



## Initial Environmental Examination

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Project Number: 47273-004 /005 /006  
Loan Numbers: Tranche 2 – 3221 /3222  
Tranche 3 – 3325 /3326  
Tranche 4 – 3610

March 2020

### SRI: Integrated Road Investment Program Improvement, Rehabilitation and Maintenance of A003 Road from Kochchikade (CH 38 + 000 km) to Puttalam (CH 126 +800 km)

Prepared by the Road Development Authority, Ministry of Highways for the Asian Development Bank.

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**Asian Development Bank**



**Ministry of Roads and Highways  
Road Development Authority**



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# **SRI: Integrated Road Investment Program Road Maintenance Contract**

**Improvement, Rehabilitation and Maintenance of  
The section of A003 Road from Kochchikade Bridge to  
Chilaw**

## **Initial Environmental Examination Report**

**Final Report**

**March 2020**

**Prepared by  
EML Consultants (Pvt) Ltd**

**Submitted to  
Road Development Authority  
Ministry of Roads and Highways**

**Submitted to  
Asian Development Bank**

## ABBREVIATIONS

ADB	Asian Development Bank
AIA	Archeological Impact Assessment
AP	Affected Person
CEA	Central Environmental Authority
CEA	Ceylon Electricity Board
CRC	Conventional Road Contracts
DMC	Disaster Management Center
EARF	Environment Assessment and Review Framework
EIA	Environmental Impact Assessment
EMoP	Environmental Monitoring Plan
EMP	Environmental Management Plan
EPL	Environmental Protection License
ESA	Equivalent Standard Axles
ESDD	Environment and Social Development Division
GNDs	Grama Niladari Divisions
GRM	Grievance Redress Mechanism
GSMB	Geological Survey and Mines Bureau
IA	Implementing Authority
IEE	Initial Environmental Examination
IFC	International Financial Corporation
iRoad	Integrated Road Investment Program
LA	Local Authority
MCM	Million Cubic Meter
MRHW	Ministry of Roads and Highways
MRM	Management Review Meeting
NEA	National Environmental Act
NEP	National Environment Policy
NWSDB	National Water Supply and Drainage Board
PAA	Project Approving Agency
PEA-NWP	Provincial Environmental Authority, North Western Province
PES	Provincial Environmental Statute
PIC	Project Implementation Consultant
PIU	Project Implementation Unit
RDA	Road Development Authority
REA	Rapid Environmental Assessment
RMC	Road Maintenance Contracts
ROW	Right of Way
SAPE	Survey and Preliminary Engineering
SPS	ADB, Safeguards Policy Statement, 2009
SSEMAP	Site Specific Environmental Management Action Plan

**CURRENCY EQUIVALENTS**

Currency unit- Sri Lanka Rupee (Rs) US

\$1.00 = Rs.186

(As of March , 2020)

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# EXECUTIVE SUMMARY

## 1. Introduction

I. Remote areas in Sri Lanka with lack of all-weather access to the socio-economic centers have rendered a large portion of the rural population with poor agricultural productivity, limited employment opportunities and slow economic growth. In order to address this problem and to improve transport connectivity between rural communities and socioeconomic centers, the Road Development Authority (RDA) under the Ministry of Roads and Highways (MRHW) is implementing the Integrated Road Investment Program (iRoad).

## 2. Project Details

II. In this concept, the 38 km stretch of A 003 road starting from the 38km post at Kochchikade and runs up to 76 km post at Chilaw, has been selected to rehabilitate within Right of Way (ROW), which requires no land acquisition and no significant or permanent involuntary resettlement impacts are expected. The road passes through 72 Grama Niladari Divisions in five Divisional Secretariat Divisions in the Puttalam District. According to the ADB's Safeguard Policy Statement (2009) and the project falls under category B. This IEE is prepared to comply with the requirements of the ADB's Safeguard Policy Statement. The project does not fall within the "prescribed list of projects" under the NEA and NWP environmental statute requirements.

III. The proposed project activities includes the initial repairs to the existing road surface, overlay the surface, construction and widening of pavements ( if possible), improving road alignment correction of undulations in the longitudinal profile, cleaning and reconstruction of road side drains, construction of side-walks, cleaning and reconstruction of culverts and bridges, construction of earth retaining structures and the provision of road markings & road signs.

IV. The major materials required for the construction of the road works are soil, gravel aggregates, metals, stones, steel, cement etc., These materials will be sourced from shortest distance places to avoid any environmental and social impacts. A Large number of soil borrow pits are available in Naththandiya, Alawwa and Narammala area and quarry sites are available at Badalgama Area. Several Premix Plants are available within 10 km radius.

## 3. Description of the existing environment

V. The proposed section of the road A003 runs through well urbanized human settlements, and mainly consist with the townships, home gardens, paddy lands and coconut plantations etc. The proposed section passes through three distinctive land use zones, such as Rural, Transmission and Urban. Out of the proposed 38 km stretch, only 3.39% is rural. 72% of the remaining area is in transition zone and the rest, 23.68%, comes under Urban area.

VI. The existing carriageway of the road varies from 5.0 m to 7.0 m in width within the ROW of between 14.5m and 20.2m, thereby generally having sufficient width to support for the proposed widening, where required. The road generally follows good horizontal and

vertical alignments and has good drainage provisions but as they were not properly maintained, needs improvement.

VII. Project area falls under the Wannu complex of the Lithotectonic unit of Sri Lanka. The proposed project area falls under IL1a and (small part of IL1b) category, representing the Low Country, Intermediate agro-ecological zone, where the yearly rainfall expectancy value of 75% of the rainfall is > 1,400 mm. The proposed road section falls under the coastal lowlands. The elevation varies from 3 m to 22 m mean sea level. The average temperature is 27.5 C°. The maximum and minimum temperatures are 30 C° and 25 C° respectively. Annual rainfall of the proposed project area is varying from 1,200 to 2,000 mm.

VIII. The main water bodies in the proposed road stretch are Maha Oya, Gin Oya, Maha Wewa, Karambalan Oya (Lunu Oya), Thinnapitiya Wewa and Mahawewa. Apart from these, there are several seasonal water ways, which are generated during the rainy season.

IX. Karambalan Oya area comprising about two km stretch from 69+800 to 61+700 is subjected to frequent flooding and overtopping the water during the rainy season. In addition, several local flooding areas are recorded during the field visits. These flooding are mainly due to lack of and the improper maintenance of the cross culverts and road side drains. Inundation of roads is also observed due to the erosion of the soft shoulders in many places.

X. The existing surface water quality in Thinnapitiya Wewa and Gin Oya has certain extent of the pollution'. The ambient air quality tested were within the National Ambient air quality standards. The noise levels measured point at Madampe, the background noise levels at day time are exceeding the noise level standards for construction and operational period. But at Chilaw and Wennapuwa, the measured noise levels are within the prescribed level for day time during the construction stage but are exceeding during the night time for both construction and operation periods. The elevated noise levels observed are mainly due to the vehicular movements.

XI. Out of the total 85 floral species recorded, none of the species is endemic to Sri Lanka. One plant species (*Phyllanthus emblica*) recorded on the proposed project site belongs to 'Vulnerable' category (VU) in 2012 Red List. 64 Least concern (LC), two Near Threatened (NT) and one Data Deficient (DD) species with 18 introduced species were recorded from the study area. Forty three (43) bird species, 26 butterfly species, 6 reptile species, 5 amphibian, 5 dragonfly species, 4 fresh water fish species and 4 mammal species were recorded during the field study within the proposed project area and surrounded 50m neighboring area (approximately). All faunal taxon, which recorded in the survey are common species to the intermediate and dry zones of Sri Lanka, and none of the threatened endemic species in the proposed project area is found. The project does not fall under any environmental sensitive area or comes under an ecological protection and reservation area.

XII. The major portion of the proposed road is located in the urban and transitional land use development zone. The total population in the project related 5 DSDs is 344,212 recorded from 90,921 families. Nearly 52 % are females. 91% of the populations are

Sinhalese, 5% Muslim, 3% Tamil and others 1%. Average 40% of the people are attended Grade 9-10 level. Private sector and self-employments contribute about 42% of the total population in the area. Agriculture mainly consists of coconut and paddy cultivation. Coconut cultivation is predominant agricultural practices in the project catchment area contribute to 88% and paddy cultivation contribute only 11%.

XIII. There are 402 small and medium enterprises and 102 large scale industries located in the five DSDs. Production of roofing tiles, and other terra-cotta products is the major industrial activity located in the area. Nearly 98% of the populations in the study area are accessible to safe drinking water, public electricity supply and possess safe toilet facilities.

#### 4. Anticipated Impacts and Proposed Mitigation Measures

##### 4.1 Pre-construction Phase

No.	Activities	Impacts	Mitigation measures
1.	Delay in Initiation and Poor Environmental Practices by the Contractor	<ul style="list-style-type: none"> <li>- poor environmental management by the contractor</li> <li>- delay the progress of the project with various environmental issues</li> <li>- Potential public protests due to above</li> </ul>	<ul style="list-style-type: none"> <li>- appointing an Environmental Specialist to the Contractor</li> <li>- conditions should be included in the tender documents</li> <li>- Improved awareness of contractors' management.</li> </ul>
2.	Shifting, Reinstalling and Removal of Public Utilities	<ul style="list-style-type: none"> <li>- Temporary termination of service</li> </ul>	<ul style="list-style-type: none"> <li>- proper coordination with the relevant agencies prior to the commencement of the construction.</li> </ul>
3.	Resource Mobilization	<ul style="list-style-type: none"> <li>- Temporary lands in which resources are mobilized will cause inconvenience to the general public.</li> </ul>	<ul style="list-style-type: none"> <li>- selecting existing temporary sites</li> <li>- locating sites about 500m away from the residential area,</li> <li>- conducting basic environmental assessment for the sites,</li> <li>- obtaining necessary permits and clearances from the relevant agencies and recruiting local labor</li> </ul>
4.	Natural Hazards aggravated by the Project, and Impacts to the Road and the neighborhood.	<ul style="list-style-type: none"> <li>- Inconvenience to the road users, houses and properties due to inundation</li> </ul>	<ul style="list-style-type: none"> <li>- conduct hydrological study</li> </ul>

## 4.2 Construction Phase

No.	Activities	Anticipated impacts	Mitigation measures
1.	Disposal of wastes generated from land preparation and construction activities etc.	- Impact on public health and safety, and the scenic beauty of the project area and to the local people in the area.	- identifying suitable sites for the temporary collection of waste materials, - adapting proper engineering designs to minimize the clearing area, - covering all wastes with suitable materials, - reusing the top soils and disposing of remaining wastes without instigating any environmental issues
2.	Rehabilitation or reconstruction of culverts may require temporarily diversion	- Temporary and local flooding	- adapting proper diversion streams, proper storage and disposal of wastes - minimizing culvert and drainage works during the rainy season - the contractor should ensure there is no blockage of natural path due to the construction activities. Keeping the drainage paths clear during construction and arranging alternative paths if unavoidable.
3	Impacts on water quality due to erosion and Silt Runoff	- Eroded soil can be washed out to nearby siltation of canals, reservoirs and paddy fields Increased suspended particulates and siltation in the water body harmful to the aquatic organism	Carrying out construction works in dry periods - providing adequate silt traps during the rainy season - covering cut and open areas with suitable materials will minimize the anticipated impacts.
4.	Impacts due to the extraction, transportation and storage of construction materials	- Soil erosion lowering the river beds and resulting lowering of ground water levels, - Causing destruction to the river banks and natural habitat at the quarry sites. - Potential damages due to flying rocks during rock blasts, - Damages to minor roads causing inconveniences to the local people.	- utilizing construction materials from the existing quarry and borrow pits - obtaining prior approval from the relevant agency for new quarries and borrow pits - transporting materials in covered vehicles, - restoring the mining pits and locating storage sites well away from residential areas. - Selecting metal quarries sufficiently away from settlements and other public gathering places, insisting control blasting with small explosive charging. - Introducing road blocks at blasting times and a siren system and making the neighborhood residents aware.
5.	Impacts on	- Uncovered transportation of	- necessary approvals from the

No.	Activities	Anticipated impacts	Mitigation measures
	Local Road Net works	materials, high speed vehicular movements, and bad physical condition of the local roads due to the material transportation will cause inconvenience to the people resulting annoyance.	relevant local authority <ul style="list-style-type: none"> <li>- covering transportation vehicles</li> <li>- cleaning the spills on the road and mud adhering to the tyre</li> <li>- Carrying out condition survey on public internal roads,</li> <li>- Sprinkling water over the road surface during dusty hours.</li> </ul>
6.	Impacts due to generation of dust and Air Quality issues due to construction activities	<ul style="list-style-type: none"> <li>- Inconvenience to local people, who reside closer to the proposed road or quarries.</li> <li>- Inconvenience to the road users,</li> <li>- Deposition of dust along the roads, nearby houses and public places and vegetation.</li> <li>- Respiratory illnesses</li> </ul>	<ul style="list-style-type: none"> <li>- quarries, crushers and asphalt plants should be located 500m away from the residential area</li> <li>- wetting of open surfaces</li> <li>- covering of transporting vehicles</li> <li>- controlled blasting</li> </ul>
7.	Impacts due to Noise and Vibration due to construction activities	<ul style="list-style-type: none"> <li>- Creating nuisance to the community in close vicinity of the project activities</li> </ul>	<ul style="list-style-type: none"> <li>- limiting working hours to day time,</li> <li>- proper maintaining of vehicles,</li> <li>- maintaining noise levels at the National Emission Levels,</li> <li>- siting crushers, concrete batching plant and asphalt plant well away from the residential areas</li> </ul>
8.	Impacts due to removal of road site trees	<ul style="list-style-type: none"> <li>- Changes in local micro climate</li> <li>- Increase greenhouse gasses impacts</li> </ul>	<ul style="list-style-type: none"> <li>- if there is any cutting of trees involved get approval from the forest department</li> <li>- compensated by planting trees 1:3 in suitable places in the project area.</li> <li>- Avoiding cutting trees by changing road alignment where possible.</li> </ul>
9.	Social impacts due to the Establishment of labor camps	<ul style="list-style-type: none"> <li>- Social conflicts due to undisciplined behaviours.</li> <li>- Nuisance due to noise in night time disturbing peace in the area</li> </ul>	<ul style="list-style-type: none"> <li>- the labor camps should be located well away from the residential areas</li> <li>- Conduct necessary awareness program</li> <li>- Make the contractor accountable for discipline of his staff through the contract.</li> </ul>
10	Impacts to Road Side Structures	<ul style="list-style-type: none"> <li>- Temporary loss of livelihoods and access due to the shutting down of businesses during the civil works.</li> </ul>	<ul style="list-style-type: none"> <li>- RDA will inform them in advance (about 30 days in advance) about the project, its construction schedule and also the needs of the shifting of the structures,</li> </ul>
11.	Risk of HIV, STD and Covid-19	<ul style="list-style-type: none"> <li>- Spreading of diseases to the local community</li> </ul>	<ul style="list-style-type: none"> <li>- Conduct awareness program</li> <li>- Follow government guidelines for Covid-19</li> </ul>

### 4.3 Anticipated impacts and mitigation measures during the operation period

No.	Activity	Impacts	Mitigation measures
1.	Encroachment of ROW	- Encroachment of the ROW directly affects the pedestrian, regular maintenances as well as future expansions of the road.	- Placing boundary stones, regular inspections and removal of unauthorized structures by the relevant agencies
2.	Noise and Air Pollution	- Disturbance to the household, especially for vulnerable persons, such as babies, children and elderly. Schools, religious places, and offices	- Maintaining vehicles in good conditions - Maintaining road in good conditions
3	Increase of road accidents	- Injuring or killing people, animals and damaging vehicles and road side properties.	- Displaying speed limit signs, restricting overtaking at risky locations, introducing speed barriers and marking pedestrian crossings. - Introducing prompt accident clearing mechanism to minimize disruption of traffic flow.

### 5. Benefits of proposed iROAD Program

XIV. The rehabilitation of the existing 38km highway road has several benefits at local, regional and national levels. The project provides improved road access, reduces travel time, supports rural agriculture systems by improving the accessibility and connectivity to the economic centers and market linkages. The road development also facilitates local, regional and national economic development. It is expected that the overall impacts will be reduced poverty in the remote rural villages and, finally, contributes to increase the overall national productivity.

### 6. Institutional Arrangement

XV. Ministry of Roads and Highways (MRHW) is the Executing Agency (EA) of this investment program. RDA is the Implementing Agency (IA) of the program. A project implementing unit (PIU) has already been established under DG/RDA to coordinate the overall program, starting from SAPE works. A Project Implementing Consultants (PIC) has also been appointed to support provincial PIU. The environmental specialist of PIC shall guide the contractor in implementing the EMAP and monitoring. the environmental cell/unit of PIU shall conduct overall monitoring of implementation of EMAP. The ESDD of RDA shall also monitor the implementation. The PIC has an Environment Safeguard Consultant (ES), who is responsible to guide the contractor in all environmental related issues in the particular project. Appointed civil work contractors will be directly responsible to execute environment safeguard measures at site level.



## **7. Environment Management Plan (EMP)**

XVI. An Environmental Management plan is prepared based on the anticipated environmental impacts and proposed mitigation measures. The EMP will be considered as a guidance document to minimize the anticipated environmental impacts but the construction contractor will prepare a site-specific Environmental Management Action Plan (EMAP). All necessary costs for the implementation of the EMAP will be included in the contract. The PIC will prepare necessary monitoring formats and the contractor will periodically submit the reports on the progress on the implementation of the EMAP to PIC. The environmental specialist of PIC shall guide the contractor in implementing the EMAP and monitoring. However, the environmental cell/unit of PIU shall conduct overall monitoring of implementation of EMAP. The ESDD of RDA shall also monitor the implementation.

## **8. Environmental Monitoring Plan**

XVII. An Environmental Monitoring Plan (EMoP) has been prepared in conjunction with the EMP.. The EMoP includes the parameters to be monitored, frequency of monitoring and the costs for such monitoring, such as mainly for the field tests.

## **9. Grievance Redress Mechanisms**

XVIII. Issues may occur during construction and again during operation. Any concerns will need to be addressed quickly and transparently, and without retribution to the Affected Person (AP). A Grievance Redress Mechanism (GRM), therefore, will be established to resolve disputes and grievance relating to environmental concerns and other complaints associated with the proposed project. In Sri Lanka, project affected persons have recourse to the judicial system, public administrative system, political system, civil society organizations to resolve disputes. The government has also established Mediation Boards (MB) and Special Mediation Boards (SMB) at the DS level to amicably settle disputes. However, finding solutions to conflicts through these systems takes a long time, incurs expenses, and also do not have open access to some, and these often causes delays in project implementation and increased the expenditure to government due to compensation to contractors. The proposed GRM is based on three level tiers. Site level Grievance Redress Committee (GRC) (tier 1), Divisional level GRC (Tier-2) and a National level GRC (tier3) for resolution of any issues related to the project. Complaints may also be submitted to ADB's Office of the Special Project Facilitator or Office of Compliance Review in accordance with ADB's Accountability Mechanism.

## **10. Public Consultation**

XIX. According to the requirements of the ADB SPS, for Environment Category B project roads the respective draft IEE will be disclosed before the Management Review Meeting (MRM) or equivalent meeting or approval of the respective project, if there is no MRM. Signboards with project information, including details on the nature of construction works, road length, construction period, the name of the contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil, and English) in strategic locations in the proposed road stretch. In addition, an information flyer could be distributed among residents, who live along the route providing information on how they could assist the project. (ADB-2017). At the community

consultations and the stockholder consultations conducted for this IEE, the participants highlighted the need of the improvement of this road section as it in a dilapidated condition. Frequent flooding in some locations in the project area inconvenience the users of the road. Accidents also reported due to the damaged road condition and unsafe for the pedestrians who use the road. Therefore, they appreciate the project.

## **11. Conclusion and Recommendations**

XX. The IEE concludes that the impacts from the construction activities are mitigatable. All impacts are site specific, reversible and can be minimized by adhering to appropriate mitigation measures. The pre-construction, construction and operational EMP identifies environmental impacts arising from the project. However, along with the corresponding schedule and monitoring of mitigation measures will ensure that identified impacts are maintained at insignificant.

XXI. The project does not fall under any prescribed project list of the National Environmental (Environmental Assessment Procedures) Regulations under the National Environmental Act. Therefore, no need of EIA/IEE under NEA.

## I. INTRODUCTION

### A. Background

1. According to the 2012, census by Census and Statistics Department, the majority of population in Sri Lanka is in rural sector (77.4%). Urban population share of the country is 18.2 percent while the estate population consists of 4.4 percent. In addition, urbanization is relatively high in Western province (38.8 %) and very low in North Central (4.0%) and North Western (4.1%)<sup>1</sup> provinces. As state in the Central Bank Annual report, 2018., the Poverty Head Count Index is 4.1 (2016)<sup>2</sup>. Poverty is concentrated in areas, where connectivity to towns and markets, access to electricity and average educational attainment, are relatively low, and an agricultural labor is an important source of employment. Location attributes are highly correlated with each other, which indicate the many-sided nature of the challenges faced by poor areas. Remote areas with lack of all-weather access to the socio-economic centers have rendered a large portion of the rural population with poor agricultural productivity, limited employment opportunities and slow economic growth.

2. In order to address this problem and improve transport connectivity between rural communities and socio-economic centers, the Road Development Authority (RDA) under the Ministry of Roads and Highways is implementing an Integrated Road Investment Program (iRoad). In this program, about 1000 Grama Niladari Divisions (GNDs) throughout the country were selected as rural hubs in terms of the population, development potential and distance to trunk road network. As a first step for developing rural hubs, the government is enhancing the connectivity by (i) improving rural access roads by linking the rural hubs to trunk road network to all weather standards, and (ii) operating a sustainable trunk road network at least to a fair condition<sup>3</sup>.

3. The investment program will improve the accessibility of the road network in rural areas of Sri Lanka, and thereby, increase the involvement of the rural population in nationwide economic and social development. An integrated road network will support long-term rural development. The investment program will upgrade and maintain about 3,100 km of rural access roads to all-weather standard; rehabilitate and maintain to a good condition about 400 km of national roads; and improve the capacity of road agencies, including the MRHW, the Road Development Authority (RDA), provincial road agencies, and local authorities with respect to road asset management, project management, and contract administration. The investment program will play a catalytic role in the sustainable development of Sri Lanka<sup>4</sup>.

4. This program is financed by the Asian Development Bank (ADB) under a Multi tranche Financing Facility (MFF). The investment program covers four tranches that will be

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<sup>1</sup> Department of Census and Statistics, 2012 Census Data

<sup>2</sup> Annual Report of Central Bank Sri Lanka., 2018

<sup>3</sup> RDA- 2014, SRI: Integrated Road Investment Program, Tranche II, Initial Environmental Examination (IEE), Northwestern Province, Final Report, September 2014, Submitted by Environmental Social Development Division, Road Development Authority Ministry of Highways, Ports & Shipping

<sup>4</sup> <https://www.adb.org/projects/47273-002/main>

implemented over a period of ten years. The investment covers, Sabaragamuwa Province, Central Province, North Central Province, North Western Province and Western Province (Kalutara District).

5. The program comprises two types of contracts as; (i) Conventional Road Contracts (CRC) and (ii) Road Maintenance Contracts (RMC). Five projects have been defined under CRC package as project 1 in Southern Province, project 2 in Sabaragamuwa Province and Kalutara District of Western Province, project 3 in Central Province, project 4 in North Central Province, and project 5 in North Western Province. A set of national roads have been selected under RMC packaging.

6. Rehabilitation of roads is followed by mandatory maintenance of the completed Provincial & Rural Roads for three years (under CRC packages) while the selected National Highways will be rehabilitated for two years and maintained and managed over a period of five years through RMC packaging. This type of contract significantly expands the involvement and responsibility of private sector civil contractors in infrastructure development, from a simple execution of civil works to management and conservation of national assets (in this case the road infrastructure).

7. The Rehabilitation and Improvement of the national road - Peliyagoda – Puttalam Road (A003) from Kochchikade Bridge to Chillaw (from 38Km to 76Km) in the North-Western Province is selected under the RMC.

## **B. Objectives of the Proposed Project**

8. As stated earlier, the broad objective of this project is to improve the connectivity of road network in rural areas of Sri Lanka, so that rural population can be conveniently involved in the nation-wide economic and social development.

9. Objectives of this project are:

The broad objective of iRoad program is to "develop an efficient road-based link between selected socio economic centres, cities, townships and villages and to enhance the capacities of road agencies". And the specific objectives could be.

- to rehabilitate and maintain the road section from 38 km to 76 km of Peliyagoda - Puttalam (A003) highway,
- there by to maintain an efficient road link between NWP, WP and other inter linked areas through this highway section.

10. In order to achieve these objectives, the proposed road will be upgraded with the following guidelines:

- Upgrade and maintain the existing roads to all weather standards,
- Surfacing existing pavements with Asphalt Concrete (AC),
- Repair or reconstruct damaged culverts,
- Introduce suitable drains for all road sections and built up drains, where necessary,
- Remove any irregularities that are on the existing vertical profile,

- There by improve the vehicle operating speeds while ensuring the safety of the road users.

### **C.Objectives of the Initial Environmental Examination Report**

11. According to the EARF for the project, the project falls under the category B. This also confirmed by the Environmental Screening conducted by the Consultant. This IEE covers upgrading and maintaining 38 km of National Road to all weather standards. The objective of this Initial Environmental Examination (IEE) is to gather and provide:

- (I). Baseline information about the general environmental settings of the project area will cover the following physical, biological and socio environments;
  - Physical Environment (including climate, air quality, noise, topography, soil, surface and ground water hydrology, and natural hazards, etc.),
  - Biological Environment (protected forest and wildlife areas, fauna and flora and the presence of endemic, endangered species),
  - Social Environment (socio economic profile of the communities living in the project influence area, infrastructure facilities and land use),
- (II). Identify potential impacts of the project and the characteristic of the impacts, magnitude, distribution, affected groups, and the duration during preconstruction, construction and operational phases of the project;
- (iii) Propose effective mitigation measures to avoid/ minimize the project induced adverse impacts while enhancing the beneficial impacts, and
- (iv) to assess the best alternative project options at most benefits and least costs in terms of financial, social, and environmental dimensions.,
- (v) Formulate an effective Environmental Management Plan (EMP) and monitoring plan,
- (vi) Preparation of institutional requirements and Grievance Redress Mechanism (GRM),

### **D.Approach, Methodology and Personnel Involved**

12. The approach and methodology in conducting the present study are listed below:

#### **I. Initial Discussion with the Project Staff**

13. Discussions were held on 19<sup>th</sup> September 2019 with the Environmental and Social Safeguards Unit of the RDA with the team of engineers working on the project to understand the scope of expected engineering and other activities that will take place at the proposed site as well as any sites (such as construction material sourcing places) outside the project area and the physical interventions proposed to be carried out at the site, construction methodologies, and equipment to be used, preconstruction activities, etc.

## **II. Literature review**

14. The following reports and documents were reviewed:

- EARF prepared for iRoad Program<sup>5</sup>
- Safeguard Policy Statement, Asian Development Bank, June 2009.
- Operations Manual Bank Policies (BP), Asian Development Bank, 2013
- Environmental Assessment Guidelines, Asian Development Bank, 2003
- The Environmental assessment processes as outlined in the OM Section F1/OP (2013) and the Environmental Assessment Guidelines
- Relevant environmental regulations, guidelines, and Policies of Sri Lanka have been reviewed.
- Published and unpublished reports
- Relevant EIA/IEE and ADB projects.
- The entire list of literatures and report reviewed for this IEE is given under the reference at the end of this report

15. Several field visits were carried out either as whole team or as individual sectoral specialists to the project site including the neighborhood to understand the existing environmental conditions and issues pertaining the proposed road section. Based on the above observations, screening, using the REA Checklist (**See Annex I.1 and I.2**), included in the EARF, was carried out. The study corridor used for the assessment is 50m width section along the either sides of the existing road.

16. Based on the finding of the REA, to meet the requirements of ADB, the IEE report followed the TOR given in the EARF prepared for the Integrated Road Investment Program.

17. Physical baseline environmental settings were studied using the topo sheets 1:50,000, land survey topo map and google maps for the understanding the topographic characters of the area. Geology and Soil were assessed by conducting field observations, and the available secondary information, such as National Atlas, GSMB soil maps. Climate and Meteorology were assessed using the relevant information obtained from the Meteorological Department and relevant Websites.

