercise great care in the storage and use of chemicals because they may be explosive, poisonous, corrosive or combustible.
- Separate different chemicals physically and store accordingly after proper labeling.
- Stock taking of all hazardous will be mandatory together with enforcement of manufacturer's or supplier's safety standard/s and drill exercises.
- New and less known chemicals and building materials, for which toxicological studies are wanted, need to be properly evaluated prior to their inclusion in the materials list.
- All containers should be clearly labeled to indicate contents.
- Maintain the Material Safety Data Sheet of all chemicals for reference on safety precautions to be taken and the use of suitable PPE.
- Ensure use of correct personal protective equipment before allowing workers to handle chemicals.
- When opening containers, ensure holding of a rag over the cap/lid or use of safety gloves, as some volatile liquids tend to spurt up when released.
- Eye fountain, emergency shower and breathing apparatus should be available near the workplace. Ensure immediate medical attention in case of spill/splash of a chemical.
- Safety instructions for handling emergency situations shall be displayed prominently at both the storage and use locations.

B.TRANSPORTATION, REFUELING AND MAINTENANCE PROCEDURE

- Truck or suitable containers will bring in all fuel and fluids.
- There will be no storage of fuel, oil or fluids within 200m of a water line such as river pond or canal.
- Prior to re-fueling or maintenance, drip pans and containment pans will be placed under the equipment.
- Absorbent blankets may also be required to be placed under the equipment and hoses where there is a possibility of spillage to occur.
- All used oils or fluids will be properly contained and transported to appropriately licensed (authorized) disposal facilities.
- Following re-fueling and maintenance, the absorbent blankets (if any) and spill pans will be picked up and the fuel truck or container moved outside of the 100m (or 50m) wide area.

C.EMERGENCY SPILL PROCEDURE

- Should a spill occur, either through accidental spillage or equipment failure, the applicable emergency spill procedure as outlined in sections below and/or as directed by the manufacturer/supplier shall be followed:

Spill Procedure (Inside a Stream)

- In the case of a spill, overflow or release of fluid into the stream waterway (whether water is flowing during the spill or not), do what is practical and safely possible to control the situation, while sending SOS for help from the technical wings and fire brigade or any other govt. agency.
- Stop the flow
- Stop the release into the waterway
- Shut down the equipment
- Close valves and pumps.
- Plug leaking of damage hosepipes or containers with suitable sealants or temporary plugs at the holes.

Remove Ignition Sources

- Cut off the supply sources and shut down the sources of power supply.
- Cordon up the area and salvage the spilled materials for recycling or disposal as would be suggested by the technical experts or as per the manufacturer's guidelines for the product. In case of inflammable materials, mobile phones, electrical switches and heat generating machines, sparking electrodes etc. shall not be operated.
- Portable fire extinguishers need to be kept handy in such vehicles for immediate use as a damage control measure.

Clean-up and Disposal

- Emergency Services shall be engaged for the containment, clean-up and disposal of contaminants released into the environment.

Reporting

- The Contractor's Environmental Engineer will document the event and submit the reports to the CSC, the Client and appropriate regulatory agencies like the Pollution Control Board.

Procedure Review

- The Engineer will review the report, determine if changes are required to be incorporated in the plan of activity under the revised guidelines and recommendation/s that have been suggested by the technicians/manufacturer/ supplier /fire brigade /TNPCB /environment officer of the PIU, as the case may be.

Spill Procedure (On Land)

- All types of spills are hazardous - whether liquid or amorphous or solid and accordingly the spill has to be dealt with. For liquids, sealing the leakage or emptying the container into another empty vessel may be considered. For solid or semi-solid or viscous products, special salvage equipment are to be used. For fine particles and water soluble chemicals, neutralizing or scraping the affected soil from the area has to be resorted to with mechanical removal and depositing at a safe site as would be recommended by experts.

Notification

- All legal authorities such as civil administration including the district Collector, the sub-divisional officer, Tehsildar, the local SHO of the police station, the SP, Divisional Forest Officer, the TNPCB authority monitoring the pollution in the area, site engineer/supervision consultant and Environmental Engineer of PIU, local gram Panchayat and people's representatives have to be informed about the incident, the probable damage, current and after effects, precautionary measures to be taken and already taken and restrictions imposed on movement of men, material, live stock etc in an around the site of spill.

Cleanup and Disposal

- The CSC Environmental Engineer will ensure that a proper cleanup and disposal method is determined. Absorbent pads will soak up the spilled material. The pads will be contained and removed from site for disposal at a licensed (authorized) facility.

Reporting

- The Contractor's Environmental Engineer will document the event and submit reports to the CSC, the Client and appropriate regulatory agencies like the Pollution Control Board(s).

Procedure Review

- The Engineer will review the report; determine, if changes are required to procedures and; recommend implementation of all required changes.

ANNEXURE 5.12 REPORTING FORMAT FOR IDENTIFICATION OF CONSTRUCTION CAMP SITE

A	Project Details		Date of reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	Site Details			
1.	Place Name		Landmark	
2.	Name of Panchayat / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Area of site		Current land use	
6.	Ownership of the land	Owned / leased	Survey no.	
7.	If leased / rented, name, address and contact details of owner			
8.	Distance* from any major settlement or village			
9.	Distance from any major surface water course or body			
10.	Distance from ecologically sensitive areas			
11.	Distance from the Project road			
12.	Width and type (paved or unpaved) of access road			

13.	No of trees with girth> 0.3m	
14.	No of trees to be cut	
15.	Is top soil conservation required (Yes/ No)	
List of enclosures:	(a) Location map	
	(b) Layout plan	
	(c) Photographs of the site	
	(d) List of machinery, equipments and vehicles to be used	
	(e) List of schools and hospitals with in 200 m distance from the boundary of the camp	
C. Submission Details	Submitted by (Environment & Safety Engineer of Contractor)	Approved / Rejected by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

* All distances are to be measured from the boundary of the site.

Note: Contractor has to fill and submit this format to the CSC upon identification of each construction camp site. Subsequently, the Environmental Engineer of CSC has to visit the site and approve / reject the site with reasons. The Environmental Engineer of CSC has to give a copy of this format to the contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval

ANNEXURE 5.13 REPORTING FORMATS FOR IDENTIFICATION OF LABOUR CAMP SITE

A		Project Details		Date of reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
B		Site Details			
1.	Place Name		Landmark		
2.	Name of Panchayat / Municipality		Revenue Village		
3.	Taluk		District		
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS	
5.	Area of site		Current land use		
6.	Ownership of the land	Owned / leased	Survey no.		
7.	If leased, name, address and contact details of owner				
8.	Distance* from any major settlement or village				
9.	Distance from any major surface water course or body				

10.	Distance from ecologically sensitive areas	
11.	Distance from the Project road	
12.	Width and type of access road	
13.	No of trees with girth > 0.3m	
14.	No of trees to be cut	
15.	Is top soil conservation required (Yes/ No)	
List of enclosure:	Location map	
	Layout Plan	
	Photographs of the site	
C. Submission Details	Submitted by (Environment & Safety Engineer of Contractor)	Approved / Rejected by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

* All distances are to be measured from the boundary of the site.

Note: Contractor has to fill and submit this format to the CSC upon identification of each Labor camp site. Subsequently, the Environmental Engineer of CSC has to visit the site and approve / reject the site with reasons. The Environmental Engineer of CSC has to give a copy of this format to the contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

ANNEXURE 5.14 REPORTING FORMAT FOR IDENTIFICATION OF QUARRY AND STONE CRUSHER SITE

A	Project Details		Date of reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	Site Details			
1.	Place Name		Landmark	
2.	Name of Panchayat / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Area of site		Current land use	
6.	Ownership of the land	Owned / leased	Survey no.	
7.	If leased, name, address and contact details of owner			
8.	Type of material available and its quantity			
9.	Distance* of the site from:			
	(i) any major settlement or village			
	(ii) any major surface water course or body			
	(iii) any bridge, water supply system, infiltration well or pumping installation			
	(iv) any public road			
	(v) ecologically sensitive areas			
	(vi) nearest quarry / stone crusher			

10.	Distance from project road	
11.	Width and type of access road	
12.	No of trees with grid >0.3m	
13.	No of trees to be cut	
14.	Is top soil conservation required: Yes/ No	
15.	Place identified for top soil conservation	
List of enclosure:	(a) Location map	
	(b) Layout plan	
	(c) Photographs of the site	
	(d) List of schools and hospitals with in 200 m distance from the boundary of the site	
C. Submission Details	Submitted by (Environment & Safety Engineer of Contractor)	Approved / Rejected by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

** All distances are to be measured from the boundary of the site.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each quarry and stone crusher site. Subsequently, the Environmental Engineer of CSC has to visit the site and approve / reject the site with reasons. The Environmental Engineer of CSC has to give a copy of this format to the contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

ANNEXURE 5.15 REPORTING FORMAT FOR IDENTIFICATION OF BORROW AREAS

A		Project Details		Date of Reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
B		Site Details			
1.	Place Name		Landmark		
2.	Name of Panchayat / Municipality		Revenue Village		
3.	Taluk		District		
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS	
5.	Area of site		Current land use		
6.	Ownership of the land	Owned / leased	Survey no.		
7.	If leased, name, address and contact details of owner				
8.	Distance* from any major settlement or village				
9.	Distance from any major surface water course or body				
10.	Distance from ecologically sensitive areas				
11.	Distance from the Project road				
12.	Width of and type of access road				
13.	No of trees with girth> 0.3m				
14.	No of trees to be cut				
15.	Is top soil conservation required (Yes/ No)				
List of enclosure:		Location map			
		Layout Plan			

	Photographs of the site	
C. Submission Details	Submitted by (Environment & Safety Engineer of Contractor)	Approved / Rejected by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

** All distances are to be measured from the boundary of the site.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each borrow area. Subsequently, the Environmental Engineer of CSC has to visit the site and approve / reject the site with reasons. The Environmental Engineer of CSC has to give a copy of this format to the contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

ANNEXURE 5.16 REPORTING FORMAT FOR IDENTIFICATION OF DEBRIS DISPOSAL SITE

A		Project Details		Date of Reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
B		Site Details			
1.	Place Name		Landmark		
2.	Name of Panchayat / Municipality		Revenue Village		
3.	Taluk		District		
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS	
5.	Area of site		Current land use		
6.	Ownership of the land	Owned / leased	Survey no.		
7.	If leased, name, address and contact details of owner				
8.	Distance* from any major settlement or village				
9.	Distance from any major surface water course or body				
10.	Distance from ecologically sensitive areas				
11.	Distance from the project road				
12.	Width and type of access road				
13.	No of trees with girth > 0.3m				
14.	No. of trees to be cut				
15.	Is top soil conservation required (Yes/ No)				
List of enclosure:		Location map			
		Layout Plan			
		Photographs of the site			

C. Submission Details	Submitted by (Environment & Safety Engineer of Contractor)	Approved / Rejected by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

** All distances are to be measured from the boundary of the site.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each debris disposal site. Subsequently, the Environmental Engineer of CSC has to visit the site and approve / reject the site with reasons. The Environmental Engineer of CSC has to give a copy of this format to the contractor after his approval / rejection with remarks. On approval of a site, the Contractor has to prepare the Management and Redevelopment Plan for this site as per the Guidelines given in EMP and submit to CSC for approval.

ANNEXURE 5.17 REPORTING FORMAT FOR IDENTIFICATION OF SOURCES OF WATER FOR CONSTRUCTION

A	Project Details	Date of Reporting:		
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	Site Details			
1.	Place Name		Landmark	
2.	Name of Panchayat / Municipality		Revenue Village	
3.	Taluk		District	
4.	Nearest Chainage (km) of the project road		location w.r.t. project road	LHS/ RHS
5.	Type of water body (River / Canal / lake)			
6.	Existing users			
7.	Ownership of the water body			
8.	Authority responsible for giving permission			
9.	If private, name, address and contact details of owner			
10.	Distance from project road			
11.	Width and type of access road			
List of enclosure:		Location map		
		Photographs of the site		

C. Submission Details	Submitted by (Environment & Safety Engineer of Contractor)	Approved / Rejected by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

** All distances are to be measured from the boundary of the site. Ground water should not be used for construction.*

Note: Contractor has to fill and submit this format to the CSC upon identification of each water source for construction. Subsequently, the Environmental Engineer of CSC has to visit the site and approve / reject the site with reasons. The Environmental Engineer of CSC has to give a copy of this format to the contractor after his approval / rejection with remarks.

ANNEXURE 5.18 FORMAT FOR REGISTER OF COMPLAINTS AND REPORTING

A	Project Details		Information		
1.	Name of Package and Corridor (SH Number)		Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor				
3.	Contract date and duration				
B	Details of Complaint Received		Site Name		
Sl. No.	Date of Complaint	Name and address of person with contact details	Complaint	Action taken with date	Signature of ESE of Contractor
1					
2					
3					

A register in this format shall be maintained at each site office of the contractor. This same format shall be used to compile and report the details of complaints received at all sites to the CSC along with the Monthly Report of the Contractor. The Environmental Engineer of CSC has to give instruction to the Contractor, if any further action has to be taken on any complaint

ANNEXURE 5.19 FORMAT FOR REGISTER OF SITES OPENED AND CLOSED AND REPORTING

A		Project Details		Information						
1.	Name of Package and Corridor (SH Number)		Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II							
2.	Name and address of the Contractor									
3.	Contract date and duration									
B Site Detail										
S No	Site Opening Date	Type of Site*	Address of Site (Place name, Landmark, Revenue Village, Survey No., Panchayat, Taluk and District)	Name and Address of the Owner	List of Clearances Required	Issue Date of each Clearance	Expiry Date of each Clearance	Site Closing Date	Redevelopment Status	Signature of ESE of Contractor
1										
2										
3										

* Construction Camp / Labor camp / Quarry Area and Stone Crusher Unit / Borrow Area / Debris Disposal Site / Water Source. A site should be opened only after submitting the Management and Redevelopment Plan prepared as per the Guidelines given in EMP and got it approved by the EO of the CSC. A register in this format (preferably in A3 size paper) should be maintained by the contractor for each road. This same format shall be used to report the details of sites opened and closed to the CSC along with the Monthly Report of the Contractor. The EO of CSC has to give instruction to the contractor if any clearance is pending for any site.

ANNEXURE 5.20 CHECKLIST FOR MONITORING OF CONSTRUCTION CAMP MANAGEMENT

A		Project Details		Date of Monitoring:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Construction Camp with sl. no. in Register of Sites				
B.		Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / Not Applicable)	Corrective Actions Proposed	Remarks	
1.	Whether concrete flooring and oil interceptors are provided for hot mix plant area and work shop, vehicle washing and fuel handling area?				
2.	Are all the first aid facilities provided in the camp?				
3.	Whether the plant is located in such a way that there are no residences, public institutions or hospital within a radius of 250 M from the centre of the plant?				
4.	Whether the vehicle movement in and out of the camp is in a controlled manner?				
5.	Does water in cross drainage channels block?				
6.	Whether all the plant and machineries are well maintained and regularly serviced?				
7.	Whether all the drains and channels are covered?				

8.	Whether a green belt is provided along the periphery of camp?			
9.	Whether water is stored for dust suppression in the camp?			
10.	Whether sanitation facilities are provided for male and female?			
11.	Whether separate garbage bins are provided to collect the garbage?			
12.	Whether septic tanks with soak pits are provided?			
13.	Whether the location of soak pit is in such a way that it does not pollute the ground water?			
14.	Whether a qualified safety officer is appointed for ensuring safety?			
15.	Whether noise barriers near sensitive receptors are provided?			
16.	Whether personal protective equipments are provided?			
17.	Whether warning sign boards are set up at the entrance gate for the public?			
18.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Construction Camp Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.21 CHECKLIST FOR MONITORING OF LABOUR CAMP MANAGEMENT

A		Project Details		Date of Monitoring:
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Labor Camp with sl. no. in register of sites			
B		Monitoring Details		
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / Not Applicable)	Corrective Actions Proposed	Remarks
1.	Whether the camps are floored with concrete?			
2.	Is all the first aid facilities provided in the camp?			
3.	Whether the camp is located in such a way that there are no residences, public institutions or bio sensitive area within a radius of 500m from the camp?			
4.	Whether the vehicle movement in and out of the camp is in a controlled manner?			
5.	Whether LPG for cooking is provided?			
6.	Whether safe drinking water is provided?			
7.	Whether all the drains and channels are covered?			
8.	Whether a green belt is provided along the periphery of camp?			
9.	Whether day care centers are provided with in the camp?			

10.	Whether sanitation facilities are provided separately for male and female?			
11.	Whether separate garbage bins are provided to collect the garbage?			
12.	Whether septic tanks with soak pits are provided?			
13.	Whether the location of soak pit is in such a way that it does not pollute the ground water?			
14.	Whether a qualified safety officer is appointed for ensuring safety?			
15.	Whether proper fencing of the camp is done?			
16.	Whether the workers are well aware of cleanliness, hygiene, community livings, AIDS etc.?			
17.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Labor Camp Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.22 CHECKLISTS FOR MONITORING OF QUARRY AND STONE CRUSHER MANAGEMENT

A	Project Details	Date of Monitoring:		
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Quarry & Crusher with sl. no. in register of sites			
B	Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / NA)	Corrective Actions Proposed	Remarks
1.	Whether the crusher units and/or other dust-producing units are housed in a building with a wall of minimum 23 cm thickness and with suitable roofing?			
2.	Whether the quarry site is located at a distance of minimum 500 m from human settlement, railway line, national highway, state highway, eco-sensitive area or district road*?			
3.	Whether the stone quarry is located at a minimum distance of 50 m from a water body ⁴ ?			

⁴ If this is not possible, given the topographical features of the region, pl specify the reasons clearly.

4.	Whether the vehicle movement in and out of the camp is in a controlled manner?			
5.	Whether a dust extraction with collection system is provided in the crusher unit and all transfer points?			
6.	Whether safe drinking water is provided for the workers?			
7.	Whether a dust extraction unit with collection system is provided in the crusher unit and all transfer points?			
8.	Whether a green belt is provided along the periphery of the quarry?			
9.	Whether adequate systems with water spray and sprinkling provides for dust suppression?			
10.	Whether the roads inside the crusher premises is tarred or concreted?			
11.	Whether separate garbage bins are provided to collect the garbage?			
12.	Whether the crusher, compactor and other connecting unit working time is restricted to daytime (6 am to 6 pm)?			
13.	Whether dust sealing arrangement is provided in the impactor to avoid fugitive emission?			
14.	Whether the ambient sound level (Leq) at a distance of 1 m away from the boundary of the site is within 55 dB (A)?			
15.	Whether the occupier is conducting air monitoring on the suggested frequency?			

16.	Whether contour trenches are made to control soil erosion?			
17.	Whether workers are properly trained?			
18.	Whether sign boards of size 6' x 4' mentioning the project details and Contractor's details are placed for public?			
19.	Whether the stack height of the D.G set is adequate?			
20.	Whether arrangement made for avoiding fugitive emission from plants/ premises are adequate?			
21.	Whether natural drainage patterns are kept clear without not alteration or blockage?			
22.	Whether top soil conservation has been undertaken?			
23.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Quarry & Crusher Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.23 CHECKLIST FOR MONITORING OF BORROW AREA MANAGEMENT

A		Project Details		Date of Monitoring:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Borrow Area with sl. no. in register of sites				
B		Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / NA)	Corrective Actions Proposed	Remarks	
1.	Whether the work at night is fully avoided?				
2.	Whether the approach road to the borrow area well maintained?				
3.	Whether the necessary traffic sign board is kept to control the traffic flow?				
4.	Whether any record is kept for the number of trees cut?				
5.	Whether a record on total quantity of earth evacuated is maintained?				
6.	Whether all waste materials from the borrow area is properly disposed?				
7.	Whether the relaying of the preserved top soil is carried out?				
8.	Whether required signage for the protection of the works or safety and convenience of public provided?				

9.	Whether effective measures are taken to control nuisance and disturbance arising from the execution work?			
10.	Whether the excavation is carried out in such a manner that the activity will not damage adjacent properties or cause contamination of nearby stream or other water bodies?			
11.	Whether the land is leveled after completion of work?			
12.	Whether the borrow pits are redeveloped?			
13.	Whether water logging is avoided?			
14.	Whether arrangements are made for regular sprinkling of water?			
15.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Borrow Area Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.24 CHECKLIST FOR THE MONITORING OF DEBRIS DISPOSAL SITE MANAGEMENT

A		Project Details		Date of Monitoring:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Debris Disposal Site with sl. no. in register of sites				
B		Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / NA)	Corrective Actions Proposed	Remarks	
1.	Whether the construction operations are carrying out in such a manner that no waste material is dumped or disposed off in an unhealthy manner that causes any environmental hazard?				
2.	Whether the debris forming work close to the streams and water bodies are generally avoided during the monsoon period?				
3.	Whether the debris disposal site is at least 200 meter away from the surface water body?				
4.	Whether the debris disposal site is at least 500 meter away from the ecologically sensitive are, residential area or main road?				

5.	Whether the debris disposal along the water courses and close to the drainage channels are in such a manner that these do not cause any blockage to the flow of water?			
6.	Whether the bituminous waste is used as a surfacing material to the access roads to base camps, quarries, borrow area, temporary diversion, haulage routes etc.?			
7.	Whether the waste disposal details are submitted to the CSC in the prescribed format?			
8.	Whether the spoils from excavation of the river bed are disposing off at specified area suggested by the engineers?			
9.	Whether the debris generated due to dismantling of existing permanent structure is reused in the temporary diversion?			
10.	Whether the preserved topsoil is used for redevelopment of the area?			
11.	Whether green belt is developed?			
12.	Whether all applicable clearances are obtained and valid till date?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for each Debris Disposal Site Quarterly. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.25 CHECK LIST FOR MONITORING OF REDEVELOPMENT OF CONSTRUCTION CAMP SITE

A		Project Details		Date of Monitoring:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Construction Camp with sl. no. in register of sites				
B		Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / NA)	Corrective Actions Proposed	Remarks	
1.	Are all the temporary structures cleared as per the list in the redevelopment plan?				
2.	Are all building debris, garbage, night soils and POL waste disposed off safely?				
3.	Are all disposal pits or trenches filled, disinfected and effectively sealed off?				
4.	Are the facilities that could be put to re-use maintained well?				
5.	Are all the spills within the camp site effectively disposed off from the site?				

6.	All the area within the camp site is leveled and spread over with stored top soil.			
7.	Has the residual top soil been utilized effectively?			
8.	Has the entire camp area been made clean and tidy without disturbing the adjacent lands?			
9.	Are the plantations / green belt along the boundary of the camp maintained well?			
10.	Are the 'before' and 'after' scenarios of the site documented through photographs and submitted to CSC?			
11.	Are the conditions mentioned by the owner in the agreement adhered to?			
12.	If not, mention the details of the conditions that are not adhered to and further steps to be taken.			
13.	Can 'works completion' certificate be issued to this site?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Construction Camp Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.26 CHECK LIST FOR MONITORING OF REDEVELOPMENT OF LABOUR CAMP SITE

A		Project Details		Date of Monitoring:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Labor Camp with sl. no. in register of sites				
B		Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / NA)	Corrective Actions Proposed	Remarks	
1.	Are all the temporary structures cleared as per the list in the redevelopment plan?				
2.	Are all building debris, garbage, night soils and POL waste disposed off safely?				
3.	Are all disposal pits or trenches filled, disinfected and effectively sealed off?				
4.	Are the facilities that could be put to re-use maintained well?				
5.	Are all the spills within the camp site effectively disposed off from the site?				

6.	All the area within the camp site is leveled and spread over with stored top soil.			
7.	Has the residual top soil been utilized effectively?			
8.	Has the entire camp area been made clean and tidy without disturbing the adjacent lands?			
9.	Are the plantations / green belt along the boundary of the camp maintained well?			
10.	Are the 'before' and 'after' scenarios of the site documented through photographs and submitted to CSC?			
11.	Are the conditions mentioned by the owner in the agreement adhered to?			
12.	If not, mention the details of the conditions that are not adhered to and further steps to be taken.			
13.	Can 'works completion' certificate be issued to this site?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Labor Camp Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.27 CHECK LIST FOR MONITORING OF REDEVELOPMENT OF QUARRY AND STONE CRUSHER SITE

A	Project Details		Date of Monitoring:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Quarry & Crusher with sl. no. in register of sites			
B	Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / NA)	Corrective Actions Proposed	Remarks
1.	Are all the temporary structures cleared as per the list in the redevelopment plan?			
2.	Are all debris, garbage, night soils and POL waste disposed off safely?			
3.	Are the facilities that could be put to re-use maintained well?			
4.	Has the conserved top soil been reused?			
5.	Are the improvement measures identified in the redevelopment plan implemented?			
6.	If not, mention the measures yet to be implemented.			
7.	Has the residual top soil been utilized effectively?			
8.	Has the entire area been made clean and tidy without disturbing the adjacent lands?			
9.	Are the plantations / green belt along the boundary of the camp maintained well?			

10.	Has additional tree plantation been undertaken as mentioned in the re-development plan?			
11	Has erosion control measures and slope stabilization measures been undertaken?			
12.	Whether pits created by blasting are filled with overburden soil.			
13.	Has the local community been involved in the implementation of redevelopment plan?			
14.	Are the required photographs submitted to CSC?			
15.	Are the conditions mentioned by the owner in the agreement adhered to?			
16.	If not, mention the details of the conditions that are not adhered to and further steps to be taken.			
17.	Can 'works completion' certificate be issued to this site?			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Quarry and Crusher Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.28 CHECK LIST FOR MONITORING OF REDEVELOPMENT OF BORROW AREAS

A		Project Details		Date of Monitoring:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Borrow Area with sl. no. in register of sites				
B		Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / NA)	Corrective Actions Proposed	Remarks	
1.	Has slope stabilization been undertaken along the edges (if there is a level difference)?				
2.	Is all the waste material raised from the borrow area disposed off properly?				
3.	Has the preserved top soil been used in redevelopment of site?				
4.	Has the borrow areas been re-vegetated properly?				
5.	Are the cross drainage system and the flood water drains managed properly to avoid occurrence of flooding?				
6.	Are the borrow area pits re-developed?				
7.	Is the leveling of depression after filling-in of wastes undertaken?				
8.	Selection of Species as per TNRSP Project Guidelines for plantation.				

9.	Has bund creation and temporary fencing been undertaken?			
10.	Ponds including creation of new ones and enhancing capacity of existing ones (for irrigation; pisciculture and general uses by people and/or cattle)			
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date	

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Borrow Area as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.29 CHECK LIST FOR MONITORING OF REDEVELOPMENT OF DEBRIS DISPOSAL SITE

A		Project Details		Date of Monitoring:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Borrow Area with sl. no. in register of sites				
B		Monitoring Details			
Sl. No.	Environmental Management Measures	CSC's observation (Yes / No / NA)	Corrective Actions Proposed	Remarks	
1.	Rehabilitation of the dump site by planting local shrubs and other plant species.				
2.	Conversion of debris site into farm land, playground, parking area, block plantation area etc.				
3.	Maintenance of the hydrological flow in the area.				
Signature of Environment and Safety Engineer (ESE) of the Contractor with date			Signature of Environmental Engineer of the CSC with date		

Note: The Environmental Engineer of the CSC has to use this format to monitor the implementation of Environmental Management Measures for the redevelopment of each Debris Disposal Site as and when it is closed. Corrective actions with specific timeframe should be proposed for each Environmental Management Measure, which is not implemented satisfactorily. A copy of the filled up format should be given to the ESE of the Contractor. CSC has to attach this format to the Quarterly Report to be submitted to PIU, with details of corrective action taken by the Contractor.

ANNEXURE 5.30 REPORTING FORMAT FOR WORK FORCE MANAGEMENT

A	Project Details			Date of Reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
5.	Name of Work Site with sl. no. in register of sites				
B. Status of work force					
Sl. No	Category of work force	Work force in the Previous Month (No.)	Work force added in the reporting month (No.)	Work Force left in the reporting month (No.)	Total work force in the reporting month (No.)
1.	Unskilled Laborers				
2.	Skilled laborers				
3.	Supervisors				
4.	Engineers				
5.	Office Staff				
	Sub Total				
	Grand Total				

C. Categorization of work force											
Sl. No	Category of work force	Male		Female		Employment Status		Residential Status		Accommodation Status	
		< 18 yrs	> 18 yrs.	< 18 yrs.	> 18 yrs.	Regular	Temporary	Migrant	Local	Staying in Labor Camp / Quarters	Others
1.	Unskilled Laborers										
2.	Skilled laborers										
3.	Supervisors										
4.	Engineers										
5.	Office Staff										
	Sub Total										
	Grand Total										
D. Details of non-working migrated people, living in the Labor Camps / Staff Quarters as part of work force family											
No. of children (0-6 yrs.)			No. of children (7-18 yrs.)			No. of adults			Grand Total		
Male	Female	Total	Male	Female	Total	Male	Female	Total			
C. Submission Details											

	Submitted by (Environmental & Safety Engineer of Contractor)	Approved by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

Note: Contractor has to fill and submit this format to the CSC along with the Monthly Report. In addition to that, the Contractor has to maintain the database of work force in the form of a register. An attendance register for the work force should also be maintained by the Contractor. Contractor has to report the details of migrant work force to the nearest police station. The CSC has to visit the sites and verify the details. The Environmental Engineer of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.31 REPORTING FORMAT FOR OCCUPATIONAL HEALTH AND SAFETY MEASURES

A	Project Details		Date of reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B	Implementation Status of Health and Safety Measures			
Sl. No.	Health and Safety Measures	Implementation Status (Yes / No)	Remarks	
1	Appointment of qualified Environment and Safety Engineer			
2	Approval for Construction Safety Management Plan by the Engineer.			
3	Provision for flags and warning lights for potential hazards			
4	Provision of adequate staging, form work and access (ladders with handrail) for works at a height of more than 3.0 m			
5	Provision of adequate shoring / bracing / barricading / lighting for all deep excavations of more than 3.0 m depth.			
6	Provision for sufficient lighting especially for night time work			
7	Construction Workers safety - Provision of personnel protective equipments			

	A. Helmets		
	B. Safety Shoe		
	C. Dust masks		
	D. Hand Gloves		
	E. Safety Belts		
	F. Reflective Jackets		
	G. Earplugs for labor		
8	Workers engaged in welding work shall be provided with welder protective shields		
9	All vehicles are provided with reverse horns.		
10	All scaffolds, ladders and other safety devices shall be maintained in as safe and sound condition		
11	Regular health checkup for labor/ Contractor's personnel		
12	Ensuring the sanitary conditions and all waste disposal procedures & methods in the camps.		
13	Provision for insurance coverage to the workers		
C.	Submission Details		

	Submitted by (Environment & Safety Engineer of Contractor)	Approved by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

Note: Contractor has to fill and submit this format to the CSC along with the Monthly Report. The CSC has to visit the sites and verify the details. Further mitigation measures, if required, can be suggested by the CSC. The Environmental Engineer of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.32 REPORTING FORMAT FOR TOP SOIL CONSERVATION

A		Project Details		Date of Reporting:
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II		
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
5.	Name of Site with sl. no. in register of sites			
B		Top Soil Conservation Details		
Sl. No.	List of Activities	Status (Yes / No)	Remarks	
1.	Whether the location was pre-identified?			
2.	Whether the slope is < 1:2?			
3.	Whether height is less than 2 m?			
4.	Whether edges of pile are protected by silt fencing?			
5.	Whether multiple handling is kept to a minimum			
6.	Whether measures are taken to prevent the loss during rains.			
7.	Whether any other measure is provided? If yes, What is it?			