18. As there were no adequate secondary information on the existing surface water quality, ambient noise levels and the ambient air quality, three ground water samples and two surface water samples were tested and three ambient noise levels and three air quality measurements were carried out on the 18<sup>th</sup> and 19<sup>th</sup> October 2019 by the Environmental Laboratory & Consultancy Services. The details are given in the relevant sections.

19. Biological assessments were conducted for Flora and Fauna in the project area, including tree counting from 25/09/2019 to 28/09/2019. The ecological survey was guided by the assessment methods outlined in the DWC Biodiversity Baseline Manual, International Union for Conservation of Nature (IUCN)'s red list, the National Red List and other field assessment guides prepared by various research organizations and individuals. The

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<sup>5</sup> Environmental Assessment and Review Framework, SRI: Integrated Road Investment Program, June 2014

findings are discussed in the relevant sections of this report.

20. Identification of key habitats, floral and faunal diversity is crucial in evaluating potential negative ecological impacts of proposed project activities. In order to identify the species in the proposed project area, a rapid assessment on terrestrial and ecological resources was carried out within the proposed project area and surrounded area.

21. Different sampling techniques were used to sample different taxon. Terrestrial fauna observed in both sides of the A003 were recorded. Point counts were also carried out for birds except the line transects. A binocular was used to observe birds and butterflies. Canon DSLR camera was used to photograph faunal and floral species in the vicinity.

22. No any live specimen is collected during the field study. Species identification and nomenclature of the species present was based on the latest literature published on the fauna and flora of Sri Lanka. The conservation status of the species was determined according to the 2012 Red list of Threatened Fauna and Flora of Sri Lanka by Ministry of Environment. Further, relevant secondary information was gathered from people living in nearby communities.

23. Identification of habitat types in the study area of this road traverses (A003) spans over a variety of man-made habitat types including terrestrial, aquatic and semi-aquatic systems in the intermediate zone.

1. Terrestrial habitats: Roadside vegetation, Home gardens, Agricultural lands and Riverine vegetation
2. Aquatic habitats: Tanks, small fresh water bodies and Lagoon areas

24. The information for the Social Assessment was collected from the assessments carried out by the Social Due Diligence for the proposed project using social assessment tools like, KIIs, FGDs and Community Consultations and Questionnaire surveys.

25. The potential impacts during the construction and the operational activities were identified by comparing baseline situation and the key components of the proposed development activity. The potential impacts were identified considering the nature of significance, positive or negative, direct or indirect, short-term or long-term, unavoidable or irreversible during construction, operation and decommissioning phases.

26. Based on the identification of level of significance of the impacts, appropriate mitigation measures were formulated. Appropriate mitigation hierarchy based on avoidance, minimization and restoration measures were applied. The proposed mitigation measures are given in **Section V** of this report.

27. A comprehensive Environmental Management Plan has been prepared, including the Following:
- Detailing the management measures, roles, and responsibilities for implementation, supervision, and their cost;
  - Indicating parameters to be monitored, their location, frequency of monitoring and



- reporting, roles and responsibilities and cost;
- Minimizing social conflict situations by creating awareness, minimizing nuisance to the neighborhood and the road users and strictly observing disciplinary behaviors of construction staff.
- Institutional arrangements to ensure successful implementation.

28. The Proposed comprehensive Environmental Monitoring Plan (EMoP) specifies the monitoring indicators to measure the performance of each mitigation measure, monitoring mechanisms and frequency to support EMP.

29. Following the total assessment, consultants provided a report with conclusions and recommendations to the client as a guide to mitigate the environmental impacts that could be arisen on the environment during the implementation and the operational periods.

To comply with the requirements of ADB, the IEE report followed the TOR given in the EARF prepared for the Integrated Road Investment Program.

30. This IEE report has been prepared by a team of consultants representing EML Consultants (Pvt) Ltd., led by A Rajaratnam (Chartered Environmentalist) as the team leader and Eng. Rohan Perera (Transport and Highway Engineer), Eng. Gnanadasa (Hydrologist), Mr. K. Jinapala (Sociologist), Mr. Bandara (Ecologist), Mr Anton Sutharsan (Infrastructure Development Assistant) and Ms. Udyā Abeysinghe (Project Manager).

31. The Consultants wish to acknowledge the kind assistance of the Director and the Engineers attached to the iRoad Program, Road Development Authority for their support during the field visits and for providing information of the project interventions.



## **II. POLICY AND LEGAL FRAMEWORK**

### **A. Applicable Laws, Regulations, Standards and Requirements<sup>6</sup>**

32. The implementation of the proposed project activities will be administered by the environmental laws and regulations of Sri Lanka and the ADB safeguard policies.

33. This chapter therefore describes Sri Lankan national laws, regulations and policies relevant to this project and the ADB SPS and as well as international agreements that are pertinent to the construction and operation of the project.

#### **A1. National Environmental Act and other Applicable Regulations**

#### **A2. Environmental Protection and Management**

34. The commitment and responsibility of the Sri Lankan government and its citizens to environmental protection is enshrined in the country's constitution (GoSL 1978<sup>7</sup>). Chapter VI (Directive Principles of State Policy and Fundamental Duties), Sections 27 (14) and 28 (f) declares that: "The State shall protect, preserve and improve the environment for the benefit of the community" and "it is the duty of every person in Sri Lanka to protect nature and conserve its riches".

35. The Central Environmental Authority (CEA) was created in 1982 as the government regulatory and enforcement agency for environmental matters. This was followed by the establishment of a cabinet-level Ministry of Environment in 1990, which became the Ministry of Environment and Natural Resources (MENR) in 2001 and developed the National Environment Policy (NEP) in 2003. The environmental protection mandate passed to a new Ministry of Mahaweli Development and Environment in January 2015, with the mission to "manage the environment and natural resources to ensure national commitment for sustainable development for the benefit of the present and future generation."

36. The basic legislation governing the protection and management of the environment is the National Environmental Act (NEA) No 47 of 1980, and its subsequent amendments, No 56 of 1988 and No 53 of 2000. The NEA includes two main regulatory provisions through which the environmental impacts of development are assessed, mitigated and managed:

- (i) The Environmental Impact Assessment (EIA) procedure for major development projects - regulations published in Government Gazette Extraordinary No 772/72 of 24 June 1993 and in subsequent amendments;
- (ii) The Environmental Protection License (EPL) procedure for the control of pollution - regulations published in Government Gazette Extraordinary No 1533/16 of 25 January 2008.

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<sup>6</sup> This chapter is adopted from the: i. ADB (2014),

<sup>7</sup> Government of Sri Lanka (1978, as amended): The Constitution of the Democratic Socialist Republic of Sri Lanka (Revised Edition 2015), 221 pp. (<http://www.parliament.lk/files/pdf/constitution.pdf>)

### **A.2.1 Environmental Impact Assessment**

37. The provision for EIA is contained in Part IV C of the NEA, which requires the submission of an IEE or EIA report in respect of certain “prescribed projects.” These are specified in Gazette Extraordinary No 772/22 of 24 June 1993 and include the following:

- (i) Construction of national and provincial highways involving a length exceeding 10 kilometers (Note: the proposed project does not belong to this category)
- (ii) Projects that fall within sensitive areas as defined in the National Environmental (Procedure for approval of projects) Regulations, No.1 of 1993.

38. The EIA process is implemented through designated Project Approving Agencies (PAA), which are line ministries and agencies with responsibility and jurisdiction over the project. The appropriate PAA is determined by CEA by the following (unranked) criteria (with the proviso that the project proponent cannot also act as the PAA):

- The agency with jurisdiction over the largest area;
- The agency with jurisdiction over diverse or unique ecosystems;
- The agency within whose jurisdiction the environmental impacts (resource depletion) are likely to be the greatest; or
- The agency having statutory authority to license or otherwise approve the prescribed project.

39. The EIA process involves the following steps:

- (i) The proponent submits to the PAA preliminary information on the project in the form of a Basic Information Questionnaire (BIQ) provided by CEA;
- (ii) The PAA screens the project by the information provided, and informs the proponent within six days whether an EIA or IEE is required<sup>8</sup>;
- (iii) The PAA then determines the scope of the study, taking into account the views of CEA, and relevant state agencies and the public, if appropriate. The PAA devises ToR, specifying the nature and content of the IEE or EIA report, and provides these to the proponent in writing within 14 (IEE) or 30 (EIA) days of receipt of the preliminary information;
- (iv) If the PAA considers that the preliminary information provided by the proponent is sufficient for the purpose of an IEE report, the PAA proceed as in (vi) below;
- (v) The proponent conducts the studies necessary to fulfill the ToR (or engages consultants to do so) and submits the number of copies of the final IEE or EIA report as may be required by the PAA.
- (vi) The PAA conducts a technical review of the report, within 21 days for an IEE and 30 days for an EIA.
- (vii) An EIA report is also subject to public review. In this case, the PAA submits a copy of the EIA report to CEA, and by the publication of a notice in the Gazette and one daily national newspaper in Sinhala, Tamil and English languages, invites the public to inspect the report and make written comments.

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<sup>8</sup> An EIA is required for prescribed projects that involve complex environmental issues; and an IEE is required for projects that do not have complex environmental issues.

- (viii) The public forward any comments to the PAA within 30 working days and these are forwarded by the PAA to the project proponent. The proponent responds to the PAA in writing regarding all comments, within six days of completion of the public inspection.
- (ix) After the technical review (IEE/EIA), and within six days of receipt of the proponent's response to public comments on an EIA, the PAA either: a) grants approval for implementation of the project, subject to certain conditions; or b) refuses approval for project implementation, giving reasons for the decision.
- (x) Within 30 days of granting approval, the PAA submits to CEA a report containing a plan to monitor project implementation, which is then implemented after approval.

## **A.2.2 Environmental Protection License (EPL)**

40. The Environmental Protection License (EPL) scheme was introduced under the NEA in order to: prevent or minimize the release of discharges and emissions from industrial activities in compliance with national discharge and emission standards; provide guidance to industry on methods of pollution control; and encourage the use of new pollution abatement technologies, such as cleaner production, waste minimization, etc.

41. In Gazette Extraordinary 1533/16 of 25 January 2008, industries are classified into three categories (A, B or C) depending on their pollution potential. Part A comprises 80 high polluting activities, Part B consists of 33 activities and Part C includes 25 activities. The items relevant to the projects are:

### **Part A- High Polluting Activities:**

- Asphalt processing plants, Concrete batching plants having a production capacity of 50 or more cubic meters per day,
- Mechanized mining activities with multi bore hole blasting or single bore hole blasting activities with production capacity having 600 or more cubic meters per month,
- Hostels and similar dwelling places where occupancy level is exceeding 200 or more,
- Any industry where 200 or more workers per shift are employed, etc.

### **Part B- Medium Polluting Activities:**

- Hostels and similar dwelling places where occupancy level or 25 or more boarders and less than 200 boarders,
- Concrete batching plants having a capacity less than 50 cubic meters per day,
- Single borehole blasting with industrial mining activities using explosives, having a production capacity of less than 600 cubic meters per month,
- Granite crushing (Metal crushing) industries having a total production capacity of less than 25 cubic meters per day, excluding manual crushing operations using hand tools.;
- garages for vehicle repair and maintenance; etc.

### **Part C- Low Polluting Activities**

- Vehicle filling stations;

- Mechanized cement blocks manufacturing industries;
- Hotels and guest houses with 5-20 rooms; etc.

42. Licenses are required for the above activities conducted on site or operated outside the project area but their services are obtained. These activities are classified as Part A, Part B, depending on their magnitude of operation. Part A and B licenses are obtained either from the Head office, relevant Provincial or District Offices of the CEA<sup>9</sup>. For Part C activities, the EPL should be obtained from the relevant local Authority of the area.

### **A3. Other Relevant Environmental Regulations, Guidelines and Policies of Sri Lanka**

43. While the NEA is the key environmental legislation under GOSL, there are a number of other environmental laws and regulations that are also applicable to the investment program. The summary of the laws and regulations, including the National Environmental Act applicable for the project activities, are given in **Table II-1**.

**Table ii-1: Laws and regulations applicable for the project activities**

<b>Laws and Regulations</b>	<b>Provisions and Main Content</b>	<b>Applicability to proposed project approval needed</b>	<b>Implementing Agency</b>
National Environmental Act, No. 47 of 1980 National Environmental (Amendment) Act, No. 56 of 1988 National Environmental (Amendment) Act, No. 53 of 2000 and other Amendments	The NEA is a framework environmental statute that makes provision for the protection, management and enhancement of the environment, for the regulation, maintenance and control of the quality of the environment, and for the prevention and control of pollution by implementing the subproject.	Following Regulations related to NEA is applicable to all project components.	CEA
National Environmental (Procedure for approval of projects) Regulations, No.1 of	Regulates and Prescribes the EIA procedure and the activities that need to undergo EIA	The rehabilitation of roads does not come under the EIA/IEE procedure. But any prescribed activities like mechanized mining or any	CEA or Project Approving Agency Appointed by the CEA.

<sup>9</sup> If the proposed activities will be located in the North Western Province, the EPL also to be obtained from the Provincial Environmental Authority, North Western Province for all three categories.

Laws and Regulations	Provisions and Main Content	Applicability to proposed project approval needed	Implementing Agency
1993.Gazette Notification No. <b>772/22</b> dated <b>24.06.1993</b>	procedure for the environmental approval	activities proposed to be located in the environmental sensitive area may require the EIA/IEE.	
The activities for which Environmental Protection License (EPL) is required: Gazette Notification No. 1533/16 dated 25.01.2008	The prescribed activities for which a license is required are set forth.	Certain project-related activities may need an EPL, such as asphalt processing plant, concrete batching plants, artisanal mechanized mining activities etc.	CEA and Relevant Local Authorities for the delegated activities.
National Environment (Noise Control) Regulations 1996. Gazette Notification Number 924/12 dated 23rd May 1996.	Regulates maximum allowable noise levels for construction activities during subproject activities	Noise levels shall be strictly monitored for conformity, especially during excavations and backfilling. The contractors should ensure the conformity for the operation sub- projects, such as metal crushers, batching plants etc.,	Generally, this will come under the conditions of the environmental recommendation letter <sup>10</sup> issued by the CEA or Project Approving Agency for the project.
National Environmental (Protection & Quality) Regulations, Gazette Notification No. 1534/18 dated 01.02.2008.	This regulates the discharge and deposit of any kind of waste or emission into the environment.	Any effluent discharges and waste discharges (scheduled waste) shall conform to the Standards.	CEA and the relevant local Authority. This will be either included in the environmental recommendation letter or EPL or Scheduled waste license.
National Environment (Ambient Air Quality) Regulation 1994 and Amendment of Gazette Notification Number 1562/22 dated 15th August 2008.	Establishes permissible ambient air quality standards during proposed project activities	Ambient air quality shall be established prior to construction and be monitored during construction especially activities involving earthwork.	CEA- This will be either included in the environmental recommendation letter or EPL
National Environmental (Stationary Sources Emission Control) Regulations, No. 01 of 2019.Gazette Notification Number	Regulate the emission of stationary sources, fugitive dust emission, non-methane volatile	Some of the sub project activities, such as patching plant, premix plant, crushing operations could emit fugitive dust, non-methane volatile	CEA

<sup>10</sup> The environmental recommendations are issued through EIA/IEE procedures for the prescribed projects but for the non-prescribed project the environmental recommendation is issued after conducting the basic environmental assessment on case by case basis.

Laws and Regulations	Provisions and Main Content	Applicability to proposed project approval needed	Implementing Agency
2126/36 dated 2019.06.05	organic compounds, fugitive acid mists or fugitive ammonia mist emissions from any process area and asbestos fiber emission.	compounds and emission of asbestos fiber, if any demolition of structures, which contains asbestos sheet of roofs, is involved.	
National Environmental (Vehicle Horns) Regulations, No. 1 of 2011 Gazette Notification No. 1738/37 dated 29 <sup>th</sup> December 2011.	Regulate noise emanating from vehicular horns and specify the maximum allowable noise levels	The project activities involved in using of large numbers of vehicle during the construction period.	CEA and Commissioner of Motor Traffic
National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009	Regulates dumping municipal solid waste along sides of any national highway or at any place other than places designated for such purpose by the relevant local authority during proposed project activities	MSW that arise during the project activities has to be properly collected, stored and disposed.	CEA and the relevant local authorities
National Environment (Air Emissions, Fuel & Vehicle Importation Standards) Amended Regulations, No. 1 of 2003. Gazette Notification Number 1295/11 dated 30 <sup>th</sup> June 2003.	This sets out the Vehicular Exhaust Emission limits for every motor vehicle in use in Sri Lanka.	All the project vehicles, machinery and equipment shall conform to the emission standards.	Commissioner - General of Motor Traffic and CEA
Fauna and Flora Protection Ordinance, 1937 (Chapter 469); Fauna and Flora Protection (Amendment) Act, No. 49 of 1993 and Fauna and Flora Protection (Amendment) Act, No. 22 of 2009)	Provide for the protection and conservation of the fauna and flora and their habitats; for the conservation of the biodiversity and to provide for matters connected there with or incidental there to.	Rehabilitation and construction work of the roads, quarrying and borrowing activities, machinery and materials yards, can have negative impacts on flora and fauna. Any projects located within one miles from the boundary of the area declared under this Act should undergo the	Department of Wildlife conservation

Laws and Regulations	Provisions and Main Content	Applicability to proposed project approval needed	Implementing Agency
		EIA/IEE procedure for the environmental clearance	
National Thoroughfares Act, No. 40 of 2008 Motor Traffic (Speed Limits) Regulations, No. 1 of 2012	The Act provides a framework for planning, design, construction, maintenance of public roads. Section 26 prohibits any government department or local authority carrying out any services on a road, public road or a national highway without proper permissions	Permission shall be obtained from RDA, PRDA, and LAs for rehabilitation and closure of roads.  Speed limits of all vehicles shall conform to speed limit regulations.	Commissioner-General of Motor Traffic, RDA, PRDA, and LAs
Motor Traffic Act, No. 14 of 1995, Amended by Act, No. 05 of 1998 The Motor Traffic (Construction of Vehicles) Regulations 1983 as amended in the Gazette Extraordinary No. 1842/32 of 29.01.2014	Establishes a regulatory framework for ownership, transfer and use of vehicles within Sri Lanka and defines the dimensions of any motor vehicle	All the project vehicles shall conform to the provisions of the Act and shall not exceed the dimensions specified, especially heavy vehicles, which transport equipment, machinery and materials.	Commissioner of Motor Traffic
Felling of Trees Control Act, No. 09 of 1951 as Amended by Act No. 30 of 1953	This Act sought to prohibit and control the felling of specified trees.	No commercially and/or ecologically valuable tree species will be cut without proper approvals.	Grama-Niladari, District secretary, Forest Department



<b>Laws and Regulations</b>	<b>Provisions and Main Content</b>	<b>Applicability to proposed project approval needed</b>	<b>Implementing Agency</b>
Geological Survey and Mines Bureau (GSMB) Act No. 33 of 1992 Removal of Sand Regulations, No. 1 of 2007, Regulation for Prohibition of use of Equipment for exploration, mining and extraction of Sand & Gems, Gazette Notification Number 1454/4 dated 17th July 2006 Explosive Act, No. 36 of 1976	Regulates the exploration for minerals, mining, transportation, processing, trading in export of mineral products and usage of quarries and sand mines in the country.  To provide the control of explosions and regulations of matters connected with explosive activities.	These are applicable for material suppliers for project activities.	GSMB
Water Resources Board Act, No. 29 of 1964, Amendment No.42 of 1999 and Amendments made on 2017.03.16 by Gazette Notification No.2010/23) Irrigation Act, No. 23 of 1983 Agrarian Services Act, No. 58 of 1979	Control, regulation and development (including the conservation and utilization) of the water resources; the prevention of the pollution of rivers, streams and other water resources; the formulation of national policies relating to the control and use of the water resources.	Approval from Water Resources Board is needed for the use of ground-water resources for project activities (if any). Approvals from Irrigation Department/ Provincial Irrigation Department/Agrarian Services Department are needed for the use of surface water resources for project activities (if any)	Water Resources Board,
Soil Conservation Act, No. 25 of 1951 Amended in 24 of 1996	An act to make provisions for the enhancement and substances of productive capacity of the soil, to restore degraded land for the prevention and mitigation of soil erosion, for the conservation of soil resources and protection of land against damage by floods, salinity, alkalinity and drought	Approvals from Natural Resource Management Centre are needed if any borrow areas or any other project activities located in the declared soil conservation areas	Natural Resource Management Centre of Agricultural Department



Laws and Regulations	Provisions and Main Content	Applicability to proposed project approval needed	Implementing Agency
	and to provide for matters connected there with or incidental there to.		
Flood Protection Ordinance, No. 4 of 1924 and No 22 of 1955	An ordinance for the protection of areas subjected to damage from floods. This includes declaration of flood areas, preparation of schemes for flood protection and other rules and regulations regarding flood in the country.	Approvals and consents from the Irrigation Department, Agrarian Services Department are needed, if project activities lead to flooding.	Irrigation Department and Agrarian Services Department
Crown Land Ordinance Act No. 1947 Land Settlement Ordinance, No. 20 of 1931; Land Development Ordinance, No. 19 of 1935 as amended by land development (amendment) Act, No. 16 of 1969, No.27 of 1981, No, 22 of 1998, No, 22 of 1995; State Land Ordinance, No. 08 of 1947; Land Acquisition Act, No. 09 of 1950; State Land (Recovery of possession and divesting of State Land) Act, No. 07 of 1979; Land Grants	The act dealing with allocation and control of Crown lands in Sri Lanka for private and government activities.	Approvals and consents are needed from Commissioner General of Lands, District Secretary, Divisional Secretary or any other government institutions for acquisition/lease of lands	Commissioner General of Lands, District Secretary and Divisional Secretary

Laws and Regulations	Provisions and Main Content	Applicability to proposed project approval needed	Implementing Agency
(Special Provisions) Act, No. 43 of 1979; Title Registration Act, No. 21 of 1998			
The Antiquities (Amendment) Act No 24 of 1998, and regulations published in Gazette Extraordinary No 1152/14 of 4 October 2000	This require that an Archaeological Impact Assessment (AIA) to be conducted about every proposed development project with a land area of over 0.25 ha. The purpose of the assessment is to examine whether there are antiquities in the land, to determine the impact of the proposed development and to provide alternative measures, if necessary.	Approval of the Department of Archaeology is needed. An Archaeological Impact Assessment (AIA) will be conducted if the project area consists with any archaeological features.	Archaeological Department
Municipal Council Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the Pradeshiya Sabha Act No. 15 of 1987	These outlines the procedures in approval of building plans, approval of drainage management plans, etc., and regulations for disposal of municipal solid waste. In addition to environmental clearance, obtaining Trade license and Machinery Permits, involvement of MOH/PHI in matters related to public health and other approvals from the local authorities for site clearance; and	Approvals for building plans, drainage management plans, and disposal of municipal solid waste are needed.  Trade license and Machinery Permits shall be obtained prior to commencement of any operations.  Approval for the disposal of the waste materials is required  Approvals of the MOH/PHI in matters related to public health are needed.	MC/UC/PS

Laws and Regulations	Provisions and Main Content	Applicability to proposed project approval needed	Implementing Agency
	consent from all relevant Pradeshiya Sabhas, Provincial Councils, and Divisional Secretaries shall be obtained before construction begins.		
Labour Laws and Occupational Health and Safety  Legislation in Sri Lanka relating to Industrial, Employment and Labour relations included in the Labour Code of Sri Lanka	Sri Lankan legislation includes some laws, acts, and regulations designed to prevent the exploitation of workers and to protect their health and safety in the workplace (construction sites and operating facilities). The project proponent and all the subordinates including subcontractors will be required to comply with all such laws and provisions that may be applicable.	Compliance required during pre-construction, construction and decommissioning stages  The following sources provide further information: Department of Labour; National Institute of Occupational Safety and Health; and for an international perspective, the IFC guidelines on Occupational and Community Health and Safety.	Department of Labour
Provincial Environmental Statute No. 12 of 1990 of the North Western Province.	The PES is a framework environmental statute that makes provision for the protection, management and enhancement of the environment, for the regulation, maintenance and control of the quality of the environment, and for the prevention and control of pollution by implementing the subproject in the North-Western Province	Approval of Provincial Environmental Authority, such as EIA/EPL is required for any activities prescribed in the statute prior to the commencement of the project	Provincial Environmental Authority- North-Western Province

#### A4. Project-relevant International Agreements and Conventions

44. Sri Lanka has acceded to or ratified around 40 Multilateral Environmental Agreements and those that are relevant to this project are shown in **Table II-2**.

**Table ii-2: Project-related international agreements to which Sri Lanka is a party**

Agreement	Ratification Date	Objectives
<b>Atmosphere</b>		
Vienna Convention for the Protection of the Ozone Layer (1985)	15 December 1989	Protection of the Ozone Layer through international cooperation in the areas of scientific research, monitoring and information exchange
Montreal Protocol on Substances That Deplete the Ozone Layer (1987)	12 December 1989	Reduction and the eventual elimination of the consumption and production of Un-anthropogenic Ozone Depleting Substances
United Nations Framework Convention on Climate Change (UNFCCC-1992)	23 November 1993	Stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic systems
Kyoto Protocol (1997)	3 October 2002	The Annex 1 parties (Developed Countries) to reduce their collective emissions of greenhouse gases by at least 5% of the 1990 level by the period 2008 –2012

Agreement	Ratification Date	Objectives
<b>Biodiversity and Cultural Heritage</b>		
International Plant Protection Convention (1951)	12 February 1952	To maintain and increase international cooperation in controlling pests and diseases of plants and plant products, and in preventing their introduction and spread across national boundaries
Plant Protection Agreement for Asia and Pacific Region (1956)	27 February 1956	To prevent the introduction into and spread within the region of destructive plants
Convention concerning the protection of the World Cultural and Natural Heritage (1972)	6 June 1980	To establish an effective system of collective protection of the cultural and natural heritage of outstanding universal value organized on a permanent basis and by modern scientific methods
CITES - Convention on International Trade in Endangered Species of Wild Fauna & Flora (1973)	4 May 1979	To protect certain endangered species from being overexploited by adopting a system of import/export permits, for regarding the procedure
Convention on the Conservation of Migratory Species (1979)	6 June 1990	To protect those species of wild animals, which migrate across or outside national boundaries

Agreement	Ratification Date	Objectives
<b>Biodiversity and Cultural Heritage</b>		
The Convention on Wetlands (Ramsar Convention) (1971)	15 October 1990	This is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.
Convention on Biological Diversity (CBD-1992)	23 March 1994	Conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including appropriate access to genetic resources and by appropriate transfer of relevant technologies and appropriate funding
The UNESCO World Heritage Convention (1972)	06 June 1980	Convention concerning the protection of the World Cultural and Natural Heritage
<b>Land</b>		
United Nations Convention to Combat Desertification (UNCCD- 1994)	09 December 1998	To combat desertification and to mitigate the effects of drought in countries experiencing severe droughts and/ or desertification with the final aim being to prevent land degradation in the hyper-arid, arid, and semi-arid, dry sub-humid areas in the countries that are parties of the Convention
<b>Chemicals</b>		
Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Their Disposal (1989)	28 August 1992	To reduce transboundary movements of hazardous waste; to dispose of hazardous and other waste as close as possible to the source; to minimize the generation of hazardous waste; to prohibit shipments of hazardous waste to countries lacking the legal, administrative and technical capacity to manage & dispose of them in an environmentally sound manner; to assist developing countries in environmentally sound management of the hazardous waste they generate
Rotterdam Convention (1998)	19 January 2006	To promote shared responsibility and cooperative efforts in the international trade of certain hazardous chemicals, to protect human health and the environment; to contribute to the environmentally sound use of those hazardous chemicals by facilitating information exchange, providing for a national decision-making process on their import/export
Stockholm Convention on Persistent Organic Pollutants (POPs) (2001)	22 December 2005	To protect human health and the environment from persistent organic pollutants (POPs)

## **A5. ADB Policy on Environmental & Social Safeguards**

45. ADB's Environment Policy requires that environmental issues are considered in all aspects of the Bank's operations. The detailed requirements are defined in the Safeguard Policy Statement (2009), which builds upon the three previous policies on the environment, involuntary resettlement, and indigenous peoples, and brings them into a consolidated policy framework that enhances their effectiveness and relevance. The SPS affirms that ADB considers environmental and social sustainability as a cornerstone of economic growth and poverty reduction in Asia and the Pacific and is committed to ensuring the social and environmental sustainability of the projects it supports.

46. In this context, safeguards are operational policies that seek to avoid or reduce to acceptable levels adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. The objectives of ADB's safeguards are to:

- (i) Avoid adverse impacts of projects on the environment and affected people, where possible;
- (ii) Minimize, mitigate and/or compensate for adverse project impacts on the environment and affected people where avoidance is not possible; and
- (iii) Help borrowers/clients strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

47. The Safeguard Policy Statement applies to all projects or components financed, administered or otherwise supported by ADB, regardless of whether ADB is the funder; and ADB will not finance projects that do not comply with the SPS and the host country's social and environmental laws and regulations.

48. Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts, and the objectives are to ensure the environmental soundness and sustainability of projects and support the integration of environmental considerations into the project decision-making process. The principal tool for achieving these aims is an environmental assessment, which is a process of environmental analysis and planning to avoid or reduce the environmental impacts associated with a project. The nature of the assessment required depends on the significance of the environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures.

49. **Screening and Categorization:** ADB screens a project in the preparation stage to (i) reflect the significance of potential impacts or risks that the project might present; (ii) identify the level of assessment and institutional resources required for the safeguard process; and (iii) determine the requirements for public disclosure. Screening reviews basic information on project design and operation, the proposed project site/s, and the general environmental/social features, and is aided by ADB's Rapid Environmental Assessment (REA) checklists. By the significance of the potential environmental impacts and risks, projects are assigned into one of the following four categories:

- (i) **Category A:** projects likely to have significant adverse environmental impacts that are irreversible, diverse or unprecedented, and which may affect an area larger than the location subject to physical works. An Environmental Impact Assessment (EIA) is required.
- (ii) **Category B:** projects with potential adverse impacts that are less significant than those of Category A. Impacts are site-specific, few are irreversible, and in most cases, impacts can be mitigated more readily than those for Category A projects. An Initial Environmental Examination (IEE) is required.
- (iii) **Category C:** projects likely to have minimal or no adverse environmental impacts. No environmental assessment is required, although environmental implications are reviewed.
- (iv) **Category FI:** projects where ADB funds are invested in or through a Financial Intermediary (FI). ADB conducts safeguard due diligence of the FI's portfolio and requires an appropriate environmental and social management system (ESMS) in place, to address environmental or social risks.

50. **Environmental Assessment:** conducted under the SPS is governed by a series of policy principles, which define the scale, content, and approach to the study. The specific requirements of the Environment Safeguard Policy are given in Appendix 1 of the SPS; and the Annex to Appendix 1 provides an outline of an EIA report, which includes guidance on the overall layout and the content of each section. Guidance on the practical approach to conducting the environmental assessment is provided in the Environment Safeguards Good Practice Sourcebook (ADB, 2012). EIA and IEE studies follow the same general approach as prescribed in these documents; and the SPS states that the level of detail and comprehensiveness of the study shall be commensurate with the significance of environmental impacts and risks, so an IEE may have a narrower scope. These documents were all consulted extensively in conducting this study and preparing this report.

51. **Public Consultation:** The SPS requires the borrower/client to carry out meaningful consultation with affected people and other stakeholders to facilitate their informed participation. This should: (i) begin early during project preparation and continue throughout the project cycle; (ii) provide timely disclosure of adequate, relevant and understandable information; (iii) be free of intimidation and coercion; (iv) be gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enable incorporation of all relevant views into decision-making, including project design, impact mitigation, and sharing of project benefits and opportunities. The SPS specifies that for a Category A project, at least two consultation exercises are needed: the first at the early stage of EIA fieldwork; and the second when the draft EIA is available. The results of the consultation process are documented in the environmental assessment report.

52. **Grievance Redress Mechanism (GRM):** Issues may occur during construction and again during operation. Any concerns will need to be addressed quickly and transparently, and without retribution to the Affected Person (AP). A Grievance Redress Mechanism (GRM), therefore, needs to be established to resolve disputes and grievance relating to environmental concerns and other complaints associated with the proposed project.

53. **Information Disclosure:** The SPS requires the borrower to make relevant environmental information available to affected people and other stakeholders promptly, in an accessible place and in an understandable form and language(s). This normally involves providing the draft, and final IEE/EIA reports in public buildings in the study area, but for complex studies, brochures, leaflets, etc. can also be used, along with non-written communication methods if any stakeholders are illiterate. ADB also requires the borrower to provide the following for dissemination to a wider audience via the ADB website:

- (i) The final EIA or IEE;
- (ii) New or updated EIA/IEE, supplementary reports and/or corrective action plans, if prepared during project implementation;
- (iii) Environmental monitoring reports, also during project implementation.
- (iv) In the case of a Category A project, the SEIA must be provided at least 120 days before ADB Board consideration<sup>11</sup>.

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<sup>11</sup> ADB, 2003- ENVIRONMENTAL ASSESSMENT GUIDELINES



### III. DESCRIPTION OF THE PROJECT

#### A. Location of the project

54. The proposed road selected for the rehabilitation and improvement is 38 kms stretch of the road starting from 38km to 76km on A003 road (officially called as Peliyagoda - Puttalam road) from Kochchikade bridge (7°16'18.41"N, 79°51'50.53"E) to Chilaw (7°36'8.32"N, 79°48'43.25"E) in the Puttalam District in the North-Western Province of Sri Lanka. The summary of the administrative location of the road is given in **Table III-1**. And a map of the locations of the road with GNDs is given in the **Figure III-1**.

**Table III-1: The summary of the administrative location of the candidate road**

District	DS Division	No. of GN Divisions
Puttalam	Wennappuwa	26
	Naththandiya	11
	Mahawewa	13
	Madampe	08
	Chilaw	14
Total		72

**Source:** PIU iROAD Program

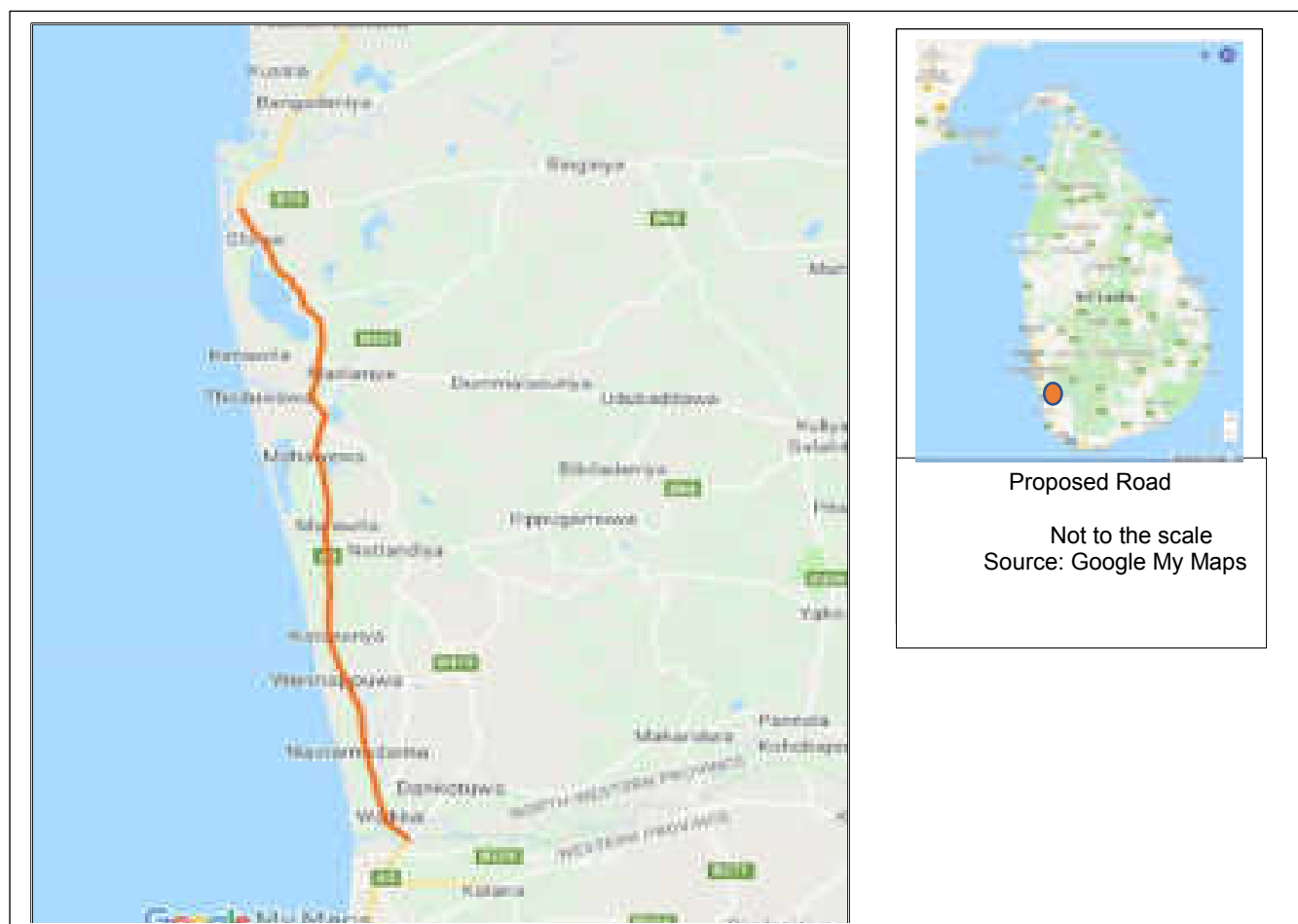


Figure III-1: Location of the proposed road section

## **B. Category of the project**

55. The overall iROAD program is categorized as Environmental Category B by the ADB through the initial studies. The Rapid Environmental Assessment (REA) conducted for this road rehabilitation also confirms this. Therefore, an Initial Environmental Examination (IEE) is adequate for this sub-project. Hence, this IEE is prepared to fulfill the requirement of the ADB's Safeguards Policy of this sub-project prior to the conventional road contract. The project does not fall under the "Prescribed list of projects" under the NEA and requirement under the NWP environmental Statute.

## **C. Need for the project**

56. The A003 road starts from Peliyagoda and ends at Puttalam with 132 km. The A003 road intersects several economic centers, such as Peliyagoda, Katunayake Airport, Katunayake free trade zone, Negombo, Chilaw, Puttalam, and also connects major economic centers, Anuradhapura, Trincomalee and districts of the Northern province; Mannar, Vavuniya, Killinochchi, Mullaithivu and Jaffna. The A003 road also goes along the coastal areas, where fishing activities are prominent. It supports the transportation of all types of agricultural products, fish from the coastal belt, roof tiles/terra-cotta, export products (to the Katunayake airport and the Colombo harbor) and other products from the rural areas. It is also one of the main roads for the transportation of pilgrims from Colombo and South as the road is connected to Anuradhapura, a major pilgrimage city. At the same time, A003 road also supports the transportation of a variety of raw materials from Colombo needed for the economic activities, mainly for the agricultural and commercial sectors in those areas. The proposed 38km stretch of the road runs through the middle section of the A003 road connecting and branching off to several vital regions of economic activity in the adjoining districts. Therefore, heavy traffic on the road is experienced. Due to the narrowness of the certain sections pavement, damaged shoulders, flooding due to inadequate capacity and the poorly maintained of culverts, potholes and damages at the railway crossings, ad-hoc commercial activities on the sidewalks, lack of properly designed road intersections, inadequate pedestrian crossings etc; this section of the road does not support the steady flow of the traffic movement. Furthermore, it is observed that these poor conditions contribute to frequent accidents causing heavy delay in transportation and friction among commuters. Therefore, the rehabilitation and up-grading of this section of the road has become an urgent necessity with a proper plan of maintenance that also ensures road safety.

## **D. Size and Magnitude of Operation**

### **D1. Proposed improvement**

57. The proposed project comprises of carrying out of rehabilitation and improvement works of A03 road from Kochchikade to Chilaw to a standard two-lane two way configuration. The project will not involve the acquisition of additional lands, and all improvement activities will be restricted to the existing ROW. The existing cross section and the proposed improvements are given in **Table III-2**.

**Table III-2: Existing cross section and the proposed improvements**

					Current cross section					Recommendation for shoulders and sidewalks	
Station		Length (km)	% of Length	Type	Current dimensions (m)						Remarks
From	To				Description	Lane	Median	Widening	Shoul		
K38+000	K39+500	7.00	5.51%	Transition Zone	2 Lanes, two way	3.20	N-A	0.50	No	Hard shoulder, 1.80 m width, Soft shoulder width 1.20 m.	In general, the ROW is not encroached and adequate space is available for the proposed development. There are several movable venters those can be temporarily shifted
K39+500	K45+000					3.20	N-A	0.50	No		
K45+000	K49+000	4.00	3.15%	Urban Section	2 Lanes, two way	3.20	N-A	No	No	It is recommended to build widening (0.50 m.) and sidewalks	
K49+000	K54+000	5.00	3.94%	Transition Zone	2 Lanes, two way	3.20	N-A	0.50	No	Hard shoulder, 1.80 m width, Soft shoulder width 1.20 m.	
K54+000	K55+000	1.00	0.79%	Urban Section	2 Lanes, two way	3.20	N-A	No	No	It is recommended to build widening (0.50 m.) and sidewalks	
K55+000	K59+000	4.00	3.15%	Transition Zone	2 Lanes, two way	3.20	N-A	0.50	No	Hard shoulder, 1.80 m width, Soft shoulder width 1.20 m.	
K59+000	K60+000	1.00	0.79%	Urban Section	2 Lanes, two way	3.20	N-A	No	No	Recommended to widen 0.50 m and add sidewalks	

					Current cross section						
Station		Length (km)	% of Length	Type	Current dimensions (m)					Recommendation for shoulders and sidewalks	Remarks
From	To				Description	Lane	Median	Widening	Shoul		
K60+000	K61+500	1.50	1.18%	Rural zone	2 Lanes, two way	3.20	N-A	0.50	No	Hard shoulder, 1.80 m width, Soft shoulder width 1.20 m.	In general, the ROW is not encroached and adequate space is available for the proposed development. There are several movable venters those can be temporarily shifted
K61+500	K62+500	1.00	0.79%	Urban Section	2 Lanes, two way	3.20	N-A	No	No	Recommended to widen 0.50 m and add sidewalks	
K62+500	K73+500	11.00	8.66%	Transition Zone	2 Lanes, two way	3.20	N-A	0.50	No	Hard shoulder, 1.80 m width, Soft shoulder width 1.20 m.	
K73+500	K75+500	2.00	1.57%	Urban Section	2 Lanes, two way	3.20	N-A	No	No	Treatment to consolidated urban zones	
K75+500	K78+000	2.50	1.97%	Transition Zone	2 Lanes, two way	3.20	N-A	0.50	No	Hard shoulder, 1.80 m width, Soft shoulder width 1.20 m.	

Source: PIU iROAD Program

58. The existing cross-section is shown in **Annex III-3**

## **D2. Project activities**

59. The scope of work proposed under the RMC includes the following: clearing and grubbing; roadway excavation; channel excavation; excavation and backfill of structures; embankment construction; sub bases, capping layers, and bases; shoulder construction, asphalt overlay; roadside and lead-away drains; cleaning, desalting, and repairing of culverts.

60. The improvement works for selected roads under iRoad Program will be as follows:

- The widening of roads will be carried out only if there is sufficient ROW.
- As the existing surface is asphalt; it will be overlaid with the AC.
- The base correction will be carried out if base failures are found along the road.
- The buildup drain and earth drain will be provided, where necessary.
- The earthwork will be carried out in required areas.
- Reconstruction and improvements and construction of new bridges
- Walkway will be provided for the major towns
- Finally, road marking, road signs will be carried out.

(Source: PIU, iRoad Program, RDA)

**Table III-3: Typical interventions proposed in RMC contract of iRoad Program**

Type of Intervention	Description	Items *
Rehabilitation	Maintenance aimed at restoring the deteriorated road surface to its original condition	Patching, maintenance of hard shoulders, double bituminous surface treatment, asphalt concrete treatment, re-surfacing, continuous maintenance of hard shoulders, painting traffic signs and guard railings, maintenance of side ditches, etc.
Periodic Maintenance	Maintenance aimed at restoring the condition of partially deteriorated pavement to a certain level	
Routine Maintenance	Maintenance work performed on a daily basis to maintain the condition of road surfaces and delay their deterioration	Cutting back foliage along hard shoulders, patching cracks, laying earth on hard shoulders, repairing potholes, using the sand sealing method to repair pavement, etc.

61. In addition, road furniture and markings will also be appropriately provided where necessary. In general, road markings are available in the road.

### D3. Extraction of Construction Material

62. Depending on Contractor's preference, construction material will be sourced from various locations to reduce haulage costs. The main materials required for construction of the roadworks are soil and gravel and aggregates. The soil is used for embankment construction. Gravel is used for sub-base construction. Aggregates, which are crushed stone, requiring blasting, crushing, screening, and at times blending, is used for base-course construction and for bituminous surfacing. Sand, aggregates, cement, and steel are needed for structural work, such as culverts and repair work of bridges, and for drainage canals and concrete embankments, if any. The tentative quantities required for the construction activities is given in **Table III-4.**

**Table III-4: Tentative quantity of construction**

Type of material	Unit	Estimated quantity
Sand	Cu.m	9,395.46
Earth	Cu.m	307,382.16
Cement	Mt	4,380.96
ABC	Cu.m	145,589.53
Rubble	Cu.m	43.55
Metal	Cu.m	73,233.71
Bitumen	MT	5,031.24
Steel	MT	925.11

63. A Large number of borrow pits are available in Nathandiya, Alawwa and Narammala area and quarry sites are available at Badalgama and Dankoduwa Areaseveral premix Plants are available within 10 km radius and asphalt RDA batching plants are available at Maho, Kottadeniya, Keragalla and Peliyagoda (Maganeguma). The available Borrow pit list is attached. **Annex III-4.**

## IV. DESCRIPTION OF THE ENVIRONMENT

### A. Existing Land use along the road

#### A1. Land Use

64. The section of the road A003 proposed to be rehabilitated and improved, in the Peliyagoda-Puttalam runs through highly urbanized human settlements; mainly consisting townships, home gardens, paddy lands and coconut plantations, fishing areas, areas popular for tourism and providing access to major power plants etc. The proposed section the road passes through three distinguished land use zones, such as Rural, Transmission and Urban areas. Out of proposed 38 km for rehabilitation and improvement only 3.39% is rural area and remainder is 72% Transition zone and 23.68% urban area. The details of land use zones in the project area are provided in **Table IV-1**.

**Table IV-1: Details of the land use zones in the project area**

Chainage		land use zones	Length in km	Percentage
K60+000	K61+500	Rural zone	1.5	
<b>Total</b>			<b>1.5</b>	<b>3.95</b>
K38+000	K45+000	Transition	7	
K49+000	K54+000	Transition	5	
K55+000	K59+000	Transition	4	
K62+500	K73+500	Transition	11	
K75+500	K76+000	Transition	0.5	
<b>Total</b>			<b>27.5</b>	<b>72.37</b>
K45+000	K49+000	Urban Section	4	
K54+000	K55+000	Urban Section	1	
K59+000	K60+000	Urban Section	1	
K61+500	K62+500	Urban Section	1	
K73+500	K75+500	Urban Section	2	
<b>Total</b>			<b>9</b>	<b>23.68</b>
<b>Grand Total</b>			<b>38</b>	<b>100.00</b>

Source: adopted from PMU/iROAD Program

65. There have been several townships, such as Nainamadama, Wennappuwa, Katuneriya, Marawila, Mahawewa, Madampe, Kakapalliya and Chilaw, along the stretch of the road and the study area consists with road-side vegetation, home gardens, cultivated lands (paddy and coconut) and aquatic habitats. The **Figure IV-1** shows the existing land use patterns.

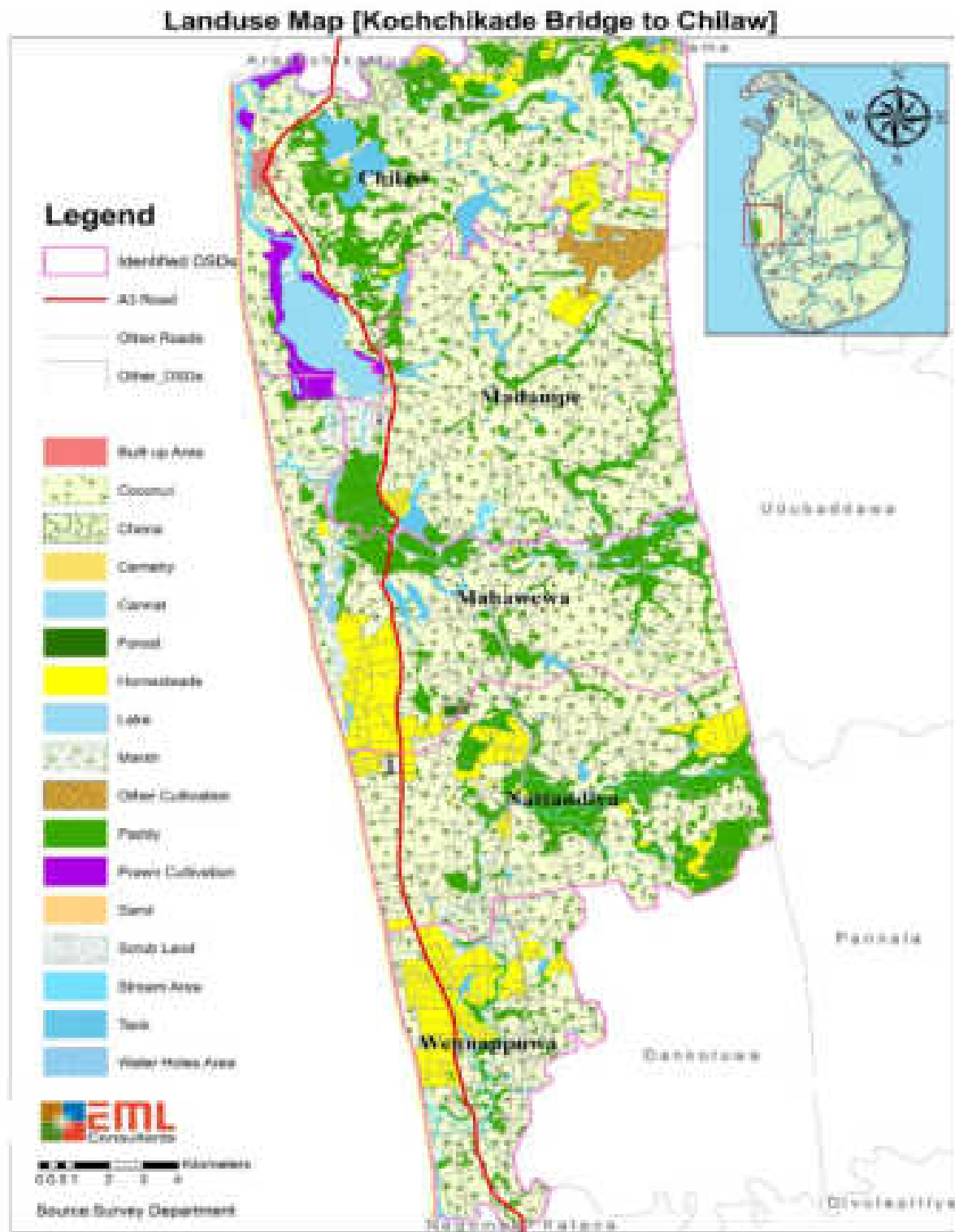


Note: (A); Roadsides without vegetation cover (40+200), (B); Urbanized area (46+500), (C); Roadsides with vegetation cover (66+600), (D); Urbanized area (48+800).

**Figure IV-1: Existing land use along the A003 road**

66. Wennappuwa and Chilaw are the two major towns located in the project area. However, in general, two distinguished areas could be identified when considering the land use pattern of the area. From 38+000 to 59+000 up to Mahawewa, 50 m either sides of the road mainly consist of buildings for residential and commercial purposes and institutions, like government buildings, schools, hospitals, religious places etc. Several cottage industries, mainly traditional lathe works and large scale roofing tile factories are located in the Waikala area. From 60+000 to Chilaw town 72+000, either sides cover with green vegetation, including tall trees on either sides of the road shoulders and paddy lands, home gardens with isolated buildings. From 72+000 to 75+000, covers the Chilaw town. Either sides of the road consist of mainly commercial establishments includes banks, health care facilities, infrastructures for public and private buses. From 72+000 to 76+000 is a transition zone includes coconut cultivation, low lands and residential house with small shops. The land use map of the area is given in **Figure IV-2**. The pictorial view of land use pattern is given in **Annex IV-1**.





**Figure IV-2:** Land use pattern of the proposed project area

## A2. Existing conditions of the carriageways and the pavements

67. The existing carriageway of the road varies from 5.0 m to 7.0 m in width within the ROW, generally providing adequate space to support for the proposed widening of the road, where required. The road generally follows good horizontal and vertical alignments and have good drainage provisions. But, due to the lack of proper maintenance, they need improvement. Hard shoulders are found in the major towns, such as Wennappuwa, Mahawewa and Chilaw intermittently with the soft shoulders. About 90% of the shoulders are soft shoulders, and are subjected to the pavement edge erosion, presenting a safety hazard to traffic and to the pedestrians, who must use the shoulder as a walkway and also riding bicycles and motor bicycles. Some samples exhibiting the conditions of the existing shoulder are given in **Figure IV-3**.



**Figure IV-3: Existing conditions of the shoulders in the project area.**

**Note:** **A-** Eroded soft shoulder at 39+500, **B-** Stagnation of water due to soft shoulder erosion at 55+600, **C-** Hard shoulder in Mahawewa Town and **D-** Eroded soft shoulder at 69+600.

Traffic speeds limits vary from 50 km/h for the “Built-up- area” and - 70 km / h for Non Build-up area<sup>12</sup>. The main build-up areas are Wennappuwa, Marawila, Mahawewa, , Madampe Old town and Chilaw. The road signs are provided along the entire stretch of the road.

### **A3. Existing Conditions of the Road Drains**

68. The drains along the road sides, mainly in the low lying areas, where flooding could occur, are located in different sizes based on the nature of hydrological condition of the area. Generally, up to Old Town of Madampe, the drains are located in the intermediate locations. But, after Old Town Madampe, continuous drains are located on both sides of the road with different sizes and different types, such as V-shaped drains, U-shaped drains, rectangular drains, semi-circular drains and, earth drains etc. Most of the drains are damaged and silted without proper maintenance. The pictorial presentation of the existing conditions of the drains are given in **Annex IV.2** Almost all the drains are damaged and completely silted other than the drains near the Chilaw town, where the drains are comparatively in good conditions.

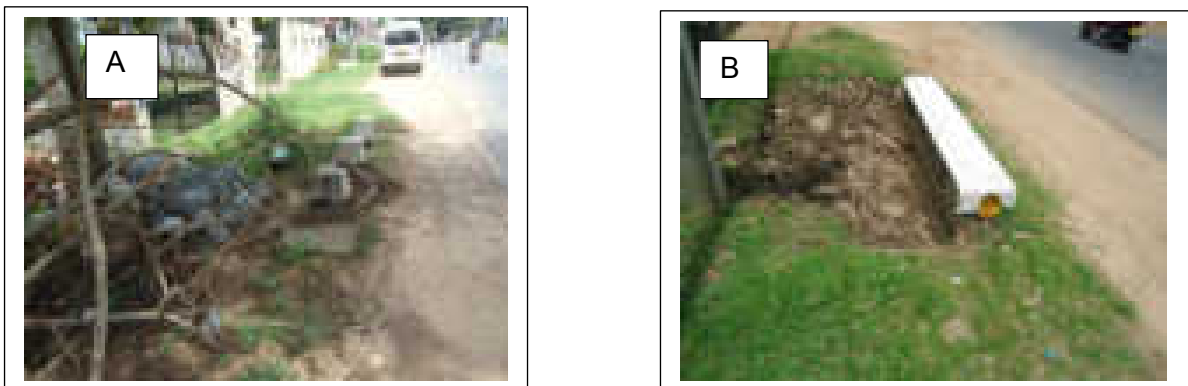
### **A4. Existing condition of culverts and bridges**

69. Field survey was conducted for the existing culverts and bridges (bridges are defined as any structure with a span >3 m) along the proposed road. The structures of the most of the bridges and culverts are found to be in good condition. However, the they are not properly maintained in terms of their hydrological performance. Most of the culverts are completely silted and are fully covered with vegetation. Lead drains are either silted or completely blocked by the residents in the area. The siltation and the blockages of culverts and bridges are causing frequent flooding in the area, and in addition, act as breeding grounds for mosquitos. In some areas, the stagnation of wastewater from the nearby residences and shop owners are also causing nuisance to the people due to the bad odor in the vicinity of such culverts and bridges. **Figure IV-4** shows the present conditions of two culverts in the project area. The Pictorial presentation of the culverts in the project area is given in **Annex IV-3**.