C. Submission Details		
	Submitted by (Environment & Safety Engineer of Contractor)	Approved by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

Note: Contractor has to fill and submit this format to the CSC along with the Monthly Report. This format is to be filled for each site, after opening the site. The CSC has to visit the sites and verify the details. Further mitigation measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.33 REPORTING FORMAT FOR WATER SPRINKLING FOR DUST SUPPRESSION

A	Project Details	Month and Year of reporting:																															
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II																															
2.	Name and address of the Contractor																																
3.	Contract date and duration																																
4.	Status of completion of the project																																
5.	Location of water sprinkling																																
B	Water Sprinkling Details																																
Particulars	Days																																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
No. of trips per day																																	
Quantity of Water Sprinkled (KLD)																																	
If not sprinkled, reason for the same																																	

C. Submission Details		
	Submitted by (Environment & Safety Engineer of Contractor)	Approved by (Environmental Engineer of CSC)
Signature & date		
Name		
Designation		
Remarks by CSC		

Note: Contractor has to fill this format for each construction site (preferably in A3 size paper) and submit to the CSC along with the Monthly Report. The CSC has to visit the sites and verify the details. Additional water sprinkling, if required, can be suggested by the CSC. The Environmental Engineer of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.34 REPORTING FORMAT FOR ROAD SAFETY MEASURES DURING CONSTRUCTION

A		Project Details		Date of Reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
B		Details of Safety Measures			
S. No	Safety Measures	Compliance Status (Yes / No)	Remarks		
a.	General				
1	A qualified Environment and Safety Engineer should be appointed				
2	A Traffic Management Plan should be prepared in accordance with IRC: SP: 55-2001 and got approved by the Engineer				
3	Maintenance of existing road stretches handed over to the Contractor should be carried out				
b.	Details of Construction Zone				
1	Length of transition sub zone should be min 50 m for a speed of 50km/hr				
2	Length of work sub zone in urban stretch should be <2 km				

3	Length of work sub zone in rural stretch should be 5-10 km		
C	Signage's in construction zones		
1	Sign saying 'Men at Work' should be kept 1 km ahead of Transition sub zone		
2	Supplementary sign saying Diversion 1km should be provided		
3	Sign saying 'Road Closed ahead' should be provided		
4	Compulsory Turn Right/Left sign should be provided		
5	Detour sign should be placed		
6	Sharp Deviation sign should be placed at end of advance warning sub zone		
7	Signage should be provided in Transition Sub Work Zone		
8	Signage saying 'Keep Right/Left should be provided		
9	Signage should be placed in work sub zone		
10	Hazard Marker should be placed where railing for CD structure on diversion starts		
11	Barricade should be provided on either side of work sub zone		
12	Flags and warning lights should be provided at Construction zones		

13	Flag persons should be provided for traffic control		
14	Metal drum /empty bitumen drum delineator, painted in circumferential strips of alternate black and white 100mm wide 2 coats fitted with reflectors 3 Nos of 7.5cm diameter or Barricades/caution tapes should be provided in construction zones		
15	Plastic crash barriers should be provided		
16	Demarcations (fencing, guarding and watching) should be provided at bridge / culvert construction sites		
17	Arrangements should be made for controlled access and entry to Construction zones		
18	Regular Inspection of Work Zone Traffic Control Devices should be carried out by authorized contractor personnel		
19	All vehicles should be provided with reverse horns		
20	Speed of construction vehicles should be controlled through road safety training of drivers		
d.	Signage in Termination sub zone		
1	Sign for indication of end of work zone should be placed 120m from end of termination sub zone		
e.	Road Delineators		
1	Roadway indicators should be provided		

2	Hazard markers should be provided		
3	Object markers should be provided		
f.	Submission Details		
	Submitted by (Environment & Safety Engineer of Contractor)		Approved by (Environmental Engineer of CSC)
Signature & date			
Name			
Designation			
Remarks by CSC			

Note: Contractor has to fill this format and submit to the CSC along with the Monthly Report. The CSC has to visit the sites and verify the details. Additional safety measures, if required, can be suggested by the CSC. The Environmental Engineer of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.35 FORMAT FOR REGISTER OF ACCIDENTS AND ITS REPORTING

A	Project Details	Date of Reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II	
2.	Name and address of the Contractor		
3.	Contract date and duration		
4.	Status of completion of the project		
B	Details of Accident and People Involved in Accident		
	Name of site where accident happened		
	Name and address of people involved in the accident		
	Whether Contractor's personnel or General public		
	Details of Injury		
	Details of treatment given		
	Details of compensation given		
C	Type of Accident (√)		
	Fall of person from a height		Explosion
	Slip, trip or fall on same level		Fire
	Struck against fixed objects		Contact with hot or corrosive substance
	Struck by flying or falling objects		Contact with poisonous gas or toxic substances.
	Struck by moving objects		Contact with poisonous gas or toxic substances
	Struck / caught by cable		Hand tool accident
	Stepping on nail etc.		Vehicle / Mobile plant accident
	Handling without machinery		Machinery operation accident
	Crushing / burying		Other (please specify)

	Drowning or asphyxiation			
D	Agent Involved in Accident (√)			
	Machinery			Stair edge
	Portable power appliance			Excavation / underground working
	Vehicle or associated equipment /machinery			Ladder
	Material being handled, used or stored			Scaffolding /gondola
	Gas, vapor, dust, fume or oxygen			Construction formwork, shuttering and false work.
	Hand tools			Electricity supply cable, wiring switchboard and associated equipment
	Floor edge			Nail, splinter or chipping
	Floor opening			Other (Please specify)
	Left shaft			
E	Unsafe Action Relevant to the Accident (√)			
	Operating without authority			Failure to use proper footwear
	Failure to secure objects			Failure to use eye protector
	Making safety devices inoperative			Failure to use respirator
	Working on moving or dangerous equipment			Failure to use proper clothing
	Using un-safety equipment			Failure to use warn others or given proper signals
	Adopting unsafe position or posture			Horseplay
	Operating or working at unsafe speed			No unsafe action
	Unsafe loading, Placing, mixing et			Others (please specify)
	Failure to use helmet			
F	Lack of Safety Measures Relevant to the Accident (√)			
	No protective gear			Unsafe layout of job, traffic etc.
	Defective protective gear			Unsafe process of job methods
	Improper dress / footwear			Poor housekeeping
	Improper guarding			Lack of warning system
	Improper ventilation			Defective tool, machinery or materials
	Improper illumination			No unsafe condition

	Improper procedure		Others (please specify)
G	Personal Factor Relevant to the Accident (√)		
	Incorrect attitude /motive		No unsafe personal factor.
	Unsafe act by another person		Other (please specify)
H	Details of Corrective and Preventive action taken		
1			
2			
3			
4			
I	Submission Details		
	Submitted by (Environment & Safety Engineer of Contractor)		Approved by (Environmental Engineer of CSC)
Signature & date			
Name			
Designation			
Remarks by CSC			

Note: Contractor has to fill this format as and when an accident happens and submits to the CSC along with the Monthly Report. The CSC has to visit the sites and verify the details. Additional safety measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.36 REPORTING FORMAT FOR ENVIRONMENTAL QUALITY MONITORING

A	Project Details			Date of Reporting:		
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II				
2.	Name and address of the Contractor					
3.	Contract date and duration					
4.	Status of completion of the project					
B	Environmental Monitoring Details					
Sl. No	Details of Monitoring Location	Period of Monitoring	Details of values exceeding the relevant standards	Reasons for pollution	Details of Corrective actions taken	Remarks
a.	Air Monitoring					
1.						
2.						
3.						

b.	Water Monitoring					
1.						
2.						
3.						
c.	Noise Monitoring*					
1.						
2.						
3.						

C		Submission Details	
		Submitted by (Environment & Safety Engineer of Contractor)	Approved by (Environmental Engineer of CSC)
Signature & date			
Name			
Designation			
Remarks by CSC			

** Noise monitoring along the road will be done by the CSC, using the Noise Meter of PIU. The CSC has to give the monitoring results to the Contractor for corrective actions, if any, required and including in this report.*

Note: The Contractor has to conduct Environmental Monitoring through a NABL approved Laboratory as per the Environmental Monitoring Plan given in the EMP, fill this format and submit to the CSC along with the Monthly Report, if monitoring was due in that month. A copy of the monitoring report given by the Laboratory has to be attached to this format. The CSC has to visit the sites and verify the details. Additional mitigation measures, if required, can be suggested by the CSC. The Environmental Engineer of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.37 REPORTING FORMAT FOR ENHANCEMENT AND MITIGATION OF CULTURAL PROPERTIES

A	Project Details	Date of reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II	
2.	Name and address of the Contractor		
3.	Contract date and duration		
4.	Status of completion of the project		
B			
Details of Enhancement and Mitigation of Cultural Properties			
Sl. No.	Location with chainage	% work completed	Remarks and reasons for delay, if any.

C	Submission Details		
	Submitted by (Environment & Safety Engineer of Contractor)		Approved by (Environmental Engineer of CSC)
Signature & date			
Name			
Designation			

Remarks by CSC

Note: The Contractor has to fill the details of cultural properties for which enhancement and mitigation measures were carried out during the reporting month in this format and submit to the CSC along with the Monthly Report. Overall progress in this activity for the entire project road is to be included in the Monthly Report. The CSC has to visit the sites and verify the details. Additional mitigation measures, if required, can be suggested by the CSC. The Environmental Engineer of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.38 REPORTING FORMAT FOR NOISE BARRIER CONSTRUCTION

A		Project Details		Date of reporting:
1.	Name of Package and Corridor (SH Number)		Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II	
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B		Details of Noise Barriers Constructed		
Sl. No.	Location with chainage	% work completed	Remarks and reasons for delay, if any.	
C		Submission Details		
		Submitted by (Environment & Safety Engineer of Contractor)		Approved by (Environmental Engineer of CSC)
Signature & date				
Name				
Designation				

Remarks by CSC

Note: The Contractor has to fill the details of Noise Barriers constructed during the reporting month in this format and submit to the CSC along with the Monthly Report. Overall progress in this activity for the entire project road is to be included in the Monthly Report. The CSC has to visit the sites and verify the details. The EO of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.39 REPORTING FORMAT FOR ENHANCEMENT MEASURES OTHER THAN CULTURAL PROPERTIES

A		Project Details		Date of reporting:
1.	Name of Package and Corridor (SH Number).		Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II	
2.	Name and address of the Contractor			
3.	Contract date and duration			
4.	Status of completion of the project			
B		Details of Enhancement Measures		
Sl. No.	Location with chainage	% work completed	Remarks and reasons for delay, if any.	
a	Raising embankment height			
b	Public water sources			
c	Bus stops and bus bays			

d	Water bodies		
e	Auto / Jeep / Taxi stands		
f	Sign Boards		
g	Oxbow land (Type C) development		
h	Any other measures		

C	Submission Details		
	Submitted by (Environment & Safety Engineer of Contractor)		Approved by (Environmental Engineer of CSC)
Signature & date			
Name			
Designation			
Remarks by CSC			

Note: The Contractor has to fill the details of enhancement measures carried out for amenities / facilities other than cultural properties during the reporting month in this format and submit to the CSC along with the Monthly Report. Overall progress in this activity for the entire project road is to be included in the Monthly Report. The CSC has to visit the sites and verify the details. Additional mitigation measures, if required, can be suggested by the CSC. The EO of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.40 REPORTING FORMAT FOR TREE PLANTATION

A		Project Details		Date of reporting:	
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II			
2.	Name and address of the Contractor				
3.	Contract date and duration				
4.	Status of completion of the project				
B		Details of Trees Planted			
Sl. No.	Location with chainage	No. of Trees to be Planted	% work completed	Remarks and reasons for delay, if any	
C		Submission Details			
		Submitted by (Environment & Safety Engineer of Contractor)		Approved by (Environmental Engineer of CSC)	
Signature & date					
Name					
Designation					
Remarks by CSC					

Note: The Contractor has to fill the details of Trees planted during the reporting month in this format and submit to the CSC along with the Monthly Report. Overall progress in this activity for the entire project road is to be included in the Monthly Report. The CSC has to visit the sites and verify the details. The EO of CSC has to give back a copy of this format to the contractor after his approval with remarks.

ANNEXURE 5.41 REPORTING FORMAT FOR MONTHLY REPORT FROM CONTRACTOR TO CSC

A		Project Details		Information					
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II							
2.	Name and address of the Contractor								
3.	Contract date and duration								
B Physical Progress Report									
S No	Enhancement measure	Physical Target (Nos)	Units carried over from previous month	Units started in reporting moths	Units completed in reporting month	Unit carried over to next month	Cumulative units completed till end of reporting month	% target completed	Remarks/Reasons for delay
			(a)	(b)	(c)	(d=a+b+c)			
1	Noise barrier								
2	Hand Pumps								
3	Bus Shelter								
4	Sign Board								
5	Preserving and landscaping cultural properties								

6	Constructing new well								
7	Providing new water taps								
8	Planting trees along road side								
9	Planting trees on inner side of sound insulating wall								
10	Concrete flooring with slope drains and oil interceptors in construction camps.								
C Details of Sites for Project Ancillary Facility									
1	Construction Camp								
2	Labor Camp								
3	Quarry & Stone crusher unit								
4	Borrow Area								
5	Debris disposal site								

6	Water sources								
<i>A site will be considered closed after redeveloping and obtaining closure certificate from CSC.</i>									
D	Summary of machinery and equipment available								
Sl. No.	Type of equipment / machinery / vehicles				Nos. available	Validity date of PUC certificate (as applicable)		Remarks	
1									
2									
3									
E	Details of lapses for which notices were issued during the previous reporting month								
S. No.	Details of notices issued by CSC			Date of Issue	Type of Lapse (Major/Minor)		Notice no	Corrective action taken	Remarks
<i>*In case of minor lapse, specify whether original notice, first reminder or second reminder.</i>									
F	Reporting formats to be annexed with this monthly report by the contractor								
S No.	REPORTING FORMAT			YES/NO	S No.	REPORTING FORMAT		YES/NO	
1	Format for Register of sites opened and closed and its reporting				8	Reporting Format for Register of Accidents and it's Reporting			

2	Format for Register of complaints and its reporting		9	Reporting Format for Enhancement and Mitigation of Cultural Properties	
3	Reporting Format for Work Force Management		10	Reporting Format for Noise Barrier Construction	
4	Reporting Format for Occupational Health and Safety Measures		11	Reporting Format for Enhancement Measures Other than Cultural Properties	
5	Reporting Format for Top Soil Conservation		12	Reporting Format for Tree Plantation	
6	Reporting Format for Water Sprinkling for Dust Suppression		13	Reporting Format for Environmental Quality Monitoring	
7	Reporting Format for Road Safety Measures During Construction				
G	Submission Details				
	Submitted by (Environment & Safety Engineer of Contractor)		Approved by (Environmental Engineer of CSC)		
Signature & date					
Name					
Designation					
Remarks by CSC					

ANNEXURE 5.42 REPORTING FORMAT FOR MONTHLY REPORT FROM CSC TO PIU

A	Project Details		Period of Reporting:						
1.	Name of Package and Corridor (SH Number)	Upgrading Madapattu – Thirukovilur Section of SH 09 (km 41+700 to km 44+000 and km 45+000 to km 66+190) and Construction of a New Link Road between SH 09 and SH 137 (km 66+190 to km 71+147) in the State of Tamil Nadu under TNRSP II							
2.	Name and address of the Contractor								
3.	Contract date and duration								
4.	Status of completion of the project								
B.	Physical Progress Report								
Sl. No.	Enhancement Measure	Physical target (Nos.)	Units carried over from previous month	Units started in reporting month	Units completed in reporting month	Units carried over to next month	Cumulative units completed till end of reporting month	% target completed	Remarks / reasons for delay
			(a)	(b)	(c)	(d=a+b-c)			
1.	Noise barrier								
2.	Hand pumps								
3.	Bus Shelter								
4.	Sign Boards								
Sl. No.	Enhancement Measure	Physical target (Nos.)	Units carried over from previous month	Units started in reporting month	Units completed in reporting month	Units carried over to next month	Cumulative units completed till end of reporting month	% target completed	Remarks / reasons for delay
			(a)	(b)	(c)	(d=a+b-c)			

5.	Preserving and landscaping the cultural properties								
6.	Constructing new well								
7.	providing new water taps								
8.	Parking space for auto rickshaws, cars and jeep								
9.	Landscaping of type C oxbow lands								
10.	Planting trees along road side								
11.	Planting trees on inner side of sound insulating wall								
12.	Concrete flooring with slope drains and oil interceptors								
C	Details of Sites for Project Ancillary facilities								
S No	Type of camp / site	Cumulative No of sites opened	No of sites operational	Cumulative No of sites redeveloped	Cumulative No of sites closed*	Remarks			
1	Construction camp								
2	Labor camp								
3	Quarry & stone crusher unit								
4	Borrow Area								
5	Debris disposal site								
6	Water sources								
* A site will be considered closed after redeveloping and obtaining closure certificate from CSC.									
D.	Summary of machinery and equipment available								

S No	Type of equipment / machinery / vehicles	Nos. available	Validity date of PUC certificate (as applicable)	Remarks		
1						
2						
3						
4						
5						
6						
7						
8						
E	Details of lapses for which notices were issued during the previous reporting month					
Sl. No.	Details of notices issued by CSC	Date of notice	Type of lapse (Major / Minor)	Notice No. *	Corrective actions taken by Contractor	Remarks
*In case of minor lapse, specify whether original notice, first reminder or second reminder.						
F.	Details of major lapses for which notices were issued during the current reporting month					
Sl. No.	List of major lapses	Date of issuing notice	Whether invoking penalty clause from next interim payment certificate is recommended?	Remarks		
1.						

2.						
3.						
4.						
5.						
G.	Details of minor lapses for which notices were issued during the current reporting month					
Sl. No.	Details of notices issued by CSC	Date of notice	Type of lapse (Major / Minor)	Notice No. *	Corrective actions taken by Contractor	Remarks
*In case of minor lapse, specify whether original notice, first reminder or second reminder.						
F.	Details of major lapses for which notices were issued during the current reporting month					
Sl. No.	List of major lapses	Date of issuing notice	Whether invoking penalty clause from next interim payment certificate is recommended?		Remarks	
1.						
2.						
3.						
4.						

G. Details of minor lapses for which notices were issued during the current reporting month						
Sl. No.	List of minor lapses	Date of issuing notice			Whether invoking penalty clause from next interim payment certificate is recommended?	Remarks
		Original notice	First Reminder	Second Reminder		
1.						
2.						
3.						
4.						
5.						
6						
7						
8						
H Reporting / Monitoring formats to be annexed with this monthly report by the CSC						
Sl. No.	Reporting / Monitoring format	Yes/No	Sl. No	Reporting / Monitoring format	Yes/No	
1.	Format for Register of sites opened and closed and its reporting		13.	Reporting Format for Environmental Quality Monitoring		
2.	Format for Register of complaints and its reporting		14.	Checklist for Monitoring of Construction Camp Management		
3.	Reporting Format for Work Force Management		15.	Checklist for Monitoring of Labor Camp Management		
4.	Reporting Format for Occupational Health and Safety Measures		16.	Checklist for Monitoring of Quarry And Stone Crusher Management		
5.	Reporting Format for Top Soil Conservation		17.	Checklist for Monitoring of Borrow Area Management		

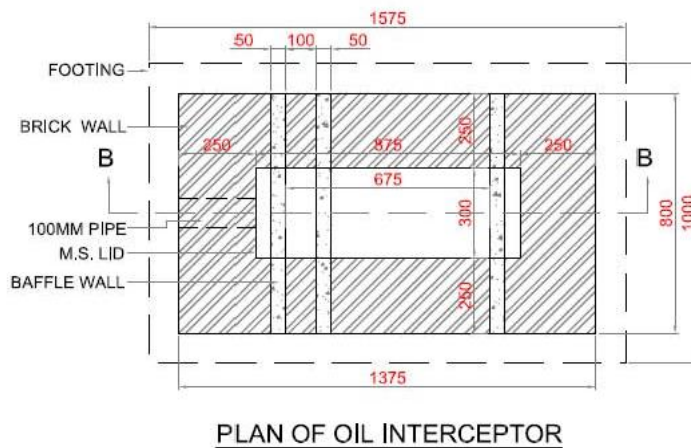
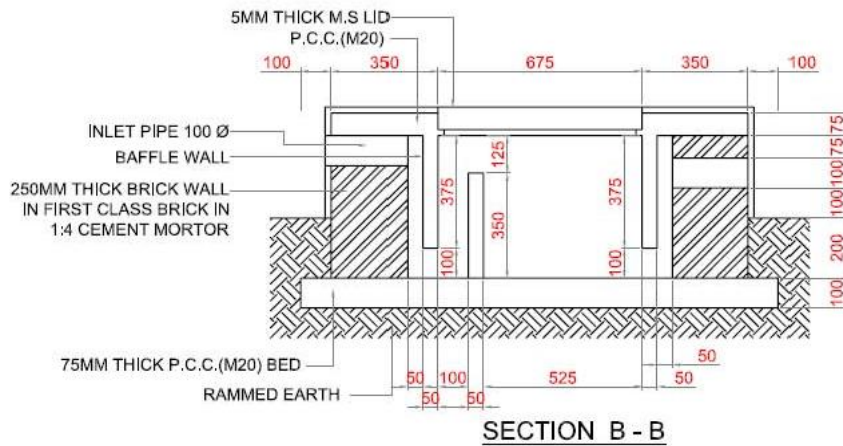
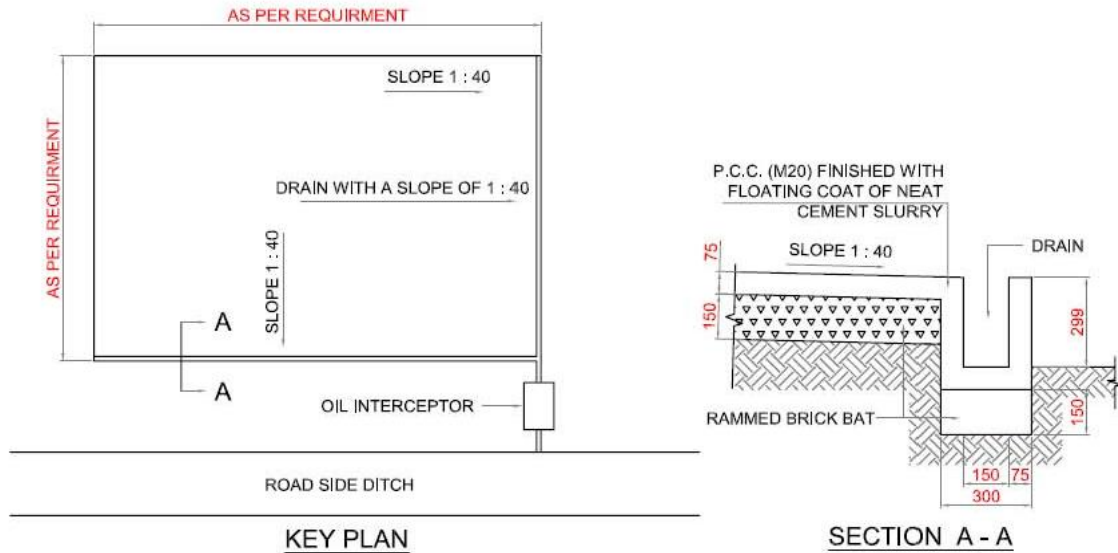
6.	Reporting Format for Water Sprinkling for Dust Suppression		18.	Checklist for The Monitoring of Debris Disposal Site Management	
7.	Reporting Format for Road Safety Measures During Construction		19.	Check List for Monitoring of Redevelopment of Construction Camp Site	
8.	Reporting Format for Register of Accidents and it's Reporting		20.	Check List for Monitoring of Redevelopment Of Labor Camp Site	
9.	Reporting Format for Enhancement and Mitigation of Cultural Properties		21.	Check List for Monitoring of Redevelopment Of Quarry And Stone Crusher Site	
10.	Reporting Format for Noise Barrier Construction		22.	Check List for Monitoring of Redevelopment Of Borrow Areas	
11.	Reporting Format for Enhancement Measures Other than Cultural Properties		23.	Check List for Monitoring of Redevelopment Of Debris Disposal Site	
12.	Reporting Format for Tree Plantation				
Submission Details		Submitted by (Environmental Engineer of CSC)		Approved by (Environmental Engineer of PIU)	
Signature & date					
Name					
Designation					
Remarks by PIU					

ANNEXURE 5.43 LIST OF PERMISSIONS TO BE OBTAINED BY THE CONTRACTOR

Sl. No	Type of Clearance	Statutory Authority	Applicability	Project Stage
1	Consent to Establish under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Tamil Nadu Pollution Control Board	For operating hot mix plants, crushers and construction camps	Construction (Prior to work initiation)
2	Consent to Operate under the Air (Prevention & Control of Pollution) Act, 1981 and The Water (Prevention & Control of Pollution) Act, 1974.	Tamil Nadu Pollution Control Board	For operating hot mix plants, crushers and construction camps	Construction (Prior to work initiation)
3	Permission to store Hazardous Materials under Hazardous Waste (Management and Handling) Act 1989	Tamil Nadu Pollution Control Board	Storage and Transportation of Hazardous Materials and Explosives	Construction (Prior to work initiation)
4	Explosive license under The Explosives Act (& Rules), 1884 (revised in 1983) for storage of fuel and other petroleum products	Chief Controller of Explosives, petroleum & Explosive Safety Organization	Storage of explosive materials	Construction (Prior to work initiation)
5	PUC certificate for vehicles for construction under Central Motor and Vehicle Act 1988	State Transport Authority - Tamil Nadu Government	For all construction vehicles	Construction (Prior to work initiation)
6	Quarry lease deeds and license under The Mines Act, 1958 *	Mining and Geology Department of Tamil Nadu	Quarrying and borrowing operations	Construction (Prior to work initiation)
7	Consent for ground water extraction	Central Ground Water Authority	Ground water extraction for construction camps	Construction (Prior to work initiation)
8	Permission for establishment of labor camp	Labor and Employment Department, Tamil Nadu	Labor camps	Construction (Prior to work initiation)

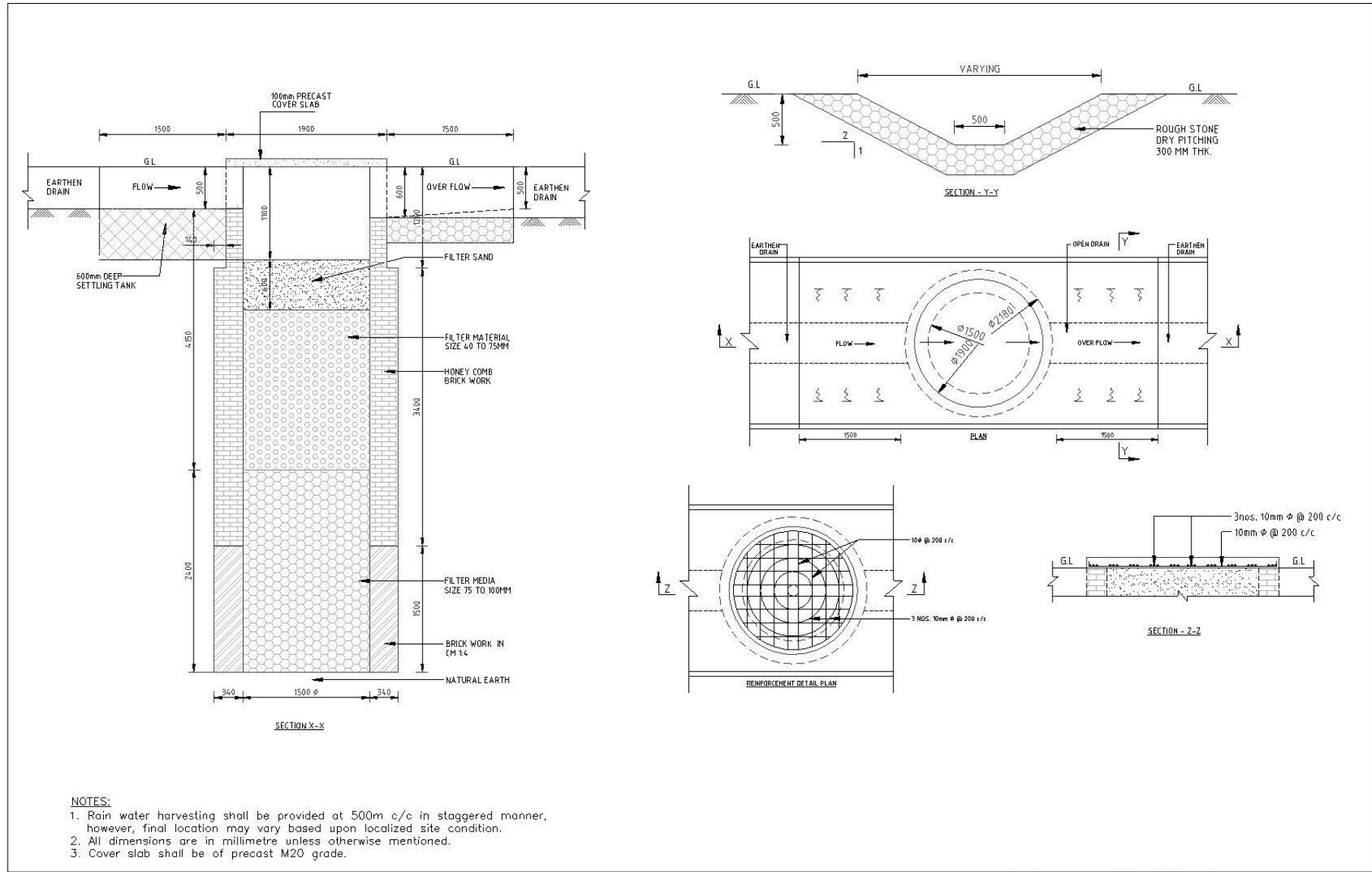
9	Consent to establish borrow area*	Local Panchayat / Municipality	Borrow area	Construction (Prior to work initiation)
10	Consent to Operate under the Air (Prevention & Control of Pollution) Act, 1981	Tamil Nadu Pollution Control Board	For operating Hot mix plants, Crushers, construction camps and batching plants	Operation
11	Consent to Operate under the Water (Prevention & Control of Pollution) Act, 1974	Tamil Nadu Pollution Control Board	For discharging of domestic waste water through soak pit	Operation
<p>* In the case of quarry, burrow areas and sand mining sites, if the contractor does not owe the sites, the contractor has to ensure that the material is obtained from approved sites as per MoEFCC guidelines dated 18th May, 2012.</p>				

ANNEXURE 5.44 SCHEMATIC DIAGRAM OF CATCH DRAIN AND OIL INTERCEPTORS



Schematic Drawing of Catch Drain and Oil Interceptor Tank

ANNEXURE 5.45 TYPICAL DESIGN OF RAIN WATER HARVESTING STRUCTURE



ANNEXURE 5.46 PUBLIC WATER SOURCES, RELIGIOUS STRUCTURES - IMPACT AND MITIGATION

List of hand pumps and extent of impact due to upgrading Madapattu – Thirukovilur Section of SH 09 and Construction of a New Link Road between SH 09 and SH 137:

LHS			Impact	Chainage	RHS		Impact
S. N o.	Name of the CPR	Distance from C/L			Distance from C/L	Name of the CPR	
1	Hand Pump	15.00	No Impact	45/360			
2				45/460	08.00	Hand Pump	Impacted fully
3				45/850	09.00	Hand Pump	Impacted fully
4				46/050	12.00	Hand Pump	
5	Hand Pump	07.00	Impacted fully	47/650			
6	Hand Pump	07.00	Impacted fully	47/960			
7	Hand Pump	08.50	Impacted fully	48/295			
8	Hand Pump	08.00	Impacted fully	48/435			
10				48/470	07.00	Hand Pump	Impacted fully
11				49/420	07.00	Hand Pump	Impacted fully
12	Hand Pump	12.00	No Impact	49/560			
13				49/660	07.00	Hand Pump	Impacted fully
14	Hand Pump	09.00	Impacted fully	49/860			
15				50/430	08.00	Hand Pump	Impacted fully
16	Hand Pump	12.00	No Impact	51/170			
17				53/230	09.00	Hand Pump	Impacted fully
18				55/250	07.00	Hand Pump	Impacted fully
19				55/420	12.00	Hand Pump	
20				55/630	05.00	Hand Pump	Impacted fully
21	Hand Pump	08.00	Impacted fully	57/650			
22	Hand Pump	08.00	Impacted fully	58/150			
23	Hand Pump	12.00	No Impact	58/530			
24				58/670	09.00	Hand Pump	Impacted

LHS			Impact	Chainage	RHS		Impact
S. No.	Name of the CPR	Distance from C/L			Distance from C/L	Name of the CPR	
							fully
25	Hand Pump	10.00	Impacted fully	58/900			
26				59/810	10.00	Hand Pump	Impacted fully
27				60/300	08.00	Hand Pump	Impacted fully
28				60/490	08.00	Hand Pump	Impacted fully
29				62/100	08.00	Hand Pump	Impacted fully
30				62/610	11.00	Hand Pump	
31	Hand Pump	09.00	Impacted fully	62/750			
32	Hand Pump	05.00	Impacted fully	65/490			
33	Hand Pump	11.00	No Impact	65/880			
34	Hand Pump	11.00	No Impact	66/110			

List of Wells and Bore Wells and Extent of Impact due to upgrading Madapattu – Thirukovilur Section of SH 09 and Construction of a New Link Road between SH 09 and SH 137:

LHS			Impacts	Chainage	RHS		Impacts
S. No.	Name of the CPR	Distance from C/L			Distance from C/L	Name of the CPR	
1				41/700	20.00	Irrigation Bore Well + Electric motor	No Impact
2	Irrigation Bore Well + Electric motor	14.00	No Impact	42/900			
3				45/850	07.50	Irrigation Bore Well + Electric motor	Impacted Fully
4				49/440	08.00	Bore Well +Electric Motor	Impacted Fully
5	Irrigation Bore Well + Electric motor	12.00	No Impact	55/540			
6				55/730	12.50	Irrigation Bore Well + Electric motor	No Impact
7	Irrigation Bore Well + Electric motor	12.00	No Impact	55/920			
8	Irrigation Bore	10.00	Impact	56/790			

LHS			Impacts	Chainage	RHS		Impacts
S. No.	Name of the CPR	Distance from C/L			Distance from C/L	Name of the CPR	
	Well + Electric motor		ed Fully				
9	Irrigation Bore Well + Electric motor	13.00	No Impact	56/920			
10				57/200	08.00	Irrigation Bore Well + Electric motor	Impacted Fully
11	Drinking Bore Well+ Electric motor	12.00	No Impact	58/150			
12	Irrigation Bore Well + Electric motor	10.00	No Impact	64/360			
13				64/800	04.50	Irrigation Bore Well + Electric motor	Impacted Fully
14	Drinking Bore Well+ Electric motor	08.00	Impacted Fully	64/820			
15				65/470	06.00	Irrigation Bore Well + Electric motor	Impacted Fully
16				66/560	11.00	Irrigation Bore Well + Electric motor	No Impact
17	Irrigation Bore Well + Electric motor	10.00	Impacted Fully	67/500			
18				69/560	09.00	Irrigation Bore Well + Electric motor	Impacted Fully
19				75/400	07.00	Panchayathi Bore Well + Electric motor	Impacted Fully

List of Public Taps and Extent of Impact due to upgrading Madapattu – Thirukovilur Section of SH 09 and Construction of a New Link Road between SH 09 and SH 137:

LHS			Impacts	Chainage	RHS		Impacts
S. No.	Name of the CPR	Distance from C/L			Distance from C/L	Name of the CPR	
1	Public Tap	15.00	No Impact	42/370			
2	Public Tap	10.00	Fully Impacted	42/600			
3	Public Tap	10.00	Fully Impacted	44/580			
4				45/450	08.00	Public Tap	Fully Impacted

S. No.	LHS		Impacts	Chainage	Distance from C/L	RHS		Impacts
	Name of the CPR	Distance from C/L				Name of the CPR		
5				45/460	08.00	Public Tap	Fully Impacted	
6				45/420	09.00	Public Tap	Fully Impacted	
7				45/550	09.00	Public Tap	Fully Impacted	
8				45/630	07.00	Public Tap	Fully Impacted	
9				45/670	04.50	Public Tap	Fully Impacted	
10				45/680	04.00	Public Tap	Fully Impacted	
11				45/730	04.50	Public Tap	Fully Impacted	
12				45/740	05.00	Public Tap	Fully Impacted	
13				45/750	04.00	Public Tap	Fully Impacted	
14				45/930	07.00	Public Tap	Fully Impacted	
15				46/025	06.00	Public Tap	Fully Impacted	
16				46/070	10.00	Public Tap	Fully Impacted	
17	Public Tap	07.00	Fully Impacted	48/080				
18	Public Tap	10.00	Fully Impacted	48/435				
19	Public Tap	12.00	No Impact	48/660				
20				49/250	12.00	Public Tap		
21				49/440	08.00	Public Tap	Fully Impacted	
22				49/665	06.50	Public Tap	Fully Impacted	
23				50/005	07.00	Public Tap	Fully Impacted	
24				50/020	07.00	Public Tap	Fully Impacted	
25				50/040	07.00	Public Tap	Fully Impacted	
26				50/200	12.00	Public Tap	No Impact	
27				53/230	09.00	Public Tap	Fully Impacted	

S. N o.	LHS		Impacts	Chaina ge	Dista nce from C/L	RHS		Impacts
	Name of the CPR	Dista nce from C/L				Name of the CPR		
28				58/050	09.00	Public Tap	Fully Impacted	
29				58/080	10.00	Public Tap	Fully Impacted	
30	Public Tap	10.00	Fully Impacted	58/230				
31				58/260	08.00	Public Tap	Fully Impacted	
32				58/420	07.00	Public Tap	Fully Impacted	
33				58/540	08.00	Public Tap	Fully Impacted	
34				58/650	07.00	Public Tap	Fully Impacted	
35	Public Tap	08.00	Fully Impacted	58/680				
36	Public Tap	09.00	Fully Impacted	58/750				
37				58/820	10.00	Public Tap	Fully Impacted	
38				59/810	07.00	Public Tap	Fully Impacted	
39				60/130	05.00	Public Tap	Fully Impacted	
40				60/320	05.00	Public Tap	Fully Impacted	
41				62/380	08.00	Public Tap	Fully Impacted	
42				62/450	07.00	Public Tap	Fully Impacted	
43	Public Tap	07.00	Fully Impacted	62/670				
44	Public Tap	08.00	Fully Impacted	62/750				
45				65/470	08.00	Public Tap	Fully Impacted	
46				65/62	07.00	Public Tap	Fully Impacted	
47	Public Tap	07.00	Fully Impacted	65/800				
48				65/860	07.00	Public Tap	Fully Impacted	
49				66/020	07.00	Public Tap	Fully Impacted	
50				66/100	07.00	Public Tap	Fully	

LHS			Impacts	Chainage	RHS		Impacts
S. No.	Name of the CPR	Distance from C/L			Distance from C/L	Name of the CPR	
							Impacted
51	Public Tap	11.00	No Impact	66/113			
52	Public Tap	07.50	Fully Impacted	66/180			
53				66/200	12.00	Public Tap	No Impact

List of Religious Structures and extent of impact due to upgrading Madapattu – Thirukovilur Section of SH 09 and Construction of a New Link Road between SH 09 and SH 137:

LHS			Impact	Chainage	RHS		Impact
S. No.	Name of the CPR	Distance from C/L (m)			Distance from C/L (m)	Name of the CPR	
1	Temple	28.00	No Impact	38+690			
2	Temple	20.00	No Impact	42+370			
3	Hindu Cultural Complex	08.00	Impacted partially	45+010			
4	Mary-Matha Statue	12.00	No Impact	45+365			
				45+400	11.00	Church	No Impact
5	Hindu Cultural Statues	07.00	Impacted fully	45+850			
6				49+480	10.50	Temple	Impacted partially
7				49+495	10.50	Mariyamma Temple	Impacted Partially
8	Balaji Temple	10.00	Impacted partially	49+640			
9				49+970	07.50	Shiva Statue	Impacted Partially
10	Vinayak Temple	09.00	Impacted partially	50+800			
11	Murugan Temple	12.00	No impact	53+600			
12	Temple	12.00	No Impact	55+250			
13				55+670	07.00	Murugan Temple	Impacted Partially
14	Mariyamma Temple	10.00	Impacted partially	58+550			
15	Mariyamma Temple	12.00	Impacted partially	58+880			

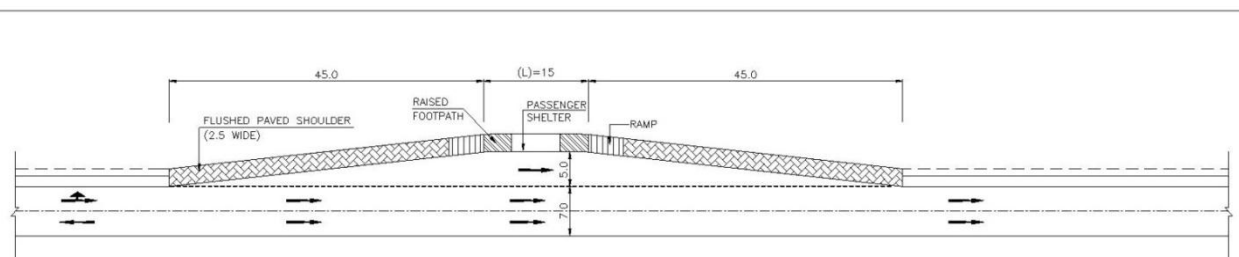
LHS			Impact	Chainage	RHS		Impact
S. No.	Name of the CPR	Distance from C/L (m)			Distance from C/L (m)	Name of the CPR	
16	Vinayaka Temple	07.00	Impacted partially	59+100			
17				59+700	12.00	Temple	No Impact
18				59+870	11.00	Church	No Impact
19				61+670	11.00	Mariyamma Temple	No Impact
20				62+650	11.00	EAD-GA	No Impact
21	Mary – Matha Statue	11.00	No Impact	64+370			
22				64+410	09.00	Mary – Matha Church	Impacted partially
23	Mariyamma Temple	09.00	Impacted partially	64+470			
24				64+920	04.00	Temple	Impacted Fully
25	Anjaneya Statue	07.00	Impacted Fully	64+460			
26	Vinayaka Temple	07.00	Impacted Fully	65+650			
27	Vinayaka Temple	11.00	No Impact	66+000			

ANNEXURE 5.47 BUS STOPS AND BUS BAYS, IMPACT, MITIGATION AND ENHANCEMENTS

Proposed locations of Bus Bays and Passenger Shelters:

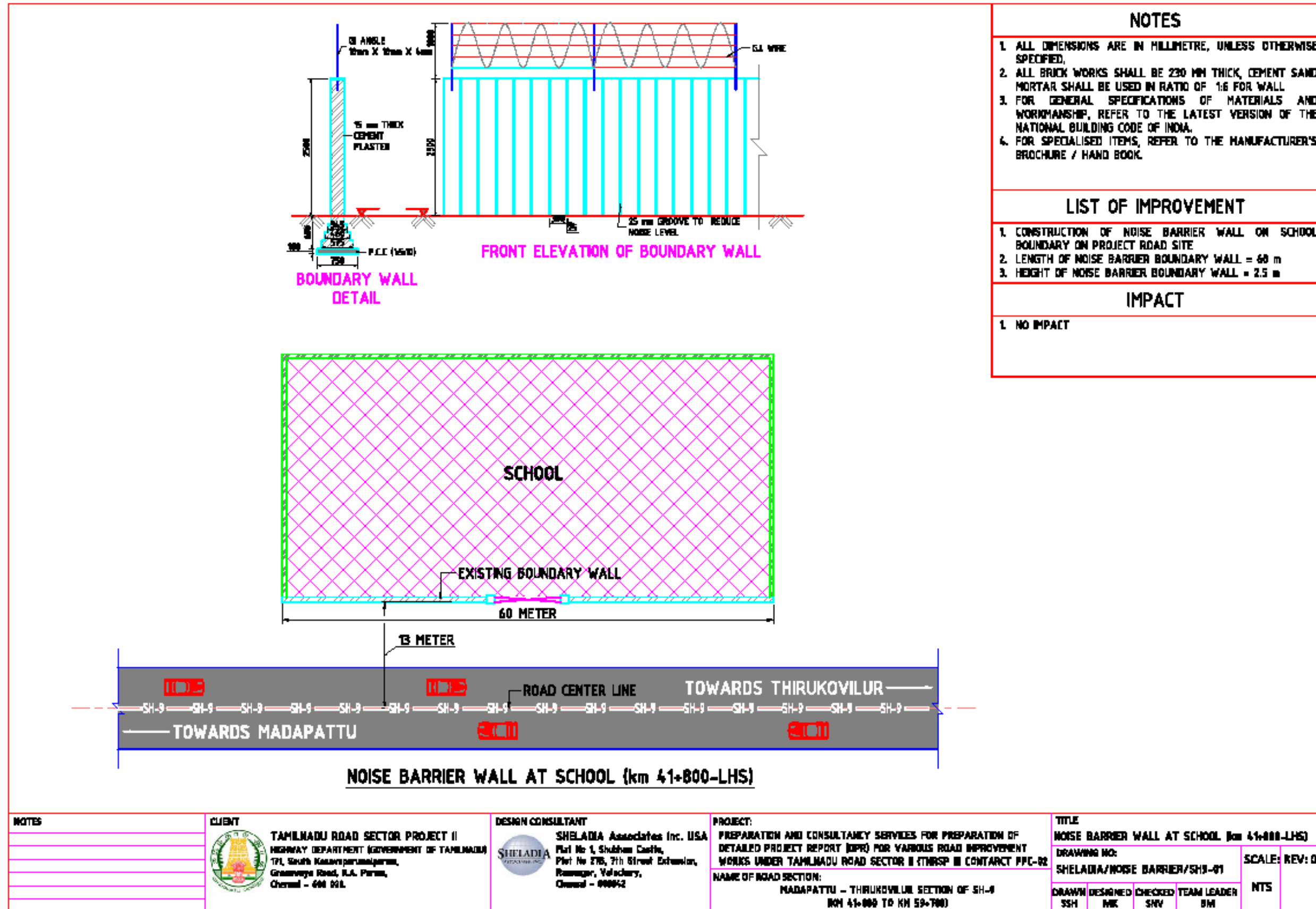
S.No.	Design Chainage	Side	Village Name
1	45+430	RHS	Madapattu
2	45+510	LHS	
3	48+050	LHS	Kothanur
4	48+220	RHS	
5	49+350	LHS	Periyasevalai
6	49+850	RHS	
7	55+190	RHS	Pavandhur
8	55+360	LHS	
9	57+420	RHS	Pennaivalam
10	57+610	LHS	
11	58+700	RHS	Ammavasai palayam
12	58+800	LHS	
13	60+200	LHS	T.Kunnattur
14	60+300	RHS	
15	62+100	LHS	Edapalyam
16	62+270	RHS	
17	64+400	LHS	Muthalur
18	64+400	RHS	
19	65+830	LHS	Kolapakkam
20	65+900	RHS	

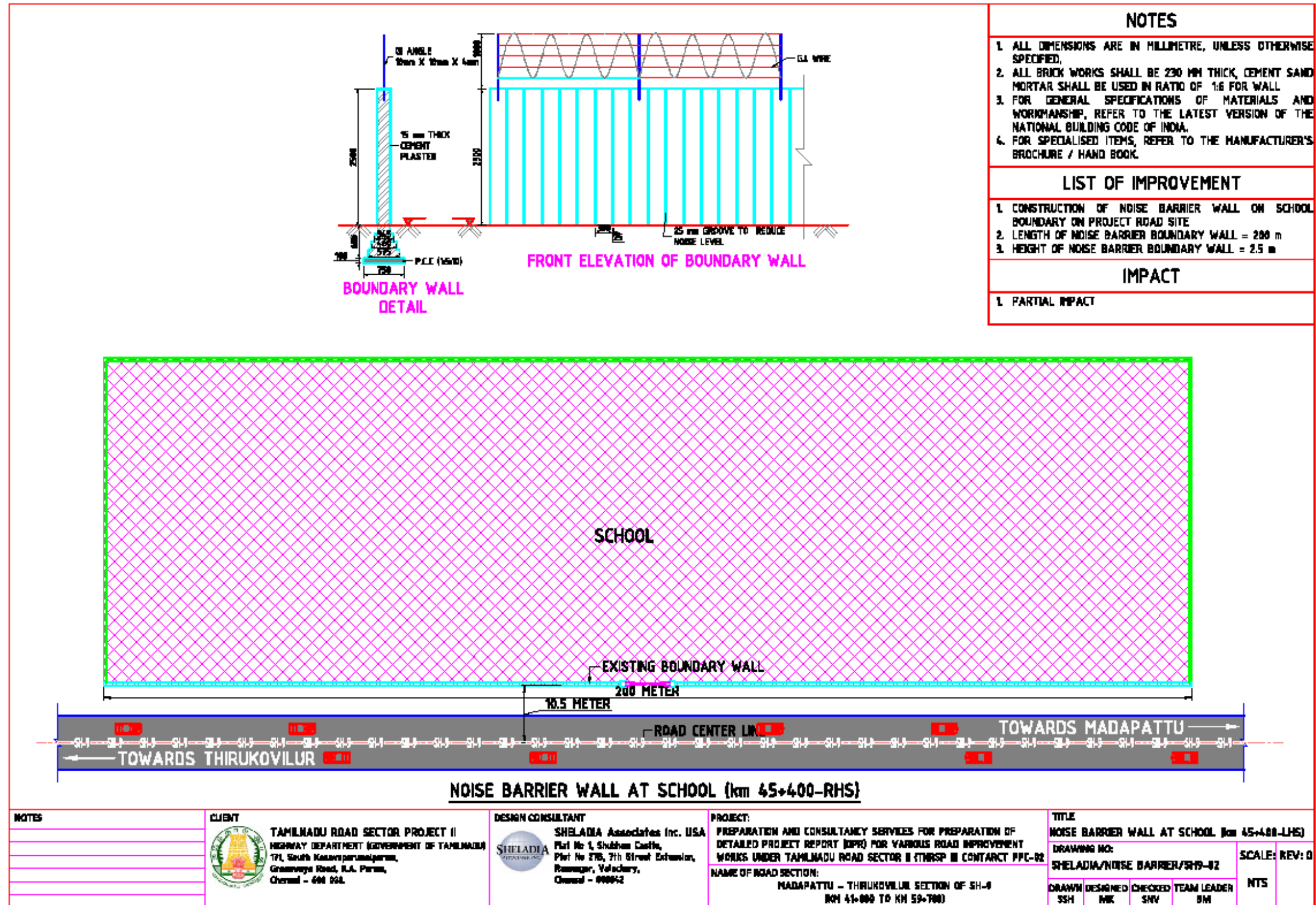
Typical Layout of Bus Bay



ANNEXURE 5.48 SCHEDULE AND SPECIFICATIONS FOR SITE SPECIFIC NOISE SENSITIVE RECEPTOR

S N	Details of Enhancement Measures	Location (Chainage)	Length (m)	Width	Height (m)	Materials to used (Specification)	Typical Drawing (refer Drawing No)	Additional details about site specific enhance measure
1	Noise Barrier wall on School	41+800 (LHS)	60	23 mm	2.5	Bricks, Concrete wall & GI wire	Sheladia/ Noise Barrier/S H9-01	Wall height increase and GI wire fencing on top
2	Noise Barrier wall on School	45+400 (RHS)	200	23 mm	2.5	Bricks, Concrete wall & GI wire	Sheladia/ Noise Barrier/S H9-02	Wall height increase and GI wire fencing on top
3	Noise Barrier wall on School	47+500 (LHS)	100	23 mm	2.5	Bricks, Concrete wall & GI wire	Sheladia/ Noise Barrier/S H9-03	Wall height increase and GI wire fencing on top
4	Noise Barrier wall on School	47+900 (RHS)	60	23 mm	2.5	Bricks, Concrete wall & GI wire	Sheladia/ Noise Barrier/S H9-04	Wall height increase and GI wire fencing on top
5	Noise Barrier wall on School	50+300 (LHS)	60	23 mm	2.5	Bricks, Concrete wall & GI wire	Sheladia/ Noise Barrier/S H9-05	Wall height increase and GI wire fencing on top
6	Noise Barrier wall on School	58+300 (LHS)	50	23 mm	2.5	Bricks, Concrete wall & GI wire	Sheladia/ Noise Barrier/S H9-06	Wall height increase and GI wire fencing on top
7	Noise Barrier wall on School	59+700 (RHS)	250	23 mm	2.5	Bricks, Concrete wall & GI wire	Sheladia/ Noise Barrier/S H9-07	Wall height increase and GI wire fencing on top





NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRE, UNLESS OTHERWISE SPECIFIED,
2. ALL BRICK WORKS SHALL BE 230 MM THICK, CEMENT SAND MORTAR SHALL BE USED IN RATIO OF 1:6 FOR WALL
3. FOR GENERAL SPECIFICATIONS OF MATERIALS AND WORKMANSHIP, REFER TO THE LATEST VERSION OF THE NATIONAL BUILDING CODE OF INDIA.
4. FOR SPECIALISED ITEMS, REFER TO THE MANUFACTURER'S BROCHURE / HAND BOOK.

LIST OF IMPROVEMENT

1. CONSTRUCTION OF NOISE BARRIER WALL ON SCHOOL BOUNDARY ON PROJECT ROAD SITE
2. LENGTH OF NOISE BARRIER BOUNDARY WALL = 200 m
3. HEIGHT OF NOISE BARRIER BOUNDARY WALL = 2.5 m

IMPACT

1. PARTIAL IMPACT

NOTES

CLIENT

	TAMILNADU ROAD SECTOR PROJECT II HIGHWAY DEPARTMENT (GOVERNMENT OF TAMILNADU) TPL, South Kalanjarapuram, Greenways Road, R.A. Puram, Chennai - 600 054.
--	--

DESIGN CONSULTANT

	SHELADIA Associates Inc. USA Flat No 1, Shubham Castle, Plot No 276, 7th Street Extension, Ram Nagar, Velachery, Chennai - 600042
--	--

PROJECT:

PREPARATION AND CONSULTANCY SERVICES FOR PREPARATION OF DETAILED PROJECT REPORT (DPR) FOR VARIOUS ROAD IMPROVEMENT WORKS UNDER TAMILNADU ROAD SECTOR II (TNRSP II) CONTRACT PFC-02

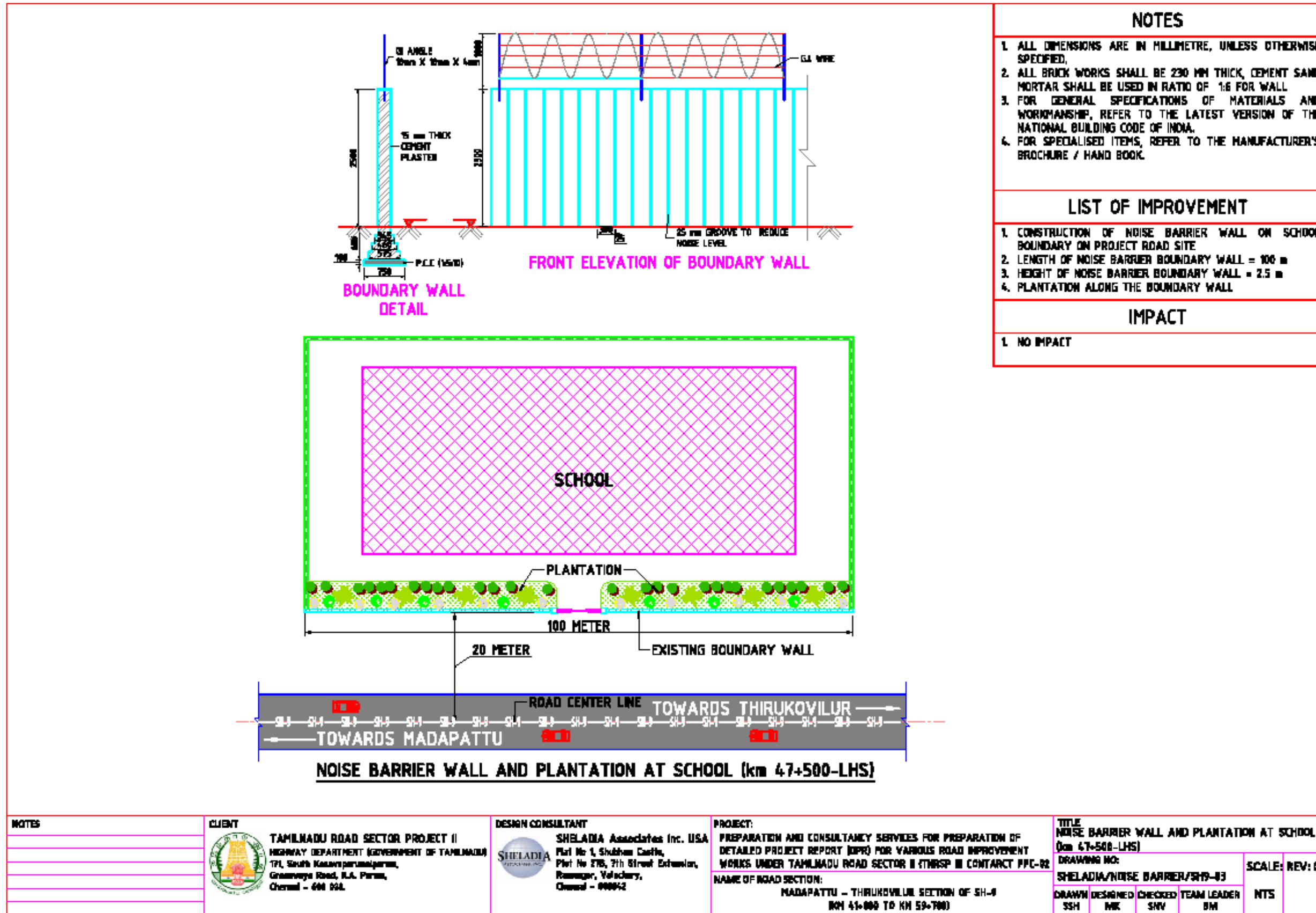
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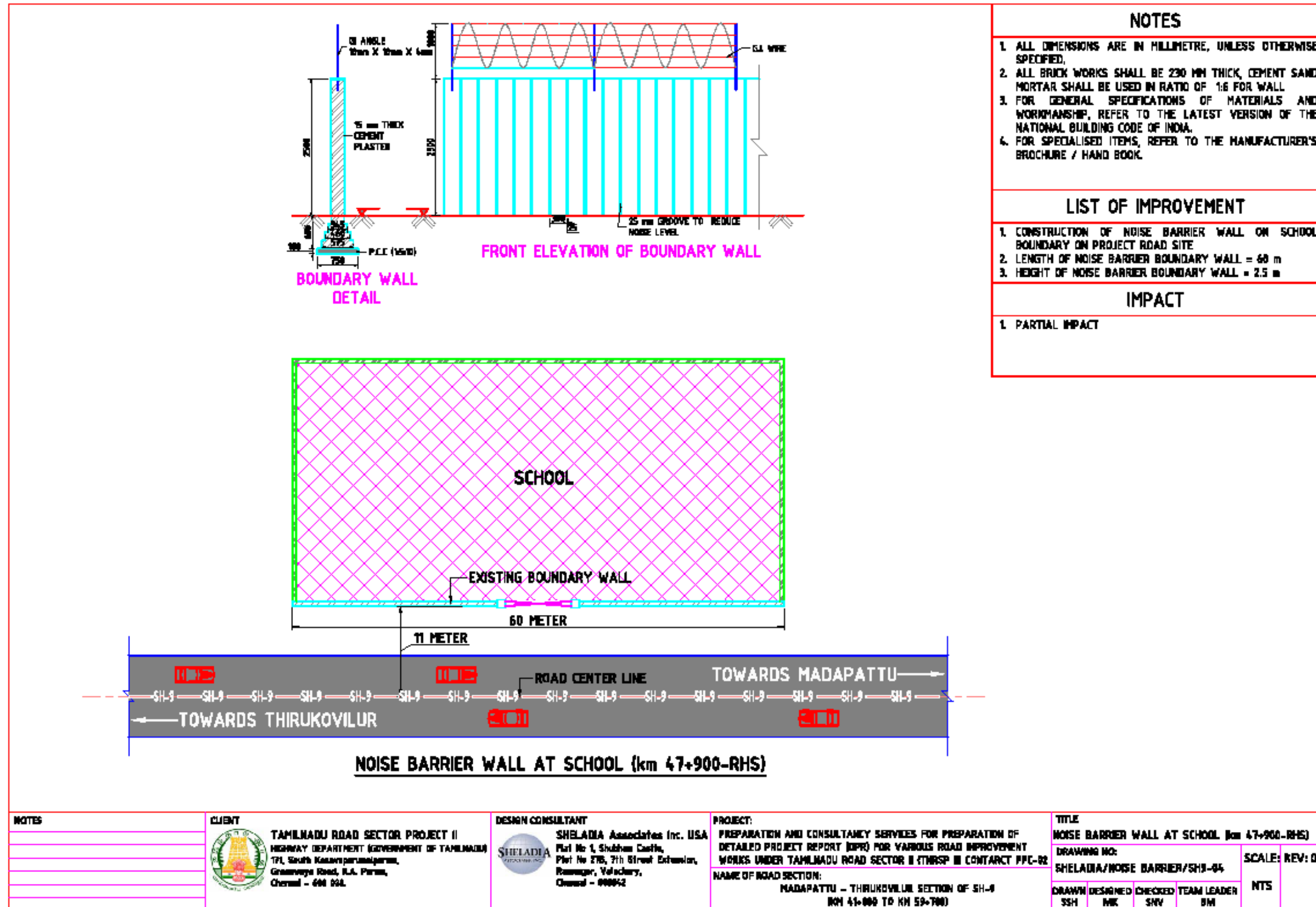
MADAPATTU - THIRUKOVILUR SECTION OF SH-9
 KM 41+000 TO KM 59+700

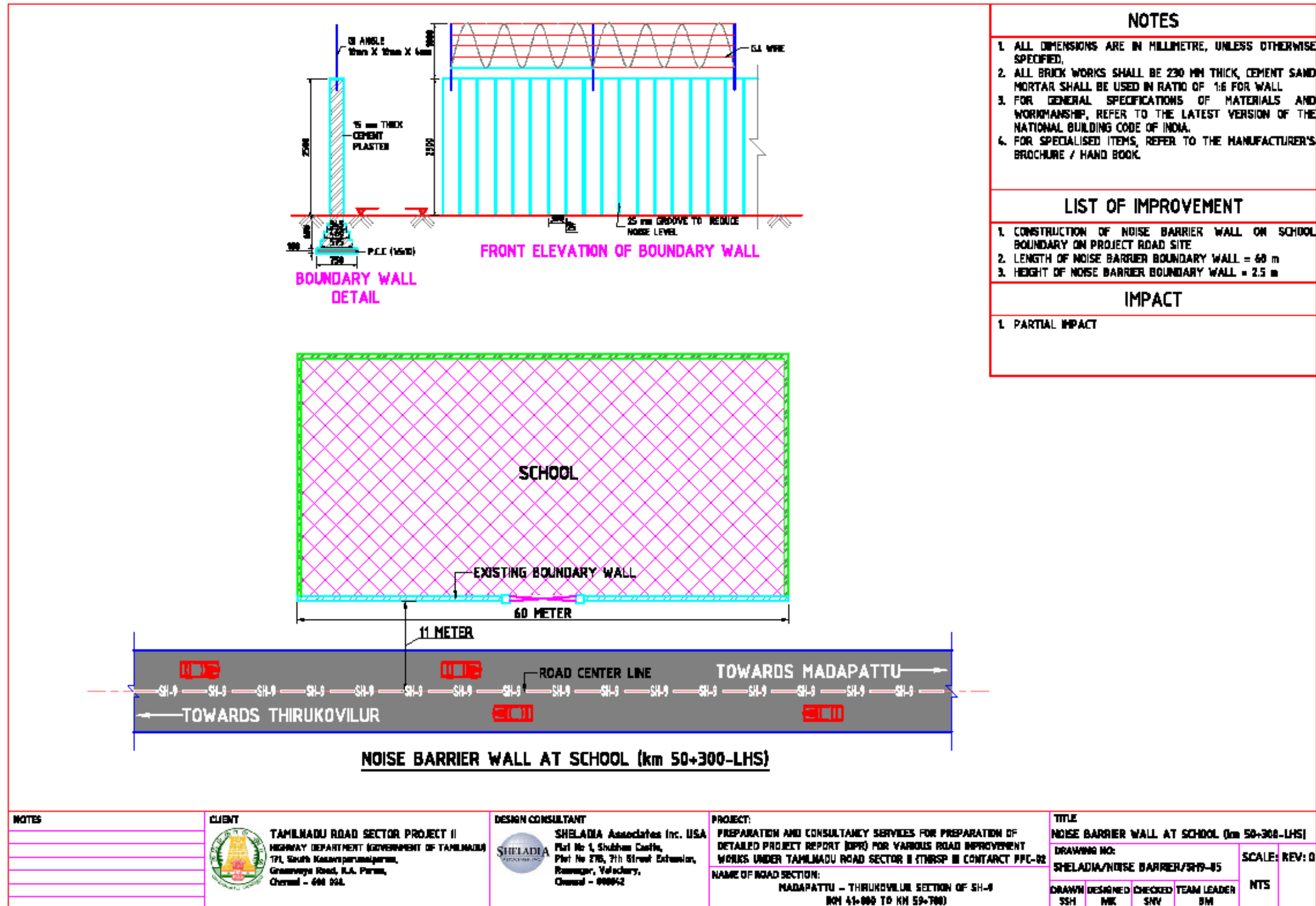
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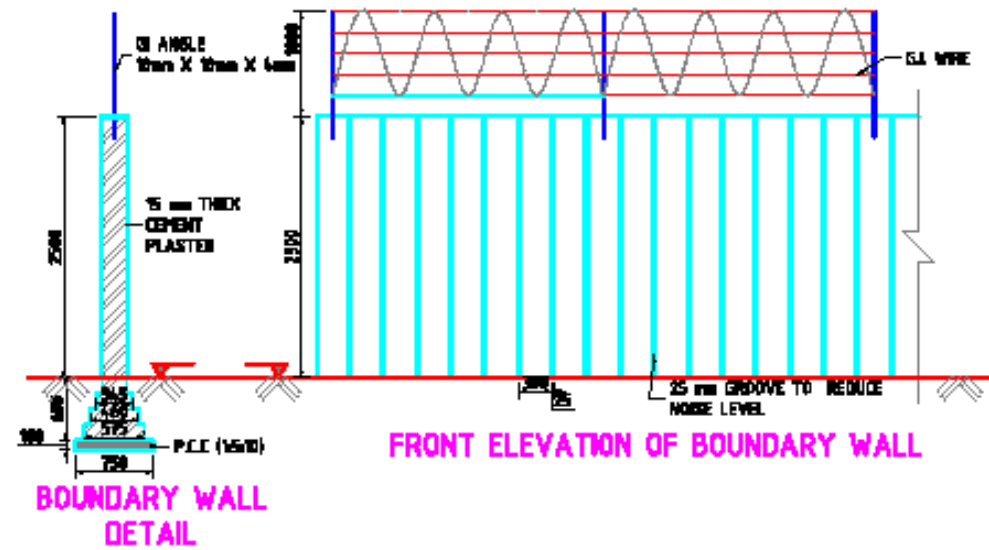
NOISE BARRIER WALL AT SCHOOL (km 45+400-LHS)

DRAWING NO:	SCALE: REV: 0
SHELADIA/NOISE BARRIER/S19-02	NTS
DRAWN DESIGNED CHECKED TEAM LEADER	
SSH MK SHV BM	





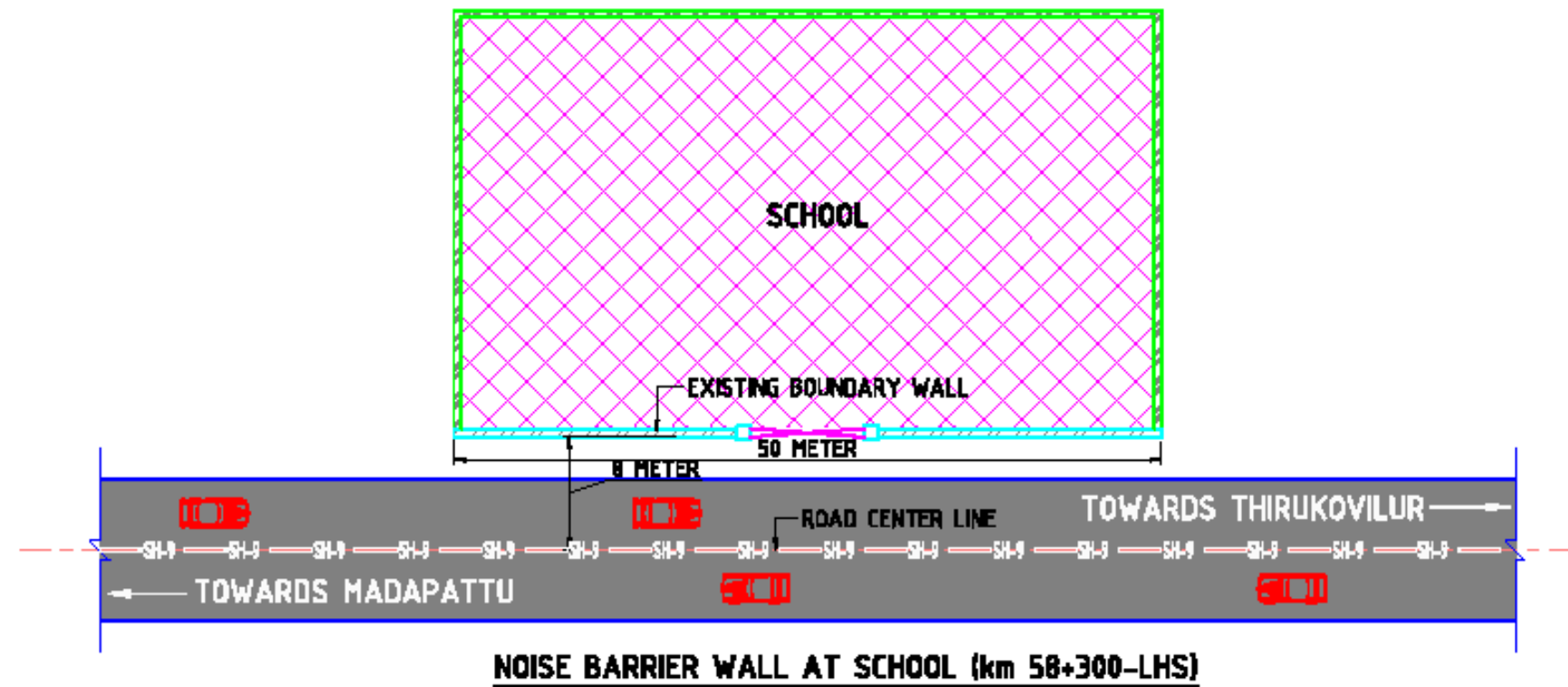




- ### NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRE, UNLESS OTHERWISE SPECIFIED,
 2. ALL BRICK WORKS SHALL BE 230 MM THICK, CEMENT SAND MORTAR SHALL BE USED IN RATIO OF 1:6 FOR WALL
 3. FOR GENERAL SPECIFICATIONS OF MATERIALS AND WORKMANSHIP, REFER TO THE LATEST VERSION OF THE NATIONAL BUILDING CODE OF INDIA.
 4. FOR SPECIALISED ITEMS, REFER TO THE MANUFACTURER'S BROCHURE / HAND BOOK.


- ### LIST OF IMPROVEMENT
1. CONSTRUCTION OF NOISE BARRIER WALL ON SCHOOL BOUNDARY ON PROJECT ROAD SITE
 2. LENGTH OF NOISE BARRIER BOUNDARY WALL = 50 m
 3. HEIGHT OF NOISE BARRIER BOUNDARY WALL = 2.5 m

- ### IMPACT
1. PARTIAL IMPACT



NOTES

CLIENT



TAMILNADU ROAD SECTOR PROJECT II
 HIGHWAY DEPARTMENT GOVERNMENT OF TAMILNADU
 7/1, South Kasimparumaiapuram,
 Greenways Road, I.A. Park,
 Chennai - 600 044.

DESIGN CONSULTANT



SHELADIA Associates Inc. USA
 Plot No 1, Shubham Castle,
 Plot No 276, 7th Street Extension,
 Rameswari, Velachery,
 Chennai - 600042

PROJECT:
 PREPARATION AND CONSULTANCY SERVICES FOR PREPARATION OF DETAILED PROJECT REPORT (DPR) FOR VARIOUS ROAD IMPROVEMENT WORKS UNDER TAMILNADU ROAD SECTOR II (TNRSP II) CONTACT PFC-02

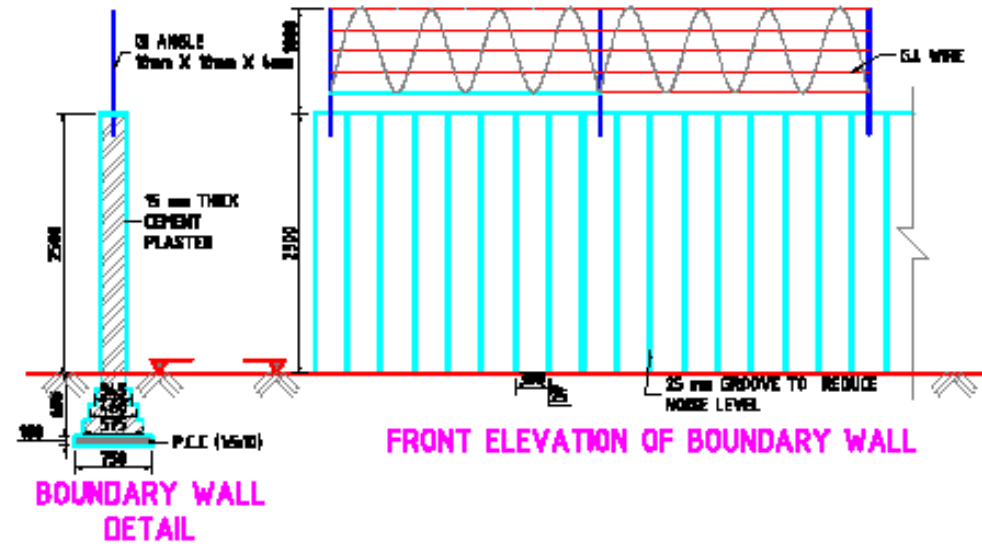
NAME OF ROAD SECTION:
 MADAPATTU - THIRUKOVILUR SECTION OF SH-9
 KM 41+000 TO KM 59+700

TITLE
 NOISE BARRIER WALL AT SCHOOL (km 58+300-LHS)

DRAWING NO:
 SHELADIA/NOISE BARRIER/SH9-07

SCALE: REV: 0

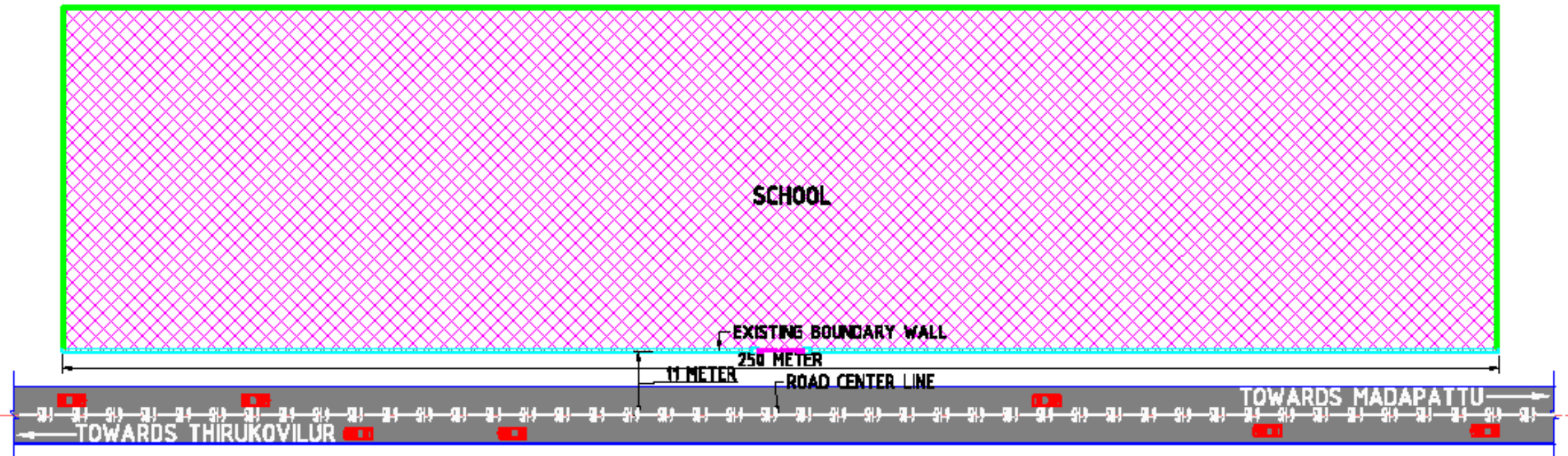
DRAWN	DESIGNED	CHECKED	TEAM LEADER	NTS
SSH	IMK	SNV	DM	





NOTES
1. ALL DIMENSIONS ARE IN MILLIMETRE, UNLESS OTHERWISE SPECIFIED.
2. ALL BRICK WORKS SHALL BE 230 MM THICK, CEMENT SAND MORTAR SHALL BE USED IN RATIO OF 1:6 FOR WALL
3. FOR GENERAL SPECIFICATIONS OF MATERIALS AND WORKMANSHIP, REFER TO THE LATEST VERSION OF THE NATIONAL BUILDING CODE OF INDIA.
4. FOR SPECIALISED ITEMS, REFER TO THE MANUFACTURER'S BROCHURE / HAND BOOK.

LIST OF IMPROVEMENT
1. CONSTRUCTION OF NOISE BARRIER WALL ON SCHOOL BOUNDARY ON PROJECT ROAD SITE
2. LENGTH OF NOISE BARRIER BOUNDARY WALL = 250 m
3. HEIGHT OF NOISE BARRIER BOUNDARY WALL = 2.5 m

IMPACT
1. PARTIAL IMPACT

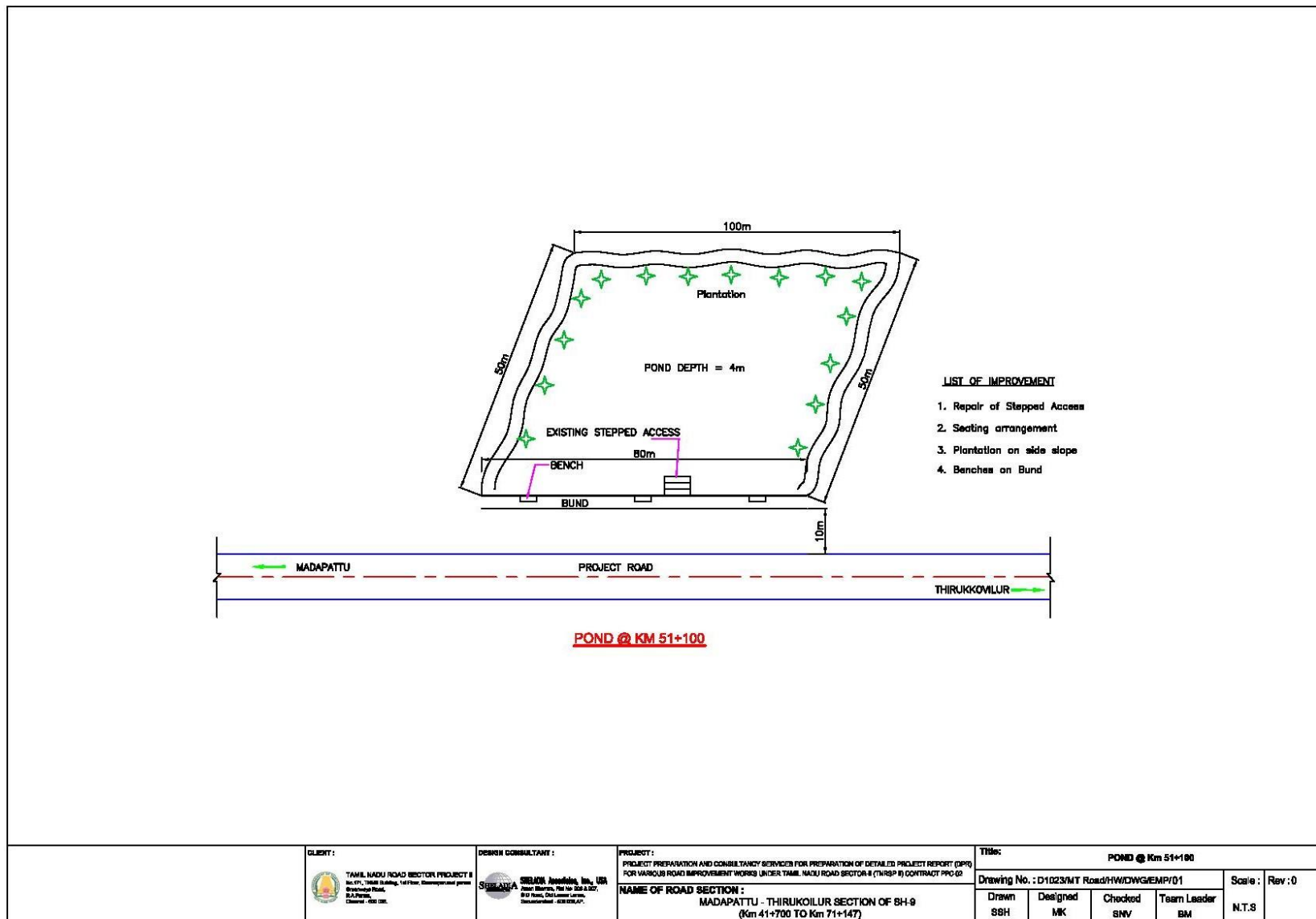


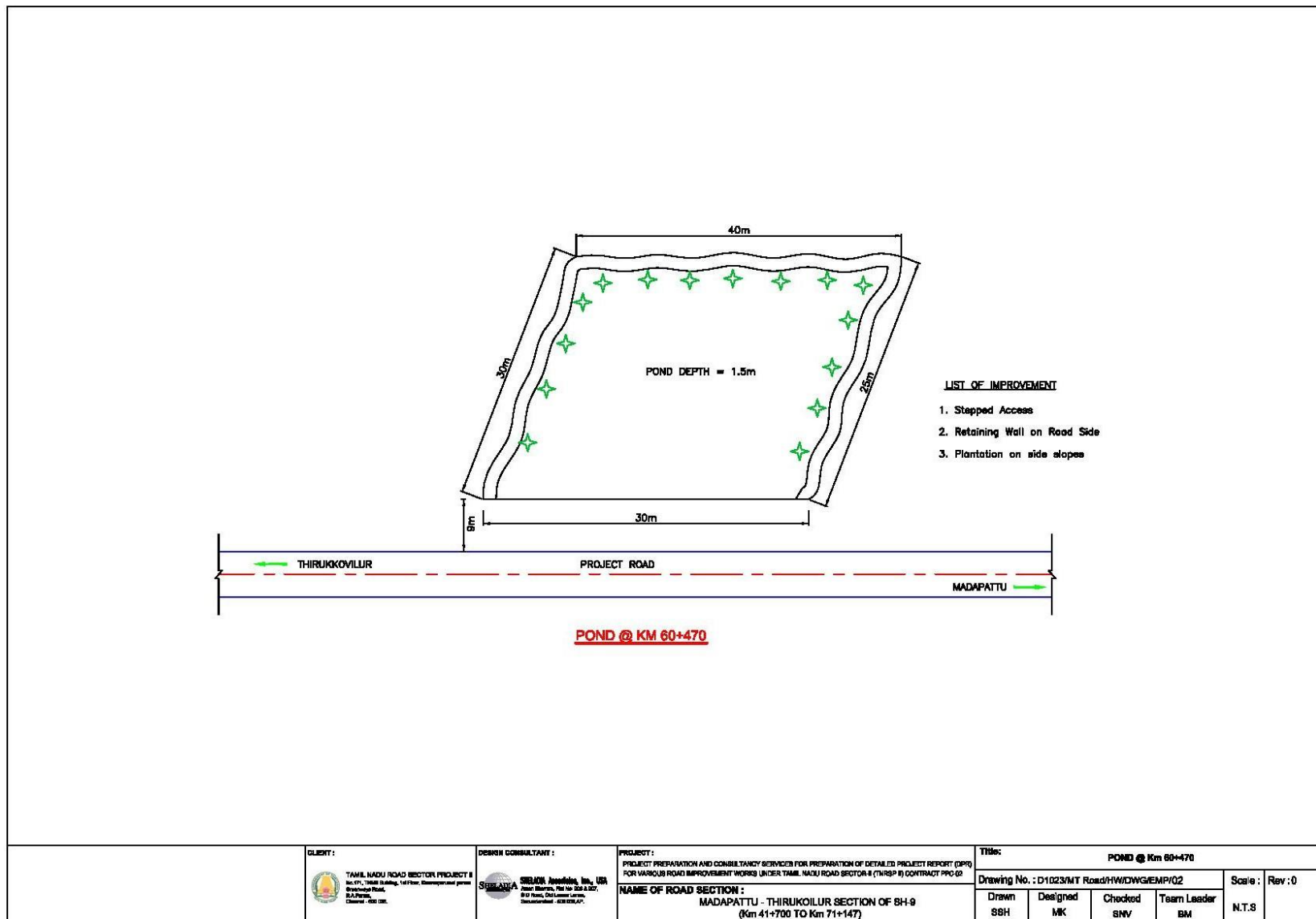
NOISE BARRIER WALL AT SCHOOL (km 59+700-RHS)

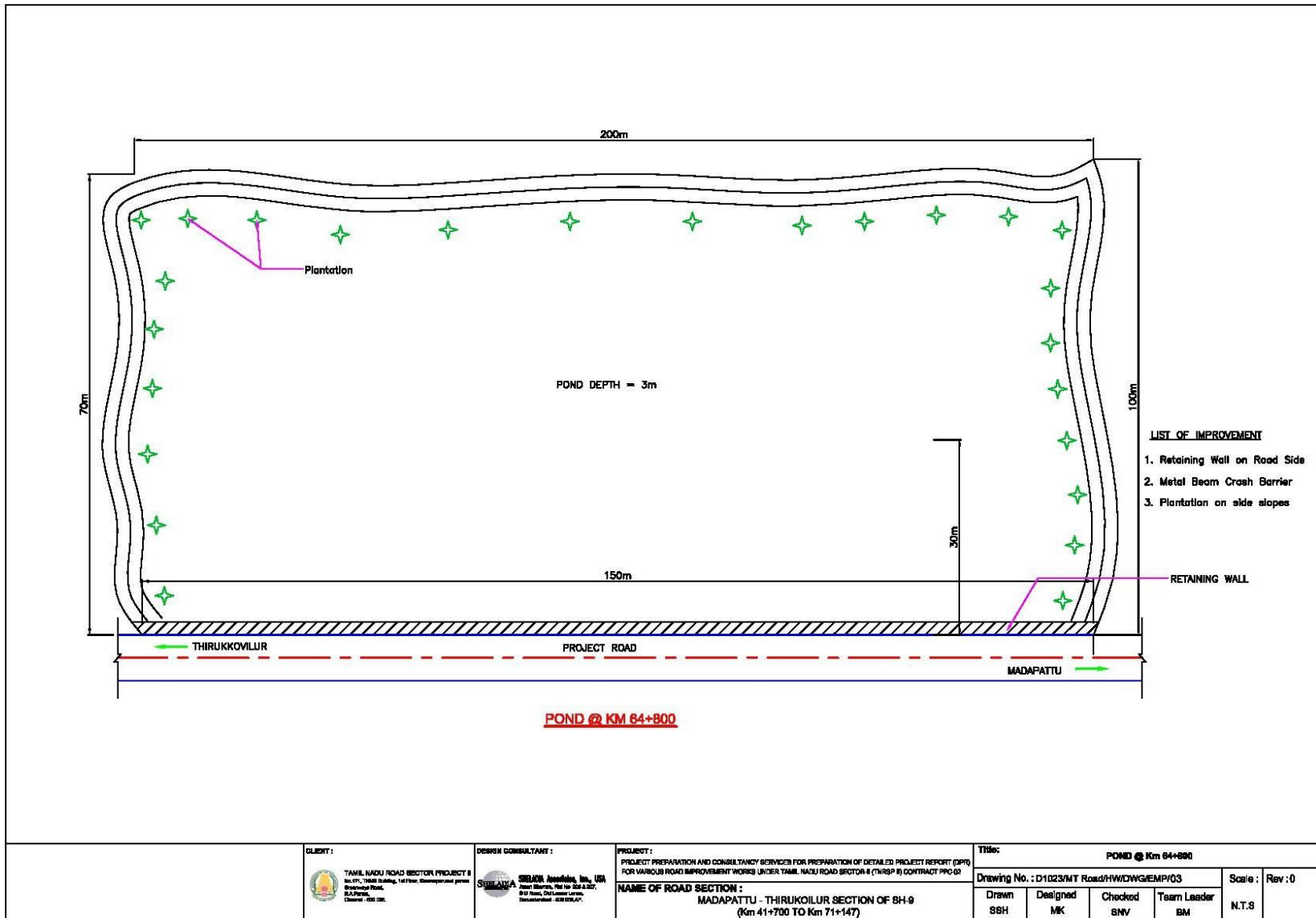
NOTES	CLIENT  TAMILNADU ROAD SECTOR PROJECT II HIGHWAY DEPARTMENT (GOVERNMENT OF TAMILNADU) TPI, South Kasavampuram, Greenway Road, S.A. Puram, Chennai - 600 044.	DESIGN CONSULTANT  SHELADIA Associates Inc. USA Flat No 1, Shubham Centre, Plot No 276, 7th Street Extension, Ram Nagar, Velachery, Chennai - 600042	PROJECT: PREPARATION AND CONSULTANCY SERVICES FOR PREPARATION OF DETAILED PROJECT REPORT (DPR) FOR VARIOUS ROAD IMPROVEMENT WORKS UNDER TAMILNADU ROAD SECTOR II (TNRSP II) CONTACT PFC-02 NAME OF ROAD SECTION: MADAPATTU - THIRUKOVILUR SECTION OF SH-09 (KM 44+000 TO KM 59+700)	TITLE NOISE BARRIER WALL AT SCHOOL (km 59+700-RHS)	
				DRAWING NO: SHELADIA/NOISE BARRIER/S19-01	SCALE: REV: 0
				DRAWN: SSM DESIGNED: MK CHECKED: SHV TEAM LEADER: BM	NTS

ANNEXURE 5.49 SCHEDULE AND SPECIFICATIONS FOR PROPOSED WATER BODIES ENHANCEMENT MEASURES & MITIGATION MEASURES

S. No	Details of Enhancement Measures	Location (Chainage)	Length (m)	Width (m)	Depth(m)	Materials to used (Specification)	Typical Drawing (refer Drawing No)	Additional details about site specific enhance measure
1	Pond enhancement	51+100 (LHS)	100	50	4	Concrete GI Sheet Metal Beam	D1023/MT Road/HW/DW G/EMP01	Repair of step access Seating arrangement around trees Benches on bund Existing temple beatification
2	Pond enhancement	60+470 (RHS)	40	30	1.5	Concrete Plant	D1023/MT Road/HW/DW G/EMP02	Step access Retaining wall on road side Plantation on side slope
3	Pond enhancement	64+800 (RHS)	150	70	3	Concrete GI Sheet Metal Beam Plant	D1023/MT Road/HW/DW G/EMP03	Retaining wall Metal beam crash barrier Plantation on side slope

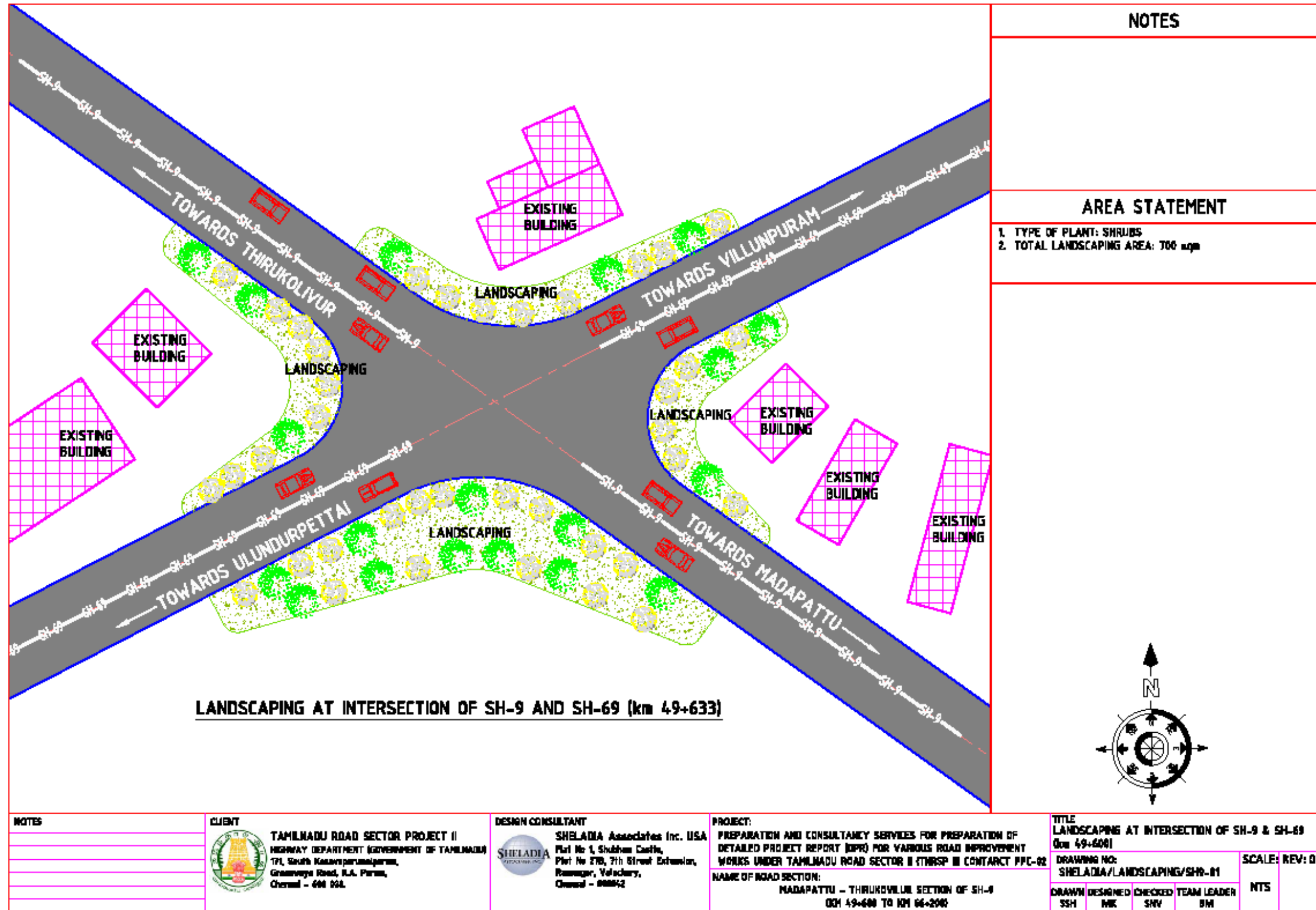






ANNEXURE 5.50 SCHEDULE AND SPECIFICATIONS FOR PROPOSED SITE OF LANDSCAPING AT INTERSECTION & REALIGNMENT LOCATIONS

S. No	Details of Enhancement Measures	Location (Chainage)	Area (sq m)	Materials to used (Specification)	Typical Drawing (refer Drawing No)	Additional details about site specific enhance measure
1	Landscaping at Intersection of SH09 & SH69	km 49+633	700	Shrub	Sheladia/Landscaping/SH9-01	Shrub plantation at intersection
2	Landscaping at Intersection of SH09 & SH137 (Link Road)	66+200	300	Shrub	Sheladia/Landscaping/SH9-02	Shrub plantation at intersection
3	Landscaping at realignment location	km 48+951 to km 49+141	220	Shrub	Sheladia/Realignment & Landscaping/SH9-01	Shrub plantation at realignment location
4	Landscaping at realignment location	km 64+537 to km 64+719	230	Shrub	Sheladia/Realignment & Landscaping/SH-02	Shrub plantation at realignment location



NOTES

AREA STATEMENT


1. TYPE OF PLANT: SHRUBS
2. TOTAL LANDSCAPING AREA: 700 sqm

NOTES

CLIENT

 **TAMILNADU ROAD SECTOR PROJECT II**
 HIGHWAY DEPARTMENT (GOVERNMENT OF TAMILNADU)
 171, South Kasimparanai, Chennai - 600 094.

DESIGN CONSULTANT

 **SHELADIA Associates Inc. USA**
 Plot No 4, Shubham Castle,
 Plot No 27B, 7th Street Extension,
 Ram Nagar, Velachery,
 Chennai - 600042

PROJECT:
 PREPARATION AND CONSULTANCY SERVICES FOR PREPARATION OF
 DETAILED PROJECT REPORT (DPR) FOR VARIOUS ROAD IMPROVEMENT
 WORKS UNDER TAMILNADU ROAD SECTOR II (TNRSP II) CONTRACT PFC-02

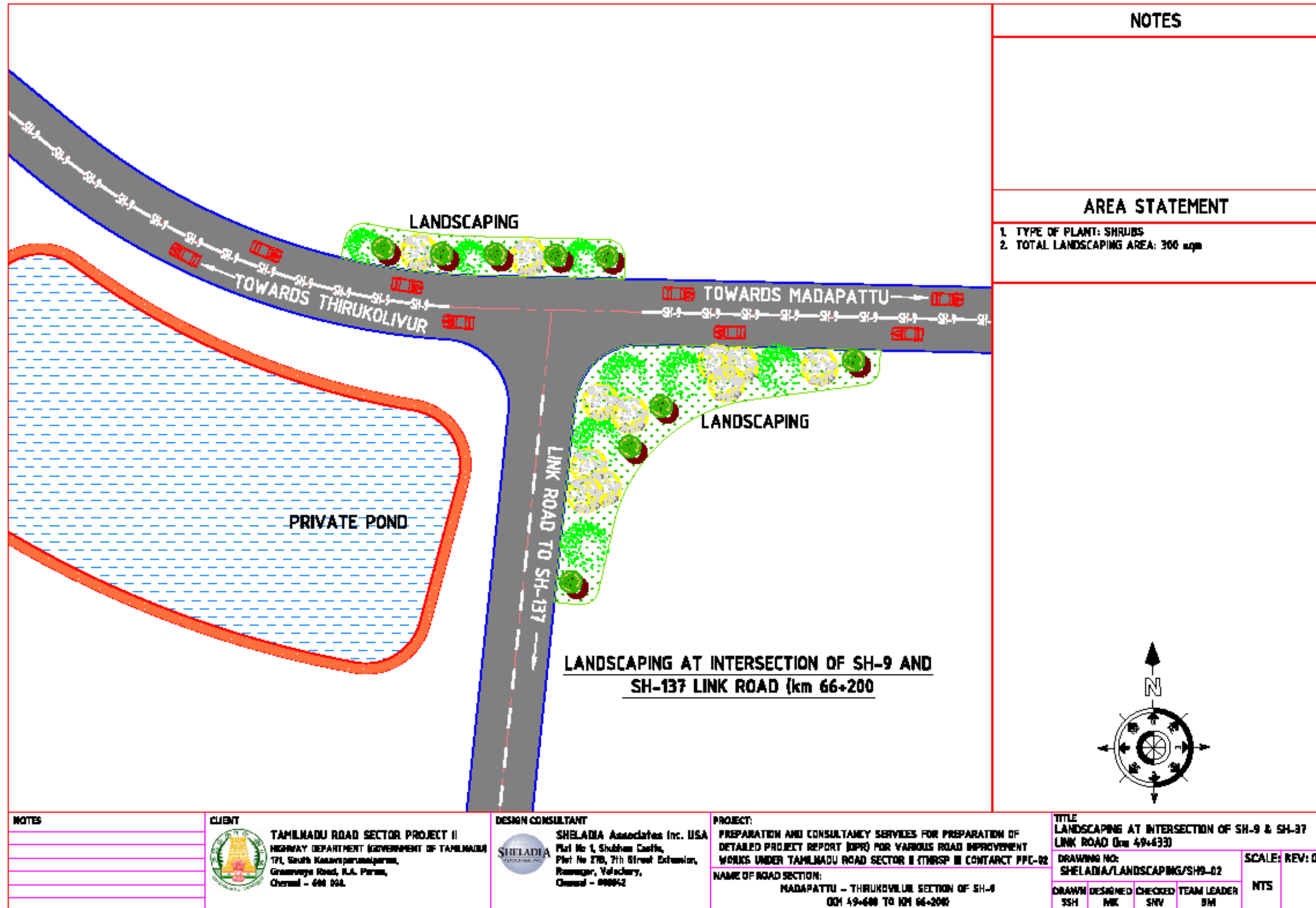
NAME OF ROAD SECTION:
 MADAPATTU - THIRUKOVILUR SECTION OF SH-9
 CHM 49+600 TO KM 66+200