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<sup>12</sup> Motor Traffic (Speed Limits) Regulations, No. 1 of 2012.

70. Details of the hydraulic condition shall be studied prior to the detailed design. Almost all of them are in need of at least, clearing and cleaning.



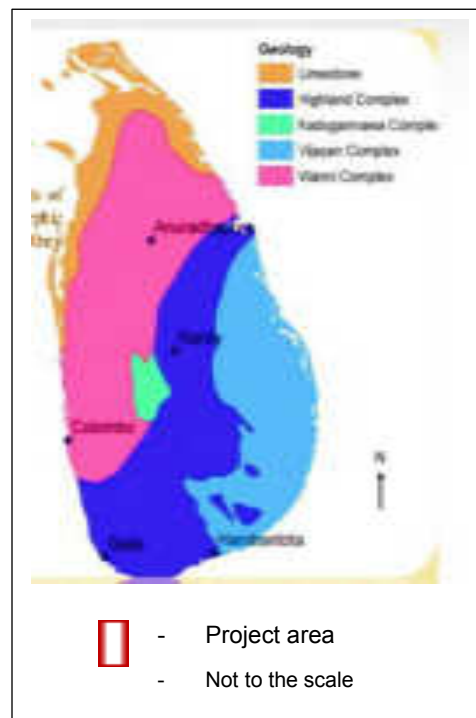
**Figure IV-4: Present conditions of the drains in the project area**

**Note:** A- Culvert No 42/4- Right side, outlet completely closed by the residents dumping construction material. B-Culvert No.50/1- Right side, the out let and the culverts are completely blocked due to heavy siltation.

## B. Physical Environment

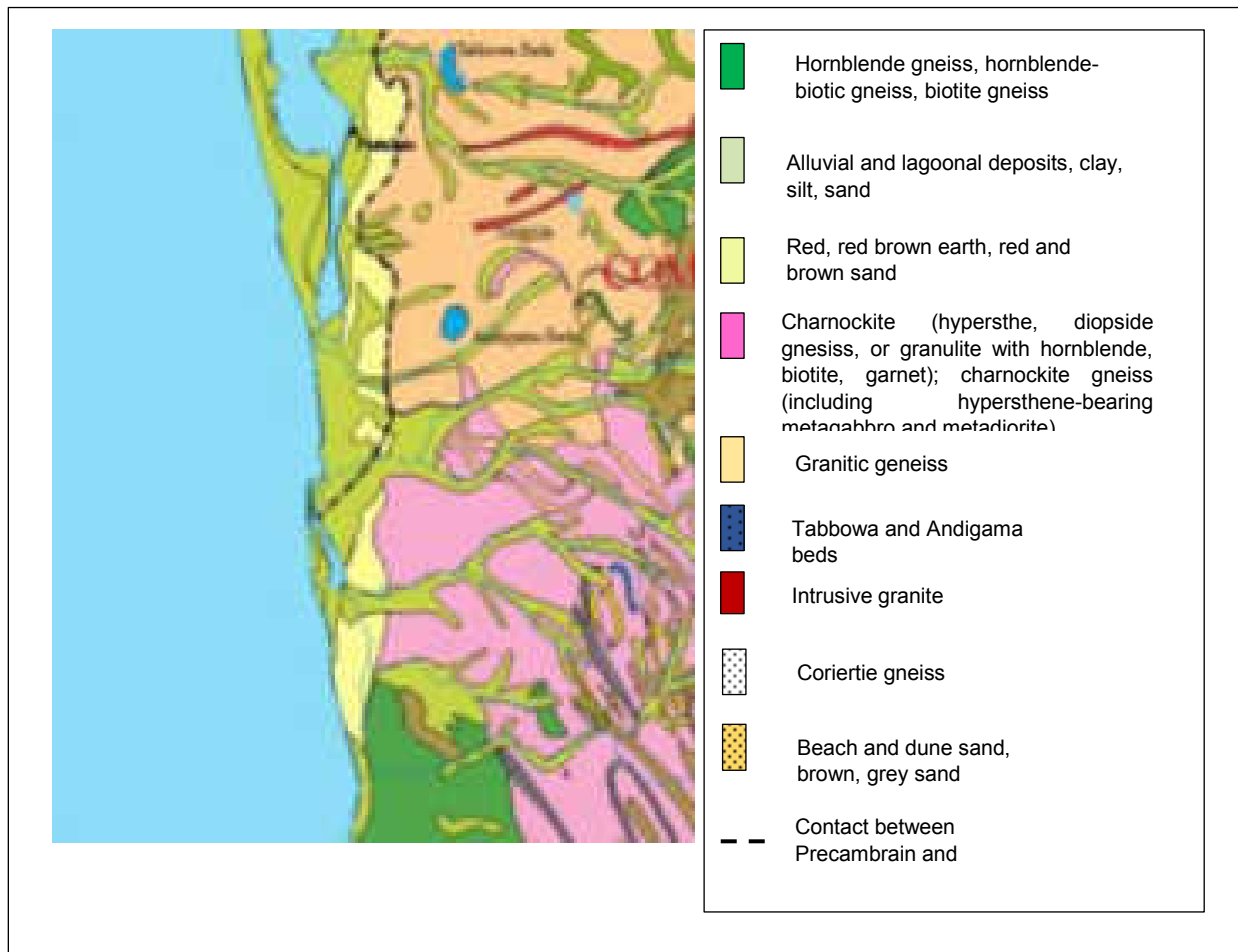
### B1. Geology

71. “As shown in **Figure IV-5**, project area falls under the Wannai complex of the Lithotectonic unit. The rock and soil types are Precambrian Eon and Cenozoic periods. Holocene alluvial and lagoon deposits, clay, silt and sand and Beach and dune sand, brown and grey sand and Pleistocene deposits red, red brown earth, red and brown sand and gravel and paltry ferrugized also present”.



A. Lithotectonic Units of Sri Lanka<sup>13</sup>

<sup>13</sup> National Atlas of Sri Lanka 2007.



B. Geological map of the area

**Figure IV-5: Geology of the project area**

## B2. Climate, Topography and Soils

72. According to the Agro-ecological Regional Map of Sri Lanka, the proposed project area falls under IL1a category representing the Low country. The IL 1a represents the Intermediate agro-ecological zone, where the yearly rainfall expectancy value of 75% of the rainfall is  $> 1,400 \text{ mm}^{14}$ .

73. Based on the Agro-ecological Regional Map of Sri Lanka the soil types found in the IL1a category area are Red-Yellow Podzolic soils with strongly mottled sub soil, Low humic Gley soils, Red- Podzolic soils with soft and hard Laterite; and Regosols on old red and yellow.

74. Sri Lanka is characterized by a variety of land forms, ranging from flat erosion or peneplain, to a very complex assemblage of mountains, ridges, plateau and valleys. The proposed road section falls under the coastal lowlands with elevations from sea level to 270m having slopes small to flat. The topography of the proposed road is almost flat. The elevation varies from 3 m to 22 m mean sea level. The lowest elevation 3 m (MSL) at 50+000 and the highest elevation of 22m (MSL) at 57+480 are observed.

## B3. Hydrology

### B3.1 Temperature,

75. Marawila is in the middle of Chilaw and Thoppuwa junction. Hence, Marawila was selected to represent the temperature of the study area. The temperature variation from 2009 to 2019 is given in **Figure IV-6**. According to it the average temperature is  $27.5 \text{ C}^0$ . The maximum and minimum temperatures are  $30 \text{ C}^0$  and  $25 \text{ C}^0$  respectively.

76. According to the Meteorology Department the temperature is as given in **Table IV - 2**<sup>15</sup>.

**Table IV-2:** Mean temperature at Marawila

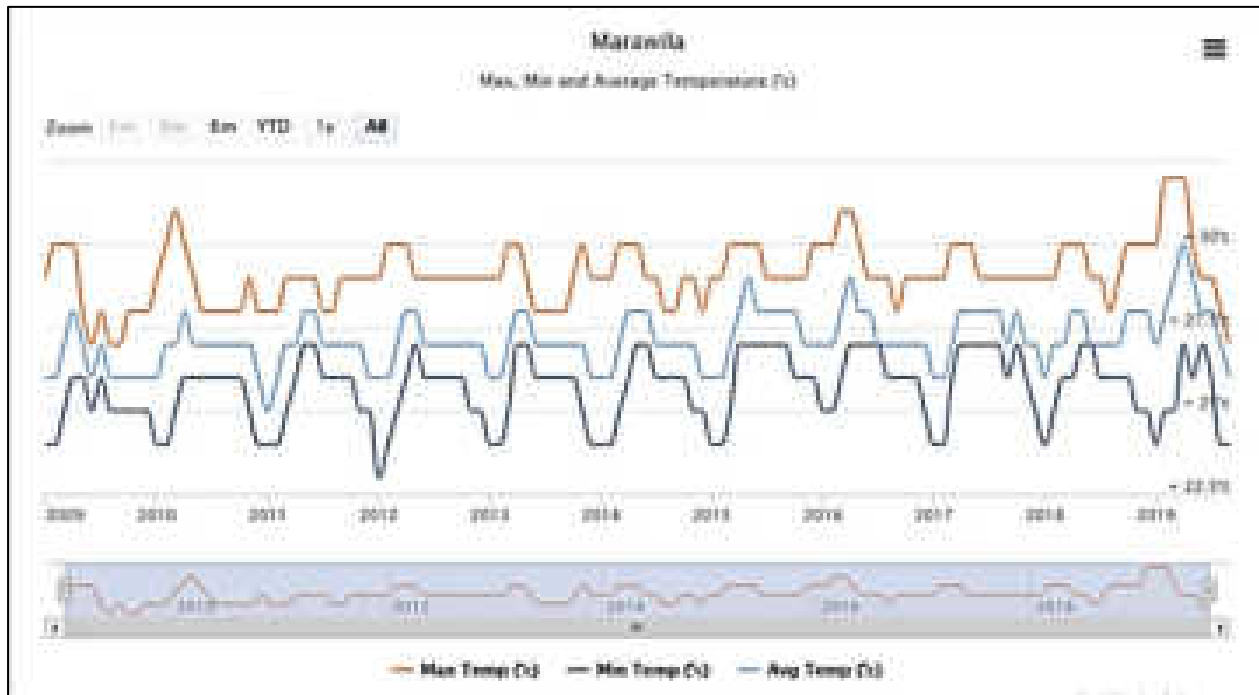
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
25.7	26.7	28.1	28.7	29	28.8	28.5	28.5	28.5	27.6	26.6	25.9	27.7

**Note:** Monthly average for 10 years from 2009 to 2019

77. Based on the above **Table IV-2**, it is assumed that the average temperature in between Chilaw and Thoppuwa junction is in the range of  $27 \text{ C}^0$  to  $28 \text{ C}^0$ .

<sup>14</sup> National Atlas at Sri Lanka 2007

<sup>15</sup> <https://www.worldweatheronline.com/marawila-weather-averages/southern/lk.aspx>



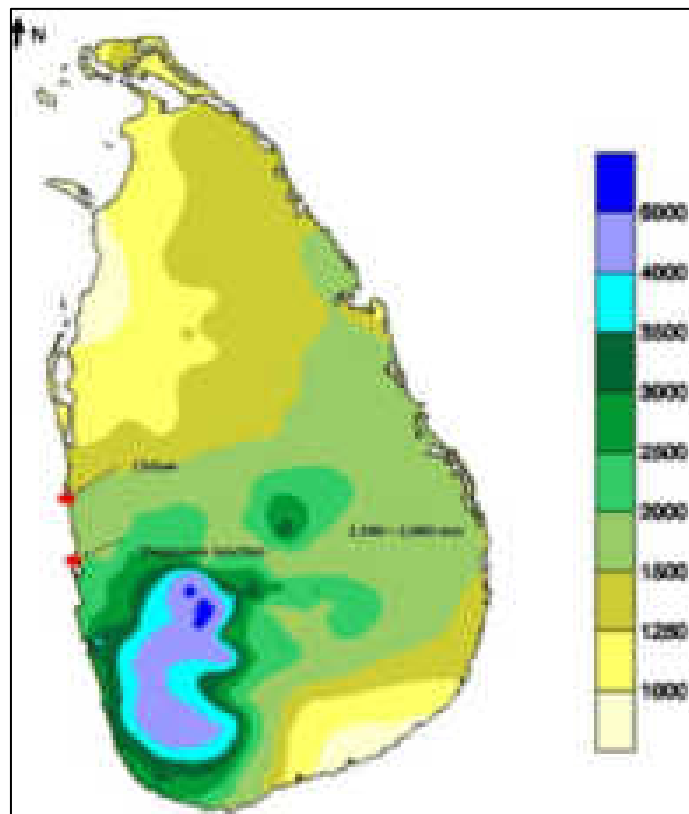
**Figure IV-6: Temperature variation for ten years period at Marawila**

### B3.2 Rainfall

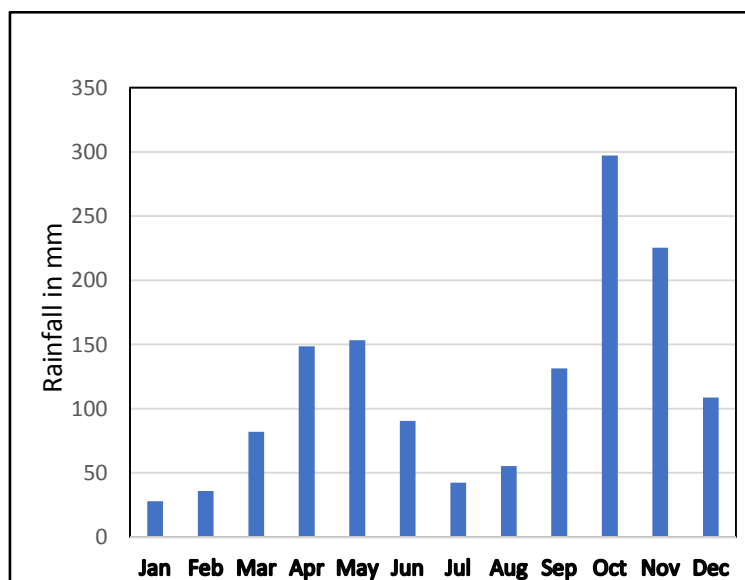
78. The road starts from Kochchikade bridge and ends at Chilaw. As indicated in **Figure IV-9**. These two places are located in the boundary of 1,200 to 2,000 mm annual rainfall zone. Hence, the annual rainfall of the area is varying from 1,200 to 2,000 mm.

79. The rainfall stations in between Chilaw and Thoppuwa junction are Madampe, Marawila and Lunuwila. Horakelle Estate rainfall station is below Thoppuwa junction. Marawila rainfall station is almost middle between Chilaw and Thoppuwa junction. Therefore, Marawila was selected to represent as appropriate rainfall station. The rainfall data is available since 1995. The monthly data from 1995 to September 2019 is given in **Annex IV.4**. Monthly mean rainfall is given in **Figure IV-7**. According to **Figure IV-7**, the rainfall is high in April, May, October and November. Therefore, floods can be expected in these months. But the catchments of rivers, which cross the road are far away from the road. In those areas rainfall may be different to Marawila. In that case, in other months also flood situations can be expected.





**Figure IV-7:** Annual rainfall in the study area



Source: Metrological Department

**Figure IV-8:** Monthly mean rainfall in the study area

### B3.3 Surface water resources, rivers, lakes streams etc.

80. The interested section of the road starts from Kochchikade bridge at Thoppuwa junction and ends at Chillaw town. The distance in between these two points is 36 km. The main water bodies in this stretch are Maha Oya, Gin Oya, Maha Wewa, Karambalan Oya (Lunu Oya) and Thinapitiya Wewa (**Table IV-3**). In addition to these main surface water bodies, a large number of seasonal streams also cross the road throughout the stretch.



**Figure IV-9:** Main water bodies from Thoppuwa junction to Chillaw

81. The location of main surfaces water bodies is explained in above sections. A summary of locations is given in **Table IV-3**.

**Table IV-3:** Locations of main water resources

Water body	Location	Coordinates
Maha Oya	38 km post	E – 79.863642 <sup>0</sup> , N – 7.270305 <sup>0</sup>
Gin Oya	Between 41 – 42 km posts	E – 79.850902 <sup>0</sup> , N – 7.299355 <sup>0</sup>
Maha Wewa	Between 59 – 60 km posts	E – 79.827255 <sup>0</sup> , N – 7.456128 <sup>0</sup>
Karabalan Oya (Lunu Oya)	Between 61 – 62 km posts	E – 79.828405 <sup>0</sup> , N – 7.471999 <sup>0</sup>
Thinipitiya Wewa	Between 61 – 62 km posts	E – 79.830096 <sup>0</sup> , N – 7.476223 <sup>0</sup>

**i. Maha Oya**

82. The road section proposed for rehabilitation and improvement starts from Maha Oya. In this location the river width is around 85 m. Maha Oya starts from Aranayake area in Kegalle district and enters sea from Sindathriya in Wayikkala area. The total length of the river is 134 km and the catchment area is 1,510 km<sup>2</sup>. The annual flow is around 1,240 MCM. The distance from the bridge to sea is 3.5 km. The location Map is given in **Annex IV.5 (Figure 1)** and the pictorial view of the bridge is given in **Figure IV-10**.



**Note:** A- - Old Bridge, B- View of the new Kochchikade Oya Bridge

**Figure IV-10: View of the Kochchikade Bridges**

ii. **Gin Oya**

83. Gin Oya crosses the road in between 41 – 42 km posts. The catchment of Gin Oya closer to the road is large around 14 km of river mostly flows parallel to the road. The catchment area at bridge is around 290 km<sup>2</sup>.

84. When the river reaches close to the sea, a branch of it connects with Maha oya. In the north direction, the river is connected to Negambo – Puttalam canal. The location of the Gin Oya is given in **Annex IV-5 (Figure 2)** and the **Figure IV-11** shows the bridges that cross the Maha Oya.



**Figure IV-11:** Gin Oya new and old bridges

iii. **Mahawewa**

85. Mahawewa is a tank located in between 59 – 60 km postson the road. The tank is maintained by the Irrigation Department of the North-Western Provincial Council. The spill water flows through a canal, which passes through Mahawewa town. Normally tank spills every year. The full spill water level of the tank is around 0.8 m below the road level. **Figure IV-12** shows the Mahawewa and its spill.

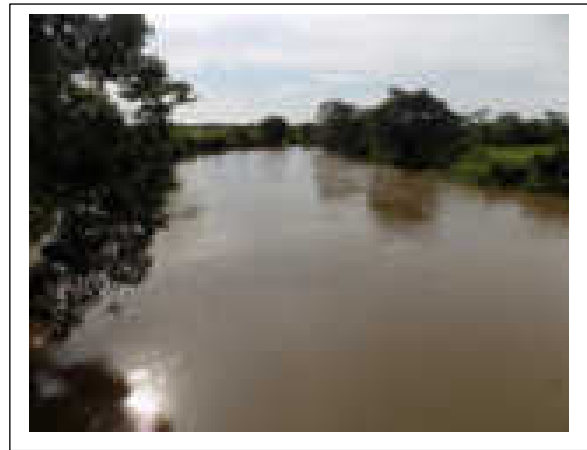


**Figure IV-12:** Mahawewa and its spill

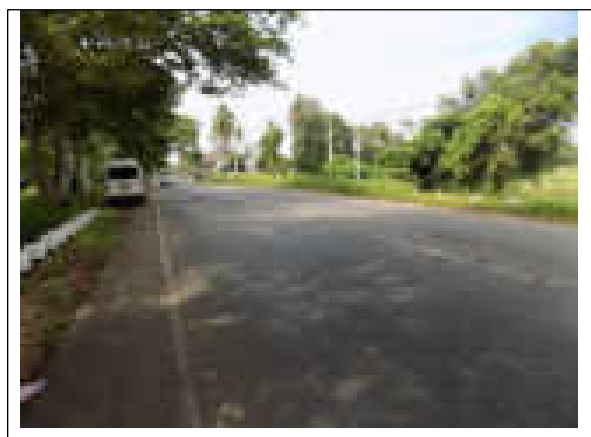
**iv. Karambalan Oya (Lunu Oya)**

86. Karambalan crosses the Chilaw road between 61 and 62 km posts. (In the Google road map this river is named as Karambalan Oya). But in 1:50,000 maps issued by Survey Department the bridge area is named as Lunu Oya.

87. The catchment area at the bridge is around 658 km<sup>2</sup>. Karambalan Oya has a larger catchment close to the road. Hence, the chances of flooding the road is high. Karambalan Oya is formed by adding several small rivers like, Lunu Oya, Kadupitiya Oya, Yatakalan Oya, Kalubulu Oya, Karaththamankade Ela, Udawatte Ela, Gulagedara Ela, Poluliyadda Yoda Ela, Dambodagalla Ela, Doowa Ela and Godakumbura Oya. The location map is given in **Annex IV.5 (Figure 3)** and the view of the Karambalan Oya bridge and Karambalan Oya and flooding areas before and after Karambalan Oya bridge are given in **Figure IV- 13 and 14** respectively.



**Figure IV-13:** Karambalan Oya bridge and Karambalan Oya



**Figure IV-14:** Flooding areas before and after Karambalan Oya bridge

**v. Thinipitiya Wewa**

88. The tank is maintained by the Irrigation Department of the North-Western Provincial Council. The spill is very close to the road. Spill water flows under the bridge. Thinipitiya tank spill and bridge in spill tail canal is shown in **Figure VI-15**.



**Figure IV-15:** Thinipitiya tank spill and bridge in spill tail canal

**B3.4 Flooding**

89. There are three types of flooding, such as river flooding, flash flooding and groundwater flooding, which are relevant for this IEE.<sup>16</sup> The details are discussed in the proceeding section.

**i. River Flooding**

90. River flooding is one of the most common types of inland flood; occurring when a body of water exceeds its capacity. When a river 'bursts its banks' - typically due to high rainfall over a prolonged period of time - localized flooding can cause considerable damage to surrounding properties, as well as posing a significant safety threat.

**ii. Flash Flooding**

91. Caused by heavy and sudden rainfall, flash flooding happens when the ground cannot absorb the water as quickly as it falls. This type of flood usually subsides quickly, but while it lasts can be fast-moving and dangerous.

**iii. Groundwater Flood**

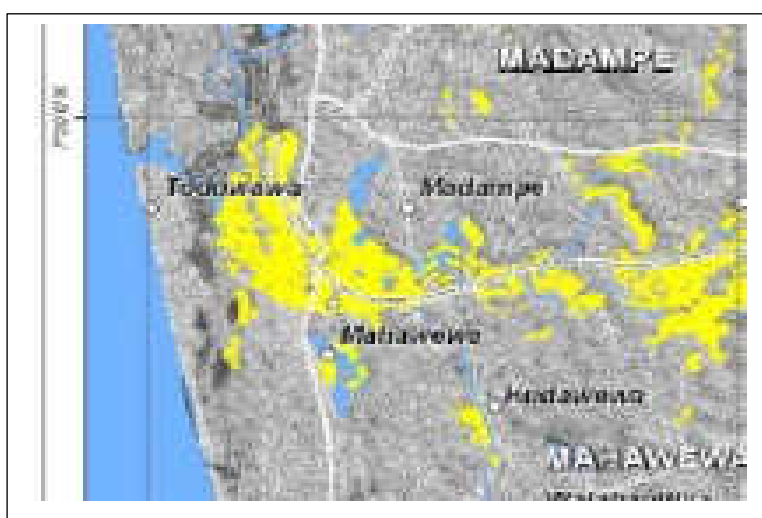
92. As opposed to flash floods, groundwater flooding takes time to occur. As rain falls over an extended period, the ground becomes saturated with water until it cannot absorb any more. When this happens, water rises above the ground's surface and causes flooding. This type of flooding can last for weeks or sometimes even months.

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<sup>16</sup> <https://www.envirotech-online.com/news/water-wastewater/9/breaking-news/what-are-the-different-types-of-floods/31906>

93. When considering the flood incidences recorded in the project area, these cannot be classified under any of these categories as these are occurring as combined affects. According to the available information, two incidences were recorded in 2006 and 2018.

94. According to the UNOSAT Satellite Image that in 2006<sup>17</sup> Karambalan Oya area about two km stretch from 69+800 to 61+700 was inundated in November 2006. **Figure IV-16** shows the inundated area in yellow colour. The flooded area in the Puttalam District in map is given in **Annex IV-6**. This was confirmed by the Grama Niladaries in Madampe DS division during consultations. According to them, this is a low-lying area and even for small showers the road can be inundated inconveniencing the pedestrians and the motorists. Therefore, this stretch of the road need to be raised in such a way as to avoid the flooding.



**Note:** Extraction from UNOSAT Satellite Image that in 2006, Yellow color indicates the flooded area

**Figure IV-16: Inundation area within the project area in November 2006**

95. Flood maps for 23 and 25 May, 2018 (**Annex IV-7**) also indicate experiencing of several flooding in these areas, including Karambalan Oya area, about two km stretch from 69+800 to 61+700.

96. In addition to the above, the following areas given in the **Table IV – 4** were also identified as flood prone during the field assessment. These flooding occur mainly due to the lack of and the improper maintenance of the cross culverts and road site drains. Inundation of roads also observed due to the erosion of the soft shoulders in many places.

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<sup>17</sup> <https://reliefweb.int/map/sri-lanka/flooded-areas-puttalam-district-sri-lanka-identification-likely-flooded-areas-post>

**Table IV-4: Flooding area in the project area**

S.NO	Location	Issues
1.	Near Culvert No. 41/1	Bolawatte Junction get flooded due to poor drainage and blockage of culvert.
2.	Near Culvert No. 41/3	The shops and the houses located in the left side of the culvert has no drains. During the rainy season the storm water get flooded at the premises about 2 feet and they have constructed a protection wall to avoid the water entering to their premises. The water levels increase due the wave action created by the vehicle movement. The owners of the building suggested provide proper drainage system to avoid this situation.
	Near culvert 43/3	The left side area gets flooding due to lack of lead way drain. Therefore, it is proposed to connect right side drain diverting from 43/2 to 43/2 culvert and connect to the existing road side drain in left side. A culvert to be constructed crossing Thaldeka Road and will be connected to existing drain at Thaldeka Road and direct to the main drain located about 100 m from the main road.
3.	Near Culvert No.48/1	A vehicle garage and the premises and surrounding area located right side of the road get flooding about one foot due to blockage of the culvert as these culverts are not properly cleaned and maintained. If lead way canal and the culverts are cleaned and maintained properly the problem will be solved.
4	Katuneriya Junction	Generally, the Katuneriya town get flooded due to lack of proper drains and erosion of the soft shoulders in either side of the road. During the rainy season the water levels reaches the center of the road and makes difficulties to the pedestrians and the motor bike riders.
5	50+000	Left site stagnation of water due to pits created due to the erosion of soft shoulders
6.	54+750, near St Xavier College. Nathandiya	Either side of the road get flooded and the road gets inundated, making inconveniences to the school children. Need proper drains
7.	46+900, near St John Paul II institute of higher education	Left side of the road In front of St John Paul II institute of higher education is getting flooded due to lack of storm water drain. Therefore, a cross culvert to be constructed to connect to the existing right-side drain.

However, a proper study will have to be carried out on the hydrology, roads, conditions of the road drainage system and the flooding area before detailed designs are made. The people in the area indicated that the rising of road levels will aggravate the present situation of inundation of their properties.



### B3.5 Ground water sources

97. The term “ground water” meant two types of ground water. One is the shallow water and the other is the deep water. Shallow water is the water, which is in the ground above the impervious layer up to the water table. Deep water is the water, which is confined in aquifers beneath the impervious layer. In a normal well shallow water is extracted and in tube wells deep water is extracted.

98. In the proximity along the road normal wells are seen in some places. But tube wells are very rare. The main reason is the water table in this area is normally from 2 to 3 m depth in the ground and also the public water supply is available in the area. Hence, there is no need to construct deep wells for domestic purposes.

### B3.6 Water quality Surface water Quality

99. Filed tests have been conducted for two major water bodies Thinnapitiya Wewa and Gin Oya to understand the existing surface water quality in the project area. The results of the tests are given in the **Table IV-5**. The surface water quality test report is given in **Table 1 and 4 of Annex IV.8**.

**Table IV-5: Results of the Surface water quality tests**

Date of Sample		19/10/2019	18.10.2019	Standards <sup>18</sup>
Location		Near Gin Oya Bridge	Thinnapitiya Tank (Wewa)	
Coordinates		7°17'58.4"N 79°51'02.9"E	7°28'34.2"N 79°49'49.0"E	
Parameter	Unit	Test Results		
pH @ Site	-	6.5	6.66	6.0-8.5
Temperature @ Site	°C	29.5	27.2	NS
Electrical Conductivity 25 <sup>0</sup> C	µS/cm	132	246	NS
Dissolved Oxygen at Site	mg/l	3.8	6.2	3
Total Dissolved Solids at 180 <sup>0</sup> C	mg/l	96	171	NS
Chemical Oxygen Demand(COD)	As mg O <sub>2</sub> /l	85	41	15
Biochemical Oxygen Demand (BOD)	mg/l	14	8	4
Oil & Grease	mg/l	<0.2	<0.2	10
Total Phosphate as PO <sub>4</sub> - P	mg/l	0.51	0.77	
Total Nitrate as NO <sub>3</sub> - N	mg/l	13.9	0.01	
E.Coli	MPN/100ml	>1800	>1800	NS
Fecal Coliform	MPN/100 ml	1600	1600	NS

**Note:** NS- Not specified,

<sup>18</sup> Category 4, Fish and Aquatic Life in the Proposed water quality standards for Sri Lanka by CEA

The tested parameters BOD and COD are exceeding the standards for the Category 4: Fish and Aquatic life in the proposed water quality standard by the CEA, but other parameters are within the standards.

#### Ground water quality

100. An assessment of open well water quality around Puttalam district has been conducted to understand the suitability of the drinking water in the area (Arasaretnam et al-2018)

101. The water quality relevant to the project area are given in **Table IV-6**.

**Table IV-6:** Ground water quality in the Project Area in 2018

S.No	Parameter Tested	Chilaw	Madampe	Wennappuwa	Marawila	WHO standards for drinking water	SLS for Drinking water. Maximum permissible Level <sup>19</sup>
1.	BOD (mg/l)	5.08	4.24	3.52	5.08	1-2	
2.	COD(mg/l)	11,52	13.44	9.60	11.52		
3.	Total Hardness(mg/l)	50	40	160	30	500	600
4.	Chloride(mg/l)	88	35.45	17.725	17.72	250	1200
5.	Nitrate(mg/l)	0.853	4.57	78.49	6.347	5 ppm	10
6.	TDS(mg/l)	1150	150	100	100	500 mg/L	
7.	pH(mg/l)	6.20	6.99	6.63	6.91	6.5 – 8.5	6.5 to 9.0

102. According to the results, that the BOD and Nitrates for all the wells and TDS in Chilaw are exceeding the WHO standards for Drinking water. The Nitrates in the Wennapuwa area is exceeding Sri Lanka standards for drinking water. Therefore, the results indicate that the standard of the water is not suitable for the drinking purposes.

103. Ground water quality (dug well water) in the project area was tested for three locations in the proposed road stretch. The tested results are given in **Table IV-7** and **Annex IV.8 (Table 1,3 and 5)**.

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<sup>19</sup> Standards for Potable Water Physical and Chemical Requirements According to SLS 614 : 1983

**Table IV-7: Results of the Ground water Quality tested**

Date of Sampling		19.10.2019	18.10.2019	18.10.2019	Sri Lanka Standards for Drinking Water Maximum allowable limit <sup>20</sup>
Location		Nainamadama East, Nainamadama	Walahapitiya Road, House near School	Chilaw	
Coordinate		7° 18'01.9" N 79° 51' 03.3" E	7°26'07.1"N 79°50'10.5"E	7°34'38.6"N 79°48'14.4"E	
Parameter	Unit	Results			
pH @ Site	-	6.2	6.2	6.8	6.5-9.0
Temperature @ Site	°C	28.7	28.1	27.1	NS
Electrical Conductivity 25°C	µS/cm	678	402	1010	3500
Dissolved Oxygen at Site	mg/l	5.33	5.28	6.11	NS
Total Dissolved Solids at 180°C	mg/l	442	308	662	NS
Chemical Oxygen Demand	As mg O <sub>2</sub> /l	BDL	33	BDL	10
Biochemical Oxygen Demand	mg/l	BDL	6.8	BDL	NS
Oil & Grease	mg/l	<0.2	<0.2	<0.2	1
Total Phosphate as PO <sub>4</sub> – P	mg/l	0.77	0.78	0.46	2
Total Nitrate as NO <sub>3</sub> – N	mg/l	0.3	0.2	0.8	45
E.Coli	MPN/100ml	900	1600	>1800	0
Faecal Coliform	MPN/100 ml	900	1600	550	10

Note: BDL- Below detectable limit

104. According to the test results that the COD exceeding the drinking water standards for Sri Lanka, well, at Walahapitiya Road, House near School and the and E.coli and Faecal Coliform for the other all tested wells.

#### **B4. Air Quality**

105. There are several smallscale industries, particularly in the Waikala area, where several lathes work and tile factories are located along the either sides of the road. These small scale industries could emit certain amount of air pollutant to the environment. Transportation is the major contributor for the destruction of air quality in the area. Ambient air quality was tested at three locations in the project area. The results of the ambient air quality tests are given in **Table IV-9** and a copy of the report is given in **Annex IV-8**.

<sup>20</sup> Standards for Potable Water Physical and Chemical Requirements According to SLS 614 : 1983

**Table IV-8: Results of the ambient air quality tests**

Date of Sampling			18-Oct-2019	19-Oct-19	18-Oct-2019	CEA Standards
Location			Madampe	Wennappuwa	Chilaw	
Coordinate			7° 29' 15.4"N 79° 49' 30.2"E	7° 34' 32.3"N 79° 47' 46.4"E	7o 19' 56.9"N 79o 50' 40.8"E	
Pollutant	Averaging Time (hr)	Unit	Test Results			
Particulate Matter (PM10)	24	µg / m3	8.3	8.3	50	100
Particulate Matter (PM2.5)	24	µg / m3	<4	9	12	50
Sulfur Oxides (SOx)	24	µg / m3	<6.6	<6.6	<6.6	
Nitrogen Oxides (NOx)	24	µg / m3	47	<5.9	<5.9	100
Carbon Monoxide (CO)	8	µg / m3	<1000	<1000	<1000	10000
Ozone (O3)	1	µg / m3	< 2	< 2	< 2	200

106. All measured parameters were below the limits recommended in the National Environmental (Ambient Air Quality) Regulations, 1994 and subsequent amendments.

#### **B5. Noise**

107. The major noise generating activity is the vehicular movements in the proposed road. The residences, business establishments and other sensitive receptors are already experiencing the elevated noise level along the road side. An existing noise level measurement was conducted for three locations in the proposed project area. The results of the measurements are given in **Table IV-9** and **Annex IV-10**.

**Table IV-9: Results of the noise level measurements**

Monitoring Locations		Madampe	Chilaw	Wennappuwa
Coordinates		7° 29' 15.4"N 79° 49' 30.2"E	7° 34' 32.3"N 79° 47' 46.4"E	7° 19' 56.9"N 79° 50' 40.8"E
Day	L 10	77	74	72
	L 90	73	68	70
	L50	75	72	71
	Allowable Levels during construction (dB(A)) <sup>21</sup>	75	75	75

<sup>21</sup> Schedule III, National Environmental (Noise Control) Regulations No. 1 of 1996

	Allowable Levels operation (dB(A)) <sup>22</sup>	55	63	55
<b>Night</b>	L 10	68	66	70
	L 90	51	56	56
	L50	63	60	61
	Allowable Levels during construction (dB(A))	50	50	50
	Allowable Levels operation (dB(A))	45	50	45

Note: L 90 is taken to be the ambient or background noise level as used (BS 4142).

108. According to the above results, that measured point at Madampe, the background noise levels at day time is exceeding the noise levels for construction and operational periods. But at Chilaw and Wennapuwa the measured noise levels are within the prescribed level for day time during the construction stage but is exceeding during night time for both construction and operation periods. The elevated noise levels observed are mainly due to the vehicular movements<sup>23</sup>.

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<sup>22</sup> Schedule I of, National Environmental (Noise Control) Regulations No. 1 of 1996

<sup>23</sup> There is no noise zone maps available at present as per the Noise control regulations. Only construction and operation noise levels for the define zones are available.

## C. Ecological Resources

### C1. General description of the project area

109. The studied area of the road (A003), approximately 38 km (from 38km to 76km) in length is entirely laid in the intermediate zone and belongs to the Northern Intermediate lowland floristic zone. This zone situated in between Northern wet lowland zone and dry zone, exhibiting mixed characteristics of both zones. The vegetation cover of the neighboring area generally comprises of dry mixed evergreen and moist semi evergreen forest type (Ashton and Gunatilleke, 1987; Weerasinghe, 2008).

### C2. Terrestrial habitats of the study area

#### Roadside vegetation within ROW



**Figure IV-17: Roadside vegetation (within shoulder and ROW) (A); Continuous tree belts (62+900), (B); Large trees (63+400).**

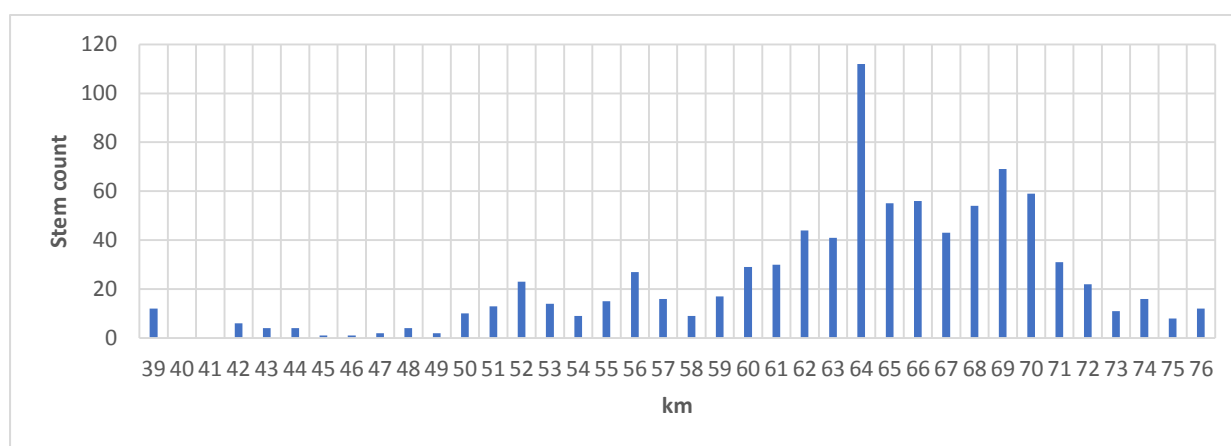
110. The roadside vegetation is one of the most important habitat types of the project area. The tree belt in the side-ways of A003 road is cultivated for shading purpose and enhance the surrounding environment. The roadside vegetation improves the air quality, the aesthetic beauty of the area, provides shade, retains soil moisture and conserves the soil.

111. The tree cover along the road traverses within the ROW is dominated by *Acacia auriculiformis* (Acasia), Kumbuk (*Terminalia arjuna*), Kohomba (*Azadirachta indica*), Robarosia (*Tabebuia rosea*), Kaha-mara (*Peltophorum pterocarpum*), May-mara (*Delonix regia*), Kottamba (*Terminalia catappa*), Ehela (*Cassia fistula*) and Pihimbiya (*Filicium decipiens*). The list of roadside trees, which are located within 3m corridor from the edge of the existing road is compiled within **Annex IV-11**. ( $\geq 10$  cm girth at the breast height).

112. There are several species recorded from the roadside vegetation Ehela (*Cassia fistula*), Kaha-kona (*Senna spectabilis*), Jam (*Muntingia calabura*), Monara mal (*Caesalpinia pulcherrima*) and Pera (*Psidium guajava*) without economic or timber value ( $< 10$  cm girth at the breast height) but, increase the aesthetic beauty of the roadsides.

113. Maha nuga (*Ficus benghalensis*), Para-mara (*Albizia saman*), Hewan-mara (*Albizia lebbek*) and Kumbuk (*Terminalia arjuna*) are with the larger boles above 150 cm at the breast height.

114. Considering the vegetation of the ROW, there are number of trees ( $\geq 150$  cm girth at the breast height) covering or blocking the roadways were observed. Within 66 km range, seven (7) Maha nuga (*Ficus benghalensis*) trees and two (2) Maha nuga (*Ficus benghalensis*) trees near 63+400 km were observed (**Figure IV-17 B**). Continuous tree belt of Kumbuk (*Terminalia arjuna*) was recorded from 59+700 to 61+100 km area (on left side from Colombo to Puttalam direction) with large number of trees above 150 cm girth at the breast height. According to the recorded data from ROW vegetation, a 'green zone' can be identified from 59+700 to 72+800 range due to availability of wayside trees (Ref. **Figure IV-18**).



**Figure IV-18: Recorded stems in the waysides from 38km to 76km on A003 road.**

### Outside the ROW within 50m from the ROW

#### Home gardens

115. The project area mainly consists of small, medium and large scale industries, religious places and residences. In addition, groceries, business premises and workshops, medium to large scale houses are also located in the study area. In several locations bare land plots, playgrounds and small home gardens can be observed.

116. Home gardens found along the study routes are comprised of fruits, vegetable crops cultivations, ornamental plants, medicinal plants, fuel-wood and timber trees. Among them coconut (*Cocos nucifera*), jack (*Artocarpus heterophyllus*), neem (*Azadirachta indica*), and mango (*Mangifera indica*) were commonly observed. Also, commercially valuable exotic timber species, such as teak and mahogany were also observed in home gardens.

### Agricultural lands



**Figure IV-19: Agricultural lands of the study area (A); Paddy fields (62+900), (B); Coconut cultivation land (75+700).**

117. Paddy cultivation in the area is mainly done using irrigation water from man-made minor reservoirs and rain water. Monsoonal rains play a major role in paddy cultivation. Occasional floods and unpredictable periods of drought adversely affect paddy cultivation. Limited sources of irrigated waters and land area are the factors that prevent expansion of paddy cultivation.

118. Paddy fields are attributed to the presence of stagnating water, which is temporary and seasonal in nature. Therefore, flooded rice fields are considered as agronomical managed marshes, and the main crop of the rice field is *Oryza sativa*. Also, paddy fields provide regulating services by increasing water storage, trapping of sediments, percolation from rice fields help recharge groundwater. Moreover, paddy fields are valued for their scenic beauty.

119. Coconut cultivation lands are also recorded from the study area in addition to the paddy fields. Large area of utilizable land was under coconut plantations in homestead plots as well as in large plantations. Other economic crops in the area are mostly grown in homestead plots and include mangoes, papaya and banana.

### C3. Riverine vegetation





**Figure IV-20: Riverine vegetation of (A); Gin Oya (41+600), (B); Karambalan oya (61+100).**

120. Riverine vegetation was observed in the river banks of Gin Oya and Karambalan Oya within the study area. This vegetation exhibits tropical dry/mixed evergreen forest type and scrublands (Weerasinghe, 2008). In the periphery of this habitats, trees and shrubs, such as Kumbuk (*Terminalia arjuna*), Bakmee (*Nauclea orientalis*), Ela Midella (*Barringtonia acutangula*), Nebedda (*Vitex leucoxydon*), Karen koku (*Acrostichum aureum*) and Nala gas (*Phragmites karka*) were recorded.

## 1. Aquatic habitats of the study area

### Tanks and small fresh water bodies



**Figure IV-21: Some aquatic habitats of the study area (A); Maha wewa tank (61+700), (B); A small fresh water body (71+950).**

121. The study area is comprised with few water tanks, rivers and canals. These tanks (Maha wewa and Kudupiti wewa) supply water for agricultural lands via canals. Meantime, it provides habitats for fish and other aquatic fauna, such as amphibians, terrapins and other aquatic invertebrates. Also, these streams and tanks are used for fishery purposes, and harvested fish is a nutritional supplement for the communities. However, both tanks have no unique vegetation cover or a catchment area due to urbanization. A considerable area of the above tanks is covered with aquatic plant species, such as Olu (*Nymphaea pubescens*), Nelum (*Nelumbo nucifera*), Salvinia (*Salvinia molesta*) and Japan jabara (*Eichhornia crassipes*) etc.

122. Maha oya, Gin oya and Karambalan oya laid through the study area provide wide range of advantages for the communities from this fresh water ways. They provide habitat for fresh water fish species, such as Mada aandha (*Anguilla bicolor*), Soraya (*Amblypharyngodon melettinus*), Bandi thiththaya (*Puntius vittatus*) and Kudamassa (*Rasbora dandiya*).

### Lagoon area

123. Chilaw lagoon is located within 300m distance from the western side of A003 road. Karambalan Oya connection with the lagoon and lagoon ecosystem is especially important for many bird species for their feeding, breeding and nesting purposes. The lagoons also provide good habitats for mangroves and mangrove associated tree species.

## C2. Summary of Flora findings

124. A total of 85 species were observed belonging to 42 families, during the field study. Summaries of recorded floral species are given in **Table IV - 10**. Majority of plant species recorded in the study site are trees (51), followed by herbs (15), shrubs (8) and aquatic species (4). Among the recorded species about 33% are introduced, exotic, or invasive to Sri Lanka. None of the recorded species is unique or restricted to the project area.

**Table IV-10: Overall summary of the flora observed during the study (Study site and home gardens.**

Total species	Families	Native Species	Introduced species
85	42	57	28

125. Out of the total 85 floral species recorded, no any species is endemic to Sri Lanka. One plant species (*Phyllanthus emblica*) (Left Side, Coordinates 7.532921 N, 79.820997 E at 68+380 km) recorded on the proposed project site belongs to 'Vulnerable' category (VU) in 2012 Red List. 64 Least concern (LC), two Near Threatened (NT) and one Data Deficient (DD) species with 18 introduced species were recorded from the study area.

126. Overall profile of the recorded flora from road side and home garden vegetation are compiled in **Annex IV-12**.

## C3. Fauna

127. A total of 93 faunal species were recorded during the survey representing birds, butterflies, reptiles, amphibians, mammals and dragonflies.

128. Visual Encounter Survey (VES) method was used to record the faunal species. Faunal survey was carried out along the wayside vegetation of proposed A003 road and 50 m away from the project boundary. In addition, photographic records were used to identify the visual aspect of habitats of the proposed project area.

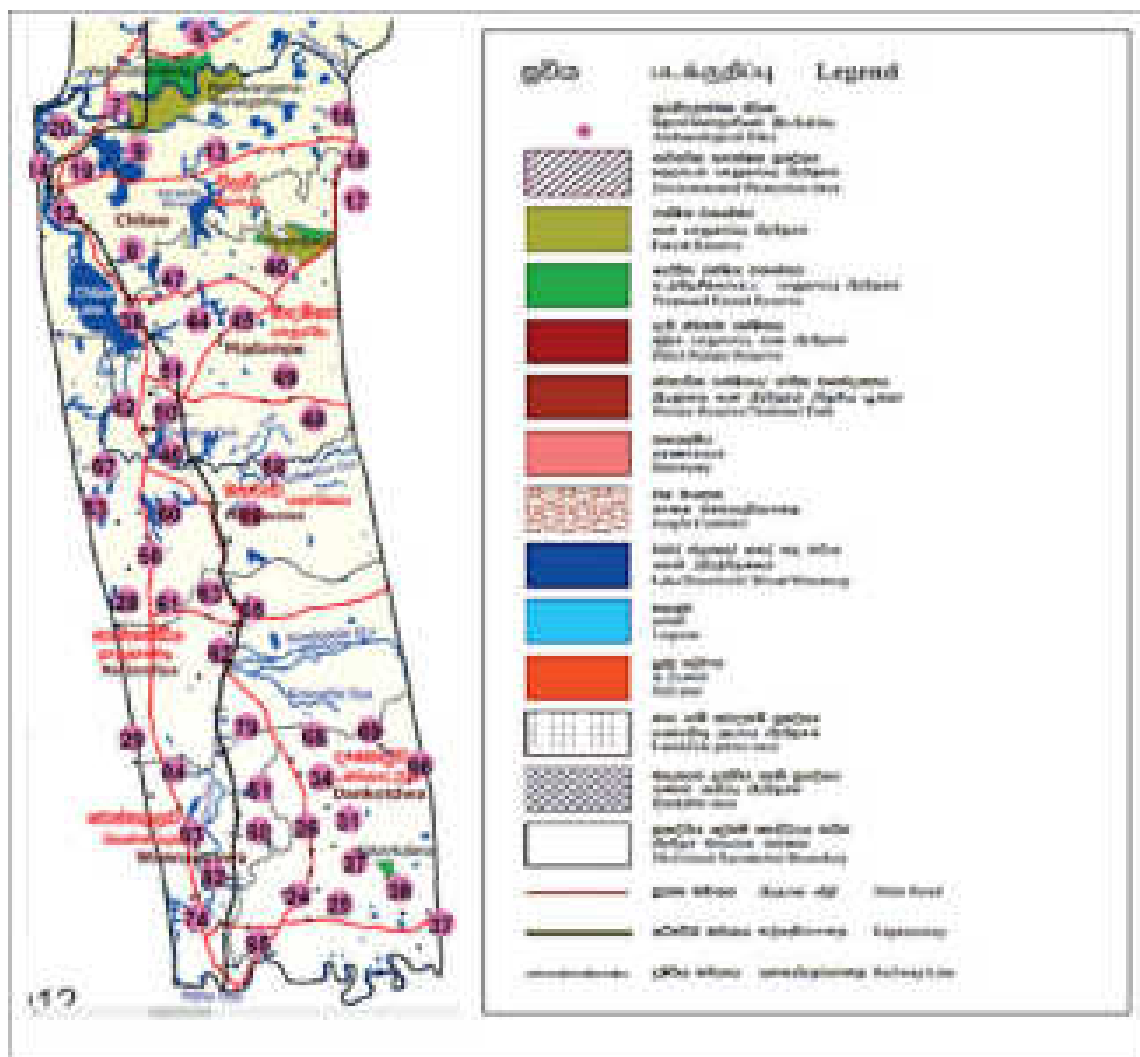
129. Most of the species that observed in the project area are common residents in such kind of habitats throughout the island. A detailed summery of the faunal species encountered in the project area and surrounding areas is given in **Annex IV-13**.

130. 43 bird species, 26 butterfly species, 6 reptile species, 5 amphibians, 5 dragonfly species, 4 fresh water fish species and 4 mammal species were recorded during the field study within the proposed project area and surrounded 50m neighboring area

(approximately). All faunal taxon, which recorded in the survey, are common species to the intermediate and dry zones of Sri Lanka, and no any threatened or endemic species in the proposed project area are found.

#### C4. Environmental sensitive area

131. There is no environmentally sensitive area declared under any Acts or Regulations in the project area. Chilaw lagoon is located about 300 m away from the LH side of the project from 60+000 to 65+000. According to the Environmental Sensitive area maps as in **Figure IV-22** prepared by the CEA, except the natural water bodies, the project area does not fall under any environmental sensitive area.



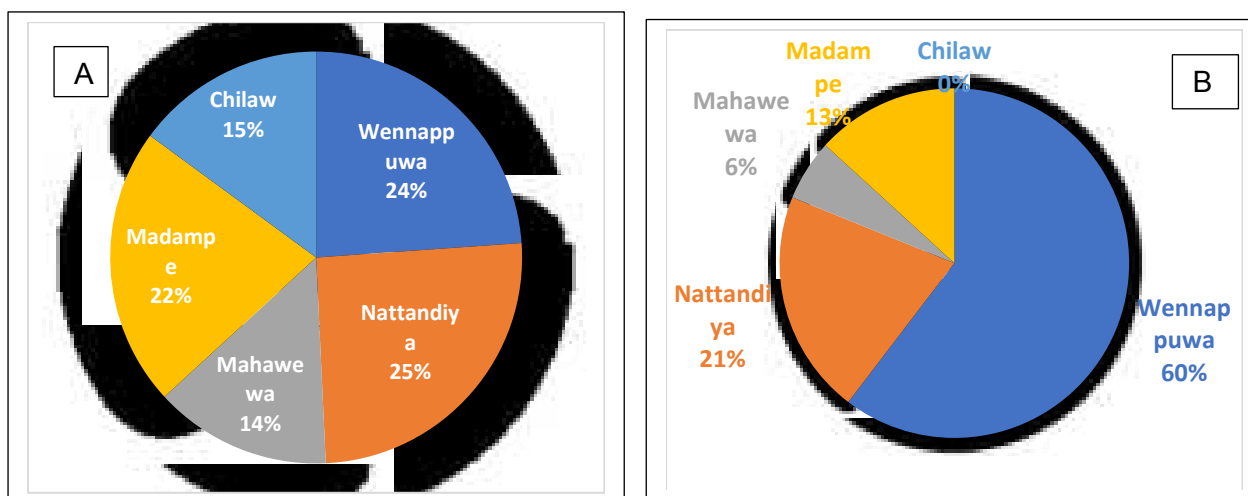
**Source:** Extracted from Environmental Sensitive Area Map, CEA, 2012

**Figure IV-22: Environmental Sensitive area in the proposed project area**

## D. Economic Development:

### Industries

132. Fairly, large numbers of industries are found in the DSDs located in the project area. The Small and Medium Enterprise<sup>24</sup> (SME) contribute large proportions of the total industries in the DSDs. Out of 402 SMEs, 102 are in Nattandiya, 96 in Wennappuwa, 88 in Madampe, 60 in Chilaw and 56 in Mahawewa DSD. The percentage of distribution of SMEs in the DSDs is in **Figure IV-20**. There are 53 large scale industries located in five DSDs in the project. 32 industries are in Wennappuwa and 11 in Nattandiya remaining industries are located in other three DSDs. The percentage of distribution of industries in the DSDs is in **Figure IV-23**. The details of the industries are given in **Annex IV-14**.



A- Large scale industries

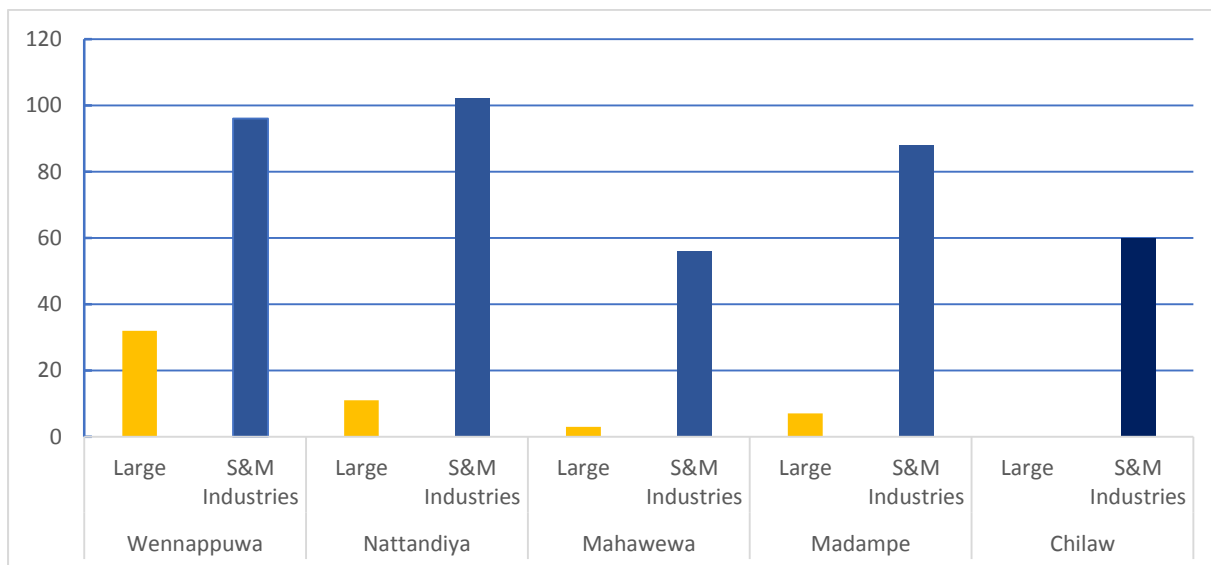
B- Small and Medium Enterprises

Source: Resource Profile- 2018, Divisional Secretariat, Wennnappuwa, Naththandia, Mahawewa, Madampe and Chilaw

**Figure IV-23: Distribution of Industries in the five DSDs locate in the Project area**

133. The SMEs mainly consists of varies type of products such as roof tiles, coir, garments, etc, In the meantime large scale industries also located in the area. But large scales are mainly Roof tiles, coir and, food and beverages. The distribution of the large scale industries are given in **Figure IV-24**.