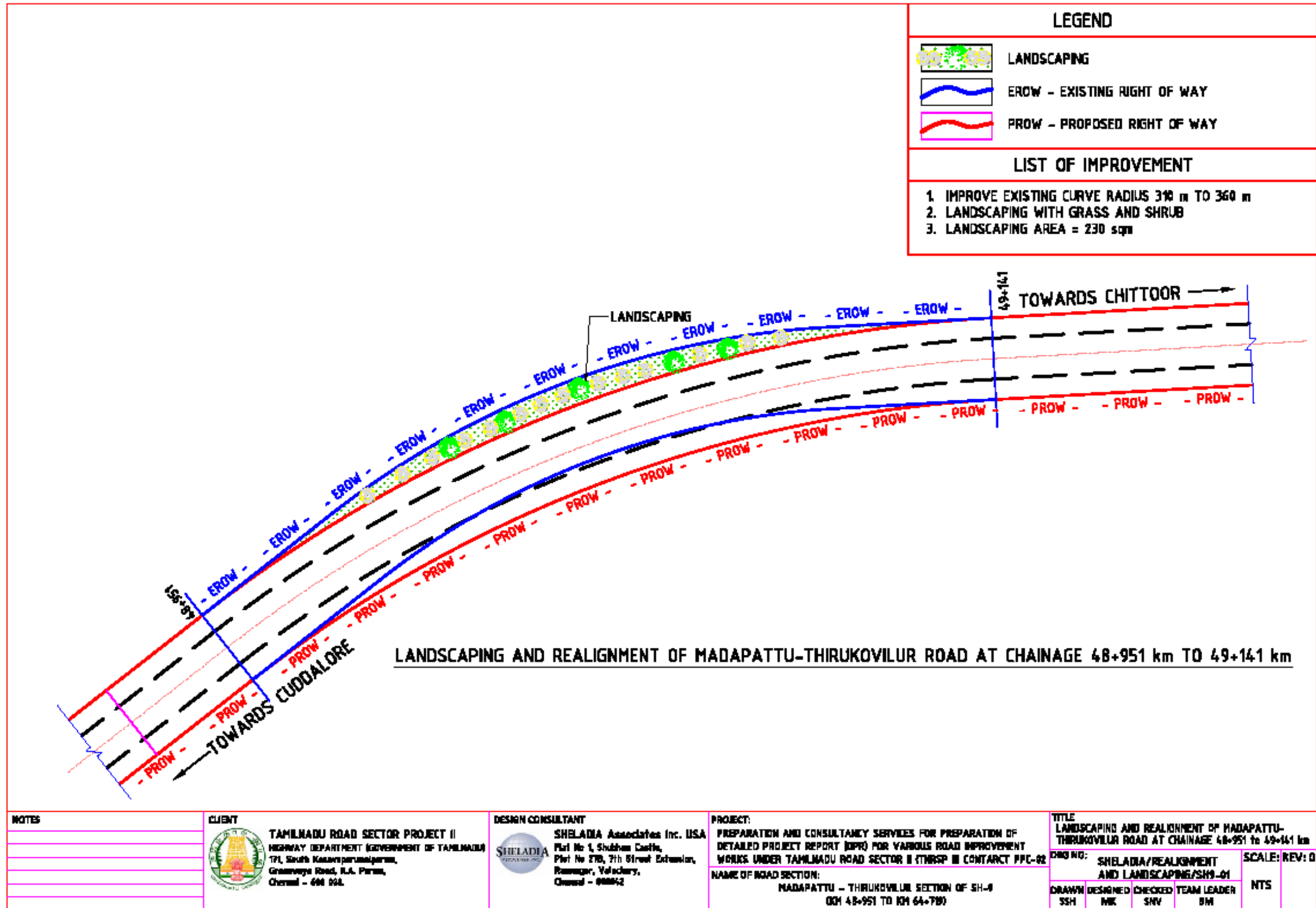
TITLE
 LANDSCAPING AT INTERSECTION OF SH-9 & SH-69
 Km 49+600

DRAWING NO:
 SHELADIA/LANDSCAPING/SHR-01

SCALE: REV: 0

DRAWN	DESIGNED	CHECKED	TEAM LEADER	NTS
SSH	MBK	SNV	BM	





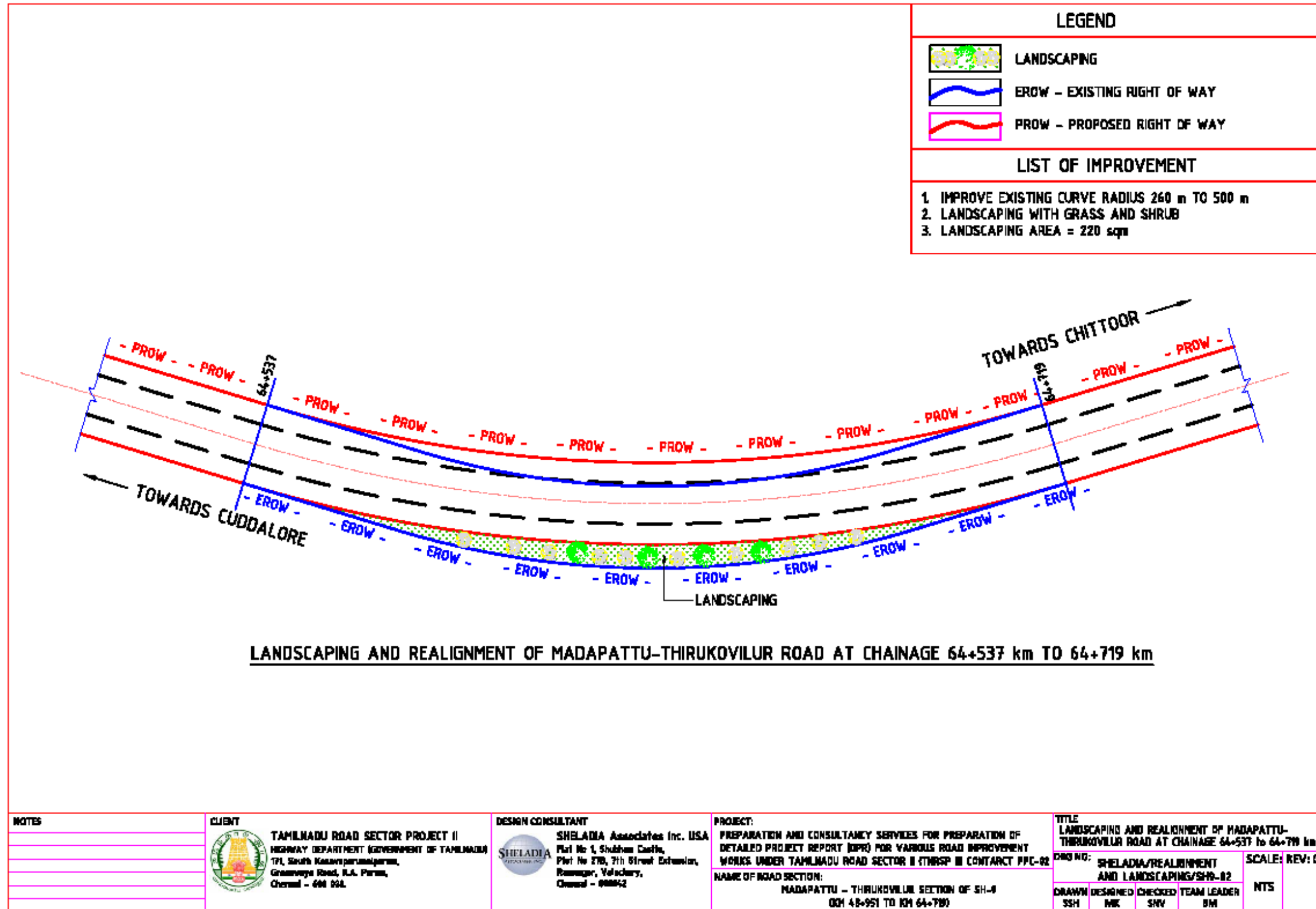
NOTES	

CLIENT	TAMILNADU ROAD SECTOR PROJECT II HIGHWAY DEPARTMENT (GOVERNMENT OF TAMILNADU) TPI, South Kanavurparamban, Greenways Road, K.A. Puram, Chennai - 600 064.
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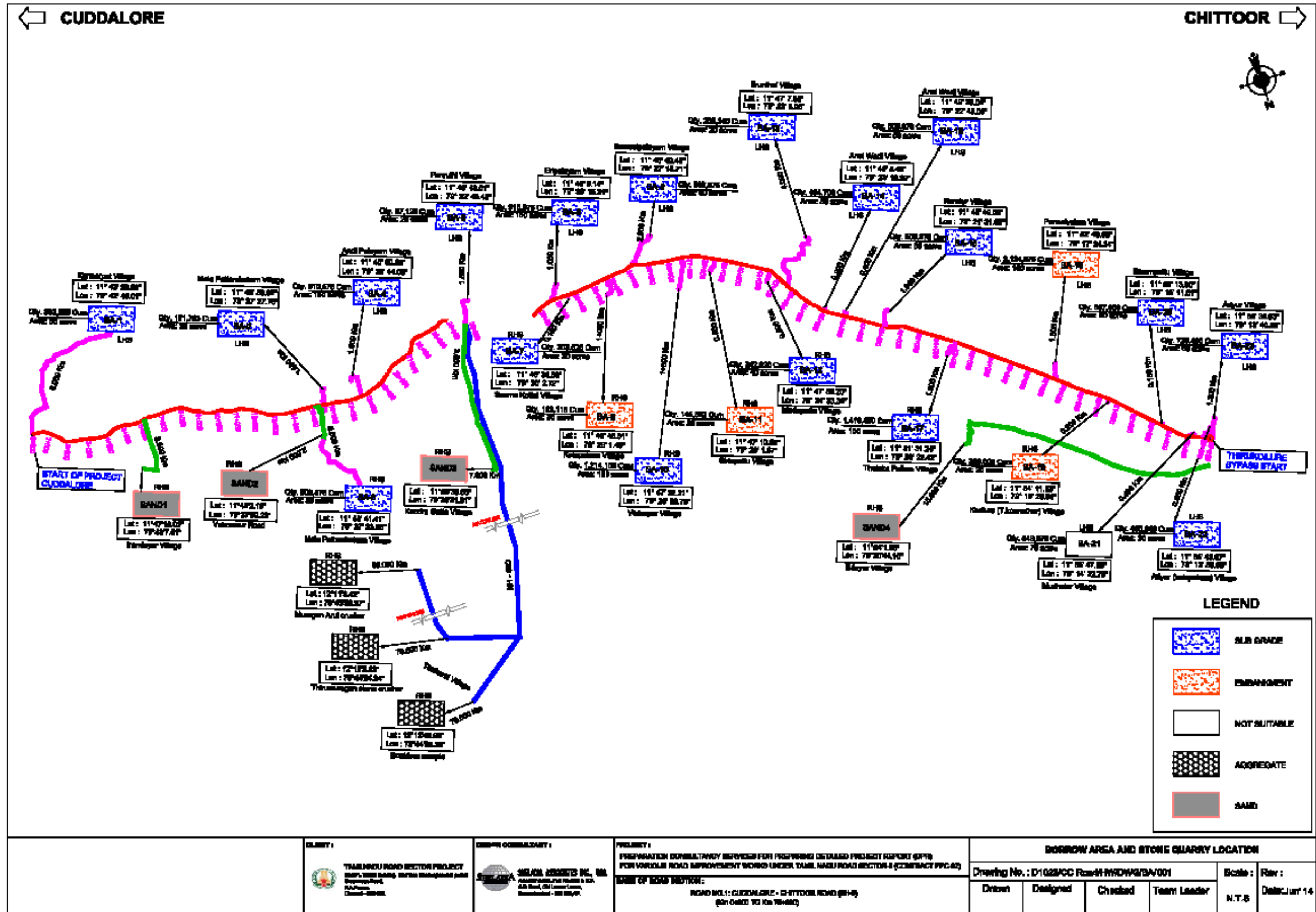
DESIGN CONSULTANT	SHELADIA Associates Inc. USA Plot No 1, Shubham Castle, Plot No 27B, 7th Street Extension, Rameswari, Velachery, Chennai - 600042
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PROJECT:	PREPARATION AND CONSULTANCY SERVICES FOR PREPARATION OF DETAILED PROJECT REPORT (DPR) FOR VARIOUS ROAD IMPROVEMENT WORKS UNDER TAMILNADU ROAD SECTOR II (TNRSP II) CONTRACT PPC-02
NAME OF ROAD SECTION:	MADAPATTU - THIRUKOVILUR SECTION OF SH-09 (CH 48+951 TO CH 64+700)

TITLE					LANDSCAPING AND REALIGNMENT OF MADAPATTU- THIRUKOVILUR ROAD AT CHAINAGE 48+951 TO 49+141 km
DWG NO:					SHELADIA/REALIGNMENT AND LANDSCAPING/SH9-01
DRAWN	DESIGNED	CHECKED	TEAM LEADER	NTS	SCALE: REV: 0
SSH	NIK	SNV	BM		



ANNEXURE 5.51 QUARRY, BORROW AREAS AND MATERIAL SOURCES AVAILABLE



MATERIAL SOURCES AVAILABLE

Description	Unit	Quantity
Borrow Earth	m3	256,710
Fine Aggregate	m3	7,133
Course Aggregate	m3	202,701
Steel	MT	485
Cement	MT	3,656
Bitumen	MT	3,891

ANNEXURE 5.52 LIST OF POLES (<30 CM DIA) WITHIN ROW RECOMMENDED FOR TRANSPLANTATION

Left Hand Side

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
1	41.7-47.8	Custard apple (pol) <10	1		1
2	LHS	Karuvai (pol) <10	5		5
3		Kodukapulli (pol) <10	1		1
4		Nura (pol) <10	3		3
	41.7-47.8 total		10		10
1	41.8-41.9	Beech (pol) <10	3		3
2	LHS	Erukan (pol) <10	4		4
3		Karuvai (15) (pol) <10	1		1
4		Katamuni (pol) <10	8		8
5		Nura (pol) <10	3		3
6		Panai maram (pol) <10	2		2
7		Veppa maram		1	1
8		Veppa maram (pol) <10	5		5
	41.8-41.9 total		26	1	27
1	41.9-42.0	Erukan (pol) <10	5		5
2	LHS	Karuvai (25) (pol) <10	1		1
3		Nura (15) (pol) <10	1		1
4		Seavandi (pol) <10	2		2
5		Veppa maram (pol) <10	10		10
	41.9-42.0 total		19		19
1	42.0-42.1	Erukan (pol) <10	12		12
2	LHS	Karuvai (30) (pol) <10	1		1
3		Katamuni (20) (pol) <10	1		1
4		Nura (24) (pol) <10	1		1
5		Panai maram (pol) <10	2		2
6		Pola kuchi (30) (pol) <10	1		1
7		Thoongumoonji (pol) <10	7		7
8		Veppa maram (20) (pol) <10	1		1
	42.0-42.1 total		26		26
1	42.1-42.2	Karuvai (30) (pol) <10	1		1
2	LHS	Karuvai (45) (pl)		1	1
3		Panai maram (pol) <10	4		4
4		Veppa maram (pol) <10	6		6
	42.1-42.2 total		11	1	12
1	42.2-42.4	Kailee (25) (pol) <10	1		1
2	LHS	Karuvai (15) (pol) <10	1		1
3		Veppa maram (pol) <10	7		7
	42.2-42.4 total		9		9

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
1	42.4-42.6	Karuvai (24) (pol) <10	1		1
2	LHS	Karuvai (45) (pol) <10	1		1
3		Panai maram (pol) <10	1		1
	42.4-42.6 total		3		3
1	42.5-42.6	Veppa maram		1	1
	42.5-42.6 total			1	1
1	42.6-42.7	Karuvai (35) (pol) <10	1		1
2	LHS	Nura (18) (pol) <10	1		1
3		Pola kuchi (30) (pol) <10	1		1
	42.6-42.7 total		3		3
1	42.7-42.8	Nura		1	1
2	LHS	Pola kuchi (pol) <10	9		9
	42.7-42.8 total		9	1	10
1	42.8-42.9	Pola kuchi (22) (pol) <10	1		1
2	LHS	Thekku (pol) <10	6		6
3		Veppa maram (pol) <10	4		4
	42.8-42.9 total		11		11
1	42.9-43.0	Erukan (pol) <10	6		6
2	LHS	Katamuni (pol) <10	4		4
3		Panai maram (pol) <10	2		2
4		Pola kuchi (40) (pol) <10	1		1
5		Veppa maram (pol) <10	6		6
	42.9-43.0 total		19		19
1	43.0-43.1	Karumpu (103) (pol) <10	1		1
2	LHS	Karuvai (20) (pol) <10	1		1
3		Nura (pol) <10	6		6
4		Veppa maram (15) (pol) <10	1		1
	43.0-43.1 total		9		9
1	43.1-43.2	Elupai		1	1
2	LHS	Karuvai (pol) <10	12		12
3		Nura (pl)		1	1
4		Nura (pol) <10	7		7
5		Veppa maram		1	1
6		Veppa maram (pl)		3	3
7		Veppa maram (pol) <10	6		6
	43.1-43.2 total		25	6	31
1	43.2-43.3	Elupai		2	2
2	LHS	Karuvai (20) (pol) <10	1		1
3		Nura (pol) <10	2		2
	43.2-43.3 total		3	2	5
1	43.3-43.4	Karuvai (30) (pol) <10	1		1
	43.3-43.4 total		1		1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
1	43.4-43.5	Karuvai (pol) <10	6		6
2	LHS	Konai (14) (pol) <10	1		1
3		Pala (pol) <10	3		3
	43.4-43.5 total		10		10
1	43.7-43.8	Erukan (pol) <10	10		10
2	LHS	Nura (pol) <10	8		8
3		Veppa maram		2	2
4		Veppa maram (14) (pol) <10	1		1
	43.7-43.8 total		19	2	21
1	43.8-43.9	Karuvai (cn)		3	3
2	LHS	Karuvai (pol) <10	6		6
3		Nura (pol) <10	3		3
4		Panai maram (pol) <10	6		6
5		Veppa maram		1	1
6		Veppa maram (cn)		1	1
7		Veppa maram (pol) <10	1		1
	43.8-43.9 total		16	5	21
1	43.9-44.0	Panai maram (pol) <10	3		3
2	LHS	Pola kuchi (22) (pol) <10	1		1
3		Veppa maram (pol) <10	4		4
	43.9-44.0 total		8		8
1	44.0-44.1	Erukan (14) (pol) <10	1		1
2	LHS	Karuvai (pol) <10	10		10
3		Nura (20) (pol) <10	1		1
4		Nura (cn)		2	2
5		Panai maram (pol) <10	4		4
6		Veppa maram (14) (pol) <10	1		1
	44.0-44.1 total		17	2	19
1	44.1-44.2	Beech (20) (pol) <10	1		1
2	LHS	Karuvai (15) (pol) <10	1		1
3		Katamuni (14) (pol) <10	1		1
4		Panai maram (pol) <10	5		5
5		Pola kuchi (pol) <10	2		2
6		Veppa maram (cn)		12	12
	44.1-44.2 total		10	12	22
1	44.2-44.3	Beech (pol) <10	10		10
2	LHS	Karuvai (pol) <10	6		6
3		Nura (pol) <10	3		3
4		Panai maram (pol) <10	3		3
	44.2-44.3 total		22		22
1	44.4-44.5	Beech (15) (pol) <10	1		1
2	LHS	Karuvai (30) (pol) <10	1		1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
3		Nura (pol) <10	4		4
4		Panai maram (pol) <10	3		3
	44.4-44.5 total		9		9
1	44.5-44.6	Arasan (pol) <10	3		3
2	LHS	Karuvai (pol) <10	12		12
3		Nura (pol) <10	7		7
4		Veppa maram		1	1
5		Veppa maram (pol) <10	6		6
	44.5-44.6 total		28	1	29
1	44.6-44.7	Karuvai (17) (pol) <10	1		1
2	LHS	Karuvai (30) (pol) <10	1		1
3		Nura (15) (pol) <10	1		1
4		Nura (pol) <10	6		6
5		Panai maram (pol) <10	6		6
6		Veppa maram (22) (pol) <10	1		1
7		Veppa maram (pol) <10	4		4
	44.6-44.7 total		20		20
1	44.7-44.8	Karuvai (55) (cn)		1	1
2	LHS	Karuvai (pol) <10	10		10
3		Nura		1	1
4		Nura (pol) <10	6		6
5		Panai maram (15) (pol) <10	1		1
6		Pola kuchi (pol) <10	10		10
7		Veppa maram		16	16
8		Veppa maram (cn)		8	8
9		Veppa maram (pol) <10	10		10
	44.7-44.8 total		37	26	63
1	44.9-45.0	Beech		2	2
2	LHS	Karuvai (15) (pol) <10	1		1
3		Karuvai (25) (pol) <10	1		1
4		Panai maram (pol) <10	9		9
5		Veppa maram		3	3
6		Veppa maram (pol) <10	4		4
	44.9-45.0 total		15	5	20
1	45.2-45.3	Beech (14) (pol) <10	1		1
2	LHS	Karuvai (pol) <10	12		12
3		Manjal arali (fenced)		1	1
	45.2-45.3 total		13	1	14
1	45.3-45.4	Karuvai (30) (pol) <10	1		1
	45.3-45.4 total		1		1
1	45.4-45.5	Karuvai (35) (pol) <10	1		1
	45.4-45.5 total		1		1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
1	45.5-45.6	Karuvai (60) (pol) <10	1		1
	45.5-45.6 total		1		1
1	45.6-45.7	Karuvai (60) (pol) <10	1		1
	45.6-45.7 total		1		1
1	45.7-45.8	Karuvai (90) (pol) <10	1		1
	45.7-45.8 total		1		1
1	45.8-45.9	Karuvai		1	1
2	LHS	Karuvai (20) (pol) <10	1		1
3		Panai maram (pol) <10	8		8
4		Veppa maram		3	3
5		Veppa maram (pol) <10	6		6
	45.8-45.9 total		15	4	19
1	45.9-46.0	Echan (pol) <10	10		10
2	LHS	Karuvai (20) (pol) <10	1		1
3		Katamuni (14) (pol) <10	1		1
4		Nura		1	1
5		Veppa maram		3	3
	45.9-46.0 total		12	4	16
1	46.0-46.1	Echan (pol) <10	4		4
2	LHS	Karuvai (pol) <10	9		9
3		Panai maram (pol) <10	10		10
4		Veppa maram		4	4
	46.0-46.1 total		23	4	27
1	46.1-46.2	Echan (pol) <10	1		1
2	LHS	Karuvai (pol) <10	16		16
3		Katamuni (pol) <10	6		6
4		Panai maram (pol) <10	10		10
5		Veppa maram		2	2
	46.1-46.2 total		33	2	35
1	46.2-46.3	Karuvai (30) (pol) <10	1		1
2	LHS	Panai maram (pol) <10	8		8
3		Thoongumoonji		1	1
4		Veppa maram		3	3
5		Veppa maram (20) (pol) <10	1		1
	46.2-46.3 total		10	4	14
1	46.3-46.4	Karuvai (pol) <10	10		10
2	LHS	Nura (pol) <10	3		3
3		Panai maram (pol) <10	1		1
	46.3-46.4 total		14		14
1	46.4-46.6	Echan (pol) <10	5		5
2	LHS	Karuvai (42) (pol) <10	1		1
3		Nura (pol) <10	4		4

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
4		Panai maram (pol) <10	1		1
5		Thoongumoonji		1	1
	46.4-46.6 total		11	1	12
1	46.5-46.6	Karuvai (pol) <10	6		6
2	LHS	Natukaruvai (pol) <10	9		9
	46.5-46.6 total		15		15
1	46.6-46.7	Karuvai (14) (pol) <10	1		1
2	LHS	Nura		1	1
3		Nura (cn)		3	3
4		Nura (pl)		6	6
5		Nura (pol) <10	4		4
6		Pola kuchi (40) (pol) <10	1		1
7		Veppa maram		8	8
8		Veppa maram (pl)		4	4
9		Veppa maram (pol) <10	5		5
	46.6-46.7 total		11	22	33
1	46.7-46.8	Beech		1	1
2	LHS	Karuvai (22) (pol) <10	1		1
3		Katamuni (15) (pol) <10	1		1
4		Panai maram (pol) <10	1		1
5		Pola kuchi (pol) <10	10		10
6		Sapathi kailee (pol) <10	1		1
7		Thoongumoonji		2	2
	46.7-46.8 total		14	3	17
1	46.8-46.9	Athu pasorai (fenced)		3	3
2	LHS	Beech		1	1
3		Karuvai		1	1
4		Karuvai (pol) <10	4		4
5		Nochi		1	1
6		Sapathi kailee (pol) <10	2		2
7		Veppa maram		1	1
	46.8-46.9 total		6	7	13
1	46.9-47.0	Athu pasorai (fenced)		4	4
2	LHS	Nochi (pol) <10	1		1
3		Thekku (fenced)		1	1
	46.9-47.0 total		1	5	6
1	47.0-47.1	Beech		1	1
2	LHS	Bhir (pol) <10	6		6
3		Karuvai (15) (pol) <10	1		1
4		Nura (20) (pol) <10	1		1
	47.0-47.1 total		8	1	9
1	47.1-47.2	Karuvai (20) (pol) <10	1		1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
2	LHS	Nura		1	1
3		Nura (pol) <10	10		10
	47.1-47.2 total		11	1	12
1	47.2-47.3	Beech		1	1
2	LHS	Custard apple		1	1
3		Karuvai (20) (pol) <10	1		1
4		Nura		3	3
5		Nura (pol) <10	8		8
6		Veppa maram		1	1
	47.2-47.3 total		9	6	15
1	47.5-47.6	Karuvai (pol) <10	5		5
2	LHS	Nochi (pol) <10	3		3
3		Nura		1	1
4		Veppa maram		2	2
	47.5-47.6 total		8	3	11
1	47.6-47.7	Amanakku (pol) <10	6		6
2	LHS	Karuvai (14) (pol) <10	1		1
3		Nura (pol) <10	9		9
4		Veppa maram		1	1
	47.6-47.7 total		16	1	17
1	47.7-47.8	Karuvai (pol) <10	6		6
	47.7-47.8 total		6		6
1	47.8-47.9	Custard apple (pol) <10	6		6
2	LHS	Karuvai (pl)		6	6
3		Karuvai (pol) <10	5		5
4		Nura (pol) <10	10		10
5		Povarsan (pl)		3	3
6		Seavandi		1	1
	47.8-47.9 total		21	10	31
1	47.9-48.0	Vatha		1	1
	47.9-48.0 total			1	1
1	48.0-48.1	Karuvai (17) (pol) <10	1		1
	48.0-48.1 total		1		1
1	48.1-48.2	Araspathi (pol) <10	2		2
2	LHS	Karuvai (14) (pol) <10	1		1
3		Manjal arali (pol) <10	6		6
4		Nochi (pol) <10	3		3
5		Veppa maram		1	1
6		Veppa maram (pol) <10	1		1
	48.1-48.2 total		13	1	14
1	48.2-48.3	Povarsan (pl)		1	1
2	LHS	Veppa maram (pl)		1	1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
	48.2-48.3 total			2	2
1	48.3-48.4	Karuvai (pol) <10	6		6
2	LHS	Vagai (pol) <10	10		10
	48.3-48.4 total		16		16
1	48.4-48.5	Karuvai (15) (pol) <10	1		1
2	LHS	Veppa maram (pol) <10	9		9
	48.4-48.5 total		10		10
1	48.5-48.6	Karuvai (30) (pol) <10	1		1
	48.5-48.6 total		1		1
1	48.7-48.8	Drumstick (pl)		1	1
	48.7-48.8 total			1	1
1	48.9-49.0	Thekku (fenced)		1	1
	48.9-49.0 total			1	1
1	49.0-49.1	Athupasorai		2	2
2	LHS	Karuvai (25) (pol) <10	1		1
	49.0-49.1 total		1	2	3
1	49.1-49.2	Karuvai (14) (pol) <10	1		1
2	LHS	Nura (pol) <10	1		1
3		Veppa maram (pol) <10	1		1
	49.1-49.2 total		3		3
1	49.3-49.4	Karuvai (15) (pol) <10	1		1
2	LHS	Karuvai (20) (pol) <10	1		1
	49.3-49.4 total		2		2
1	49.5-49.6	Beech (pol) <10	1		1
	49.5-49.6 total		1		1
1	49.8-49.9	Custard apple		1	1
2	LHS	Drumstick		1	1
3		Seavandi (pol) <10	1		1
4		Veppa maram		2	2
5		Veppa maram (pol) <10	2		2
	49.8-49.9 total		3	4	7
1	49.9-50.0	Karuvai (pol) <10	10		10
2	LHS	Pupai		2	2
	49.9-50.0 total		10	2	12
1	50.0-50.1	Drumstick (pol) <10	1		1
2	LHS	Karuvai (pol) <10	9		9
3		Nochi (pol) <10	3		3
	50.0-50.1 total		13		13
1	50.1-50.2	Bhir		1	1
2	LHS	Bhir (pol) <10	1		1
3		Karuvai (20) (pol) <10	1		1
4		Nura		1	1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
5		Nura (pol) <10	4		4
	50.1-50.2 total		6	2	8
1	50.2-50.3	Karuvai (pol) <10	10		10
	50.2-50.3 total		10		10
1	50.3-50.4	Seavandi		2	2
	50.3-50.4 total			2	2
1	50.4-50.5	Karuvai (pol) <10	1		1
	50.4-50.5 total		1		1
1	50.5-50.6	Karuvai		2	2
2	LHS	Seavandi		5	5
3		Veppa maram		1	1
	50.5-50.6 total			8	8
1	50.6-50.7	Karuvai (pl)	2		2
2	LHS	Vaagai		1	1
3		Veppa maram		3	3
	50.6-50.7 total		2	4	6
1	50.7-50.8	Manjal arali		1	1
	50.7-50.8 total			1	1
1	50.8-50.9	Karuvai (pol) <10	8		8
2	LHS	Veppa maram (pol) <10	1		1
	50.8-50.9 total		9		9
1	51.0-51.1	Karuvai (15) (pol) <10	1		1
2	LHS	Karuvai (pol) <10	9		9
	51.0-51.1 total		10		10
1	51.3-51.4	Erukan (pol) <10	1		1
2	LHS	Nura (pol) <10	6		6
3		Panai maram (pol) <10	1		1
4		Veppa maram		1	1
5		Veppa maram (20) (pol) <10	1		1
	51.3-51.4 total		9	1	10
1	51.4-51.5	Karuvai (pol) <10	6		6
2	LHS	Veppa maram		1	1
3		Veppa maram (pol) <10	10		10
	51.4-51.5 total		16	1	17
1	51.5-51.6	Veppa maram		8	8
	51.5-51.6 total			8	8
1	51.7-51.8	Elumuchi (pol) <10	8		8
2	LHS	Karuvai (pol) <10	10		10
3		Seavandi (pol) <10	1		1
4		Sevandi		3	3
5		Veppa maram		1	1
	51.7-51.8 total		19	4	23

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
1	51.8-51.9	1/2 goose berry (pl)		3	3
2	LHS	Beech (pol) <10	1		1
3		Drumstick (pol) <10	1		1
4		Karuvai (pol) <10	1		1
5		Manjal arali (pl)		1	1
6		Nura		1	1
7		Panai maram (pol) <10	1		1
8		Povarsan (pl)		5	5
9		Seavandi (pol) <10	10		10
10		Vagai (pl)		5	5
	51.8-51.9 total		14	15	29
1	51.9-52.0	Karuvai		1	1
2	LHS	Pala		1	1
3		Veppa maram		1	1
	51.9-52.0 total			3	3
1	52.0-52.1	Karuvai (30) (pol) <10	1		1
2	LHS	Veppa maram		3	3
	52.0-52.1 total		1	3	4
1	52.1-52.2	Veppa maram		1	1
2	LHS	Veppa maram (pol) <10	6		6
	52.1-52.2 total		6	1	7
1	52.2-52.3	Veppa maram		1	1
	52.2-52.3 total			1	1
1	52.3-52.4	Veppa maram (15) (pl)		1	1
2	LHS	Veppa maram (16) (pl)		1	1
	52.3-52.4 total			2	2
1	52.4-52.5	Nochi (pl)		4	4
2	LHS	Veppa maram		2	2
3		Veppa maram (18) (pol) <10	1		1
	52.4-52.5 total		1	6	7
1	52.5-52.6	Karuvai (pl)		4	4
2	LHS	Karuvai (pol) <10	6		6
3		Nura		1	1
4		Nura (pl)	2	3	5
5		Veppa maram		7	7
6		Veppa maram (cn)		5	5
7		Veppa maram (pol) <10	7		7
	52.5-52.6 total		15	20	35
1	52.6-52.7	Karuvai (20) (pol) <10	1		1
	52.6-52.7 total		1		1
1	52.7-52.8	Karuvai (35) (pol) <10	1		1
2	LHS	Veppa maram		3	3

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
	52.7-52.8 total		1	3	4
1	52.8-52.9	Karuvai (pol) <10	4		4
	52.8-52.9 total		4		4
1	52.9-53.0	Veppa maram		2	2
2	LHS	Veppa maram (pol) <10	10		10
	52.9-53.0 total		10	2	12
1	53.0-53.2	Beech (pol) <10	1		1
2	LHS	Thoongumoonji		1	1
3		Veppa maram		1	1
	53.0-53.2 total		1	2	3
1	53.1-53.2	Beech		1	1
2	LHS	Karuvai (pol) <10	1		1
3		Nochi (pol) <10	1		1
	53.1-53.2 total		2	1	3
1	53.2-53.3	Karuvai (20) (pol) <10	1		1
2	LHS	Nura (15) (pol) <10	1		1
	53.2-53.3 total		2		2
1	53.3-53.4	Karuvai (20) (pol) <10	1		1
	53.3-53.4 total		1		1
1	53.4-53.6	Beech (pol) <10	1		1
2	LHS	Erukan (pol) <10	4		4
3		Karuvai (15) (pol) <10	1		1
4		Katamuni (20) (pol) <10	1		1
5		Seavandi		2	2
	53.4-53.6 total		7	2	9
1	53.6-53.7	Beech		1	1
2	LHS	Beech (pol) <10	5		5
3		Karuvai (15) (pol) <10	1		1
4		Nura (pol) <10	10		10
5		Veppa maram (pol) <10	8		8
	53.6-53.7 total		24	1	25
1	53.7-53.8	Karuvai (20) (pol) <10	1		1
2	LHS	Veppa maram (pol) <10	9		9
	53.7-53.8 total		10		10
1	53.8-53.9	Karuvai (30) (pol) <10	1		1
2	LHS	Karuvai (pol) <10	9		9
3		Pola kuchi (pol) <10	10		10
4		Veppa maram (14) (pol) <10	1		1
	53.8-53.9 total		21		21
1	53.9-54.0	Karuvai (pol) <10	4		4
2	LHS	Natukaruvai (pol) <10		10	10
3		Veppa maram		3	3

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
4		Veppa maram (20) (pol) <10	1		1
	53.9-54.0 total		5	13	18
1	54.0-54.1	Beech (pol) <10	10		10
2	LHS	Karuvai (pol) <10	18		18
3		Nura (30) (pol) <10	1		1
4		Thoongumoonji		1	1
5		Veppa maram		3	3
6		Veppa maram (15) (pol) <10	1		1
7		Veppa maram (20) (pol) <10	1		1
	54.0-54.1 total		31	4	35
1	54.1-54.2	Karuvai (20) (cn)		1	1
2	LHS	Karuvai (20) (pol) <10	1		1
3		Nura		1	1
4		Veppa maram (cn)		4	4
	54.1-54.2 total		1	6	7
1	54.2-54.3	Beech (pol) <10	2		2
2	LHS	Karuvai (30) (pol) <10	1		1
3		Panai maram (pol) <10	2		2
4		Vaagai		1	1
	54.2-54.3 total		5	1	6
1	54.3-54.4	Karuvai (20) (pol) <10	1		1
2	LHS	Veppa maram		2	2
3		Veppa maram (pol) <10	4		4
	54.3-54.4 total		5	2	7
1	54.4-54.5	Karuvai (pol) <10	6		6
	54.4-54.5 total		6		6
1	54.6-54.7	Beech		2	2
2	LHS	Karuvai (15) (pol) <10	1		1
3		Vaagai		1	1
4		Veppa maram		3	3
5		Veppa maram (pol) <10	4		4
	54.6-54.7 total		5	6	11
1	54.7-54.8	Bhir (pol) <10	2		2
2	LHS	Karuvai (30) (pol) <10	1		1
3		Thoongumoonji (pol) <10	2		2
4		Veppa maram (cn)		4	4
	54.7-54.8 total		5	4	9
1	54.8-55.0	Karuvai (pol) <10	10		10
	54.8-55.0 total		10		10
1	54.9-55.0	Karuvai (30) (pol) <10	1		1
	54.9-55.0 total		1		1
1	55.0-55.1	Erukan (pol) <10	2		2

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
2	LHS	Karuvai (20) (pol) <10	1		1
	55.0-55.1 total		3		3
1	55.1-55.2	Karuvai (15) (pol) <10	2		2
	55.1-55.2 total		2		2
1	55.2-55.3	Beech		1	1
2	LHS	Karuvai		2	2
3		Karuvai (pol) <10	4		4
	55.2-55.3 total		4	3	7
1	55.3-55.4	Erukan (pol) <10	6		6
2	LHS	Karuvai (15) (pol) <10	1		1
3		Nura (pol) <10	11		11
4		Panai maram (pol) <10	4		4
5		Veppa maram (pol) <10	8		8
	55.3-55.4 total		30		30
1	55.5-55.6	Custard apple		2	2
2	LHS	Nura		1	1
3		Nura (pol) <10	2		2
	55.5-55.6 total		2	3	5
1	55.6-55.7	Erukan (pol) <10	9		9
2	LHS	Karuvai (pol) <10	6		6
	55.6-55.7 total		15		15
1	55.7-55.8	Karuvai (30) (pol) <10	1		1
2	LHS	Nura		1	1
3		Veppa maram		2	2
	55.7-55.8 total		1	3	4
1	55.8-55.9	Erukan (pol) <10	1		1
2	LHS	Karuvai (20) (pol) <10	1		1
3		Karuvai (pol) <10	10		10
4		Veppa maram		2	2
	55.8-55.9 total		12	2	14
1	55.9-56.0	Karuvai (15) (pol) <10	1		1
2	LHS	Nura (pol) <10	10		10
3		Veppa maram (pol) <10	5		5
	55.9-56.0 total		16		16
1	56.0-56.1	Beech		3	3
2	LHS	Beech (pol) <10	4		4
3		Erukan (pol) <10	7		7
4		Karuvai (pol) <10	3		3
5		Nura (pol) <10	2		2
6		Pala (pol) <10	4		4
7		Panai maram (pol) <10	1		1
8		Veppa maram		2	2

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
9		Veppa maram (pol) <10	6		6
	56.0-56.1 total		27	5	32
1	56.0-56.2	Erukan (pol) <10	4		4
	56.0-56.2 total		4		4
1	56.3-56.4	Beech (pol) <10	3		3
2	LHS	Karuvai (pol) <10	10		10
	56.3-56.4 total		13		13
1	56.4-56.5	Erukan (20) (pol) <10	1		1
2	LHS	Karuvai (pol) <10	10		10
3		Veppa maram (pol) <10	9		9
	56.4-56.5 total		20		20
1	56.5-56.6	Karuvai (30) (pol) <10	1		1
2	LHS	Karuvai (60) (pol) <10	1		1
	56.5-56.6 total		2		2
1	56.6-56.7	Karuvai (20) (pol) <10	1		1
	56.6-56.7 total		1		1
1	56.7-56.8	Karuvai (15) (pol) <10	1		1
2	LHS	Nura (pol) <10	9		9
	56.7-56.8 total		10		10
1	56.8-56.9	Erukan (pol) <10	2		2
2	LHS	Karuvai (15) (pol) <10	1		1
3		Panai maram (pol) <10	4		4
	56.8-56.9 total		7		7
1	56.9-57.0	Karuvai (40) (cn)		1	1
	56.9-57.0 total			1	1
1	57.0-57.1	Karuvai (15) (cn)		1	1
	57.0-57.1 total			1	1
1	57.1-57.2	Beech (pol) <10	2		2
2	LHS	Custard apple (pl) (cn)		2	2
3		Karuvai (pol) <10	1		1
4		Koyya (pl) (cn)		2	2
5		Nura (pol) <10	10		10
6		Seavandi (27) (pl) (cn)		1	1
7		Seavandi (pol) <10	10		10
8		Veppa maram (cn)		4	4
	57.1-57.2 total		23	9	32
1	57.2-57.4	Drumstick (pol) <10	10		10
2	LHS	Karuvai		1	1
3		Karuvai		1	1
4		Karuvai (15) (pol) <10	1		1
5		Karuvai (pol) <10	14	4	18
6		Nura		5	5

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
7		Nura (pol) <10	22		22
8		Otheyan (pol) <10		1	1
9		Panai maram (pol) <10	1		1
10		Veppa maram		1	1
11		Veppa maram (pol) <10	2	5	7
	57.2-57.4 total		50	18	68
1	57.4-57.5	Karuvai (pol) <10	3		3
2	LHS	Veppa maram		1	1
	57.4-57.5 total		3	1	4
1	57.5-57.6	Manjal arali		1	1
2	LHS	Manjal arali (pol) <10	10		10
3		Nura		2	2
4		Sevandi (cn)		6	6
5		Vatha		1	1
	57.5-57.6 total		10	10	20
1	57.6-57.7	Custard apple (fenced)		4	4
2	LHS	Karuvai (20) (pol) <10	1		1
3		Karuvai (pol) <10	8		8
4		Nura		2	2
	57.6-57.7 total		9	6	15
1	57.8-57.9	Karuvai (30) (pol) <10	1		1
	57.8-57.9 total		1		1
1	57.9-58.0	Karuvai (15) (pol) <10	1		1
2	LHS	Veppa maram (pol) <10	8		8
	57.9-58.0 total		9		9
1	58.0-58.1	Karuvai (60) (pol) <10	1		1
2	LHS	Veppa maram (cn)		6	6
	58.0-58.1 total		1	6	7
1	58.1-58.2	Karuvai		1	1
2	LHS	Karuvai (20) (pol) <10	1		1
3		Veppa maram		1	1
	58.1-58.2 total		1	2	3
1	58.2-58.3	Karuvai (30) (pol) <10	1		1
	58.2-58.3 total		1		1
1	58.3-58.4	Nura		1	1
	58.3-58.4 total			1	1
1	58.4-58.5	Drumstick		1	1
2	LHS	Karuvai (pol) <10	6		6
	58.4-58.5 total		6	1	7
1	58.6-58.7	Karuvai (pol) <10	14		14
2	LHS	Sewangi (pol) <10	4		4
3		Veppa maram		1	1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
	58.6-58.7 total		18	1	19
1	58.8-58.9	Drumstick (pol) <10	1		1
2	LHS	Povarsan (pol) <10	1		1
3		Vagai (pol) <10	10		10
	58.8-58.9 total		12		12
1	58.9-59.0	Drumstick (pol) <10	1		1
2	LHS	Karuvai (pol) <10	12		12
3		Nochi (pol) <10	4		4
4		Nura		1	1
5		Nura (pol) <10	3		3
	58.9-59.0 total		20	1	21
1	59.0-59.1	1/2 goose berry (pol) <10	1		1
2	LHS	Drumstick (pol) <10	2		2
3		Elumuchai (pol) <10	1		1
4		Karuvai (pol) <10	4		4
5		Manjal arali		1	1
6		Maruthani (20) (pol) <10	1		1
7		Maruthani (pol) <10	1		1
8		Vagai (pol) <10	1		1
	59.0-59.1 total		11	1	12
1	59.1-59.2	Karuvai (pol) <10	10		10
2	LHS	Nura (15) (pol) <10	1		1
3		Nura (cn)		1	1
4		Veppa maram (pol) <10	1		1
	59.1-59.2 total		12	1	13
1	59.2-59.3	Bhir (pol) <10	4		4
2	LHS	Karuvai (15) (pol) <10	1		1
3		Nura		1	1
4		Nura (pol) <10	9		9
	59.2-59.3 total		14	1	15
1	59.4-59.5	Karuvai (22) (pol) <10	1		1
2	LHS	Nura (20) (pol) <10	1		1
3		Veppa maram (pol) <10	4		4
	59.4-59.5 total		6		6
1	59.6-59.7	Karuvai (20) (pol) <10	2		2
2	LHS	Nura (pol) <10	8		8
3		Panai maram (pol) <10	5		5
4		Veppa maram		1	1
	59.6-59.7 total		15	1	16
1	59.9-60.0	Karuvai (pol) <10	10		10
	59.9-60.0 total		10		10
1	60.1-60.3	Karuvai (pol) <10	2		2

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
	60.1-60.3 total		2		2
1	60.3-60.4	Karuvai (pol) <10	3		3
2	LHS	Thekku (pol) <10	1		1
3		Veppa maram (pol) <10	3		3
	60.3-60.4 total		7		7
1	60.4-60.5	Karuvai (pol) <10	4		4
2	LHS	Polakuchi (pol) <10	5		5
	60.4-60.5 total		9		9
1	60.5-60.6	Kailee (40) (pol) <10	1		1
2	LHS	Karuvai (pol) <10	4		4
3		Veppa maram (pol) <10	2		2
	60.5-60.6 total		7		7
1	60.6-60.7	Kailee (15) (pol) <10	1		1
2	LHS	Karuvai (20) (pol) <10	1		1
3		Veppa maram (pol) <10	1		1
	60.6-60.7 total		3		3
1	60.7-60.8	Karuvai (pol) <10	10		10
2	LHS	Veppa maram (pol) <10	4		4
	60.7-60.8 total		14		14
1	60.8-60.9	Karuvai (pol) <10	1		1
	60.8-60.9 total		1		1
1	60.9-61.0	Karuvai (pol) <10	10		10
	60.9-61.0 total		10		10
1	61.0-61.1	Karuvai (15) (pol) <10	1		1
	61.0-61.1 total		1		1
1	61.1-61.6	Karuvai (65) (pol) <10	1		1
2	LHS	Karuvai (70) (pol) <10	1		1
	61.1-61.6 total		2		2
1	61.7-61.9	Karuvai (15) (pol) <10	3		3
	61.7-61.9 total		3		3
1	61.9-62.0	Karuvai (15) (pol) <10	1		1
2	LHS	Nura (pol) <10	9		9
3		Thekku (pol) <10		2	2
4		Vatha		3	3
5		Vatha (pol) <10	1		1
	61.9-62.0 total		11	5	16
1	62.0-62.1	Custard apple (pol) <10	4		4
2	LHS	Karuvai (60) (pol) <10	1		1
3		Nura (pol) <10	2		2
4		Veppa maram (fenced)		1	1
	62.0-62.1 total		7	1	8
1	62.1-62.2	Amanaku (pol) <10	4		4

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
2	LHS	Arali		1	1
3		Arali (pol) <10	1		1
4		Custard apple		1	1
5		Elumuchai (pol) <10	2		2
6		Koyya		2	2
7		Vagai (pol) <10	8		8
8		Vatha		1	1
9		Veppa maram		1	1
	62.1-62.2 total		15	6	21
1	62.2-62.3	Erukan (pol) <10	2		2
2	LHS	Maruthani (pol) <10	5		5
3		Sevandi		2	2
4		Sevandi (pol) <10	4		4
	62.2-62.3 total		11	2	13
1	62.3-62.4	Maa		1	1
2	LHS	Maruthani (pol) <10	2		2
3		Murungai (pol) <10	4		4
4		Nura		1	1
5		Nura (pol) <10	3		3
6		Otheyan (pol) <10	1		1
7		Puliya maram		1	1
8		Vatha		1	1
	62.3-62.4 total		10	4	14
1	62.4-62.5	Amanaku (20) (pol) <10	1		1
2	LHS	Karuvai (pol) <10	12		12
3		Nura (pol) <10	16		16
4		Polakuchi (pol) <10	10		10
5		Veppa maram		3	3
6		Veppa maram (pol) <10	6		6
	62.4-62.5 total		45	3	48
1	62.5-62.6	Nura (pol) <10	2		2
2	LHS	Pala		2	2
3		Povarsan (pol) <10	4		4
4		Pupai (pol) <10	4		4
5		Veppa maram (pol) <10	2		2
	62.5-62.6 total		12	2	14
1	62.6-62.7	Custard apple		2	2
2	LHS	Drumstick		1	1
3		Elumuchai (pol) <10	2		2
4		Maa (pol) <10	1	1	2
5		Marathai (pol) <10	6		6
6		Nura (pol) <10	8		8

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
7		Thekku		2	2
8		Thekku (pol) <10	9		9
9		Vatha		1	1
	62.6-62.7 total		26	7	33
1	62.7-62.8	Custard apple (fenced)		2	2
2	LHS	Jack (fenced)		1	1
3		Kodukapali (pol) <10	8	8	16
4		Koyya (fenced)		1	1
5		Maa (pol) <10		1	1
6		Otheyan (pol) <10	2		2
7		Panai maram (pol) <10	4		4
8		Sapotta (pol) <10		3	3
9		Thoongumoonji (pol) <10	1		1
10		Vagai (pol) <10	6		6
11		Veppa maram (fenced)		1	1
	62.7-62.8 total		21	17	38
1	62.8-62.9	Bhir (pol) <10	5		5
2	LHS	Custard apple		2	2
3		Drumstick (fenced)		1	1
4		Karuvai (pol) <10	10		10
5		Maruthai (pol) <10	4		4
6		Nura		4	4
7		Nura (fenced)		2	2
8		Nura (pol) <10	3		3
9		Panai maram (pol) <10	7		7
10		Veppa maram (fenced)		1	1
	62.8-62.9 total		29	10	39
1	62.9-63.0	Drumstick (pol) <10	1		1
2	LHS	Kanala murungai (pol) <10	1		1
3		Karuvai (pl) (cn)		8	8
4		Maa (pol) <10	2		2
5		Nura (pl) (cn)		1	1
6		Pupai		1	1
7		Sevandi		1	1
8		Thoongumoonji (pl) (cn)		1	1
9		Vagai (pol) <10	1		1
10		Vatha		1	1
11		Veppa maram		2	2
	62.9-63.0 total		5	15	20
1	63.0-63.1	Beech		2	2
2	LHS	Beech (pol) <10	4		4
3		Drumstick		1	1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
4		Drumstick (pol) <10	1		1
5		Karuvai (30) (pol) <10	1		1
6		Marungai (pol) <10	4		4
7		Maruthani (pol) <10	1		1
8		Otheyan (pol) <10	1		1
9		Thai		1	1
10		Veppa maram		1	1
11		Veppa maram (pol) <10	12		12
	63.0-63.1 total		24	5	29
1	63.2-63.3	Beech (pol) <10	3		3
2	LHS	Karuvai (30) (pol) <10	1		1
3		Karuvai (pol) <10	10		10
4		Kodukapali (pol) <10	4		4
5		Maruthani (pol) <10	10		10
6		Pupai (pol) <10	1		1
7		Sevandi		1	1
8		Vatha (fenced)		2	2
9		Veppa maram (fenced)		1	1
	63.2-63.3 total		29	4	33
1	63.3-63.4	Beech (pl) (cn)		1	1
2	LHS	Beech (pol) <10	1		1
3		Custard apple		1	1
4		Karuvai (pol) <10	10		10
5		Kodukapali (pl) (cn)		1	1
6		Marungai (pol) <10	2		2
7		Maruthani (pol) <10	6		6
8		Nura		1	1
9		Nura (pol) <10	1		1
10		Vatha (pl) (cn)		1	1
11		Veppa maram		2	2
	63.3-63.4 total		20	7	27
1	63.4-63.5	Karuvai (20) (pol) <10	1		1
	63.4-63.5 total		1		1
1	63.5-63.6	Beech		1	1
2	LHS	Beech (pol) <10	2		2
3		Karuvai (20) (pol) <10	1		1
	63.5-63.6 total		3	1	4
1	63.6-63.8	Beech		1	1
2	LHS	Bhir (pol) <10		5	5
3		Karuvai (20) (pol) <10	1		1
4		Karuvai (pol) <10	10		10
	63.6-63.8 total		11	6	17

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
1	63.8-63.9	Beech		2	2
2	LHS	Karuvai (pol) <10	10		10
	63.8-63.9 total		10	2	12
1	63.9-64.0	Karuvai (15) (pol) <10	1		1
	63.9-64.0 total		1		1
1	64.0-64.1	Beech		1	1
2	LHS	Beech (pol) <10	1		1
3		Bhir (pol) <10	1		1
4		Karuvai (pol) <10	6		6
5		Nura		1	1
	64.0-64.1 total		8	2	10
1	64.1-64.2	Karuvai (25) (pol) <10	1		1
	64.1-64.2 total		1		1
1	64.2-64.3	Karuvai (25) (pol) <10	1		1
2	LHS	Veppa maram		1	1
	64.2-64.3 total		1	1	2
1	64.3-64.4	Amanaku (15) (pol) <10		3	3
	64.3-64.4 total			3	3
1	64.4-64.5	Amanaku (pol) <10	10		10
2	LHS	Beech		2	2
3		Beech (pol) <10	4		4
4		Karuvai (pol) <10	10		10
5		Koyya		2	2
6		Maa		1	1
7		Nura (pol) <10	2		2
8		Veppa maram (cn)		1	1
	64.4-64.5 total		26	6	32
1	64.7-64.8	Beech		1	1
2	LHS	Nura (fenced)		1	1
3		Pupai (fenced)		1	1
	64.7-64.8 total			3	3
1	64.8-64.9	Karuvai (15) (pol) <10	1		1
2	LHS	Karuvai (fenced)		4	4
3		Koyya (fenced)		2	2
4		Nura (20) (pol) <10	1		1
5		Sevandi (fenced)		3	3
6		Sevandi (pol) <10	8		8
	64.8-64.9 total		10	9	19
1	64.9-65.0	Karuvai (30) (pol) <10	1		1
2	LHS	Karuvai (45) (pol) <10	1		1
	64.9-65.0 total		2		2
1	65.1-65.2	Karuvai (20) (pol) <10	1		1

Sr. No.	Chainage km	Tree name	<10 cm	10 to 30 cm	Total
	65.1-65.2 total		1		1
1	65.2-65.3	Karuvai (15) (pol) <10	1		1
	65.2-65.3 total		1		1
1	65.3-65.4	Erukan (pol) <10	2		2
2	LHS	Karuvai (pol) <10	6		6
	65.3-65.4 total		8		8
1	65.4-65.5	Karuvai (40) (pol) <10	1		1
	65.4-65.5 total		1		1
1	65.5-65.6	Karuvai (20) (pol) <10	1		1
	65.5-65.6 total		1		1
1	65.7-65.8	Karuvai (pol) <10	10		10
	65.7-65.8 total		10		10
1	65.8-65.9	1/2 geese berry (pol) <10	1		1
2	LHS	Adathodai (pol) <10	3		3
3		Bhir (pol) <10	2		2
4		Karuvai (pol) <10	8		8
5		Vagai (pol) <10	6		6
	65.8-65.9 total		20		20
1	65.9-66.0	Bhir (pol) <10	1		1
2	LHS	Elumuchai (cn)		1	1
3		Karuvai (pol) <10	6		6
4		Maa		1	1
5		Sempeathai (pol) <10	1		1
	65.9-66.0 total		8	2	10
1	66.0-66.1	Karuvai		1	1
2	LHS	Karuvai (15) (pol) <10	2		2
	66.0-66.1 total		2	1	3
1	66.1-66.19	Karuvai (pol) <10	11		11
2	LHS	Veppa maram		1	1
	66.1-66.19 total		11	1	12
	Grand total		1870	490	2360

Note: The above tree list is for the facilitation of transplation. Out of these the contractor in consultation with environmental Specialist of CSC and Environmental specialist of TNRSP may decide which species are feasible for transplant. The productive species may be selected depending upon site suitability.

List of Poles (<30cm) within 15m on either side from existing centerline on Madapattu – Thirukovilur Section of SH 09 recommended for Transplantation

Right Hand Side

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
1	41.7-47.8	Beech (pol) <10	2		2
2	RHS	Erukan (pol) <10	6		6
3		Karuvai (pol) <10	5		5
4		Nura (pol) <10	4		4
5		Seavarali (pol) <10	5		5
6		Thoongumoonji		1	1
	41.7-47.8 total		22	1	23
1	41.8-41.9	Karuvai (pol) <10	7		7
2	RHS	Katamuni (pol) <10	10		10
3		Nura (pol) <10	5		5
4		Pola kuchi (pol) <10	4		4
5		Veppa maram (pol) <10	3		3
	41.8-41.9 total		29		29
1	41.9-42.0	Karuvai (pol) <10	2		2
2	RHS	Veppa maram		1	1
	41.9-42.0 total		2	1	3
1	42.0-42.1	Karumpu (1000) (pol) <10	1		1
2	RHS	Karuvai (35) (pol) <10	1		1
3		Nura (pol) <10	6		6
4		Veppa maram		1	1
5		Veppa maram (15) (pol) <10	1		1
	42.0-42.1 total		9	1	10
1	42.1-42.2	Karuvai (20) (pol) <10	1		1
2	RHS	Katamuni (pol) <10	4		4
3		Panai maram (pol) <10	1		1
4		Veppa maram (15) (pol) <10	1		1
	42.1-42.2 total		7		7
1	42.2-42.4	Karuvai (30) (pol) <10	1		1
	42.2-42.4 total		1		1
1	42.3-42.4	Karuvai (30) (pol) <10	1		1
2	RHS	Pola kuchi (45) (pol) <10	1		1
3		Veppa maram (30) (pol) <10	1		1
	42.3-42.4 total		3		3

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
1	42.4-42.6	Kanala murungai (25) (pol) <10	1		1
2	RHS	Karuvai (40) (pol) <10	1		1
3		Povarsan (pol) <10	2		2
4		Veppa maram		1	1
5		Veppa maram (pol) <10	4		4
	42.4-42.6 total		8	1	9
1	42.5-42.6	Karuvai (40) (pol) <10	1		1
2	RHS	Karuvai (45) (pol) <10	1		1
3		Nura (pol) <10	6		6
4		Panai maram (pol) <10	1		1
5		Pola kuchi (30) (pol) <10	1		1
6		Veppa maram (cn)		1	1
7		Veppa maram (pol) <10	12		12
	42.5-42.6 total		22	1	23
1	42.6-42.7	Karuvai (20) (pol) <10	1		1
2	RHS	Karuvai (cn)		3	3
3		Veppa maram (15) (pol) <10	1		1
4		Veppa maram (cn)		2	2
	42.6-42.7 total		2	5	7
1	42.7-42.8	Karuvai (pol) <10	2		2
2	RHS	Nura (14) (pol) <10	1		1
3		Pola kuchi (pol) <10	10		10
	42.7-42.8 total		13		13
1	42.8-42.9	Adathodai (pol) <10	10		10
2	RHS	Karuvai (30) (pol) <10	1		1
3		Pola kuchi (20) (pol) <10	1		1
	42.8-42.9 total		12		12
1	42.9-43.0	Erukan (pol) <10	3		3
2	RHS	Karumpu (100) (pol) <10	1		1
3		Karuvai (pol) <10	6		6
4		Nura (15) (pol) <10	1		1
5		Pola kuchi (40) (pol) <10	1		1
6		Veppa maram (pol) <10	10		10
	42.9-43.0 total		22		22
1	43.0-43.1	Karuvai (27) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	10		10
3		Panai maram (pol) <10	3		3
4		Veppa maram (40) (pol) <10	1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	43.0-43.1 total		15		15
1	43.1-43.2	Karuvai (15) (pol) <10	1		1
2	RHS	Veppa maram (pol) <10	10		10
	43.1-43.2 total		11		11
1	43.2-43.3	Erukan (pol) <10	2		2
2	RHS	Karumpu (500) (pol) <10	1		1
3		Karuvai (42) (pol) <10	1		1
4		Veppa maram (pol) <10	2		2
	43.2-43.3 total		6		6
1	43.3-43.4	Karumpu (200) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	11		11
3		Nura (pol) <10	6		6
	43.3-43.4 total		18		18
1	43.4-43.5	Erukan (pol) <10	10		10
2	RHS	Pola kuchi (75) (pol) <10	1		1
3		Veppa maram (pol) <10	8		8
	43.4-43.5 total		19		19
1	43.5-43.6	Karuvai (pol) <10	6		6
2	RHS	Nura (14) (pol) <10	1		1
3		Panai maram (pol) <10	8		8
4		Pola kuchi (35) (pol) <10	1		1
5		Veppa maram (pol) <10	6		6
	43.5-43.6 total		22		22
1	43.6-43.7	Arasan (pol) <10	4		4
2	RHS	Pala		1	1
3		Sevakku (75) (pol) <10	1		1
4		Veppa maram (20) (pol) <10	1		1
	43.6-43.7 total		6	1	7
1	43.7-43.8	Karuvai (pol) <10	7		7
2	RHS	Nura (cn)		1	1
3		Pala		1	1
4		Panai maram (pol) <10	9		9
5		Veppa maram (pol) <10	5		5
	43.7-43.8 total		21	2	23
1	43.8-43.9	Erukan (pol) <10	1		1
2	RHS	Karuvai (30) (pol) <10	1		1
3		Nura (pol) <10	10		10

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
4		Pala (pol) <10	1		1
5		Panai maram (14) (pol) <10	1		1
6		Panai maram (15) (pol) <10	1		1
7		Veppa maram (pol) <10	10		10
	43.8-43.9 total		25		25
1	43.9-44.0	Karumpu (50) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	7		7
3		Nochi (pol) <10	7		7
4		Nura (pol) <10	5		5
5		Pala		1	1
6		Veppa maram (pol) <10	20		20
	43.9-44.0 total		40	1	41
1	44.0-44.1	Araspathi (20) (pol) <10	1		1
2	RHS	Karuvai (14) (pol) <10	1		1
3		Karuvai (pol) <10	9		9
4		Katamuni (pol) <10	6		6
5		Nura (pol) <10	17		17
6		Pala (cn)		1	1
7		Panai maram (pol) <10	18		18
8		Veppa maram (15) (pol) <10	1		1
	44.0-44.1 total		53	1	54
1	44.1-44.2	Arasan (40) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	6		6
3		Katamuni (35) (pol) <10	1		1
4		Panai maram (pol) <10	5		5
5		Veppa maram (pol) <10	8		8
	44.1-44.2 total		21		21
1	44.2-44.3	Erukan (pol) <10	2		2
2	RHS	Karuvai (pol) <10	6		6
3		Katamuni (50) (pol) <10	1		1
4		Panai maram (pol) <10	2		2
5		Veppa maram		1	1
6		Veppa maram (pol) <10	12		12
	44.2-44.3 total		23	1	24
1	44.4-44.5	Erukan (pol) <10	4		4
2	RHS	Karuvai (pol) <10	1		1
3		Natukaruvai (pol) <10	1		1
4		Nura (14)	1		1
5		Nura (14) (pol) <10	1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	44.4-44.5 total		8		8
1	44.5-44.6	Arasan (pol) <10	1		1
2	RHS	Karuvai (pol) <10	3		3
3		Nura		1	1
4		Veppa maram		3	3
	44.5-44.6 total		4	4	8
1	44.6-44.7	Karuvai (28) (pol) <10	1		1
2	RHS	Karuvai (32) (pl)		1	1
3		Nura		10	10
4		Nura		1	1
5		Pala		1	1
6		Panai maram (pol) <10	1		1
7		Veppa maram		3	3
8		Veppa maram (pol) <10	9		9
	44.6-44.7 total		11	16	27
1	44.7-44.8	Karuvai (15) (pol) <10	1		1
2	RHS	Karuvai (25) (pol) <10	1		1
3		Karuvai (30) (pol) <10	1		1
4		Nura (pol) <10	6		6
5		Panai maram (14) (pol) <10	1		1
6		Panai maram (17) (pol) <10	1		1
7		Panai maram (pol) <10	4		4
8		Seala maram		1	1
9		Veppa maram		7	7
10		Veppa maram (25) (pol) <10	1		1
11		Veppa maram (30) (cn)		1	1
12		Veppa maram (30) (pol) <10	1		1
13		Veppa maram (pol) <10	10		10
	44.7-44.8 total		27	9	36
1	44.9-45.0	Beech		1	1
2	RHS	Karuvai (40) (pol) <10	1		1
3		Karuvai (45) (pol) <10	1		1
4		Panai maram (pol) <10	4		4
5		Thoongumoonji		1	1
6		Veppa maram (pol) <10	6		6
	44.9-45.0 total		12	2	14
1	45.1-45.2	Karuvai (18) (pol) <10	1		1
	45.1-45.2 total		1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
1	45.2-45.3	Karuvai (pol) <10	12		12
	45.2-45.3 total		12		12
1	45.3-45.4	Otheyan (pol) <10	1		1
2	RHS	Vatha (pol) <10	10		10
	45.3-45.4 total		11		11
1	45.4-45.5	Arali (15) (pol) <10	1		1
2	RHS	Povarsan		4	4
	45.4-45.5 total		1	4	5
1	45.5-45.6	Karuvai (32) (pol) <10	1		1
2	RHS	Kodukapali (pol) <10	1		1
3		Veppa maram (pol) <10	1		1
	45.5-45.6 total		3		3
1	45.6-45.7	Karuvai (pol) <10	4		4
2	RHS	Panai maram (pol) <10	6		6
	45.6-45.7 total		10		10
1	45.7-45.8	Karuvai (20) (fenced)		1	1
2	RHS	Nura (fenced)		6	6
3		Seavandi (3) (fenced)		1	1
4		Veppa maram		4	4
	45.7-45.8 total			12	12
1	45.8-45.9	Seavandi		1	1
2	RHS	Seavandi (fenced)		2	2
3		Veppa maram		2	2
4		Veppa maram (fenced)		4	4
	45.8-45.9 total			9	9
1	45.9-46.0	Echan (pol) <10	1		1
2	RHS	Karuvai (pol) <10	3		3
3		Maruthani (pol) <10	2		2
	45.9-46.0 total		6		6
1	46.0-46.1	Drumstick		2	2
2	RHS	Vatha		1	1
	46.0-46.1 total			3	3
1	46.1-46.2	Panai maram (pol) <10	5		5
2	RHS	Veppa maram		4	4
	46.1-46.2 total		5	4	9

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
1	46.2-46.3	Aamanaku (fenced)		2	2
2	RHS	Karuvai (fenced)		3	3
3		Karuvai (pol) <10	12		12
	46.2-46.3 total		12	5	17
1	46.4-46.6	Echan (pol) <10	3		3
2	RHS	Karuvai (cn)		5	5
3		Nura (cn)		8	8
4		Nura (pol) <10	8		8
5		Panai maram (pol) <10	6		6
6		Veppa maram (cn)		4	4
7		Veppa maram (pol) <10	4		4
	46.4-46.6 total		21	17	38
1	46.5-46.6	Echan (pol) <10	4		4
2	RHS	Karuvai (75) (pol) <10	1		1
3		Natukaruvai		1	1
4		Nura (pol) <10	9		9
5		Panai maram (pol) <10	1		1
6		Pola kuchi (24) (pol) <10	1		1
7		Veppa maram		1	1
8		Veppa maram (pol) <10	10		10
	46.5-46.6 total		26	2	28
1	46.6-46.7	Karuvai (40) (pol) <10	1		1
2	RHS	Karuvai (cn)		4	4
3		Nura (cn)		1	1
4		Nura (pol) <10	9		9
5		Veppa maram (cn)		3	3
6		Veppa maram (pol) <10	4		4
	46.6-46.7 total		14	8	22
1	46.7-46.8	Karuvai (30) (pol) <10	1		1
2	RHS	Nura		1	1
3		Nura (16) (pol) <10	1		1
4		Pola kuchi (20) (pol) <10	1		1
5		Veppa maram (20) (pol) <10	1		1
	46.7-46.8 total		4	1	5
1	46.8-46.9	Bamboo (40) (cn)		1	1
2	RHS	Beech		1	1
3		Karuvai (15) (pol) <10	1		1
4		Karuvai (32) (cn)		1	1
5		Natukaruvai (pol) <10	10		10