<sup>24</sup> Small and Medium sized Enterprises (SMEs) is made up of a enterprises which employ less than 300 employees and which have an annual turnover not exceeding Rs.750 Mn.( MIC-2017)  
[http://www.industry.gov.lk/web/images/pdf/framew\\_eng.pdf](http://www.industry.gov.lk/web/images/pdf/framew_eng.pdf)



Source: Resource Profile- 2018, Divisional Secretariat, Wennappuwa, Naththandia, Mahawewa, Madampe and Chilaw

**Figure IV-24: Distribution Large scale and the SEMs in the five DSDs in the project area**

### Water supply

134. National water supply is available for the people living around the proposed road section. Wennappuwa has highest percentage of 97% of people access to the safe water while the Chilaw DSD has only 88% and 12% has not safe drinking water but access either to the dug well or common water sources. The details of the availability of the water in the five DSDs in the project area are given in **Table IV-11**.

**Table IV-11: Availability of drinking water in the five DSDs in the project area**

DSD	Source of Water		
	No of GNDs	Water supply available %	No water supply %
Wennappuwa	52	97	3
Nattandiya	47	96	2
Mahawewa	47	89	11
Madampe	49	93	7
Chilaw	49	88	12

Source: Resource Profile- 2018, Divisional Secretariat, Wennappuwa, Naththandia, Mahawewa, Madampe and Chilaw

### Sanitation

135. In general above more than 98% of the people are possess proper sanitary facility with toilet system. The Wennappuwa DSD has the 100% people access to the safe toilet system but Madampe DSD has only 98 %. The availability of the toilet facilities to the people in the five DSDs in the project area is given in the **Table IV-12**.

**Table IV-12: Availability of toilet facilities in the DSDs in the Project area.**

DSD	No of GNDs	Have toilet facility %	None %
Wennappuwa	52	100	0
Nattandiya	47	98	2
Mahawewa	47	99	1
Madampe	49	97	3
Chilaw	49	98	2

Source: Resource Profile- 2018, Divisional Secretariat, Wennnappuwa, Naththandia, Mahawewa, Madampe and Chilaw

### Transportation

136. Good transport network is available to the community living in the proposed road section, though it needs to be updated. The A003 highway connects the major towns and economic centers in north and south directions.

137. According to the field survey conducted by the consultants, there are about 125 roads connecting the proposed A003 road section. These roads include B, C and D grade roads. The details of B grade roads are given in **Table IV-13**.

**Table IV-13: B grade roads which connect the proposed section of the project area**

Name of the road	Type of the road	Name of the junction or point of Our study road connecting to other roads	Destination of the roads running towards
Thoppuwa – Madampe Road	B419	Thoppuwa Junction	Through Dankotuwa to Thummodara
Angampitiya- Bolawaththa- Dankotuwa Road	B137	Bolawaththa Junction	Bolawaththa
Wennappuwa – Kirimetiyan Road	B473		Lunuwila
Kurunegala-Narammala- Madampe Road	B247	Madampe Old town Junction	Kurunegala
Bo Tree Rd	B59	Galahitiyawa Junction	Connect to Madampe town and Kurunegala-Narammala-Madampe Road
Chilaw –Wariyapola Road	B79	Chilaw Junction	Wariyapola via Bingiriya

Source: Resource Profile- 2018, Divisional Secretariat, Wennnappuwa, Naththandia, Mahawewa, Madampe and Chilaw

### Land use

138. Discussed in Chapter IV.

### Energy Utilization

139. Averagely nearly 99% of the communities in the project DSDs have access to the public services in the project area. In Chilaw DSD 100% households are provided with electrical supply. About 98 % of the Wennappuwa, Mahawewa and Madampe and 98 % of the households in Nattandiya have access to the public electricity supply respectively. The utilization of the electricity in the GNDs are given in **Table IV-14**.

**Table IV-14: Utilization of Electricity by the project in DSDs in the Project**

DSD	No of GNDs	Source of electricity		
		National Grid %	Other sources (Solar panels/ Mini Hydro power etc.)	No Electricity
Wennappuwa	52	99	-	1
Nattandiya	47	98	-	2
Mahawewa	47	99	-	1
Madampe	49	99	-	1
Chilaw	49	100	-	0

Source: Resource Profile- 2018, Divisional Secretariat, Wennappuwa, Naththandia, Mahawewa, Madampe and Chilaw

### Agricultural development

140. When considering the other areas of the country, in the DSDs in the project area, the paddy cultivation is not a predominant agricultural activity. However, Naththandiya and Chilaw DSDs have more than 1,000 Ha of paddy lands. But Wennappuwa has only 40 Ha of. However, coconut cultivation is predominant agriculture activities in the project area. Other crops about 122 Ha found in the Madampe DSD but others are less than 20 Ha. In total 11.19% of the cultivation and 88% of the coconut cultivation is observed in the project area. The details of the agricultural practices in the five DSDs in the project area is given in the **Table IV-15**.

**Table IV-15: Agricultural practice in the project area**

DSD	Paddy (Ha)		Coconut		Other Crops <sup>25</sup>		Vegetable		Total	
	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%	Area (Ha)	%
Nathandiya	1,210	36.74	350	1.35	5	3.14	9.04	19.61	1,574.04	5.35
Madampe	468	14.21	5,382.32	20.76	122.22	76.66	19.98	43.33	5,992.52	20.37
Chilaw	1,052	31.95	7,269.78	28.04	1.54	0.97	1.01	2.19	8,324.33	28.29
Wennappuwa	40	1.21	5,652.65	21.80	19.02	11.93	10.12	21.95	5,721.79	19.45
Mahawewa	523	15.88	7,269.78	28.04	11.67	7.32	5.95	12.90	7,810.40	26.55
<b>Total</b>	<b>3,293</b>	<b>100.00</b>	<b>25,924.54</b>	<b>100.00</b>	<b>159.44</b>	<b>100.00</b>	<b>46.11</b>	<b>100.00</b>	<b>29,423.09</b>	<b>100.00</b>
<b>%</b>		<b>11.19</b>		<b>88.11</b>		<b>0.54</b>		<b>0.16</b>	<b>0.34</b>	<b>100.00</b>

**Source:** Resource Profile- 2018, Divisional Secretariat, Wennappuwa, Naththandia, Mahawewa, Madampe and Chilaw

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<sup>25</sup> Banana, Pineapple, Mango, Rambutan, Orange, etc.



## E. Socio- Economic Condition

141. The socio-economic baseline condition in the corridor area of the proposed project is established on the secondary and primary data collected through the socio-economic survey conducted with sample households and using the resource profiles of 5 DSDs relevant to the project. The data bases in these 5 DSD offices have significant limitations on the availability of socio-economic data. The data on individual GNDs within the DSD is not available at all. However, this gap was filled by the data collected from the household survey conducted within 5 DSDs.

### E1. Demographic Condition

142. The road proposed to improve under iROAD program is located in the Puttalam District in the North-Western Province of the country. This is one of the main highways that connect the Western Province to the Northern Province of the country. This road is one section of the main road networks in the country, and therefore, improvements will have significant connectivity impacts throughout the country. Apart from the population of other parts of the country that become indirect beneficiaries, a large section of the population in 5 Divisional Secretariat Divisions through which the candidate road runs can be defined as the direct beneficiaries of the road. While some of this population has direct access, others reach the road through the network of other roads that are connected to this candidate road. The people in Colombo and other town ships located between Chilaw and Colombo also use this road. Therefore, it can be said that the entire population of the country will benefit from the proposed improvements to the road.

143. The total population in the project related 5 DSDs is 344,212 reporting from 90,921 families. Wennappuwa DSD area is the largest project related catchment area in terms of population. The lowest number is reported from Madampe DSD area. The population data in the catchment areas of the proposed road for improvement is shown in **Table IV-16**.

**Table IV-16: Population in the Relevant DSDs**

DS Division	No of Families	Population
Chilaw	19,494	72,260
Wennappuwa	21,324	84,613
Naththandiya	20,059	74,743
Mahawewa	15,203	59,290
Madampe	14,841	53,306
Total	90,921	344,212

**Source:** Resource profiles of relevant DSDs - 2018

144. **Population with gender differences:** The improved road will generate benefits for both male and female road users irrespective of their gender differences. A major characteristic in the 5 DSDs is that female population is larger than the male population. Observing the present increasing trend of the road user women population, even among the rural women, who tend to use motor bikes, the improved road will generate specific benefits for women. It is to be expected that local communities living in 5 DSD areas would frequently

use the road for routine traveling. The population with gender segregation is presented in **Table IV-17**.

**Table IV-17: Gender Segregated Population in DSDs**

DS Division	Female population		Male population		Total Population
	No	%	No	%	
Chilaw	37,769	52	34,491	48	72,260
Wennappuwa	44,882	53	39,731	47	84,613
Naththandiya	38,983	52	35,760	48	74,743
Mahawewa	30,957	52	28,333	48	59,290
Madampe	27,762	52	25,544	48	53,306
<b>Total</b>	180,353	52.2	163,859	47.8	344,212

**Source:** Resource profiles of relevant DSDs - 2018

145. **Population with ethnic differences:** Sinhala is the largest ethnic group living in the road related catchment (91%). The balance percentage of the population is occupied by Tamils, Muslims and others. The population data with ethnic differences is shown in **Table IV-18**.

**Table IV-18: Population with ethnic related differences**

DS Division	Ethnicity								Total Population
	Sinhala		Tamil		Muslim		Other		
	No	%	No	%	No	%	No	%	
Chilaw	59,556	82.3	6,109	8.5	6,437	9	158	0.2	72,260
Wennappuwa	82,983	98.1	1,446	1.7	67	0.1	117	0.1	84,613
Naththandiya	64,102	86	1,905	3	8,666	11	70	0.0	74,743
Mahawewa	57,964	98	1,271	2	40	0.0	15	0.0	59,290
Madampe	48,970	92	1,245	2	3,071	6	20	0.0	53,306
Total	313,575	91	11,976	3	18,281	5	380	1	344,212

Source: Resource profiles of relevant DSDs – 2018

146. **Population with age differences:** Little more than 50% of the population can be categorized as people, within employable age group (19-55). About 25% are dependents because some of them are children under 5 years and others are above 55 years of age. However, people within school going ages and employees are considered as frequent users of the candidate road compared to the people under other age categories, **Table IV-19**.

**Table IV-19: Population under different age ranges**

DS Division	Age Range										Total Population
	0-5		6-18		19-35		36-55		55<		
	No	%	No	%	No	%	No	%	No	%	
Chilaw	7226	10	18,788	26	18065	25	15175	21	13006	18	72260
Wennappuwa	8461	10	19461	23	21927	26	18615	22	16149	19	84613
Naththandiya	5954	8	18295	24	30185	40	10181	14	10128	14	74743
Mahawewa	5401	8	11809	18	23175	39	11326	19	7579	16	59290
Madampe	3838	7	10768	20	21344	40	10211	20	7145	13	53306

**Source:** Resource profiles of relevant DSDs – 2018

147. **Education levels:** About 2% to 3% of the population has no formal education. There is no flexibility in the data base maintained in resource profiles of 5 DS offices to extract segregated data on population presently attending education and the persons, who had already completed education. The data on education levels in the road catchment area compatible with other DSDs in rural and semi urban environments of the country. For example, 12% of people with GCE (A/L) and 1% to 2% with University Degrees are the average figures reported on education in Rural Sri Lanka. The available on education levels of people in 5 DS areas is presented in **Table IV- 20**.

148. **Employment of people in the road catchment:** Majority of employed population is reported from non-governmental sector (94%). Only about 6% of the employed persons are reported from the Government sector. A significantly high percentage of population is employed in other countries (16%). This is a common phenomenon observed in this North-Western coastal belt of the country. However, improved road, especially the main road proposed, will enhance the transport facility of employees in the area. The data on employments of people living in road catchment is shown in **Table IV-21**.

DS Division	Education Level																Total
	Pre-School		Non-Educated		Grades 05-8		Grade 9-10		O/L		A/L		Graduated		Post Graduated		
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Chilaw	4964	7	2628	3.6	12079	17	28741	40	15910	22	6756	9.3	1092	1	90	0.1	72260
Wennappuwa	5410	6.3	1705	2	13215	15	41604	49	14568	17.2	6120	7.2	1819	2.1	172	0.2	84613
Naththandiya	5901	7.8	1828	2	18806	25.1	19201	26	18100	24	9201	12	1572	2	134	0.1	174743
Mahawewa	2864	5	997	2	10149	17	21843	37	15079	25	7385	12	937	1.5	36	0.06	59290
Madampe	3760	7	1023	2	7910	15	22243	42	10385	19	6892	13	981	1.8	112	0.2	53306

**Table IV-20: Education levels of population in road catchment area**

**Table IV-21: Employment in road catchment**

DS Division	Employment Composition														Total No of Employees
	Government		Private		Labor		Business		Self-Employment		Abroad		Other		
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	
Chilaw	2,366	5	6845	16	6,055	14	8,050	19	13,044	30	3,908	9	2,844	7	43,112
Wennappuwa	1,680	3	11,242	22	6,600	13	7,140	14	7,181	14	12,919	26	4,006	8	50,768
Naththandiya	3,404	10	9,034	26	4,688	14	2,100	6	6,919	20	6,405	18	2,149	6	34,699
Mahawewa	767	3	3,834	15	3,067	12	4,089	16	7,157	28	3,834	15	2,812	11	25,560
Madampe	2,079	8	5,200	19	6,975	26	3,150	12	5,002	18	2,652	10	1,858	7	26,916
Total	10,296	6	36,155	20	27,385	15	24,529	14	39,303	22	29,718	16	13,669	8	181,055

Source: Resource profiles of relevant DSDs – 2018

149. **Project Relevant Grama Niladari Divisions:** The proposed project area consists of 5 DSDs and intercepting 72 GNDS with total population 344,212. The details are given in the **Table IV-22.**

**Table IV-22. Population details in the project relevant GNDS**

DSD	GND	Total HH	Total Population
Wennappuwa	26	21,324	84,613
Naththandiya	11	20,059	74,743
Mahawewa	13	15,203	59,290
Madampe	8	14,841	53,306
Chilaw	14	19,494	72,260
Total	72	90,921	344,212

**Source:** Resource profiles of relevant DSDs - 2018

150. **Educational:** **Table IV-23** below presents the level of educational attainment of sample population. Data collected show slightly higher level of performance of male in GCE (A/L) and above. Higher percentage of women shows slightly higher level of performance in G.C.E (O/L) and below. The following information indicates the educational situation of sample population and the difference between male and female. The information on percentage ranges show the situation of households interviewed from 5 DSDs.

**Table IV-23. Percentage ranges show the situation of households interviewed**

Level of Education attainment	Total	Male		Female	
		No	%	No	%
Age< 5yrs	417	204	48.9	213	51.1
No Schooling	407	162	39.8	245	60.2
Grade 1-5	1315	626	47.6	689	52.4
Grade 5-10	3301	1628	49.3	1673	50.7
Up to G.C.E. O/L	3360	1675	49.9	1685	50.1
G.C.E. O/L Pass	1902	1038	54.6	864	45.4
Up to G.C.E. A/L	1960	1040	53.1	920	46.9
G.C.E. A/L Pass	1289	712	55.2	577	44.8
Undergraduate/Graduate	403	222	55.1	181	44.9
Post graduate	18	11	61.1	7	38.9
Other	90	48	53.3	42	46.7
Total	14462	7366	50.9	7096	49.1

**Source-**Sample survey conducted in 2019

151. **Employment:** Most of the household heads are involved in private sector and self-employment employment activities. The percentage of heads of households involved in business is also significant (14.8%). The percentage (ranges) of the households involved in different employments in 5 DSDs are shown below for summarized description of the employment profiles of the household heads in sample households interviewed.

**Table IV-24.Occupation of household heads**

Employment	Percentage of HHs
Farmers	0.8
Public sector	10.3
Private sector	18.2
Skilled labor	13
Business	14.8
Self-employment	19.6
Wage labor	10.4
Fishermen	3.5
Foreign Employment	6.2
Dependents	0.8

**Source**-Sample survey conducted in 2019

152. **Average household income and expenditure:** Nearly 39% of the households interviewed draw monthly income Rs 15000 to Rs.50000. The percentage of households drawing more than Rs 100000 monthly income is 12.8 % of the total households interviewed. About 8.1% of the households are reported as households drawing monthly income blow Rs 5000. The table 3-15 includes the data on monthly income and expenditure of the households interviewed. About 70% of the households spend about Rs 15000 to 50000 per month for their household needs.

**Table IV-25: Monthly income and expenditure of the sample households**

Income category	Average (SLR) Monthly Income		Average Monthly Expenditure	
	No	%	No	%
Less than 5,000	390	8.1	243	4.9
5,001 - 14,999	23	0.5	432	8.6
15,000 - 49,999	1906	39.3	3499	69.9
50,000 - 74,999	1271	26.2	588	11.7
75,000 - 100,000	636	13.1	151	3.0
More than 100,000	618	12.8	92	1.8
Total	4844	100.0	5005	100.0

**Source**-Sample survey conducted in 2019

## **V. SCREENING OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES**

### **A. Significance of Impacts**

153. The following section provides an assessment of the project's likely impacts on physical, biological, socio-economic, physical and cultural resources, and also identifies mitigation measures to ensure how potential environmental impacts could be avoided or managed/reduced to acceptable levels. Where the environmental impacts are deemed to be major (or significant) or minor level, mitigation measures detailed in the project's EMP need to be incorporated into the project design and bidding documents.

### **B. Pre- construction**

#### **B1. Delay in initiation and poor environment practices by the contractor**

Delay in initiation and poor environmental management by the Contractor will lead to the environmental degradation and community dissatisfaction in the project area and also delay the project with various environmental issues. The preparation and obtaining approval for the EMAP, obtaining necessary clearances such as EPL, GSMB permits for quarrying etc. that results delays in implementing environmental practices.

154. These also adversely impact on the satisfaction level of the relevant ministry and the financing agencies. To mitigate the anticipated adverse environmental impacts, the following mitigation measures are proposed.

#### **Mitigation Measures**

- Appoint a full-time environment specialist, to coordinate with PIU for updating this IEE and implementing the EMP and EMoP, including the conducting of all surveys and monitoring actions etc
- The contractor should prepare the following documents as a part of the EMAP.
  1. Waste Management Plan
  2. Spoil Disposal Plan
  3. Drainage Management Plan
  4. Erosion and Siltation Control Plan
  5. Traffic Management Plan
  6. Hazardous Materials Management Plan
  7. Occupational hygiene and safety Plan considering the inclusion of containment of spread of any epidemics within labor camps.
  8. Emergency Response Plan
  9. Quarry extraction and rehabilitation plan

#### **B2. Re-shifting and Temporary relocation**

155. Proposed road rehabilitation work will be restricted to existing ROW. No land acquisition involved, but a few moveable structures and semi-permanent structures in the road side may need to be temporarily shifted during the construction period. The details of the affected people are given in **Table V – 1**.

**Table V-1: Affected people in the project area**

Nature of property	No	%
Business structure (semi-permanent)/ Stall ( fish, vegetable, fruits etc)	3	33.3
Moveable structures	6	66.6
Total	9	100.0

156. During the road construction, vendors have indicated their desire to volunteer to readjust their structures. Therefore, no compensation required for the lands. However, every business person affected by the project need short period for shifting of their structures and it will cause some temporary livelihood impact. These impacts will not be significant IR impact.

### Mitigation measures

157. The following measures shall be taken to mitigate impacts associated with encroached structures.

- A re-shifting plan should be prepared, including the location, means of relocation, whereto, when and by whom,
- Prior notice should be given and adequate time period should be allowed to those, who need to remove, shift and adjust their encroachment.
- Providing labor for shifting and resettling the structures outside the ROW.

### B3. Shifting, Reinstalling and Removal of Public Utilities

158. The proposed road crosses five towns and rural areas. Hence, a large no. of service utilities is available. Except, water supply line, which is in the middle of the proposed road in some sections, others are along the edges of the ROW, and therefore, no shifting or removal is necessary.

### Water supply pipe lines

The details of the water supply lines available in the project area is given in **Table V – 2**

**Table V-2: Water Supply lines**

No.	National Water Supply and Drainage Board Branch	Changes		Availability of water supply lines
1.	Wennappuwa	45+750	7+225	Pipe line goes nearly 1.5 m away from the edge of the carriage way in the right side of the road. The sizes are 160 mm, 110 mm and 90 mm. Earlier there were manholes along the pipe line route. Now those are not available.



No.	National Water Supply and Drainage Board Branch	Changes		Availability of water supply lines
2.	Kakkapalliya	58+530	59+875	Pipe lines go through under-ground on both sides about 1.5 m away from the edge of the carriage way. The sizes are 90, 110, 160 and 225 mm
		60+580	61+120	Pipe lines go through underground on both sides about 1.5 m away from the edge carriage way. The sizes are 90, 110, 160 and 225 mm
		61+315	61+360	Only on the right side. 63 mm about 1.5 m away from the
		61+740	72+300	The pipe lines are available on both sides along the existing drains up to the railway crossing. The pipelines cross through the existing culverts. The pipe sizes are 90, 110, 160, 225, and 280 mm.
3.	Chilaw	72+300	76+000	The pipe lines are available on both sides in different sizes. New lines are provided on the either in the existing drainage or edge of the ROW. The pipe sizes are 90, 110, 160, 225, and 280 mm. In some areas the old pipe line also in function. These lines are located in the middle of the road. Such lines could be connected to the new lines if necessary. Prior information is necessary. The pipe sizes are 90, 110, 160, 225, and 280 mm

159. In general, the pipe lines are going through underground about 1.5m away from the edges of the carriage ways. However, it is necessary to conduct detailed study to the exact location of the pipeline for the detailed design. About 0.5 km length, from 65+500 to 76+000, the pipe line is going through the middle of the road. These pipelines to be relocated to the edge of the road. Further, from 61+740 to 72+300 the pipe lines are going along the road side drains. The drains are mainly earth drains. Most of these drains are already silted and the bunds are damaged. These drains need to be de-silted and bunds need to be reconstructed. Changes to be made to damage pipe lines during the improvement of the drainages. Need proper mitigation measures to reduce such impacts.

**Table V-3: Utility lines in the project area with in 2m from the ROW**

Road Side	Medium-voltage lines	Low-voltage lines	Telecommunications lines	Transformers
Left	528	970	625	28
Right	370	971	911	13
Total	898	1941	1536	41

**Source:** EML field survey

160. As these utilities are located at the end of the shoulder and there is no space for the relocation as the adjacent lands are private lands in most cases. As no detailed designs available at the time of preparation of this IEE, it is not possible to consider the number of public utilities to be relocated or removed. But there may be some utilities to be relocated and removed based on the detailed design.

161. Therefore, during the pre-construction phase these public utilities have to be removed or relocated prior to handover the contract. It is very important the removal and shifting of these public utilities to be carried out without damaging those and other existing utilities, such as pipe lines, irrigation canals etc.

**Mitigation measures:**

- Proper coordination with relevant agencies, such as NWSDB, CEB, and SLT is vital to reduce such impacts.
- Well trained, experienced workers and machine operators should be employed to reduce the damage to public utilities as well as private properties during the removal and re-establishment process.
- To mitigate the impacts on local community due to interruption of electricity, communication facilities or water supply (if applicable) advance notices should be given verbally as well as through the media. Also, interruption of these facilities should be done during specific time periods to minimize the effect.
- The contractor along with the RDA should prepare a working schedule with consultation of the other relevant authorities to remove/shift and reestablish public utilities. RDA is responsible to pay the cost for the removal/shifting & re-establishment of public utilities.

**B4. Impact on Archaeological reserve**

162. There are no archeological sites on the road sites. But a large number of cultural sites, particularly religious places, are available along the road sites. The impacts will be common as in the other areas of the proposed project. Therefore, no special mitigations are required.

**B.5. Resources Mobilization**

163. Spaces are needed for the storage of materials, establishment of labor camps, and for construction equipment. To mitigate causing inconveniences to general public by erecting temporary resource centers, following measures are suggested.

- Temporary lands are readily available in the surrounding project area and must be selected. These should be at least 500m away from residential areas, water bodies,

- cultivated lands and socially sensitive areas, such as schools, temples, kovils, churches and mosques, and governmental offices and establishments,
- conduct site specific environmental assessment for the selected site, including the physical environmental, topography, availability of natural drains, ecological assessment, whether any diggings/cuttings to be made, etc., social assessment, like distance to the socially sensitive area, and plan to avoid any significant impacts,
- Approvals from relevant authorities must be obtained to use temporary lands in order to comply with national laws and regulations,
- Preparation of the temporary lands and access road must be carried out in such a way as to minimize disturbances to natural vegetation cover,
- Recruitment of laborers, both unskilled and skilled, from the locality, will reduce the need for having large labor camps and will lead to lesser impacts due to such labor camps during the construction stage.

#### **B6. Natural hazards aggravated by the project and impacts to the road due to natural hazards**

164. About two km stretch from 69+800 to 61+700 where the road stretch passes adjacent to catchment of Lunu Oya river, there are seasonal/ intermittent freshwater bodies, which cause floods in the area.

#### **Mitigation Measures**

- Surface water hydrology along the road with special attention to these flood-prone locations shall be deeply studied during the detailed design stage and the pre-construction phase. Possible mitigation measures for the above issues shall be provided, and the types and sizes of cross drainage structures, road finish level (RFL), adequacy of lead-away / tail canals, flow connectivity issues and the surface treatment shall be decided accordingly in rehabilitating the road.
- Close coordination with Department of Irrigation, Department of Agrarian Services and Disaster Management Center (DMC) shall be maintained in this regard to obtaining information on high flood levels, their return periods, respective retention periods and other recommendations to support the final design. The public consultation will also be used to verify the findings.

#### **B7. Health and safety due to the Construction of Labor camps**

Health and safety in the labor camp is very important. Therefore, the following guidelines should be followed during the construction of labor camps.

- Provision of proper and adequate drinking water and toilet facilities. At least 1 toilet should be provided for every 15 workers.
- Provision of enough dust bins to collect the dry and wet waste.
- All electrical installation should in accordance with the construction safety guidelines

- Labors should be trained for solid waste disposal, usage of water and toilet facilities, health care practices. (This will help to avoid/ land and water pollution and avoid unhygienic conditions).
- Labors should be provided with safety equipment to prevent the accidental hazards.
- Regular health checkup camps, pest control programs, safety trainings shall be held to avoid unhygienic and mismanagement conditions in labor colony.

## **C. Construction Phase**

### **C1. Physical Impacts and Mitigation**

#### **C1.1 Anticipated impacts due to disposal of wastes generated from land preparation and construction activities etc.**

165. During the construction period, especially during the land preparation, removal of vegetation, waste land clearing, residue disposal, construction waste, dredging, operation of labor camps, will generate a large quantity of waste materials that will have to be carefully handled. The cleaning of road side drains and culverts also generates large amount of silt and mud as the road side drains and culverts are completely silted and covered with vegetation. Construction activities also generate fairly large quantity of debris. There will be municipal solid waste and wastewater generated from labor camps and offices, and storage yards. The septic tanks in the area are subject to frequent overflow during the rainy seasons due to high level of ground water. If silt materials, municipal solid waste and waste waters are not properly disposed of, including the effluent of the septic tanks are not properly managed, significant negative impacts could be anticipated on public health and safety and scenic beauty of the project area and to the local people in the area. Degradable wastes also attract pests, such as rats and flies, which contribute to unhealthy, dirty, and unsightly places to reside in as the Labor camps, garbage disposal sites and material storage yards provide favorable habitats for vectors of diseases, like mosquitoes and rats. Contamination of water bodies with wastewater, construction debris, and spoil will create a significant impact on the aquatic lives and the people inhabited in the area.