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
6		Veppa maram		3	3
7		Veppa maram (cn)		10	10
	46.8-46.9 total		11	16	27
1	46.9-47.0	Beech (fenced)		1	1
2	RHS	Karuvai (15) (pol) <10	1		1
3		Nura		2	2
4		Nura (pl)		2	2
5		Nura (pol) <10	9		9
6		Povarsan (fenced)		6	6
7		Vathamudaki (pl)		1	1
8		Veppa maram		2	2
9		Veppa maram (pl)		4	4
	46.9-47.0 total		10	18	28
1	47.0-47.1	Karuvai (75) (pol) <10	1		1
2	RHS	Veppa maram (pol) <10	10		10
	47.0-47.1 total		11		11
1	47.1-47.2	Karuvai (30) (pol) <10	2		2
2	RHS	Nura (15) (pol) <10	1		1
3		Panai maram (pol) <10	3		3
4		Pola kuchi (pol) <10	8		8
5		Thoongumoonji		1	1
6		Veppa maram		3	3
7		Veppa maram (14) (pol) <10	1		1
8		Veppa maram (20) (cn)		1	1
	47.1-47.2 total		15	5	20
1	47.2-47.3	Nura (25) (pol) <10	1		1
	47.2-47.3 total		1		1
1	47.3-47.4	Karuvai (17) (pol) <10	1		1
2	RHS	Karuvai (30) (pol) <10	1		1
3		Nura		3	3
4		Veppa maram		3	3
5		Veppa maram (pol) <10	14		14
	47.3-47.4 total		16	6	22
1	47.4-47.5	Amanakku (pol) <10	4		4
2	RHS	Panai maram (pol) <10	10		10
3		Pola kuchi (pol) <10	1		1
4		Seavandi (pol) <10	6		6
5		Veppa maram		1	1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	47.4-47.5 total		21	1	22
1	47.5-47.6	Pola kuchi (14) (pol) <10	1		1
2	RHS	Veppa maram (pol) <10	11		11
	47.5-47.6 total		12		12
1	47.6-47.7	Karuvai (pol) <10	12		12
2	RHS	Nura (pol) <10	6		6
3		Otheyan (pol) <10	1		1
	47.6-47.7 total		19		19
1	47.7-47.8	Veppa maram		1	1
	47.7-47.8 total			1	1
1	47.8-47.9	Beech		2	2
2	RHS	Seavandi		1	1
	47.8-47.9 total			3	3
1	47.9-48.0	Beech		3	3
2	RHS	Beech (pol) <10	1		1
3		Echan (pol) <10	1		1
	47.9-48.0 total		2	3	5
1	48.0-48.1	1/2 goose berry		2	2
2	RHS	Beech		2	2
3		Drumstick		1	1
4		Maruthani (pol) <10	1		1
5		Thoongumoonji		1	1
6		Vatha (pol) <10	1		1
7		Vathamudaki (pol) <10	1		1
8		Veppa maram		2	2
	48.0-48.1 total		3	8	11
1	48.1-48.2	Beech		1	1
2	RHS	Karuvai (pol) <10	8		8
3		Veppa maram		4	4
	48.1-48.2 total		8	5	13
1	48.2-48.3	Beech		1	1
	48.2-48.3 total			1	1
1	48.3-48.4	Arali (pol) <10	3		3
2	RHS	Beech (pol) <10	2		2
3		Karuvai (pol) <10	12		12
	48.3-48.4		17		17

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	total				
1	48.4-48.5	Erukan (pol) <10	3		3
2	RHS	Veppa maram		1	1
	48.4-48.5 total		3	1	4
1	48.6-48.7	Karuvai (18) (pol) <10	1		1
	48.6-48.7 total		1		1
1	48.7-48.8	Athupasorai		1	1
2	RHS	Karuvai (30) (pol) <10	1		1
	48.7-48.8 total		1	1	2
1	48.8-48.9	Karuvai (30) (pol) <10	1		1
2	RHS	Katamuni (15) (pol) <10	1		1
3		Nura (15) (pol) <10	1		1
4		Veppa maram (pol) <10	3		3
	48.8-48.9 total		6		6
1	48.9-49.0	Karuvai (20) (pol) <10	1		1
2	RHS	Thoongumoonji		1	1
	48.9-49.0 total		1	1	2
1	49.0-49.1	Karuvai (30) (pol) <10	1		1
	49.0-49.1 total		1		1
1	49.1-49.2	Karuvai		1	1
2	RHS	Nura		1	1
3		Povarsan		1	1
4		Pupai		1	1
5		Seavandi		3	3
	49.1-49.2 total			7	7
1	49.2-49.3	Amanakku (pol) <10	4		4
2	RHS	Karuvai (30) (pol) <10	1		1
3		Seavandi		2	2
	49.2-49.3 total		5	2	7
1	49.3-49.4	Beech (pol) <10	1		1
2	RHS	Karuvai		1	1
3		Karuvai (20) (pol) <10	1		1
4		Karuvai (pol) <10	5		5
5		Povarsan (25) (pol) <10	1		1
	49.3-49.4 total		8	1	9
1	49.5-49.6	Arali (pol) <10	1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	49.5-49.6 total		1		1
1	49.8-49.9	Drumstick		1	1
2	RHS	Drumstick (pl)	1		1
3		Karuvai (14) (pol) <10	1		1
4		Karuvai (20) (pol) <10	1		1
	49.8-49.9 total		3	1	4
1	49.9-50.0	Custard apple (pl)		4	4
2	RHS	Koyya		1	1
3		Maruthani (pol) <10	1		1
4		Seavandi (pl) (cn)		4	4
	49.9-50.0 total		1	9	10
1	50.0-50.1	Drumstick (pol) <10	1		1
2	RHS	Karuvai (pol) <10	9		9
3		Pupai		1	1
4		Seavandi		3	3
5		Vagai (pol) <10	8		8
	50.0-50.1 total		18	4	22
1	50.1-50.2	Karuvai (19) (pol) <10	1		1
	50.1-50.2 total		1		1
1	50.2-50.3	Karuvai (15) (pol) <10	1		1
	50.2-50.3 total		1		1
1	50.4-50.5	Karuvai (15) (pol) <10	1		1
	50.4-50.5 total		1		1
1	50.5-50.6	Karuvai (cn)		3	3
2	RHS	Karuvai (pol) <10	12		12
3		Navel (cn)		1	1
4		Pola kuchi (pol) <10	1		1
5		Veppa maram (pol) <10	6		6
	50.5-50.6 total		19	4	23
1	50.6-50.7	Otheyan		1	1
2	RHS	Seavandi (40) (cn)		1	1
	50.6-50.7 total			2	2
1	50.7-50.8	Bamboo (40) (pl)		1	1
2	RHS	Karuvai (30) (pol) <10	1		1
3		Seavandi		3	3
4		Seavandi		1	1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	50.7-50.8 total		1	5	6
1	50.8-50.9	Karuvai (pol) <10	4		4
2	RHS	Nochi (pol) <10	2		2
3		Seavandi		1	1
	50.8-50.9 total		6	1	7
1	51.0-51.1	Drumstick (pol) <10	1		1
2	RHS	Karuvai (200) (pol) <10	1		1
3		Karuvai (pol) <10	3		3
4		Veppa maram		2	2
	51.0-51.1 total		5	2	7
1	51.1-51.2	Beech		1	1
2	RHS	Karuvai (15) (pol) <10	1		1
3		Veppa maram		1	1
	51.1-51.2 total		1	2	3
1	51.2-51.3	Karuvai		1	1
2	RHS	Karuvai (30) (pol) <10	1		1
3		Sapathi kailee (pol) <10	6		6
4		Veppa maram (pol) <10	10		10
	51.2-51.3 total		17	1	18
1	51.3-51.4	Karuvai (20) (pol) <10	1		1
2	RHS	Veppa maram		5	5
3		Veppa maram (pol) <10	4		4
	51.3-51.4 total		5	5	10
1	51.4-51.5	Karuvai (32) (pol) <10	1		1
2	RHS	Veppa maram		2	2
	51.4-51.5 total		1	2	3
1	51.5-51.6	Veppa maram		6	6
	51.5-51.6 total			6	6
1	51.6-51.7	Veppa maram		1	1
	51.6-51.7 total			1	1
1	51.7-51.8	Veppa maram		8	8
	51.7-51.8 total			8	8
1	51.8-51.9	Karuvai (pol) <10	8		8
2	RHS	Pala		1	1
3		Vagai (pol) <10	9		9

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	51.8-51.9 total		17	1	18
1	51.9-52.0	Veppa maram		1	1
	51.9-52.0 total			1	1
1	52.0-52.1	Karuvai (25) (pol) <10	1		1
	52.0-52.1 total		1		1
1	52.1-52.2	Karuvai (14) (pol) <10	1		1
2	RHS	Karuvai (15) (pol) <10	1		1
3		Veppa maram		1	1
	52.1-52.2 total		2	1	3
1	52.2-52.3	Nura (pl)		1	1
2	RHS	Veppa maram		1	1
3		Veppa maram (pl)		1	1
	52.2-52.3 total			3	3
1	52.3-52.4	Vaagai		1	1
2	RHS	Veppa maram		2	2
	52.3-52.4 total			3	3
1	52.4-52.5	Karuvai (15) (pol) <10	1		1
2	RHS	Veppa maram		1	1
3		Veppa maram (20) (pol) <10	1		1
	52.4-52.5 total		2	1	3
1	52.5-52.6	Karuvai (pol) <10	4		4
2	RHS	Veppa maram (pol) <10	3		3
	52.5-52.6 total		7		7
1	52.6-52.7	Echan (pol) <10	3		3
2	RHS	Karuvai (30) (pol) <10	1		1
3		Nura (pol) <10	10		10
4		Otheyan (pol) <10	1		1
5		Panai maram (pol) <10	2		2
6		Veppa maram		3	3
7		Veppa maram (pol) <10	6		6
	52.6-52.7 total		23	3	26
1	52.8-52.9	Karuvai (30) (pol) <10	1		1
2	RHS	Nura		2	2
	52.8-52.9 total		1	2	3
1	52.9-53.0	Karuvai (pol) <10	10		10

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
2	RHS	Veppa maram (15) (pol) <10	1		1
	52.9-53.0 total		11		11
1	53.0-53.2	Karuvai (pol) <10	8		8
2	RHS	Veppa maram		1	1
	53.0-53.2 total		8	1	9
1	53.1-53.2	Karuvai (45) (pol) <10	1		1
	53.1-53.2 total		1		1
1	53.3-53.4	Karuvai (30) (pol) <10	1		1
	53.3-53.4 total		1		1
1	53.4-53.6	Adathodai (pol) <10	7		7
2	RHS	Arali (pol) <10	1		1
3		Karuvai (40) (pol) <10	1		1
4		Manjal arali (pol) <10	4		4
5		Nathiyaveatai (pol) <10	1		1
6		Navel (cn)		1	1
7		Pala		2	2
8		Pola kuchi (pol) <10	6		6
9		Vaagai		2	2
	53.4-53.6 total		20	5	25
1	53.6-53.7	Karuvai (20) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	11		11
3		Veppa maram		1	1
	53.6-53.7 total		12	1	13
1	53.7-53.8	Arali (15) (pol) <10	1		1
2	RHS	Veppa maram		1	1
	53.7-53.8 total		1	1	2
1	53.8-53.9	Kailee (40) (pol) <10	1		1
	53.8-53.9 total		1		1
1	53.9-54.0	Karuvai (40) (pol) <10	1		1
	53.9-54.0 total		1		1
1	54.0-54.1	Beech (pol) <10	1		1
2	RHS	Karuvai (20) (pol) <10	1		1
3		Nura		3	3
4		Pola kuchi (pol) <10	10		10
5		Veppa maram		2	2
	54.0-54.1		12	5	17

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	total				
1	54.1-54.2	Beech (pol) <10	4		4
2	RHS	Karuvai (cn)		10	10
3		Karuvai (pol) <10	10		10
4		Nura (cn)		2	2
5		Nura (pol) <10	6		6
6		Veppa maram		1	1
7		Veppa maram (cn)		4	4
	54.1-54.2 total		20	17	37
1	54.2-54.3	Beech (pol) <10	9		9
2	RHS	Karuvai (15) (pol) <10	1		1
3		Pala		1	1
4		Pala (cn)		1	1
5		Panai maram (pol) <10	1		1
6		Veppa maram (pol) <10	4		4
	54.2-54.3 total		15	2	17
1	54.3-54.4	Karuvai (pol) <10	10		10
2	RHS	Veppa maram (pol) <10	6		6
	54.3-54.4 total		16		16
1	54.4-54.5	Karuvai (15) (pol) <10	1		1
2	RHS	Katamuni (20) (pol) <10	1		1
3		Natukaruvai (pol) <10	1		1
4		Veppa maram		3	3
	54.4-54.5 total		3	3	6
1	54.5-54.6	Karuvai (18) (pol) <10	1		1
	54.5-54.6 total		1		1
1	54.6-54.7	Beech		1	1
2	RHS	Karuvai (30) (pol) <10	1		1
3		Vaagai		1	1
	54.6-54.7 total		1	2	3
1	54.7-54.8	Karuvai (20) (pol) <10	1		1
	54.7-54.8 total		1		1
1	54.8-55.0	Karuvai (40) (pol) <10	1		1
	54.8-55.0 total		1		1
1	54.9-55.0	Karuvai (15) (pol) <10	1		1
	54.9-55.0 total		1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
1	55.0-55.1	Karuvai (15) (pol) <10	1		1
	55.0-55.1 total		1		1
1	55.1-55.2	Karuvai (20) (pol) <10	2		2
2	RHS	Vaagai		1	1
	55.1-55.2 total		2	1	3
1	55.2-55.3	Karuvai (20) (pol) <10	1		1
	55.2-55.3 total		1		1
1	55.3-55.4	Custard apple (pol) <10	4		4
2	RHS	Karuvai (pol) <10	8		8
3		Nura		2	2
4		Seavandi		1	1
5		Seavandi (pl) (cn)	4		4
6		Vagai (pol) <10	1		1
7		Veppa maram		1	1
	55.3-55.4 total		17	4	21
1	55.5-55.6	Adathodai (pol) <10	5		5
2	RHS	Karuvai (pol) <10	6		6
3		Koyya		1	1
4		Marawali		1	1
5		Nura		2	2
6		Nura (pol) <10	5		5
7		Povarsan		1	1
8		Veppa maram (pol) <10	4		4
	55.5-55.6 total		20	5	25
1	55.6-55.7	Adathodai (20) (pol) <10	1		1
2	RHS	Erukan (pol) <10	2		2
3		Karuvai (15) (pol) <10	1		1
4		Konai		1	1
5		Konai (pol) <10	6		6
6		Mageelam		1	1
7		Povarsan		1	1
8		Seavandi		1	1
9		Seavandi (cn)		1	1
10		Vaagai		2	2
11		Vaagai (cn)		1	1
12		Vilvam		1	1
	55.6-55.7 total		10	9	19
1	55.7-55.8	Karuvai (pol) <10	4		4

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
2	RHS	Konai		1	1
3		Konai (pol) <10	6		6
	55.7-55.8 total		10	1	11
1	55.8-55.9	Karuvai (15) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	7		7
3		Marawali (30) (pol) <10	1		1
4		Nura (pol) <10	6		6
	55.8-55.9 total		15		15
1	55.9-56.0	Karuvai (15) (pol) <10	1		1
2	RHS	Veppa maram		3	3
3		Veppa maram (pol) <10	10		10
	55.9-56.0 total		11	3	14
1	56.0-56.1	Erukan (pol) <10	1		1
2	RHS	Panai maram (pol) <10	10		10
	56.0-56.1 total		11		11
1	56.0-56.2	Beech		2	2
2	RHS	Beech		1	1
3		Erukan (pol) <10	12		12
4		Karuvai (14) (pol) <10	1		1
5		Karuvai (40) (pol) <10	1		1
6		Panai maram (pol) <10	1		1
	56.0-56.2 total		15	3	18
1	56.2-56.3	Karuvai (15) (pol) <10	1		1
	56.2-56.3 total		1		1
1	56.4-56.5	Erukan (pol) <10	10		10
2	RHS	Karuvai (15) (pol) <10	1		1
3		Nura (pol) <10	4		4
4		Veppa maram (pol) <10	7		7
	56.4-56.5 total		22		22
1	56.5-56.6	Beech		2	2
2	RHS	Beech (pol) <10	2		2
3		Karuvai (pol) <10	8		8
	56.5-56.6 total		10	2	12
1	56.6-56.7	Karuvai (pol) <10	4		4
	56.6-56.7 total		4		4
1	56.7-56.8	Erukan (pol) <10	9		9

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
2	RHS	Karuvai (pol) <10	1		1
	56.7-56.8 total		10		10
1	56.8-56.9	Erukan (pol) <10	5		5
2	RHS	Karuvai (pol) <10	9		9
3		Panai maram (pol) <10	3		3
4		Thekku (20) (pol) <10	1		1
5		Veppa maram		1	1
	56.8-56.9 total		18	1	19
1	57.0-57.1	Karuvai (20) (pol) <10	1		1
2	RHS	Nura		2	2
3		Panai maram (pol) <10	4		4
	57.0-57.1 total		5	2	7
1	57.1-57.2	Drumstick (pol) <10	4		4
2	RHS	Narthai (cn)		1	1
3		Nura (pol) <10	1		1
4		Panai maram (pol) <10	9		9
5		Povarsan (pol) <10	1		1
6		Seavandi (pol) <10	14		14
7		Thiruvachi		1	1
8		Veppa maram		4	4
	57.1-57.2 total		29	6	35
1	57.2-57.4	Karuvai (14) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	10		10
3		Katamuni (20) (pol) <10	1		1
4		Narthai		1	1
5		Nura		7	7
6		Nura (cn)		4	4
7		Vagai (pl)		9	9
8		Vatha		4	4
9		Veppa maram		1	1
10		Veppa maram (cn)		2	2
	57.2-57.4 total		12	28	40
1	57.4-57.5	Drumstick		1	1
2	RHS	Elumuchai (pol) <10	1		1
3		Karuvai (35) (pol) <10	1		1
4		Karuvai (pol) <10	1		1
5		Nura		3	3
6		Nura (15) (pol) <10	2		2
7		Sevandi		3	3

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	57.4-57.5 total		5	7	12
1	57.5-57.6	Beech		1	1
2	RHS	Beech (pol) <10	3		3
3		Karuvai (15) (pol) <10	1		1
4		Manjal arali		1	1
5		Nura		1	1
6		Otheyan (pol) <10	1		1
7		Sevandi		1	1
8		Veppa maram		5	5
	57.5-57.6 total		5	9	14
1	57.6-57.7	Adathodai (15) (pol) <10	1		1
2	RHS	Custard apple		1	1
3		Drumstick (pol) <10	6		6
4		Manjal arali		2	2
5		Nura (cn)		4	4
6		Nura (pol) <10	2		2
7		Sevandi		4	4
8		Sevandi (15) (pol) <10	1		1
9		Sevandi (40) (pol) <10	1		1
10		Sevandi (cn)		1	1
11		Veppa maram		3	3
12		Veppa maram (cn)		1	1
13		Veppa maram (pol) <10	8		8
	57.6-57.7 total		19	16	35
1	57.8-57.9	Adathodai (pol) <10	10		10
2	RHS	Karuvai (pol) <10	4		4
	57.8-57.9 total		14		14
1	57.9-58.0	Karuvai (pol) <10	10		10
	57.9-58.0 total		10		10
1	58.0-58.1	Adathodai (pol) <10	2		2
2	RHS	Beech (cn)		1	1
3		Bhir (pol) <10	1		1
4		Drumstick (pol) <10	2		2
5		Karuvai		2	2
6		Karuvai (15) (pol) <10	1		1
7		Karuvai (pol) <10	4		4
8		Thennai (pol) <10	2		2
9		Vagai (pol) <10	1		1
	58.0-58.1		13	3	16

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	total				
1	58.1-58.2	Karuvai (pol) <10	10		10
	58.1-58.2 total		10		10
1	58.2-58.3	Drumstick (cn)		1	1
2	RHS	Karuvai (15) (pol) <10	1		1
3		Veppa maram (cn)		2	2
	58.2-58.3 total		1	3	4
1	58.3-58.4	Beech		3	3
2	RHS	Karuvai (cn)		2	2
3		Veppa maram (cn)		1	1
	58.3-58.4 total			6	6
1	58.4-58.5	Drumstick		2	2
2	RHS	Karuvai (20) (pol) <10	1		1
3		Panju (pol) <10	1		1
4		Pupai (pol) <10	8		8
5		Sewangi		1	1
	58.4-58.5 total		10	3	13
1	58.5-58.6	Beech (pol) <10	9		9
2	RHS	Karuvai (14) (pol) <10	1		1
3		Manjal arali		1	1
4		Vagai (pol) <10	3		3
	58.5-58.6 total		13	1	14
1	58.7-58.8	Beech		1	1
2	RHS	Maa		1	1
3		Sempeathai (pol) <10	1		1
4		Vagai (pol) <10	1		1
	58.7-58.8 total		2	2	4
1	58.8-58.9	Karuvai (18) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	1		1
3		Thekku (pol) <10	1		1
	58.8-58.9 total		3		3
1	58.9-59.0	Adathodai (20) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	5		5
3		Pola kuchi (pol) <10	2		2
4		Povarsan (pol) <10	4		4
5		Sewangi		5	5
6		Sewangi (pol) <10	3		3

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
7		Vagai (pol) <10	2		2
8		Veppa maram		2	2
9		Veppa maram (pol) <10	1		1
	58.9-59.0 total		18	7	25
1	59.1-59.2	Karuvai (25) (pol) <10	1		1
	59.1-59.2 total		1		1
1	59.2-59.3	Araspathi		14	14
2	RHS	Karuvai (40) (pol) <10	1		1
3		Nura		7	7
4		Nura (pol) <10	9		9
	59.2-59.3 total		10	21	31
1	59.4-59.5	Karuvai (40) (pol) <10	1		1
2	RHS	Nura (pol) <10	4		4
3		Veppa maram (pol) <10	10		10
	59.4-59.5 total		15		15
1	59.6-59.7	Karuvai (35) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	4		4
3		Veppa maram (pol) <10	1		1
	59.6-59.7 total		6		6
1	59.9-60.0	Custard apple		1	1
2	RHS	Custard apple (20) (pol) <10	1		1
3		Karuvai (20) (pol) <10	1		1
4		Manjal arali (pol) <10	1		1
	59.9-60.0 total		3	1	4
1	60.1-60.3	Arali (pol) <10	1		1
2	RHS	Echan (pol) <10	1		1
3		Katamuni (pol) <10	9		9
4		Nura (pol) <10	2		2
5		Veppa maram (pol) <10	4		4
	60.1-60.3 total		17		17
1	60.3-60.4	Custard apple (pol) <10	2		2
2	RHS	Drumstick (pol) <10	1		1
3		Elumuchai (pol) <10	2		2
4		Sevandi (15) (pol) <10	1		1
5		Vagai (pol) <10	1		1
	60.3-60.4 total		7		7
1	60.4-60.5	Adathodai (19) (pol) <10	1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
2	RHS	Erukan (pol) <10	4		4
3		Karuvai (pol) <10	4		4
4		Vagai (pol) <10	5		5
	60.4-60.5 total		14		14
1	60.5-60.6	Adathodai (pol) <10	10		10
2	RHS	Beech (fenced)		3	3
3		Karuvai (pol) <10	3		3
	60.5-60.6 total		13	3	16
1	60.6-60.7	Karuvai (15) (pol) <10	1		1
2	RHS	Pala (pol) <10	1		1
3		Veppa maram (pol) <10	1		1
	60.6-60.7 total		3		3
1	60.7-60.8	Karuvai (pol) <10	10		10
	60.7-60.8 total		10		10
1	60.8-60.9	Araspathi (20) (pol) <10	1		1
2	RHS	Karuvai (25) (pol) <10	1		1
3		Otheyan		1	1
4		Sevandi (pol) <10	10		10
	60.8-60.9 total		12	1	13
1	60.9-61.0	Karuvai (pol) <10	12		12
	60.9-61.0 total		12		12
1	61.0-61.1	Karuvai (18) (pol) <10	1		1
	61.0-61.1 total		1		1
1	61.6-61.7	Custard apple (pol) <10	10		10
2	RHS	Karuvai (pol) <10	5		5
3		Povarsan		2	2
4		Sevandi		6	6
5		Sevandi (20) (pol) <10	1		1
6		Vagai (pol) <10	8		8
	61.6-61.7 total		24	8	32
1	61.7-61.9	Karuvai (30) (pol) <10	1		1
2	RHS	Karuvai (pol) <10	4		4
3		Nura (pol) <10	3	1	4
4		Puliya maram		1	1
	61.7-61.9 total		8	2	10
1	61.9-62.0	Karuvai (20) (pol) <10	1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
2	RHS	Nura (fenced)		3	3
3		Veppa maram (fenced)		4	4
4		Veppa maram (pol) <10	8		8
	61.9-62.0 total		9	7	16
1	62.0-62.1	Karuvai (pol) <10	4		4
2	RHS	Pola (pol) <10	1		1
3		Sevandi (cn)		4	4
4		Sevandi (pol) <10	6		6
5		Veppa maram		1	1
	62.0-62.1 total		11	5	16
1	62.1-62.2	Amanaku (pol) <10	8		8
2	RHS	Nura (pol) <10	4		4
3		Sevandi		3	3
4		Sevandi (15) (pol) <10	1		1
	62.1-62.2 total		13	3	16
1	62.2-62.3	Beech (pol) <10	1		1
2	RHS	Custard apple		1	1
3		Karuvai (pol) <10	2		2
4		Murungai (pol) <10	1		1
5		Sempeathai (pol) <10	2		2
6		Veppa maram (pol) <10	4		4
	62.2-62.3 total		10	1	11
1	62.3-62.4	Beech		1	1
2	RHS	Drumstick		1	1
3		Vatha		1	1
4		Veppa maram		4	4
	62.3-62.4 total			7	7
1	62.4-62.5	Amanaku (pol) <10	8		8
2	RHS	Beech (pol) <10	4		4
3		Nura (pol) <10	5		5
	62.4-62.5 total		17		17
1	62.5-62.6	Custard apple		1	1
2	RHS	Drumstick		1	1
3		Drumstick (pol) <10	1		1
4		Jack		1	1
5		Kodukapali (pol) <10	1		1
6		Maruthani (pol) <10	1		1
7		Narthai		1	1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
8		Navel		1	1
9		Nura		1	1
10		Pala		2	2
11		Sevandi		6	6
12		Vatha (fenced)		1	1
13		Veppa maram		1	1
	62.5-62.6 total		3	16	19
1	62.6-62.7	Beech		2	2
2	RHS	Nura (pol) <10	9		9
3		Otheyan (pol) <10	8		8
4		Pupai		1	1
5		Thekku		1	1
6		Thekku (pol) <10	9		9
7		Veppa maram (pol) <10	12		12
	62.6-62.7 total		38	4	42
1	62.7-62.8	Beech		2	2
2	RHS	Beech (20) (pol) <10	1		1
3		Custard apple		1	1
4		Karuvai (15) (pol) <10	1		1
5		Nura		1	1
6		Thekku		4	4
7		Veppa maram (pol) <10	8		8
	62.7-62.8 total		10	8	18
1	62.8-62.9	Araspathi (pol) <10	3		3
2	RHS	Karuvai (15) (pol) <10	1		1
3		Sewakku (pol) <10	11		11
4		Thekku (pol) <10	1		1
5		Vagai		1	1
	62.8-62.9 total		16	1	17
1	62.9-63.0	Nura		3	3
	62.9-63.0 total			3	3
1	63.0-63.1	Karuvai (30) (pol) <10	1		1
	63.0-63.1 total		1		1
1	63.1-63.2	Karuvai (20) (pol) <10	1		1
	63.1-63.2 total		1		1
1	63.3-63.4	Karuvai		2	2
2	RHS	Karuvai (20) (pol) <10	1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
3		Karuvai (45) (pol) <10	1		1
4		Kodukapali		1	1
	63.3-63.4 total		2	3	5
1	63.4-63.5	Adathodai (20) (pol) <10	1		1
2	RHS	Nura		1	1
3		Nura (20) (pol) <10	1		1
4		Sugacan (100) (pol) <10	1		1
	63.4-63.5 total		3	1	4
1	63.5-63.6	Beech		1	1
2	RHS	Karuvai (30) (pol) <10	1		1
3		Sevandi (pol) <10	1		1
	63.5-63.6 total		2	1	3
1	63.6-63.8	Beech		3	3
2	RHS	Karuvai (18) (pol) <10	1		1
3		Karuvai (50) (pol) <10	1		1
4		Thoongumoonji (pol) <10	2		2
	63.6-63.8 total		4	3	7
1	63.8-63.9	Beech	1	1	2
2	RHS	Karuvai (30) (pol) <10	1		1
	63.8-63.9 total		2	1	3
1	63.9-64.0	Beech		1	1
2	RHS	Karuvai (40) (pol) <10	1		1
	63.9-64.0 total		1	1	2
1	64.0-64.1	Beech		1	1
2	RHS	Karuvai (40) (pol) <10	1		1
3		Pala		1	1
	64.0-64.1 total		1	2	3
1	64.1-64.2	Beech		3	3
2	RHS	Beech (pol) <10	10		10
3		Karuvai (pol) <10	6		6
4		Nura		1	1
5		Nura (pol) <10	7		7
	64.1-64.2 total		23	4	27
1	64.2-64.3	Amanaku (15) (pol) <10	1		1
2	RHS	Beech (15) (pol) <10	1		1
3		Karuvai (15) (pol) <10	1		1
4		Nura (pol) <10	1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
5		Pupai (pol) <10	10		10
	64.2-64.3 total		14		14
1	64.3-64.4	Adathodai (20) (pol) <10	1		1
2	RHS	Echan (pol) <10	4		4
3		Karuvai (pol) <10	8		8
4		Sevandi (14) (pol) <10	1		1
	64.3-64.4 total		14		14
1	64.4-64.5	Adathodai (30) (pol) <10	1		1
2	RHS	Beech		1	1
3		Karuvai (40) (pol) <10	1		1
4		Sevandi (15) (pol) <10	1		1
5		Sevandi (cn)		1	1
	64.4-64.5 total		3	2	5
1	64.6-64.7	Karuvai (60) (pol) <10	1		1
2	RHS	Nura (pol) <10	2		2
3		Veppa maram (pol) <10	2		2
	64.6-64.7 total		5		5
1	64.7-64.8	Nura		1	1
	64.7-64.8 total			1	1
1	64.8-64.9	Beech (fenced)		10	10
2	RHS	Drumstick (fenced)		2	2
3		Karuvai (pol) <10	11		11
4		Nura (fenced)		1	1
5		Nura (pol) <10	6		6
6		Sevandi (fenced)		8	8
7		Veppa maram (fenced)		6	6
8		Veppa maram (pol) <10	9		9
	64.8-64.9 total		26	27	53
1	64.9-65.0	Karuvai (20) (pol) <10	1		1
2	RHS	Karuvai (60) (pol) <10	1		1
3		Nura		1	1
4		Puliya maram		1	1
	64.9-65.0 total		2	2	4
1	65.1-65.2	Karuvai (35) (pol) <10	1		1
	65.1-65.2 total		1		1
1	65.2-65.3	Karuvai (40) (pol) <10	1		1
	65.2-65.3 total		1		1

Sr. No.	km	Tree name	<30 cm	10 to 30cm	Total
	total				
1	65.3-65.4	Karuvai (pol) <10	10		10
	65.3-65.4 total		10		10
1	65.4-65.5	Karuvai (15) (pol) <10	1		1
2	RHS	Povarsan (cn)		1	1
3		Veppa maram (cn)		1	1
	65.4-65.5 total		1	2	3
1	65.5-65.6	Karuvai (15) (pol) <10	1		1
2	RHS	Koyya (fenced)		1	1
3		Maa (fenced)		1	1
4		Veppa maram		1	1
	65.5-65.6 total		1	3	4
1	65.6-65.7	Adathodai (pol) <10	1		1
2	RHS	Beech		1	1
3		Drumstick (pol) <10	1		1
4		Karuvai (pol) <10	1		1
5		Sevandi		1	1
	65.6-65.7 total		3	2	5
1	65.8-65.9	Koyya		1	1
2	RHS	Manjal (pol) <10	5		5
3		Vagai (pol) <10	4		4
	65.8-65.9 total		9	1	10
1	65.9-66.0	Povarsan		1	1
2	RHS	Veppa maram (cn)		1	1
	65.9-66.0 total			2	2
1	66.0-66.1	Karuvai		1	1
2	RHS	Karuvai (pol) <10	10		10
3		Koyya		1	1
	66.0-66.1 total		10	2	12
	Grand total		1823	570	2393

Note: The above tree list is for the facilitation of transplation. Out of these the contractor in consultation with environmental expert of CSC and Environmental specialist of TNRSP may decide which species are feasible for transplant. The productive species may be selected depending upon site suitability.