166. Proper mitigations measures are required to minimize such impacts.

#### **Mitigation of negative impacts**

##### **Construction debris and spoil disposal:**

- Suitable sites shall be selected for the entire stretch of the proposed project area for the temporary collection of debris and spoils. Necessary approvals should be obtained from the relevant local Authority, CEA, and other relevant agencies,
- proper engineering design shall be followed to minimise land clearance, avoiding cutting of any trees, soil erosion during the rainy season and spreading of dust to the surrounding area,
- re-use of debris is a good option to reduce the quantity of debris. Wherever possible, surplus spoil will be used to fill eroded gullies, to fill the borrow pits and quarries, and depressed areas, etc. Metal, soil, and sand are reusable raw materials, which can be

used for backfilling, leveling and amenity planting at intersections. Wood debris can be used as fuel for worker camps or distributed to local people free of charge,

- all construction wastes should be properly stored with suitable covers, like polythene sheets, tarpaulin, or jute to prevent the spreading of dust,
- spoils shall not be disposed on sloping areas, farm land, marshy land, forest areas, especially, natural drainage path, canals and other infrastructures. The temporary debris storage sites shall not be located closer to residential or ecologically sensitive areas,
- necessary toe and retaining walls will be provided to protect the disposal of soil,
- topsoil will be reused as far as possible in maintaining green vegetation once the construction is over,
- A mechanism to store top soil and identification of the piles need to be introduced.
- the remaining non-reusable construction debris shall be dumped properly in approved dumping sites. Prior approval for the disposal site shall be obtained from the LAs of the area, after the disposal, the site will be provided with proper drainage, vegetation and adequate protection against erosion.

**Municipal solid waste:**

- Selection of the location for labor camps shall be approved by the PIC and comply with guidelines/recommendations issued by CEA and LAs,
- contractor shall make every effort to handle and manage waste generated from the construction/labor camps without causing a nuisance to the neighborhood,
- contractor should provide adequate color bins to segregate the MSW in the labor camps, national color code for segregated waste are blue, orange, red, brown and green for Paper and card boards, Polythene and plastic, Glass and bottle, Metal and Bio degradable waste respectively. All recyclable waste should be stored separately and sold out for local recycle materials collectors in the area,
- all bio-degradable waste should be handed over to the garbage collection trucks of the LA,
- site inspections and proper disposal of wastes should be ensured by the environmental officer/ safety officer of the contractor,
- proper collection and disposal of waste will ensure avoidance of negative environmental and social impacts, apart from ecological impacts, public health and negative impacts on scenic beauty.

**Wastewater disposal and proper sanitation:**

- Proper sanitation facilities (drinking water, urinals, toilets and washrooms) shall be provided to all site offices and construction/labor camps.
- All wastewater generated from the labor camps should be discharged into properly constructed septic tanks and soakage pits.
- No waste water should be allowed to stagnate in the camp site.

**Overflow of septic tank**

- Prepare an inventory of existing septic tanks
- Discuss with relevant local authorities and make arrangement to empty when required and the collected wastes should be properly disposed.

- Alternatively, services of a gulley bowser could be arranged to clear the filled septic tanks and dispose the effluent

### **C.1.2 Impacts on natural flow and existing drainage pattern and hydrology**

167. The rehabilitation or reconstruction of culverts may require temporarily diversion of streams, disturbing the natural drainage pattern and it may lead to creating flooding conditions in adjacent areas. Improperly stored construction materials can also block natural drainage patterns. Leveling, filling, excavations and formation of temporarily or permanently raised embankments in the ROW may block natural flow patterns and cause localized flooding effects in the immediate downstream.

#### **Mitigation measures:**

- The contractor shall take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear at all times,
- temporary storage of material will be made only in approved sites by the PIC, where natural drainage is not disturbed,
- all wastes will be disposed at locations approved by the Local Authority,
- if flooding or stagnation of water is caused by contractor's activities, the contractor shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property.
- The contractor shall provide immunity insurance cover to protect the client from implications due to his failures to observe the relevant guidelines
- severe rain intensities are observed during inter-monsoon and monsoon seasons and thus timing of construction during dry flow period as a mitigation measure is highly recommended,
- no material, including excavated soil will be allowed to be disposed near water bodies or in paddy lands, even on a temporary basis, to curtail any undue wash off of soil and debris to nearby water bodies and paddy lands. The contractor will ensure that not to damage or block any manmade drainage canal even on a temporary basis,
- if any natural drainage path unintentionally blocked, the contractor should remove such debris without any delay,
- contractor shall schedule his construction activities in compliance with the rainfall patterns of the project area and activities, which will induce soil erosion, shall be planned to avoid heavy rainy periods.

### **C.1.3 Impacts on Water Quality due to erosion and Silt Runoff,**

168. Soil erosion will mainly occur during the construction period due to excavation, dredging, cutting and filling, removal vegetation cover and unplanned temporary storage of gravel and soil along the roadsides. The top soil is directly exposed to showers when trees and vegetation cover is removed reducing infiltration and increasing surface runoff. Eroded soil can be washed out to nearby canals, reservoirs and paddy fields causing siltation. Increased suspended particulates and siltation in the water body will be a threaten to the

aquatic organism. To minimize these impacts, the following mitigation measures need to be adopted during the construction stage:

- natural drainages in the construction area must not be blocked to facilitate free flow of water,
- carry out construction works in any erodible area during dry season as much as possible,
- if any civil works are to be carried out during rainy days, enough silt traps, sludge pumps and interceptor drains should be incorporated in the construction site as much as possible,
- silt traps should be provided as much as possible where possible runoff is observed,
- cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid obstruction or destruction to natural drainages,
- site specific soil erosion control measures, such as (rubber masonry, concrete retaining walls, etc.,) must be taken to protect embankment slopes,
- exposed areas should be covered during the rainy seasons and turfing and terracing work should be done after the constructions.

#### **C.1.4 Extraction, Transportation and Storage of Construction Materials**

169. Commonly, the contractors will source the construction materials from the existing sources. But some contractors preferred to operate their own borrow pits and quarry sites. Extraction of sand, gravel and metal will cause soil erosion and lowering of the river beds, destruction of the river banks and natural habitat at the quarry sites. Dust emissions, noise and vibrations due to quarrying and transportation of construction materials and damages to minor roads will cause inconvenience to local people, who live closer to quarry sites and borrow pits as well as general public in the project area and others, who travels via the proposed road section. During the dry periods dust emission will cause more disturbances due to high winds creating health hazards. Water stagnation in excavated areas, such as borrow pits will provide breeding sites for mosquitoes and other disease causing vectors. This will create accidental health hazards to general public and wild animals. Mining, quarrying and storage of construction materials near quarry sites will alter the visual quality of the area.

170. The following mitigatory measures shall be used to minimize the impacts associated with the above discussed activities.

- construction materials could be extracted from existing quarries, crushers and borrow pits in the nearby areas,
- the contractor/s shall only obtain material from resource locations which has proper licenses and approvals GS&MB and CEA
- if new quarries are operated by the construction contractor;
  - quarries should not locate in any environmentally sensitive areas, or in vicinity to archaeological / cultural or religious places, schools and settlements,
  - excavation operations and rock mining / blasting activities near schools, hospitals or religious places (500m away) should be done in accordance with agreeable time periods in consultation with relevant stakeholders in a mutually understandable manner,
  - hydrology report (from a qualified hydrologist) & test blast report (GS&MB/ITI/CEA) should be obtained prior to mining activities. Standard and site specific precautionary



measures and conditions stipulated in an EPL & IML should be adhered during blasting operations,

- sand, gravel and other dust causing construction materials must be transported in covered trucks and sprinkling of water over the construction materials prior to transport to minimize dust emissions. Spraying of water along the material transport road sections where settlements exist in order to minimize the dust dispersion due to vehicular movement,
- after the constructions borrow pits must be restored by the contractor or relevant authorities. The restoration should include re-vegetation of the sites with landscaping and facilitating to re-growth of natural vegetation,
- material storage sites should not be established closer to residential areas, beside the roads, around the water bodies etc.

### **C.1.5 Impacts on Local Road Net work**

171. As the quarries, crushers and borrow pits are mainly located outside the project area transportation of materials will need through the provincial and local road network to the project site. Because of the magnitude of the project, large quantities of construction materials will be transported through the local roads. Even though the condition of the present local road network is not an obstacle to the heavy vehicular movements, unusual & high frequency of heavy vehicular movements will damage the physical condition of the local roads. Uncovered transportation of the materials, high speed vehicular movements, and bad physical condition of the local roads due to the material transportation will cause inconvenience to the local people.

- it is necessary to obtain permission from the relevant local authorities and the Director, Motor Traffic to use such local roads prior to construction begins,
- all existing high ways & local road network used by the vehicle of the contractor, or/and any of his sub-contractors or/and suppliers of materials and new roads, which are being used by traffic, shall be kept clean and clear of all dust/mud/extraneous materials dropped by the said vehicles or tyres,
- similarly, all dust/mud/extraneous materials from the works spreading on these high ways shall be immediately cleared by the contractor. Clearance shall be affected immediately by manual sweeping and debris shall be removed entirely from the road surface,
- if necessary or/and directed by the PIC or other relevant officials, the road surface shall be hosed or watered using suitable equipment,
- contractor should properly maintain all road surfaces, which will utilize for the construction related activities in better or similar conditions at all times and after the construction work, the contractor must rehabilitate all structural damages caused to the particular local roads at contractor's expense,
- public access roads to quarries should be subject to "before and after" condition surveys in conjunction with the RDA and the PIC with the contractor being held liable for damage caused by the extraordinary traffic as is provided by the Condition of Contract.



### **C.1.5 Impacts due to Dust and Air Quality and Noise and Vibration due to construction activities**

172. There are light industries like lath work (small iron casting) and roof tile factories located mainly in the Wennappuwa area. Other than that, there are no other activities related to the air pollution, such as industrial, transportation, deforestation, mining and quarrying in the road corridor. Therefore, it was presumed that project area represents ambient air quality (as specified in Ambient Air Quality Standards of the CEA). But during the construction stage of the road, dust, noise, and vibrations generated from the project activities will impact on the roadside communities and the people, who inhabit around material extraction sites and other haulage roads. Vibration during compaction works could easily damage structures close to the roads.

### **C.1.6 Impacts on Air Quality**

173. The project activities are done in urban, semi-urban and rural areas. The main construction activities that cause air pollution are earth works (excavation and dredging), quarry operations, crushers, asphalt plants, emission from vehicle operations etc. In addition, vehicles and machinery emit smoke and fine particles. If construction work is carried out in dry season dust emission is likely to be significant. Release of Volatile Organic Compounds, emission of small amounts of carbon monoxide, nitrogen dioxide and particulates from vehicular movements, blasting and dust generated from clearing, grubbing, excavating, backfilling, dumping, mixing concrete, transportation of materials, storage of soil and metal piles, etc. can be taken place in the surroundings due to wind. These substances will increase the local air pollution significantly during the construction stage. Air pollution will cause inconvenience as well as health hazards to local people, who reside closer to the proposed road or quarries etc. Also, there are several schools, religious places, government departments and authorities along the road and the deterioration of air quality will directly affects to these public places.

174. To mitigate the impacts associated with air quality, following measures can be implemented.

- Quarries, crushers and asphalt plants must be located at least 500m away from the residential or other public sensitive areas.
- Spray water before loading and transportation of soil and sand, particularly during windy conditions. Dust causing materials must be covered with tarpaulin during transportation
- Dust emissions must be minimized at working areas, excavated areas, quarry sites and crusher sites by spraying of water regularly.
- Ground surface of sites where the crusher plant, concrete batching plant and asphalt plant are located should be covered by tar layer to minimize the dust generation due to vehicle moving.
- Apart from the regular wet method for the jaw area, wet rubble can be fed, drum of the crusher can be covered by maintaining the appropriate height and conveyer belts also can be covered without disturbing to the process in order to minimize the dust generation. Dust generating from the crusher plant, loading of raw materials to the

asphalt plant & batching plant should be controlled up to the National ambient air quality standards (Gazette Notification No. 1562/22 of 15th August 2008).

- Conveyer belts of the asphalt plant also should be covered.
- Sitting of crusher plants, asphalt hot-mix plants should be downwind of close sensitive receptors.
- Construction materials must be stored in covered places or must be covered with a suitable covering to prevent dust emissions due to wind.
- Protective blasting should be carried out to minimize dust and other gas emissions. Chemical blasting is the best option, which does not cause any noise or dust emissions.
- Temperature of the Hot-mix plant should be controlled at appropriate level in order to control exhaust gasses to comply relevant emission standards.
- Use well-maintained construction and equipment fleet
- Regulate vehicle movement speed when moving along unpaved area.

### **C.1.7 Impacts due to Noise and vibration**

175. The noise impacts will be significant during construction periods due to increase of vehicular movements and machinery, blasting and crushing operations, material transport etc. Increased noise will affect the nearby communities and wild animals as well. Minimizing noise levels is highly important, especially near residential and other public sensitive areas. Following measures will help to keep noise and vibration in acceptable level during the construction phase:

- To mitigate the impacts due to noise, construction machinery should be operated only during the day time.
- Contractor shall equip properly tuned and well maintained heavy construction equipment and vehicles.
- Suitable noise controlling devices, such as exhaust silencers can be used to control noise.
- Noise level must not exceed 75 db during the day time (The maximum permissible noise levels at boundaries in the land in low noise areas range from 75 LacqT, during the daytime and 50 LacqT, during the night time for construction activities).
- All construction vehicles, machinery and equipment must be properly maintained to comply with the National Emission Standards.
- Sitting of crusher plants, concrete batching plant & asphalt plant should be done as much away from the residential areas.
- Jaw of the crusher can be installed in a sound proof area without disturbing the material feeding, and also drum can be covered maintaining appropriate height between mesh & the cover and conveyer belts also can be covered.
- Contractor is highly responsible to take precautionary measures to ensure that, the construction works do not result in damaging to adjacent properties due to vibrations.
- If vibration levels exceed the permissible levels, contractor shall modify the method of construction until compliance with the acceptable level.
- If heavy vibrators are used, a crack survey should be conducted for the close by residences specially in the Madamape old town, where the buildings are in the

boundary of the ROW, and some building, the access are constructed within the ROW.

- Vibration level should be maintained according to the “Proposed Air-Blast Over Pressure and Ground Vibration Standards for Sri Lanka” by the CEA
- Use of heavy machinery and equipment for constructions must be done only during the day time (from 6.00 am to 6.00 pm). When constructions are carried out near public sensitive areas, such as schools, hospitals or religious places the contractor must schedule the construction activities in consultation with the relevant authorities to avoid any inconvenience.

#### **C.1.8 Impacts due to Traffic**

176. Traffic congestions will occur during the construction period, especially near townships and buildup areas as most of the junctions in the road sections possess significant traffic during morning and afternoon rush hours.

177. The following measures must be taken to reduce the disturbance due to increased traffic congestion:

- A detail traffic impact assessment should be carried out in consultation with the relevant Police offices in the area and with the local community to identify the status of traffic and find alternatives to reduce traffic congestions.
- A traffic management plan must be prepared based on the Traffic Impact Assessment and implemented.
- An advance notice should provide to local communities about the schedule of construction activities.
- Proper alternative roads should be identified and inform well before the construction commences.
- Traffic regulations, such as speed limits, time of transportation (especially night time) should enforce during transportation of materials and equipment and machinery.
- Condition of road and bridges to be surveyed and documented prior to activities.
- Installation of traffic warning signs, temporary traffic lights or traffic control personnel, where construction and associated traffic has created significant impacts.

#### **C2. Ecological Impacts and Mitigation**

178. A total of 85 species were observed belonging to 39 families and no any species is endemic to Sri Lanka. One plant species (*Phyllanthus emblica*) (Left outside the shoulders, Coordinates 7.532921 N, 79.820997 E at 68+380 km) recorded on the proposed project site belongs to ‘Vulnerable’ category (VU) in 2012 Red List. 64 Least concern (LC), two Near Threatened (NT) and one Data Deficient (DD) species with 18 introduced species were recorded from the study area.

179. A total of 93 faunal species were recorded during the survey representing birds, butterflies, reptiles, amphibians, mammals and dragonflies. All faunal taxon, which recorded

in the survey are common species to the intermediate and dry zones of Sri Lanka and no any threatened, endemic species in the proposed project area.

180. There is no environmentally sensitive area declared under any Acts or Regulations in the project area.

181. Therefore, the anticipated impacts are minimal.

### **C.2.1 Impacts due to removal of roadside trees**

182. There is no need to cut any trees for the project as there is sufficient space along the ROW. However, the final detailed design is not available at the time of the preparation of this IEE. Therefore, if there is any cutting of trees involved the following mitigation measures should be adopted:

- Identify the no. of tree to be cut as per the detailed design. The approval of DS and Forest Department should be obtained for the cutting of such trees. Based on the approval, make arrangement with the State Timber Corporation to cut and remove the trees.
- The tree replanting program should be carried out within the ROW and at locations with public importance (such as schools and other government institutes) according to the necessity. Fruits and medicinal plant species, which are native to the project area, to be selected, if replanting to be undertaken outside the ROW. The continuous supervision and maintenance during the operational stage are essential to ensure the survival of trees. Planting of 1:3 of trees as suggested in the EARF shall be carried out.

### **C.2.2 Impacts on Flora and Fauna**

183. There are several freshwater habitats, particularly rivers are crossing the proposed road, and tanks, especially Mahawewa, which is bordered by the road. These water bodies can be polluted due to dumping of soil, contamination oil and other construction materials, especially during rainy days. Pollution of water directly affects the aquatic fauna and flora in those habitats. Increase turbidity will reduce penetration of light, subsequently reducing O<sub>2</sub> in the water, and subsequently reducing the productivity of lakes/ reservoirs. Above discussed impacts are short-term and can be easily mitigated by adopting following measures:

- The core project boundaries must be clearly demarcated and informed the workers.
- Hunting, fishing, collecting firewood, fauna and flora, washing and cleaning of vehicles, construction instruments should be strictly prohibited, and workers should be educated through an awareness program.
- Disposal of solid waste, waste water, chemicals, such as tar, cement etc. into water bodies should not be allowed and must be strictly monitored.
- When construction works are carrying out closer to bordering freshwater habitats, suitable engineering and biological measures must be taken to prevent aquatic pollution. E.g. to prevent entering pollutants with the surface runoff into the water source, a buffer zone can be created by planting fast growing plant species in between the road and the water source. Collecting all the pollutants using traps and

treated at one point or use of soakage pits is a suitable engineering measure to prevent aquatic pollution.

- Warning and sign boards must be displayed near the sensitive aquatic habitats to prevent throwing garbage or any kind of pollutants to the water body.

### **C3. Socio-economic Impacts and Mitigation**

#### **1. Positive impacts of iRoad Program**

184. The proposed road for rehabilitation is a highway, connecting the provinces of the Western, North-Central and Northern, which is presently at dilapidated conditions, causing frequent accidents, flooding the road sides, increasing traffic congestion and delaying in transport time. Apart from these, several rural roads, which connect agricultural community to major economic centers through this highway road, will facilitate the rural economic development. The improved road will reduce the noise and dust emissions, and in turn, will reduce health risks to the people living on the road corridor. Apart from these, the road is used by a large number of tourists, the improvement of which would help the tourism development, which is one of the core development tasks identified by the Government of Sri Lanka.

#### **2. Social impacts due to the Establishment of labor camps**

185. The recruitment of labor from outside may be envisaged depending on the availability of the labor locally. Establishment and operation of the labor camps with outside labors may create unhappiness, and possibly social conflicts, if these are not operated in proper manner. These people may consume alcohol and raise noise levels at night. It is also possible that they may behave inappropriately by disturbing local women that may disturb peace in the area. Improper disposal and discharge of waste water may pose health risks to the community living near the vicinity of the camps. Therefore, the following mitigation measures are proposed to reduce the social issues.

##### **Mitigation measures**

- Labor camps, shall be established in suitable locations away from the houses, business establishments and other sensitive institutions, such as schools, religious centers, etc. and the laborers to be made aware to behave appropriately in a manner not to become nuisance to others in the neighborhood.
- Conduct regular awareness program to the laborers on the social behavior and proper handling of wastes.
- Follow any guideline issued by the government for the any epidemic and pandemic situation (Covid -19).

#### **3. Disruption to traffic/transportation**

186. This road is heavily used for various transport purposes. The regular road users, such as school children and employees of different categories will experience inconveniences. There are a number of townships, such as Nainamadama, Wennappuwa,

Katuneriya, Marawila, Mahawewa Madampe, Kakapalliya and Chilaw along the road. These towns have a large number of schools with more than two thousand students in each, and also a large number of business establishments and government offices. The traffic-related disturbances bound to create specific impacts, such as delay in traveling time, attending to work on time to offices, schools and other business establishments. The management of the construction sites should be most effective in finding pragmatic solutions to the traffic problem. The following mitigation measures are proposed to reduce such impacts:

- Adopting proper traffic management plan at construction sites.
- One side of the road may be used for construction at a time while the other side is kept for the road users.
- Regular/continuous arrangements to manage the traffic near construction sites shall be implemented methodically.

#### **4. Impacts to roadside structures**

187. There are about 9 temporary structures on both sides of the road. There are three business structures being used by local community members to sell vegetables, fruits, fish and some other items to the road users. There are 6 movable structures in the project area. The socio-economic study team interviewed all the owners of these structures, and they expressed their willingness to shift the structures, if the need arises. The RDA will inform them in advance (about 30 days in advance) about the project and its construction schedule and also the needs of the shifting of the structures.

#### **5. Impacts to cultural Festivals.**

188. There are large numbers of religious places particularly several churches located either sides of the proposed road celebrating festivals in various time period. Some are seasonal festivals specially Christmas and new year seasonal celebrations lasts for about 2 weeks. The construction may inconvenience the celebration and increasing safety issues, people who come for purchasing goods by the movement of project vehicle, closure of roads fully or partly, open and partly constructed drains and culverts. Therefore, proper safety measures to be followed during the religious celebration. The proposed mitigation measures are:

- Temporarily terminating the project activities based on the need
- Properly provide safety signs for the construction area
- Preventing people to walk in the partly constructed area mainly drains and culverts.

#### **6. Risk of HIV other STD and communicable diseases**

189. The chance of occurring sexually transmitted diseases and HIV/AIDs and any other communicable diseases as a result of the possible influx of migrant laborers / construction workers is rather low due to the priority to be given to local hiring of labor and the still strong social control in the villages.

190. However, as a preventative measure an appropriate and timely information and awareness program to construction workers on the risks of sexually transmitted diseases and HIV/AIDS and anti-trafficking of women and children will be made as a part of the health and safety program at camp sites during the construction period.

191. Contract document includes specific requirements for the civil work contractors to conduct awareness programs among his staff and workers as well as the wider community.

192. Conduct continuous awareness program to the works on the HIV/AIDs and other communicable diseases like Covid 19.

## **7. Risk of child labor**

193. Employment of children is an offence in Sri Lanka. But there is a possibility for children to seek employment as unskilled wage labors in the construction sites due to poverty level of the area. To prevent this, it is very important to take the following mitigatory measures:

- Special safeguard measures and a special clause in the contract need to be incorporated into the contract documents.
- The Project needs to be in contact with the Labor Officers to monitor the recruitments by the contractors and to incorporate mitigatory measures.

## **8. Personal safety**

194. There is a risk of accidental damage to workers as well as the general public at construction sites, along the roads, quarrying and mining sites due to construction vehicle & equipment movements, falling rocks, falling to excavated pits, chemical sprays and unsafe power supply lines etc. Therefore, it is very important to take precautionary measures to prevent any accidents during the construction period. The construction contractor/s must take the following measures to enhance personal safety during the construction phase by:

- Placing warning and sign boards, speed limits and signs, barricades, must be placed in all construction sites in Sinhala, Tamil and English languages.
- An awareness program should be done about the personal safety of the workers and general public in the area.
- The contractor must Provide protective gears, such as footwear, ear muffers, helmets, goggles, eye-shields and clothes to workers
- Adequate ventilation for chemical storage should be kept to avoid accumulation of fumes and offensive odor that could be harmful to workers.
- Onsite first aid facilities and emergency transport facilities to the nearest hospital should be made available at construction sites at any time in order to ensure safety of workers and public in any case of an accident.



## **D. Anticipated impacts during the operational period**

### **D1. Encroachment of ROW**

195. After the construction, the ROW can be encroached at any time mainly for putting up small boutiques, vegetable and fruit sales stalls, or demarcating land boundaries. The encroachers will build permanent or temporary structures within the existing reservation causing damages to pavements, side drains or even to the soft shoulder of the ROW. Such encroachments of the ROW directly affects the pedestrian, regular maintenances as well as future expansions of the road. The RDA must play a leading role in placing boundary stones, regular inspections and removing of illegal encroachments. Further, strict enforcement of rules and regulations according to existing laws and regulations is also needed to minimize encroachments of the ROW.

### **D2. Stagnation of water**

196. The existing damaged road drains and culverts will be reconstructed in such a way as to reduce the stagnation of water and local flooding. There is a possibility to block the road side drains and culverts due to siltation by dumping of solid waste, discharge of waste water, particularly in the Old Madampe Town. The stagnation of water could act as a breeding ground for the mosquitos and vector. Emitting, bad smell also causes nuisance to the road users.

- Continuous maintenance should be carried out by the RDA
- People living near the drains should be educated to avoid dumping and discharging of wastes

### **D3. Noise and Air pollution**

197. During the operation period, the noise level will increase due to the increased movement of vehicles. It is a general habit that the motorists tend to drive faster when the road condition is good. However, this will cause higher noise levels. Movement of three wheelers and motorcycles are relatively higher than other vehicles, and these two types of vehicles emit more noise than bigger vehicles. Beeping sound of the vehicles also create considerable noise. Higher levels of noise will be a disturbance to the household, especially for vulnerable persons, such as babies, children and elderly. Schools, religious places, and offices will also be disturbed by such high levels of noise and vibration. The mitigation measures are proposed in **Section C.1.7** to minimize the anticipated impacts

198. Rehabilitation of roads will significantly reduce the existing dust emissions after the proper surfacing of the roads. Air pollution due to vehicle movement, especially diesel vehicles will be of concern. However, as compared to the present number of vehicles, the incremental numbers will not be significant even after rehabilitation. Therefore, air pollution due to vehicle emissions cannot increase after the project. On the other hand, the rehabilitation work will reduce the vehicular emissions compare to the current situation. Therefore, quality of air in the area will improve due to less dust and fugitive particles, which will cause positive impacts on human health in the area. Proper maintenance of existing



vegetation and planting new trees at suitable locations where possible will improve the air quality.

199. The following are proposed as mitigation measures:

- Maintenance of green corridors and their beneficial impact on air and noise pollution control.
- Speed limits shall be strictly enforced together with restriction in the use of horns shall be restricted near mosques, hospital, schools and densely populated settlements.
- Ensure the National Environmental (Vehicle Horns) Regulations, No. 1 of 2011.

#### **D4. Impacts on Road Safety**

200. The widening, improving of the surface conditions and straight alignment of the road induce high vehicular speed. As a result, there will be a risk of increase of road accidents. The proposed road passes towns, schools, religious places, where students and people gather frequently. These places are susceptible to accidents. Moreover, there are many residences, shops and small boutiques are located closer to the ROW. Therefore, high speed vehicle movements will cause road accidents easily.

201. To minimize road accidents, the following measures should be taken:

- Speed limits, warning and sign boards must be placed near sensitive areas and identified places, which are susceptible to accidents.
- Road furniture and road marking should be done immediately after the construction work.
- Bus bays and payments must be constructed properly.
- Edge delineation should be carried out on wider pavements. Guard railing and chevron markers should be placed on bends, sealed shoulders should be provided where the places of cycle and other slow and non- motorized traffic is significant.
- Ker bed footpaths should be placed at the town limits settlement areas.

## **E. E. Climate Change Adaptation (Impacts and Mitigation)**

202. Development is essential for the poverty alleviation of a country however it could also led to greenhouse gases emission activities like vehicle traffic, energy usages and many other activities. Concentrating GHGs in atmosphere make negative impacts on people and environment in number of ways; such as increase the global temperature that lead to climate change, negative impacts on peoples' health nature and wild life etc. Therefore, the ADB with new policies supporting sustainable, low carbon growth across Asia and the Pacific is challenged to support its members in addressing these intertwined issues. (Reducing Carbon Emissions from Transport Project, July 2010, IED, ADB)

203. Transportation plays a crucial role in the development agenda. Transport accounted for about 23% of global carbon dioxide emissions in 2010 and 27% of end-use energy emissions with urban transport accounting for about 40% of end-use energy consumption. Many experts foresee a three to five fold increase in CO<sub>2</sub> emissions from transportation in Asian countries by 2030 compared with emissions in 2000 if no changed are made to investment strategies and policies.