ANNEXURE 5.53: ARRANGEMENT WITH FOREST DEPARTMENT

REGULATORY FRAMEWORK

- The tree cutting from the RoW does not require permission from State Forest Department as road side plantation in Tamil Nadu is not declared as protected forest. The tree cutting permission will be accorded by the Revenue Authorities. The compensatory plantation will be taken up in 1: 10 ratio. For this MoU will be signed with state forest department as there is no enough space in RoW for the compensatory afforestation.

FUNDING MECHANISM

- The Ministry of Environment, Forests and Climate Change (MoEFCC) under their order dt. the 24th, April, 2004 have constituted an authority known as **Compensatory Afforestation Fund Management and Planning Authority, CAMPA** for the purpose of management of money received from user agencies for compensatory afforestation. The TNRSP being the user agency in this project will be required to deposit the money as estimated by the State Forest Department to the CAMPA for the compensatory plantation.
- CAMPA shall release funds to the State in predetermined installments through the State Level Management Committee as per the Annual Plan of Operations drawn by the State Forest Department

SELECTION OF TREE SPECIES

- Trees to be selected for planting should be site-specific taking into account the type of soil, features of the planting site e.g. for saline and alkaline soils and water logged area will require special attention.
- Browse hardiness, good growth rate, resistance to insects/pests disease and biotic interference etc should be given appropriate weightage in selection of species.
- Evergreen / semi-evergreen species should be preferred to deciduous species.
- In urban /semi-urban stretches of road, flowering trees should be preferred to add to aesthetics of the surround.
- Trees having large tomentose leaves may be included in stretches where particulates are likely to be high.
- In the matter of selection of species for planting, stakeholders need be consulted and their views accommodated keeping view the site- specifics.

PLANTING PATTERN

- Monoculture planting should be avoided. Mixed culture of shade-giving, flowering and fruit-bearing species should be preferred.
- The first row may be composed of a mix of species of flowering trees; such mix may consist of trees coming into flowers in different seasons.
- The second row may have representation of middle-sized evergreen and fruit-bearing species.
- The third row wherever feasible should be of broad-leaved evergreen species; the species should be so chosen as to make sure that they grow taller than trees planted in the first and second rows.

MANAGEMENT AND MONITORING

- Strip plantations should be properly fenced to prevent damages by biotic interference.
- Wherever possible live- hedges may be provided; in such stretches live-hedges need be grown a year ahead of actual planting; such hedges may be reinforced by weaving with split bamboos.
- It may also be explored as to whether communities along the roads can be involved in protection and maintenance of such plantations through a mechanism of sharing of usufructs.
- Local voluntary organizations, sports/youth clubs may also be encouraged for protection of such plantations through provision of incentives.

ANNEXURE 5.54 GUIDELINES FOR SELECTION OF TREE SPECIES

Highway-side plantation may be of various species, some of which are not appropriate. In many places in TN, one may find giant trees with strong stems and horizontally spreading roots. Some trees branch out early and have short stems. Some trees without deep roots system overturn when old in rain or wind.

1. TREES TO BE AVOIDED:

On all account, the following trees should be avoided along the roadside:

S No.	Trees Name	Characteristics
1	Eucalyptus (all species), Millenglonia Hortensis, Eugenia jambolana, Albizzia lebbek, Cassia siamca and Ficus (all species).	All these tree species have very weak wood and consequently break easily in windstorm. After a heavy storm, roads become blocked and traffic is stopped for a considerable length of time. During a storm, these trees are threats to vehicles plying and pedestrians on the road. Besides the <i>eucalyptus</i> have a few other negative environmental impacts.
2	Ficus bengalensis Tamil Name: Arasa Maram	The <i>Ficus</i> species are of tap root system but flowing type (average depth of root system is 1.5m). Therefore, these, when mature, may overturn in strong-wind, storm, etc. Even the existing trees may be recommended for removal from safety points of view

2. CHARACTERISTICS OF TREE SPECIES FOUND ALONG PROJECT CORRIDOR

S No.	Species	Characteristics	No. of Existing trees	% no. of existing trees
1	<i>Tamarindus indica</i> – tamarind Tamil Name: Puliya Maram	Category of wood is E. Seed yields fellose, which is used as a sizing agent. It is dust resistant, gas absorbent. Controls erosion, is drought resistant and supports wildlife.	2597	50%
2	<i>Azadirachta indica</i> - Neem Tamil Name: Veppa Maram	Category of wood is E. It is dust resistant, gas absorbent. Controls erosion, is drought resistant and supports wildlife. Seeds yield <i>margosa</i> oil, which has medicinal properties including being extremely effective in treatment of leprosy and skin diseases.	680	13%
3	<i>Pongamia pinnata</i> – Karanj Tamil Name: Punga Maram	Category of wood is E. Dust resistant, gas resistant. Controls erosion. Drought resistant. Seeds are effective in treating bronchitis. Seeds/oil have antiseptic/antiparasitic properties	266	5%

S No.	Species	Characteristics	No. of Existing trees	% no. of existing trees
4	<i>Samania Saman</i> Bagi	Category of wood is E. Planted as avenue tree. It is dust resistant, gas absorbent. Controls erosion, is drought resistant and supports wildlife. The pod fed to cows is believed to increase the quantity of milk.	230	4%
5	<i>Tactona grandis</i> - Teak Tamil Name: Thekku	Category of wood is E. Used for construction work, making timber sleepers, furniture etc. It is dust resistant, gas absorbent. Controls erosion, is drought resistant and supports wildlife. Fruits are useful in preparing chutney.	224	4%
6	- <i>Giriship</i>		103	2%
7	<i>Syzygium cumini</i> – Jamun Tamil Name: Navel Maram	Category of wood is E. Vinegar is prepared from the juice. It is dust resistant, gas absorbent. Controls erosion, is drought resistant and supports wildlife. Bark of the tree is used for tanning of leather. Fruits are very nourishing for diabetic patients.	121	2%
8	<i>Eucalyptus sp</i> - Nilgiri Tamil Name: Thaila Maram	Category of wood is E. Valuable for perfume industry. It is dust resistant, gas absorbent. Controls erosion, is drought resistant and supports wildlife. Oil paralysis the respiratory in the medulla	54	1%
9	<i>Ficus bengalensis</i>	Category of wood is E. Total inflorescence is edible. It is dust resistant, gas absorbent. Controls erosion, is drought resistant and supports wildlife. Wood forms excellent fuel.	35	1%

3. TREES TO BE SELECTED:

On the other hand, some trees are appropriate for highway landscaping. These include trees, which have thinner stem but dense foliage; that absorb/retain dust and other atmospheric pollutants; those, which erosion resistant species, etc. These species should be preferred for replanting. These trees include

S No.	Trees Name	Characteristics
1	Azardiracta indica (Neem) Tamil Name: Veppa Maram	The leaves, barks are used for medicinal purposes, and the seeds yield valuable oil. It can grow on alkaline usar soil
2	Madhuca indica (Mahua) Tamil Name: Iluppai	The fruit is edible and seeds yields oil. It is also ornamental
3	Tamarindus indica (Imli)	A beautiful tree, which stands the dust of

	Tamil Name: Puliya Maram	roads very well. Its fruit and timber are also valuable; suitable for dry area. This species is most common along project road.
4	Dalbergia sisoo (Shisham) Tamil Name: Sissoo	Yields excellent timber
5	Mangifera indica (Mango) Tamil Name: Maa	Yield valuable fruit
6	Safed siris Tamil Name: Vagai Maram	A quick growing beautiful tree. Because of the light yellow colour of the trunk, it reflects even weak light. This is an excellent roadside tree.

ANNEXURE 5.55 GUIDELINE FOR AVENUE PLANTATION

GENERAL DESCRIPTION

- Avenue plantation is suggested all along the rural stretches of the project corridor.
- The selections of species agreeing with the general landscaping of the area are suggested/ recommended in **Annexure-5.54: GUIDELINES FOR THE SELECTION OF TREE SPECIES.**
- Planting should generally be done at the height of the monsoons in the month of July.
- It is felt that a weighted emphasis should be paid to protection, maintenance and safety of the planted trees. Suitable full-timers should be employed for this purpose.
- The species to be planted would be to enhance the visual experience of the road corridor. One/ two / three rows of trees are recommended in accordance to the varying width available of different sections. Tree spacing in case of broad canopy should not be less than 10m and in case of medium canopy should not be less than 7m.
- The plants will be at spacing of 10 meters and size of the pits for planting will be 0.6m /0.75m dia and deep. Therefore, total no. of plants per km will be 200 in case where single row is proposed and 400 in case of two rows.
- The species recommended for avenue plantation should be able to withstand extreme temperature and climate conditions and also has low requirements of water. These species have been proposed considering the climatic conditions, requirements of water and future management. However other species may also be used, after approval from CSC.
- The surface for the avenue plantation should be well prepared. The masses of loose debris and any convexities will be removed and similarly and concavities are to be filled by good soil. The surface should have sufficient layer of good quality of soil so as to have a better growth and survival of trees, grasses and saplings.
- The height of the plants will not be less than 1.5m and need to be in polythene bags until the planting.
- All plants supplied must be planted within three days of removal from the nursery.
- The contractor/agency hired will be required to water the area in case of sufficient rains water after planting.
- Size of the pits for planting saplings - 75x75x75 cm
- No. of Plant per km - 200
- Use of compost of manure and refilled - 1/3 of volume of pit mixed with soil,
- The total no. tree saplings to be planted along the corridor

S. No.	Description	No. of sapling Required	Area for Landscaping (sqm)
1	Avenue Plantation		Nil
2	Realignment Sections		
3	Cultural Properties		

Table-1: Activities schedule for Plantation along the Road

Year	Month	S. No.	Activities to be done	
1 st Year	Jan to Mar	1	Surveying & Clearing of the area	
		2	Digging of Pits	
		3	Procurement of Angles Iron and Barbed wire (or other fencing material), and erecting the fence	
2 nd Year	April to June	1	Purchase of Farm yard manure	
		2	Brick/Iron etc. guard for 1 st row	
		3.	Plantation along the road	
		4	Filling up of pits with Farm yard manure and soil	
	July to August	1	Transportation of Plants	
		2	Planting of Sapling	
		3	Watering	
		4	Weeding and Hoeing	
	Sept to Nov	1	Weeding of Hoeing	
		2	Watering 4 times a month	
	Dec to Feb	1	Weeding of Hoeing	
		2	Maintenance	
	March	1	Watering 4 times a month	
	3 rd Years	April to June	1	Watering 6 times a month
			2	Casualty Replacement (20% of the total plants)
July to August		1	Weeding	
		2	Maintenance by Mali	
Sep to Nov		1	Watering 2 times a month	
		2	Maintenance by Mali	
Dec to Feb		1	Maintenance by Mali	
		2	Maintenance by Mali	
March		1	Watering 4 times a month	
		2	Maintenance by Mali	
4 th Year	April to March	1	Watering	
		2	Casualty Replacement (10% of the total plants)	
		3	Maintenance by Mali	

PLANTATION

Scope

Contractor/ agency hired to furnish all materials, labor and related items necessary to complete the work indicated on drawing and specified herein.

Materials

Saplings

- Saplings/Seedlings shall be well-formed and free from defects such as knots, sun-scaled, windburn, injuries, abrasion or disfigurement. All saplings shall be healthy, sound, and free from plant diseases, insect's pests, of their egg and well-developed root systems.
- No plant will be accepted, if branches are damaged or broken. All the plant material must be protected from the sun and weather until planted.
- Any nursery stock shall have been inspected and approved by the ES TNRSP.
- All saplings will be delivered with legible identification labels.
- The root system shall be conducive to successful transplantation. While necessary, the root-ball shall be preserved by suitable material. On soils where retention of a good ball is not possible, the roots should be suitably protected in some other way, which should cause any damage to roots.

Topsoil/Good Earth

- Topsoil or good earth shall be a friable loam, typical of cultivated topsoil of the locality containing at least 2% of decayed organic matter (humus).
- Stored topsoil will be used for plantation at median and also for roadside plantation. Otherwise it could be taken from a well-drained arable site.
- It shall be free of subsoil, stones, earth skids, sticks, roots or any other objectionable extraneous matter or debris.
- It shall contain no toxic material.
- No topsoil shall be delivered in a muddy condition.

Manure

- Only organic manure will be used for plantation. Composts from municipal solid wastes and distillery waste may be used.
- Manure shall be free from extraneous matter, harmful bacteria insects or chemicals (Subjected to safety norms).

General Condition

- Saplings shall be substantially free from pests and diseases, and shall be materially undamaged. Torn or lacerated roots shall be pruned before dispatch.
- No roots shall be subjected to adverse conditions such as prolonged exposure to drying winds or subjection to water logging, between lifting and delivery.

Supply and Substitution

Upon submission of evidence that certain materials including plant materials are not available at time of contract, the contractor shall be permitted to substitute other and plants, with an equitable adjustment of price. All substitutions shall be of the nearest equivalent species and variety to the original specified and shall be subjected to the approval of the Landscape Architect. Packaging shall be adequate for the protection of the plants and such as to avoid heating or drying out.

Each specimen of tree, or each bundle, shall be legibly labeled with the following particulars:

- Its name (Both common and Scientific)
- The name of the supplier, unless otherwise agreed.
- The date of dispatch from the nursery.

Planting

Plants and Saplings

All saplings should be supplied with adequate protection as approved. After delivery, if planting is not to be carried out immediately, balled plants should be placed and the ball covered with sand to prevent drying out. Bare rooted plants can be heeled in by placing the roots in prepared trench and covering them with earth, which should be watered into, avoid air pockets round the roots. Saplings shall be planted as suggested by Environment officer.

Digging of Pits

- Tree pits shall be dug a minimum of three weeks prior to backfilling.
- The pits shall be 60 to 90cms in diameter and 90 to 120cms deep.
- While digging the pits, the topsoil up to a depth of 30cms may be kept aside, if found good (depending upon site conditions), and mixed with the rest of the soil.
- If the soil is normal it shall be mixed with manure.
- The bottom of the pit shall be forced to break up the subsoil.

Back Filling

The soil back filled watered through end gently pressed down, a day previous to planting, to make sure that it may not further settle down after planting. The soil shall be pressed down firmly by treading it down, leaving a shallow depression all rounds for watering.

Planting

- No pits shall be dug until final position has been pegged out for approval.
- Care shall be taken that the plant sapling when planted is not be buried deeper than in the nursery, or in the pot.
- Planting should not be carried out in waterlogged soil.
- Plant saplings at the original soil depth; soil marks on the stem is an indication of this and should be maintained on the finished level, allowing for setting of the soil after planting.
- All plastic and other imperishable containers should be removed before planting.

- Any broken or damage roots should be cut back to sound for healthy growth.
- The bottom of the planting pit should be covered with 50mm to 75mm of soil.
- Bare roots should be spread evenly in the planting pit; and small mound in the centre of the pits on which the roots are well aid on and evenly spread.
- Soil should be placed around the roots, gently shaking the saplings to allow the soil particles to shift into the root system to ensure close contact with all roots and prevent air pockets.
- Back fill soil should be firmed as filling proceeds, layer by layer, care being taken to avoid damaging the roots.

Staking

Newly planted saplings must be held firmly although not rigidly by staking to prevent a pocket forming around the stem and newly formed fibrous roots being broken by mechanical pulling as the tree rocks.

Methods:

The main methods of staking shall be:

- A single vertical stake, 900mm longer than the clear stem of the saplings driven 600mm to 900mm into the soil.
- Two stakes as above driven firmly on either side of the saplings with a cross bar to which the stem is attached. Suitable for bare- rooted or Ball material.
- A single stake driven in at an angle at 45 degrees and leaning towards the prevailing wind, the stem just below the lowest branch being attached to the stake. Suitable for small bare- rooted or Ball material
- For plant material 3m to 4.5m high with a single stem a three- wire adjustable guy system may be used in exposed situations.

The end of stake should be pointed and the lower 1m to 1.2m should be coated with a non-injurious wood preservative allowing at least 150mm above ground levee.

Tying

Each sapling should be firmly secured to the stake so as to prevent excessive movement. Abrasion must be avoided by using a buffer, rubber or Hessian, between the saplings and stake. The saplings should be secured at a point just below its lowest branch, and also just above ground level; normally two ties should be used for saplings. These should be adjusted or replaced to allow for growth.

Watering

The Landscape Contractor should allow for the adequate watering in of all newly planted trees and saplings immediately after planting and during the growing season, keep the plant material well watered.

Manure/Fertilizer usage

The fertilizers/manure usage should be such that the turn of all the fertilizers comes after, every 15 days from the beginning of the monsoon till the end of winter:

Organic well-rotted dry farm yard manure: 0.05 cum or tussle.

1. Urea 25gm.
2. Ammonium sulphate 25gm.

3. Potassium sulphate 25gm.

All saplings, which are supplied pot grown, shall be well soaked prior to planting.

Watering in and subsequent frequent watering of summer planted container- grown plants is essential.

Application of inorganic manure should as far as possible be avoided. Form yard manure as biofertilizer with for better option.

COMPLETION

On completion, the ground shall be formed over and left tidy.

Special Conditions and Particular Specifications:

1. Wherever applicable, work shall be done according to C.P.W.D. specifications
2. At the time of invitation of tender.
3. Water shall be made available, near the tube well at one point. Contractors shall make their own arrangement for drawing water from there. Water charges as per the value of work done shall be deducted from the contractors Bills.
4. If electricity is required for the works, the same shall be made available at one point within the site of works, for which recovery at the prevailing rate per unit shall be deducted from the contractors' bill.
5. The work mentioned in the schedule of Quantities includes grassing as well as planting of trees and saplings. 'Contractors' quoted rates shall include execution of these works at different levels. No extra cost shall be paid for any item, for working at these levels.
6. The Contractor shall provide all facilities to subcontractor (plantation) / Environment Officer / or his authorized representatives to make frequent inspection of their Nursery and ascertain the process / quality of various categories of trees/plants etc., grown by them.
7. The safe custody and up-keep of various categories of plants brought to site is the sole responsibility of the contractor and he shall employ sufficient supervisory personnel to ensure the safety of these items.
8. The site of work may be handed over to the contractors for execution of work in phases, as soon as the same are available. Nothing extra shall be payable for such phased execution of work.
9. While excavating / executing the work the contractors shall ensure that existing cables / pipe lines / structures / fittings are not damaged.
10. The Contractor shall co-ordinate his work with other agencies employed by the Clients and ensures that the work of other agencies is not hampered in any way during the duration of contract.
11. The Contractor shall keep the site of works neat and clean during the execution of the work. Any debris found at or near the site of work shall be rescued immediately as and when so required by the Contractor.
12. On completion of the work, the site of work shall be thoroughly cleaned and all debris removed before the work is handed over satisfactorily.

13. The Contractors shall, without any additional charge to the clients, renew or replace any dead or defective plants/grass and shall fully maintain the whole landscape for a period of 12 months after the certified date of completion.
14. Saplings/small tree shall be of minimum length straight and symmetrical with a crown and having a persistent main stem. The size of crown shall be in good overall proportion to the height of the tree.
15. Small trees and saplings shall be well formed with the crown typical of the species or variety.
16. General Requirements of Plants:
 - Plants shall be typical of their species and variety, well-developed branches, and well foliated with fibrous root system. Plants shall be free from defects and injuries. Plants shall not be pruned before planting.
 - Plants shall be free from defects and injuries.
 - Plants shall not be pruned before planting.
 - Plants shall not be freshly dug and nursery grown.
 - Nursery grown plants shall have been at least once transplanted.
 - Bark shall be free from abrasion.
 - All trees, soon after planting, shall be properly supported to ensure their safety against winds or any other factor, which may affect it adversely.

Format for the monitoring of the tree plantation and landscaping is given below.

Tree Plantation and Landscaping Format

Construction Stage: Quarterly Report -Date____ Month_____ Year_____

All landscape works to be as per Landscape Plan

Sl. No	Activity	Physical Target				Financial Target			Completion Target			
		Target (tree/saplings to be planted in Package) for this Quarter		Target Achieved		% of task completed	Total (lakhs)	Budget Spent	% used	Target Date	Date of Completion/ % completed	Reason for Delay if any
		unit		No. of Trees	Survival Rate (%)							
1	Tree Plantation along roadside	km-km										
2	Landscaping of Road Junctions	Nos.										
3	Plantation at Incidental Spaces	Nos.										
4	Plantation at Locations identified for enhance-ment	Nos.										
5	Turfing on Embank-ment	km-km										
6	Saplins on Embank-ment	km-km										

Certified that the above information is correct

Assistant Conservator of Forests

ANNEXURE 5.56 GUIDELINES FOR TRANSPLANTATION OF POLES (<0.30 M GIRTH SIZE)

If trees are not very old they can be transplanted easily. The percentage of survival can be hundred per cent if the work is done properly and during the rainy season. The following steps are involved:

1. The sites where the trees are to be shifted should be selected first. The sites should be free of overhead telephone or power lines. Large pits should be dug at these sites to comfortably accommodate the 'tree roots' ball of earth.
2. Distance between pits depends on the variety. In case of short varieties with a small spread, the distance should be 10 ft. to 15 ft. For tall varieties with spreads of between 15 ft. and 20 ft. on either side, the distance should not be less than 30 feet.
3. When pits are dug at the selected sites, their sizes would depend on the dimensions/age of the tree. For trees of medium size the pit size will be around 8 feet in diameter and 5 feet deep. The actual pit size for different trees can be adjusted with experience. The point to be kept sight of is that 'trees roots' ball of earth should fit in comfortably with at least 6 to 12 inches clearance all around. Usually the pit size in feet should be directly proportional to the girth of the trees in inches.
4. Adequate quantity of soil and manure mixture @ 4:1 is necessary for each pit. A little bone meal can also be added. To start with only about 60cm soil mixture is to be filled in each pit and watered well to form a puddle before the actual transplantation. The total quantity of soil and manure required for all the pits should be mixed and arrange before the start of the actual operation.
5. Before transplantation, the trees should be 'extensively pruned'. That is, the foliage should be completely removed and all the branches should be cut off with a pruning saw. No other implement should be used. The cut surfaces should be painted with non-synthetic white paint to anaesthetize these portions. 'Extensive pruning 'helps in easier 'replanting balance' and handling, thereby reducing the shock effect. This also aids the plant roots in recovering and adhering to the new soil and reduces transpiration and/or loss of moisture.
6. The trees are now ready for lifting or uprooting. A deep trench of at least up to 5 feet in depth is to be dug around the base of the tree at least 2 to 3 feet away from the trunk in the case of trees with a girth of up to 60cm. The depth of the trench and its distance from the trunk would therefore vary with the size of the tree. The trench should be dug to gradually converge towards the base of the tree so that 'tree roots' ball of earth can ultimately be detached from the ground.
7. The trees are then to be lifted with the help of a crane of suitable size. Before lifting, a piece of gunny should be wound round the trunk, with a few wooden batons secured around the gunny pack on the outside by a steel wire rope. This will facilitate lifting without injuring the bark. Immediately the 'trees roots' ball should be sprayed with potassium phosphate solution and then wrapped and tied with a piece of very wet gunny.
8. Before replanting, the soil at the base of the pit should be watered heavily after which the uprooted tree along with the 'tree roots' ball should be lowered carefully into the new pit with the help of the crane.
9. The empty space in this pit is to be filled with the previous prepared mixture of soil, bone meal and manure and thoroughly rammed in tightly, so that no air gaps are left inside the soil. Air gaps could result in fungal infection to the roots. Sand can also be added which will fill up the air gaps when watered.

10. The trunk can now be sprayed with Blytox, a copper sulphate compound whose action is anti-fungicidal in nature.
11. The transplanted tree should be watered heavily at the base.
12. Guy ropes, angle iron or bamboos should be used for a few days to secure the tree till the soil hardens around the transplanted tree to hold it erect.
13. Four to five days after transplantation the trunk can be sprayed with potassium nitrate solution for facilitating the initiation of new shoots.
14. If rains are inadequate watering should continue for three months.

The heavily pruned transplanted tree is not a pretty sight, but this should not deter the optimist, as the chances of survival are maximum without the branches and foliage.

The list of poles(<30 cm girth size) available in RoW has been prepared to facilitate transplantation as these will be easy to transplant. Out of this list it is not necessary to transplant all poles, but contractor in consultation with CSC Environmental Expert and TNRSP Environmental Specialist may select species feasible to transplant considering productivity and local importance of tree species. The list is just for facilitation of selection.

ANNEXURE 5.57 ENVIRONMENTAL STANDARD

Monitoring Parameters and Standards

The Environmental monitoring of the parameters involved and the threshold limits specified are discussed below:

Ambient Air Quality Monitoring (AAQM)

The air quality parameters viz: Sulphur Dioxide (SO₂), Oxides of Nitrogen (NO_x), Carbon Monoxide (CO), PM10 and PM2.5 shall be regularly monitored at identified locations from the start of the construction activity. The air quality parameters shall be monitored in accordance with monitoring plan given in **Chapter-5**. The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan in **chapter-5** and specific details in chapter on baseline environment in EA. The National Ambient Air Quality Standards are given in below:

National Ambient Air Quality Standards

Pollutant	Time Weighted Average	Sensitive Area	Industrial Area	Residential I, Rural & Other Areas	Method of Measurement
Sulphur Dioxide (SO ₂)	Annual* 24 hours**	15 µg/m ³ 30 µg/m ³	80 µg/m ³ 120 µg/m ³	60 µg/m ³ 80 µg/m ³	Improved West and Gaeke Method Ultraviolet Fluorescence
Oxides of Nitrogen (NO _x)	Annual* 24 hours**	15 µg/m ³ 30 µg/m ³	80 µg/m ³ 120 µg/m ³	60 µg/m ³ 80 µg/m ³	Jacob & Hochheiser Modified method Gas phase Chemiluminescence
Suspended Particulate Matter (SPM)	Annual* 24 hours**	70 µg/m ³ 100 µg/m ³	360 µg/m ³ 500 µg/m ³	140 µg/m ³ 200 µg/m ³	High Volume Sampler (Average flow rate not less than 1.1 m ³ /minute)
Respirable Particulate Matter (RPM) Size < 10µm	Annual* 24 hours**	50 µg/m ³ 75 µg/m ³	120 µg/m ³ 150 µg/m ³	60 µg/m ³ 100 µg/m ³	Respirable Particulate Matter Sampler
Lead (Pb)	Annual* 24 hours**	0.50 µg/m ³ 0.75 µg/m ³	1.0 µg/m ³ 1.5 µg/m ³	0.75 µg/m ³ 1.00 µg/m ³	AAS Method after sampling using EPM 2000 or equivalent filter paper
Carbon Monoxide (CO)	8 hours** 1 hour	1.0 mg/m ³ 2.0 mg/m ³	5.0 mg/m ³ 10.0 mg/m ³	2.0 mg/m ³ 4.0 mg/m ³	Non-dispersive infrared Spectroscopy

* Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval

**24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days.

Source: Central Pollution Control Board, 1997 Gazette Notification dated 4/94, Part II Sec 3 (ii)

Noise Quality Monitoring

The noise levels shall be monitored at already designated locations in accordance with the Ambient Noise Quality standards given in the following table. The duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan (**Chapter-5**) and specific details in chapter on baseline environment chapter in EA report.

Ambient Noise Quality Standards

Area Code	Category of Zones	Limits of Leq in dB(A) Day*	Night*
A	Industrial	75	70
B	Commercial	65	55
C	Residential	55	45
D	Silence Zone **	50	40

* Daytime shall mean from 6.00am to 10.00 pm and Night shall mean from 10.00 pm to 6.00 am

** Silence zone is defined as area up to 100 meters around premises of hospitals, educational institutions and courts. Use of vehicles horns, loud speakers and bursting of cracking are banned in these zones.

Water Quality Monitoring

Water quality parameters such as pH, BOD, COD, DO coliform count, total suspended solids, total dissolved solids, Iron, etc. shall be monitored at all identified locations during the construction stage as per details given in Chapter-5 and will be compared with Drinking Water standards (IS 10500:2012). The duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed out in the Environmental Monitoring Plan in **chapter-5** and specific details in chapter on baseline environment in EA report.

Drinking Water Standards

Sr. No	Parameters	IS:2296 (Class C)	IS:10500-2012	Method Adopted
1	PH	6.5-8.5	6.5-8.5	pH meter
2	BOD (3 days 27°C)	3.0	NS	DO-Azide modification of Wrinkler's method
3	Temperature (°C)	NS	NS	Thermometer
4	Dissolved oxygen	4	NS	Azide Modification of Wrinkler's method
5	Color (Hazen)	300	NS	Visual Comparison method
6	Fluorides (F)	1.5	1.0 (1.5)	SPANDS method
7	Chlorides (Cl)	600	250(1000)	Argentometric Titration
8	Total Dissolved Solids	1500	500 (2000)	Gravimetric Analysis
9	Sulphates (SO ₄)	400	200 (400)	Barium Chloride method
10	Iron (Fe)	50	0.3 (No Relaxation)	Phenanthrolin method
11	Oil and Grease	0.1	NS	Partition – Gravimetric method

Sr. No	Parameters	IS:2296 (Class C)	IS:10500-2012	Method Adopted
12	Nitrates	50	45 (100)	Chromotropic acid
13	Chromium (Cr ⁶⁺)	0.05	0.05	Atomic Absorption Spectrophotometry
14	Cadmium (Cd)	0.01	0.01	Atomic Absorption Spectrophotometry
15	Lead (Pb)	0.1	0.05	Atomic Absorption Spectrophotometry
16	Copper (Cu)	1.5	0.05 (1.5)	Atomic Absorption Spectrophotometry
17	Cyanide (CN)	0.05	0.05	Chloramine-T-method
18	Selenium (Se)	0.05	0.01	Atomic Absorption Spectrophotometry
19	Arsenic (As)	0.2	0.05	Atomic Absorption Spectrophotometry
20	Phenols	0.005	0.001(0.002)	Spectrophotometer
21	Detergents	1.0	0.2 (1.0)	Spectrophotometer
22	DDT	Absent	Absent	Spectrophotometer
23	Total Coliform (MPN/100 ml)	5000	NS	Multiple Tube Fermentation Technique

NS: Not specified; Brackets ([]) indicates extended limits. All the values in mg/l if otherwise mentioned

ANNEXURE 5.58 TRAINING PROGRAMME ON ENVIRONMENTAL ASPECTS

A comprehensive training programme has been planned for the project by DPR Consultants & PIU-TNRSP intended to address all components of the project. The programme has been intended for all Contractors and Supervision Consultants. As and when found necessary PIU in consultation with PCC will select appropriate modules for the training of contractors and for the training of engineers responsible for supervision and maintenance work. List of appropriate training modules and their time frames is discussed in subsequent paragraphs.

Training Module Details

The training components may be broadly divided into the following categories:

Principles and policies for (natural and social) environmental mitigation in development projects;

Legal and institutional aspects; project mandates;

Probable (natural and social) environmental impacts and losses in road strengthening and widening projects;

The EMAP in TNRSP II consisting of

i) the construction stage environmental concerns;

ii) the environmental designs and implementation plans;

iii) the project entitlement framework;

iv) types and aspects of vulnerability of the EPs;

v) counseling and grievance redressal methods and mechanisms and

vi) financial control mechanisms;

Monitoring, evaluation and reporting methods and mechanisms and,

Inter-sectoral and inter-agency collaboration, etc.

TRAINING PROGRAMME FOR THE PIU

Training Sessions	Training Components
Module I Initiation	<ul style="list-style-type: none"> Principles and policies for (natural and social) environmental mitigation in development projects; Legal and institutional aspects; project mandates including the WB operational guidelines; Introduction to the designs, implementation schedule for TNRSP II.
Module II Project Specifics	<ul style="list-style-type: none"> Probable (natural and social) environmental impacts and losses in road strengthening and widening projects; Basic features of the EMAP and the RAP in TNRSP II
Module III EMAP	<ul style="list-style-type: none"> Construction stage environmental concerns including hot-spot mitigation matrices Environmental designs and implementation plans; Location-wise and class-wise; Project entitlement framework including group, individual or community entitlements; the verification procedure; conditions/circumstances under which

Training Sessions	Training Components
	<p>additional persons may be considered affected/entitled;</p> <ul style="list-style-type: none"> • Vulnerability of the EPs; special measures or additional supports proposed in the entitlement framework to assist vulnerable groups to protect their livelihood; • Counselling for each category of entitled persons, households or groups; method and scope of counselling; Completion and distribution of entitlement photo identity cards; • grievance redressal methods and mechanisms; market value assessment method and mechanisms proposed in TNRSP II; • Financial control mechanisms including disbursement of compensation/assistance payments in a transparent method.
Module IV Constructi on stage issues	<ul style="list-style-type: none"> • Laws and other statutes associated with the proposed project such as the Labour Laws, the various pollution control acts, Environmental (Protection) Act, Mining Act, Hazardous Materials (Handling) Act, Forest (Conservation) Act, Land Acquisition Act, Draft National Rehabilitation Policy, etc; • Efficient construction activity monitoring; compliance monitoring; • Environmental clauses in TNRSP II contract documents and their implications.
Module V Operation stage issues	<ul style="list-style-type: none"> • Monitoring requirements; monitoring techniques; • Environnemental évaluation techniques; • Reporting requirements and mechanisms for TNRSP II.
Module VI Long term issues	<ul style="list-style-type: none"> • environmental surveys including ambient air, noise, biological and water quality surveys; • social Survey, Survey questionnaire design, sampling techniques; • data storage, analysis and retrieval; • contract documents and incorporation of environmental clauses; • community consultation and participatory technology generation methods; • legal or statutory requirements for environmental, social and forestry clearance of road projects and, • contingency planning and management, etc.

The above are the major areas of training and discussion and are not an exclusive list. The additional areas of training, in order to develop long term capacity in the PIU will also be arranged, as desired/planed.