204. Improvement of the A003 road from Kochchikade Bridge to Chilaw town may increase the vehicle volume on the road, however it will impact on the vehicle operation speed and the traffic time with respect to the present conditions and that will have an impact on the emission levels of the GHG gases. Most common types of vehicles that would move on these roads are bicycles, motor cycles, three wheelers, cars, vans, buses and light commercial vehicles. Thus, emission of Carbon Dioxide (CO<sub>2</sub>) from motorized vehicles which is a GHG needs to be analyzed to evaluate the overall contribution of this investment program in terms of the change in CO<sub>2</sub> emissions.

205. The Evaluation Knowledge Brief (EKB) has developed a set of spreadsheet-based models to evaluate the CO<sub>2</sub> impacts of rural roads, urban roads, bikeway projects, expressways, light rail and Metro Rail Transit (MRT) projects, Bus Rapid Transit (BRT) projects, and railways. These Transport Emissions Evaluation Models for projects (TEEMPs) consider passenger and freight travel activity, the shares of trips by different modes and vehicle types (structure), fuel CO<sub>2</sub> efficiency (intensity), and fuel type, validated by more detailed emission factor models. The models directly estimate CO<sub>2</sub> emissions for a business-as-usual case (a no-action alternative) vs. one or more alternative modal investment interventions (including improvement to road pavement) and calculate scenario differences. The models consider induced traffic demand generated by changes in the generalized time and money cost of travel by different modes, building on best practice analysis techniques.

206. The TEEMP model was used for the analysis using default parameters for base fuel consumption, emission factor and upstream emission percentage. Occupancy-loading, average trip lengths of each type of vehicle, vehicle type growth and roughness factors (before and after improvements) were fed to the model based on the details of traffic and economic analysis for A003 road. A summary of these input parameters are presented below.

**Table V-4: Input parameters for TEEMP model for A003 road Kochchikade bridge to Chilaw**

Parameter	Input value
<b>Occupancy/loading</b>	
Two wheeler	1.60
Three wheeler	2.20
Passenger car	2.50
Light Commercial Vehicle	2.00
Bus	30.0
Heavy Commercial Vehicle	8.00
Bicycle	1.0
<b>Roughness</b>	
Before improvement	4.0 m/km
After improvement	2.5 m/km
<b>Lane configuration</b>	
No of Lanes Existing	2
No of Lanes Proposed	2

#### Model predicted CO<sub>2</sub> emission levels

207. Model output includes CO<sub>2</sub> emissions at Business as Usual (BAU) or without project; with project (i.e. with improvements) and with induced traffic; and with project and without induced traffic are present below.

**Table V-5: CO<sub>2</sub> emission for Project & induced traffic and Project without induced traffic with compared and BAU**

	Cumulative Total (million tons)	Kilo Tons/ Lifetime	Emission of CO <sub>2</sub> in Ton/km/year
BAU	2.3	115.1	4605.6
Project with induced	2.2	113.3	4530.4
Project without induced	2.2	113.3	4530.4

208. As indicated in the model output and summarized in above table the proposed improvement to existing road will bring a reduction in CO<sub>2</sub> emission even with a growth of traffic. However, this analysis is based on the assumption that the roughness of improved road surface will be maintained during the project life. Therefore, it is important that the road maintenance program is maintained throughout the project span (i.e. during operational stage). The total length of roads to be improved in this project is around 38 km and based on

calculation, 75.1 tons/km/year the net change in CO<sub>2</sub> emissions or CO<sub>2</sub> savings of the proposed investment program in NWP will 167,553.4 tons/year.

### **Mitigation measures for floods**

209. Sri Lanka faces a range of natural and socio- natural hazards such as floods, landslides, drought, cyclonic winds, tsunamis, coastal erosion and lightning strikes. Similar to the rest of Asia region, Sri Lanka is also experiencing an upward trend in the frequency and intensity of hazards and disasters as well as increasing exposure of the population, property and economy to disaster risk. Specifically noted are weather-related disasters which strike with more frequency and intensity that are attributed to the impacts of human induced climate change. Unplanned development and rapid urbanization are other key factors contributory to the growing levels of exposure to disaster risk and impacts from disaster events. The resulting damages and losses annually from the intensive and extensive disasters are significant, implicating on the scarce national development and emergency management resources, as well as on productivity and the social and economic wellbeing of the population.

210. The project area itself faces frequent flooding in recent past and 2 – 3 foot inundation for several days were observed during the survey period in areas like Wennappuwa, Nainamadama and areas in Mahawewa. Drains, culverts and bridges are blocked because of siltation and derbies due to poor maintenance. Storm water discharging ways and points were not identified and constructed properly. (Eg: Wennappuwa, instead of discharging storm water to sea, it diverted to Wennappuwa tank, which led to tank eutrophication and make sever environment problem). Therefore special attention shall be paid to road side drainage and cross drainage in designing of the improvements for these roads. Structures such as culverts, causeways and bridges with small spans will be constructed along with road side drains (either earth or concrete based on the requirement) to facilitate the existing flow regime as well as future discharge volumes as predicted by drainage analysis during level one designs. All hydraulic structures constructed on these roads will be of reinforced concrete.

211. Future flood risk areas need to identify at present and necessary actions need to carry out at the development stages such as elevate the carriage way, to decide on size of the drainage and storm water discharge points need to identify clearly.

## **VI. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN AND GRIEVANCE REDRESS MECHANISMS**

### **A. Institutional Arrangements**

212. Ministry of Roads and Highways is the Executing Agency (EA) of this investment program. Secretary to the ministry will be responsible for decisions on overall approvals and operational policies of the project. RDA is the Implementing Agency (IA) of the program. A project coordinating PIU is established under DG/RDA for coordinating overall program work starting from SAPE works.

213. The PIUs is headed by a Project Director assisted by a staff of engineers and administrative staff. The PIU has an environment and social unit staffed with one Senior Environment Safeguard Officer (ESO), one Senior Social Safeguard Officer (SSO) and their assistant staff ESDD will guide and support these environment and social units on environment and social related technical and monitoring matters.

214. The project coordinating PIU is also supported by a (Survey and Preliminary Engineering) SAPE works team, which will also include experts on the fields of environment and social safeguards. These experts in SAPE works teams will be responsible in completing required environment and social assessments during SAPE works stage, and prepare necessary environment and social safeguard documents, including ECs, REA checklists, BIQs and IEERs. ESDD shall review these documents before submission to ADB for approval and disclosure.

215. Project Implementing Consultants (PIC) is appointed for the North-Western Province to support provincial PIU in supervising the designs and civil works of the contractors. The PIC have an Environment Safeguard Consultant (ES), who is also reviewing and approving safeguard documents prepared by contractor/s (Package/cluster specific Environment Management Action Plans, Environment Monitoring Checklists and any other document related to environment safeguards); monitor safeguards implementation (i.e. execution of cluster specific EMAP at site level); and instruct and assist contractor/s to rectify any non-compliance issue and prepare periodic environment compliance monitoring reports.

216. Appointed civil work contractors will be directly responsible to execute environment safeguard measures at site level. Safeguard measures will be as per the measures outlined in the EMAP. Each contractor will appoint a qualified and experienced person to work as the Environment Officer, who will implement the safeguard measures at site level. Environmental specialist and SGRS of PIC shall guide the contractor on safeguards matters with PIU environmental unit and ESDD conducting monitoring.

## **B. Environmental Management Plan and Monitoring**

### **B1. Environment Management Plan (EMP)**

217. An Environmental Management plan is prepared based on the anticipated environmental impacts and proposed mitigation measures in **Chapter V**. The EMP includes a set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts that likely to be arisen due to the project activities. The EMP is prepared to minimize the anticipated environmental impacts during the pre- construction, construction and post construction and operational period. The EMP is given in **Annex VI-1**.

218. The EMP will be considered as a guidance document to minimize the anticipated environmental impacts but the contractor should prepare a site-specific Environmental Management Action Plan (EMAP). All necessary cost for the implementation of the EMAP should include in the contract. The PIC will prepare necessary monitoring formats and the contractor will periodically submit the report on the progress on the implementation of the EMAP to PIC. Environmental specialist and SGRS of PIC shall guide the contractor on safeguards matters with PIU environmental unit and ESDD conducting monitoring.

### **B2. Environmental Monitoring Plan**

219. An Environmental Monitoring Plan (EMoP) has been prepared in conjunction with the EMP and given in **Annex VI-I**. The purpose of the EMoP is to monitor the changes of the environmental quality, such as air , water noise, and vibration, due the implementation of the project activities to ensure the mitigation measures are implemented in a proper way, if not, take necessary actions for proper implementation or find alternative methods for the compliance of national environmental laws and regulations. The EMoP is included the parameters to be monitored, frequency of monitoring and the cost for such monitoring, such as mainly for the field tests. The Proposed EMoP is given in **Annex VI-2**.

## **C. Grievance redress mechanisms**

220. During the course of the project, it is possible that people may have concerns with the environmental management, including the implementation of the EMP. Issues may occur during construction and again during operation. Any concerns will need to be addressed quickly and transparently, and without retribution to the Affected Person (AP).

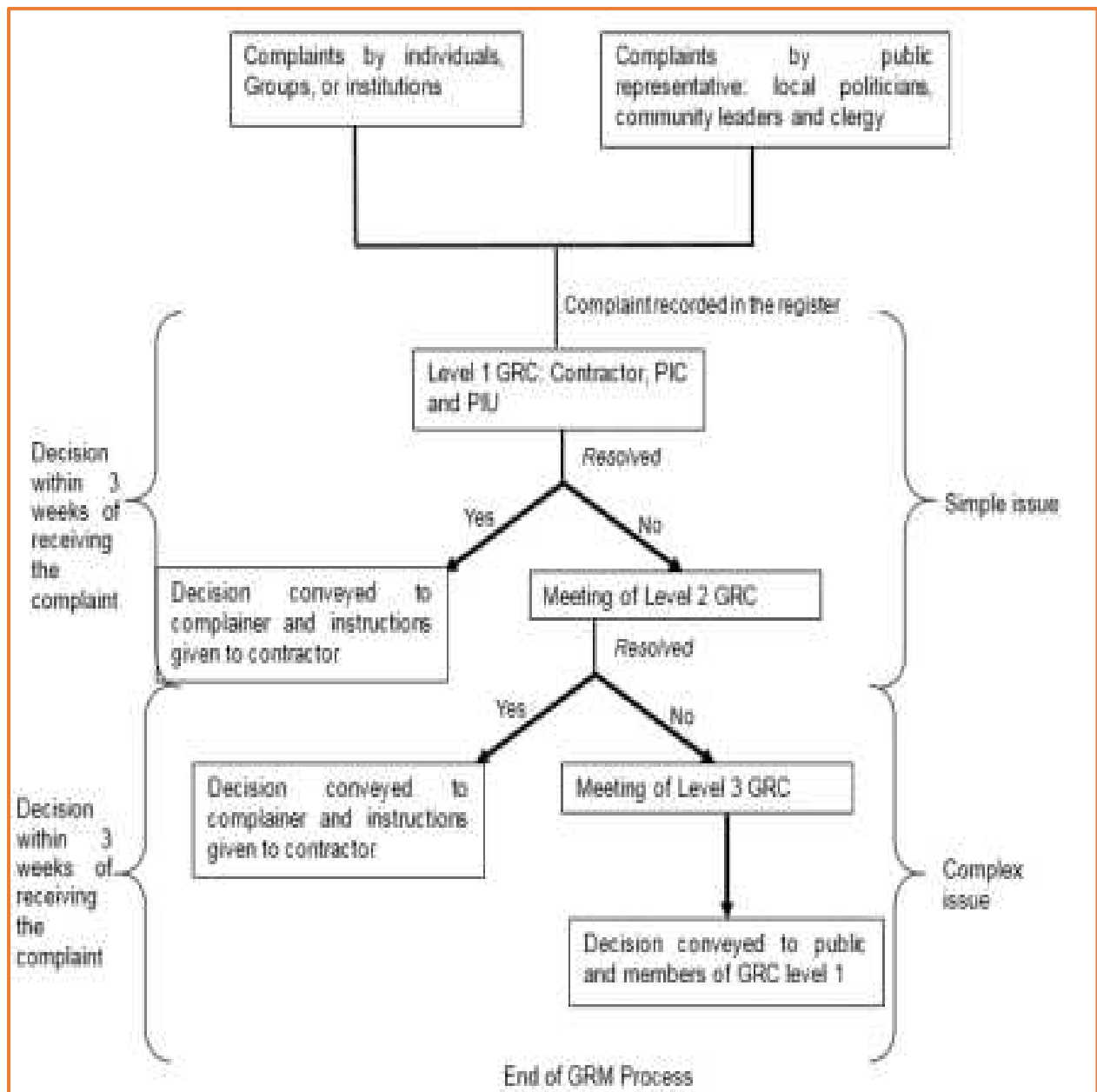
221. In Sri Lanka, project affected persons have recourse to the judicial system, public administrative system, political system, civil society organizations to resolve disputes. The government has also established Mediation Boards (MB) and Special Mediation Boards (SMB) at the DS level to amicably settle disputes. However, resolution of conflicts through these systems takes long time, incurs expenses, is not open access to some people, and, often causes delays in project implementation and increased expenditure to government due to compensation to contractors.

222. The GRM, as noted earlier, is a process for joint identification and resolution of grievances and concerns as well as a conduit for information exchange that would bring benefits to all stakeholders. By setting up GRM the project expects to:

1. Provide a forum for redressing grievances and disputes as much as possible at the lowest level
2. Create effective communication between the project and APs
3. Build up productive relationships among the all stakeholders
4. Provide access to APs to negotiate and influence the decisions and policies of the project, where they could adversely affect them
5. Mitigate or prevent adverse impacts of the project on communities and suggest appropriate corrective or preventive action
6. To harmonize project activities with those of APs

223. A well-established Grievances Redress Mechanism is functioning for the ongoing projects in Maradampkadawela-Habarana road package and others. Therefore, a similar Grievance Redress Mechanism (GRM), will be established to resolve disputes and grievance relating to environmental concerns and complaints associated with the proposed project. It is based on a multi-tiered approach as outlined below, with each tier possessing a time bound schedule with the responsible persons identified to address the grievance and consult appropriate persons at each stage as required. The objective of the GRM is to support genuine claimants (AP) to resolve their problems through mutual understanding and consensus building process with relevant parties. This is in addition to the available legal institutions for resolving issues. APs using the project GRM can choose to use legal systems at any point in the project GRM process. During detailed design stage a grievance redress committee will be established at the first tier and continues to function and membership will be expanded as described below during implementation.

The following process is to be used as described in **Figure VI-1**.



**Figure VI-1:** Summary of the proposed GRC

224. The first step is to attempt to sort out the problem directly at the local and/or project site level Grievance Redress Committee (GRC) by the AP directly contacting the projects site engineers and/or the DSC site representative, if the AP believes the issue has not been addressed properly. The project staff is to explain to AP the steps taken to assist and solve the grievances within 3 weeks. If unresolved, the AP can approach the Divisional level GRC. The Divisional GRC will reply within 3 weeks. If the complaint is within the mandate of the GRC, GRC will examine it and submit the findings to appropriate forum for necessary action. If the AP is not satisfied with the findings and action of the second tier GRC, the AP then appeals to the National level GRC for resolution. If the AP is still not satisfied and believes that harm has resulted due to non-compliance with ADB policy, and all good-faith efforts



have been made to solve the problem by working with the Project team, a complaint may be submitted to ADB's Office of the Special Project Facilitator or Office of Compliance Review in accordance with ADB's Accountability Mechanism. The last resort left for the AP is the Sri Lanka Court of Law, if it is still felt that none of the above procedures has delivered justice. The decision of the court would be final, since at this level, the problem has been adjudicated by a competent, knowledgeable legal body. **Table VI-1** a list of individuals and agencies that can be involved in the different levels of the GRM.

**Table VI-1:** Individual persons and agencies that can be contacted by the AP for assistance with a grievance

Grievance Level		Persons- Agency
Tier 1	Project/ GN level	i) Grama Niladhari of the area - Chairman ii) Representative of PIU- Secretary iii) Representative of PIC - Member iv) Representative of Contractor - Member v) A community member/religious leader- Member vi) Woman representative from the local community Member
Tier 2	Divisional Level GRC	i) Divisional Secretary of the area- Chairman ii) Representative of PIU - Secretary iii) Grama Niladhari - Member iv) Representative of PIC - Member v) Representative of Contractor- Member vi) Representative of a social organization (Non-Governmental Organization/Community-Member Based Organization) of the area vii) A community member/religious leader -Member viii) Woman representative from the local community
Tier 3	National Level	Secretary, RDA Project Director; Representative from the affected party/affected entity (nonvoting member); and Any other representative

## **D. Public Consultation and Information Disclosure**

### **D1. Public Consultation**

225. The consultants used several methods to make the stakeholders especially public aware of the proposed iROAD Program. Focus Group discussions were conducted with exclusive purpose of stakeholder consultation and other methods such as questionnaire surveys and one on one interviews were employed for dual purposes, public consultation and collecting socio-economic data.

### **D2. One on one Interview**

The consultants held two groups of one to one interviews with large number of road users in the local area.

226. Group 1 informants responded in one to one interviews are persons having small business and living in the road corridor. The views expressed by this group with large number of persons are summarized below:

- They have been using these structures for long period of time for our small business activities
- Some of them solely depend on the income from these informal businesses carried near roads edges
- They are encouraging the proposed road development. It will generate benefits to them.
- Their request is to work out alternative arrangement for them to continue their income generation activities during construction period of the project
- Some of them will have flexibility to shift their structures to alternative locations within the road reservation but many others will not have such flexibility to shift their present locations
- They all would like discuss with RDA individually case by case and make arrangement to address their problems.
- However, these discussions should be held prior to commencement of the construction activities.

227. Group 2, living in the corridor near culverts and flooding area. The views expressed by the interviewers are summarized below.

- Road get flooding during rainy season
- Pedestrians get spray water from the vehicle movement during the rainy season
- The soft shoulders are eroded and stagnating water
- No proper drainage system
- The culverts are not properly maintained
- Need improvements to the existing road



**Figure VI-2: one to one interview**

In addition to one on one interviews held with road users Focus group discussions (FGDs) with key stakeholders were also held conducted by the consultants. The details of each FGD are shown in **Table VI-2**.

**Table VI-2: Venue, dates and participants of the FGDs**

DS Division	Date	Participants		Total
		Male	Female	
Wennappuwa	16/10/2019	14	7	21
Nathanndiya	16/10/2019	24	7	31
Maha Wewa	16/10/2019	20	9	29
Madampe	23/10/2019	25	14	39
Chilaw	23/10/2019	7	1	8

228. The issues emerged from FGDs held in each road studied are mentioned below as summaries. The issues specific to the road section fallen within each DSD area are presented in SIA of this assignment. Most of the issues emerged from the FGDs held in each road were relevant to the entire road as whole and therefore, summary relevant to the entire road is presented in this section.

229. Summary of the issue discussed

#### **What are the current problems of the road?**

- There is no proper drainage system to drain out storm water. Existing drainage system is not properly constructed and, as a result, water drains very slowly. The drains are directed to natural water ponds. Therefore, natural water bodies are getting polluted. The participants proposed that storm water should be diverted to the sea,
- The use of road during the rainy seasons becomes very difficult due to flooding, especially in Nainamadama area,
- Culverts are completely blocked,

- Encroachment of the road reservations is a serious problem,
- The carpet is cracked and the surface is uneven. Therefore, there is high possibility for accidents,
- Even though Pradeshiya Sabha attends to day to day maintenance work to clean some sections of the road side drainage canals , there is no regular maintenance by the RDA.

**Issues for road users - both vehicle users and the pedestrians**

- About 25 – 30 trucks daily travel with full of waste to Aruwakkalu landfill and they make bad odor in the surrounding areas. The running of trucks daily with heavy loads also damages the road. Though they travel at night, the road is not wide enough to overtake trucks, if necessary.
- Sometimes vehicles are parked by the pedestrians' crossings or roadsides, thereby, inconveniencing other motorists, road users and pedestrians, and also creating road safety problems.
- Some building owners have extended their structures encroaching road reservation.
- Some bus halts have been established in such a manner on the carriageway of the road and when buses are stopped at halts results in the huge traffic build-up behind the buses contributing to traffic congestion and inconveniences to other motorists.

**What do you think about the current RDA maintenance practices?**

- There is absolutely no maintenance work done by RDA. High vehicle density usually developed in front of the two schools in Wennappuwa town. Pedestrian sub-ways or overpasses have not been established at this type of critical locations.
- During the rainy season, In the border areas of the road at Nainamadama West and East, storm water stagnated over 5-6 feet height but no solution has been found.
- There is no proper coordination among CEB, NWSDB, and Sri Lanka Telecom when each of them installs their infrastructure, and therefore, frequent damages to the road are observed and these damages are not timely attended.
- Signs of road crossings are not visible and it is same with the crossing lanes. The lifetime of a sign is about 3 months, and they are not replaced on time. The pedestrian lines are not visible at all.

**What are the suggestions possible to improve the designs?**

- Construction of pedestrian overpasses – in front of critical institutions, such as religious places and schools
- If detailed road maps/ plans are provided, suggestions for improvements based on our local knowledge can be provided.

- Waikkala junction is one of the dangerous bends of the road and suitable modernization should be introduced to minimize the risks of possible accidents.
- Need to build security fences in the middle of the road, especially in crowded town areas to avoid pedestrians crossing the road haphazardly.
- Increase the number of lanes at least within town limits to reduce the traffic congestion.
- Walking tracks are necessary because of the traffic (not a jogging track) This should be introduced at least within town limits.

#### **Suggestions to manage Issues that can arise during the construction period**

- Awareness of the business community about the intended project and its possible implications during construction period,
- Work out a program to identify possible alternate routes to avoid traffic in town limits,
- The road reservation area and the boundaries are not clear, therefore, make available a map in the Divisional Secretariat,
- Construction activities should be completed within the period stipulated in the contact agreement,
- A comprehensive program should be worked out to implement with the active involvement of GNs to make the public living close to the road be aware about the project and its construction induced impacts and also supports expected from the public during the construction,
- Stakeholders, DS and GNs need to know new road plan, including culverts, bridges, drainages, causeways to explain to the general public.

The issues and suggestion obtained for the consultation process will be incorporated in the detailed engineering designs. The details of the consultations are given in **Annex VI-3**.



Wennappuwa



Nattandiya



**Figure VI-3: Focus group discussion**

### **D3. Information disclosure**

230. According to the requirements of the ADB SPS, for Environment Category B roads projects, the respective draft of IEE will be disclosed before the Management Review Meeting (MRM) or before an equivalent meeting for the approval of the respective project, if there is no MRM. Signboards with the project information, including details on the nature of construction works, road length, construction period, the name of the contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil, and English) in strategic locations in the proposed road stretch. In addition, an information flyer could be distributed among residents, who live along the route providing information with how they could assist the project. (ADB-2017).

## I. CONCLUSION AND RECOMMENDATIONS

231. The scope of works of the proposed road rehabilitation project will result in the rehabilitation of a safe road for all weather conditions of 38km from 38km to 76 km A003 highway in Puttalam District of the North Western Province of Sri Lanka. Project will be implemented within the existing ROW. Rehabilitation of this road will benefit the local community and all users of this road section in safe traveling, reduce travel time, reduce flooding, reduce safe movement of the pedestrians and motor cyclists and bicycle riders, who suffer due to the flooding and erosion of soft shoulders. The implementation of this project also benefits the local communities, particularly those, who live in the road corridor and currently suffer from the excess dust and vehicular emission, elevated noise and vibration. Provisions of road sidewalks for selected congested towns also ensure the pedestrian safety. No impacts on the livelihood of APs are identified in the road corridor. The new road improvement will incorporate the climate resilient and includes climate change adaptation features that contribute to the sustainability of the project, particularly from flooding in the low-lying areas along the road. The road improvement also benefits the local community to have safe access to the economic centres and have economic benefits and livelihood improvements in the undeveloped surrounding rural areas. The proposed road is a national highway, which connects the northern part of the country to the southern part of Sri Lanka, and rehabilitation of the road, therefore, will contribute to the national economic benefit as well.

232. The negative impacts are mainly from the excavation of natural resources, such as soil, sand, metals and adverse impacts, such as dust noise, vibration and dust due to the operation of borrow pits and metal quarry operations to the nearby community and may have some impacts on the natural vegetation and natural drainage pattern of such sites. The transportation of construction materials and movement of vehicles will also cause some disturbances to the road users and people living along the road. Construction labor camps, clearing of land for stockpiling, disposal of spoil materials and storage facilities also have some impacts on the natural vegetation in such sites. Excess dust, elevated noise and vibration may have some impacts on the community living in the road corridor. The disposal and handling of construction waste needs proper disposal. Construction during the rainy season may causes erosion and silting of water bodies and increasing turbidity may impact the living organism in such water bodies. The proposed project will be implemented within the existing ROW and there is no permanent encroaches in the project area but there are several temporary structures that can be shifted during the construction period. Considering these, the impacts appeared to be moderate, which could be easily mitigatable by adopting good environmental practices and engineering interventions.

233. In the light of the above conclusions, it is recommended that the contractor be committed to put in place several measures to mitigate the negative social and related environmental impacts by adopting measures, particularly for excessive noise, dust, vibration, safety, health and social aspects of the community in the life cycle of the project.

234. It is also recommended that in addition to this commitment, the contractor should focus on implementing the measures outlined in the EMP, as well as adhering to the all

relevant National laws and ADB Safeguard Policies, related to the social and environmental, health and safety standards that govern the establishment and smooth operation of this project. It is expected that the positive impacts that expected from such activities should be maximized as much as possible as outlined above. These measures will go a long way in ensuring the best possible social and environmental compliance standards.

235. It is also recommended that the project implementation be periodically monitored by the ADB, PMU, ESDD, PIC and PIU to ensure that the social standards, security of occupants (Health safety) and environmental standards (free from pollution) are met and adhered to by the contractor.

236. Finally, the IEE concludes that there were no identifiable significant environmental impacts. All impacts are site specific, irreversible and can be minimized through appropriate mitigation measures. The pre-construction, construction and operational EMP identifies potential environmental impacts arising from the project along with a corresponding schedule and monitoring of mitigation measures to ensure potential impacts are maintained at insignificant.

237. The project does not fall under any prescribed project list of the National Environmental (Environmental Assessment Procedures) Regulations under the National Environmental Act. Therefore, no need of EIA/IEE under NEA.



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**ANNEX I.1:**  
**Rapid Environmental Assessment (REA) Checklist**

**Country/Project Title:** Integrated Road Investment Program (iRoad)- Road Maintenance Contracts (RMC) Package

**Sub-Project:** Peliyagoda – Puttalam Road (A003) from 38 to 76 km Rehabilitation and Improvement Project

**Sector Division:** Roads and Highways

Screening Questions	Yes	No	Remarks
<b>A. PROJECT SITING</b> IS THE PROJECT AREA ADJACENT TO OR WITHIN ANY OF THE FOLLOWING ENVIRONMENTALLY SENSITIVE AREAS?			
– CULTURAL HERITAGE SITE	Y		There are several cultural sites mainly, religious places Hindu temple, Buddhist temples, Churches and Mosques are located either sites of the proposed Road Section
– PROTECTED AREA		N	No environmentally or archeologically protected areas in the proposed road section
– WETLAND	Y		<p>The proposed road section passes several waterbodies, adjacent to the paddy field and irrigation tank,</p> <p>The road passes Maha Oya, Gin Oya, Maha Wewa, Karambalan Oya (Lunu Oya) and Thinapitiya Wewa. Apart from these, a large no of seasonal streams crosses the road throughout the stretch. Impact is mainly from accumulation of silting materials, blocking natural water paths making instability of river banks and bands</p> <p>The impacts can be mitigated during the construction period adopting following mitigation measures</p> <ul style="list-style-type: none"> <li>– Avoiding rainy periods for construction.</li> <li>– Avoiding erecting temporary structures, stockpiling or tipping of materials, dumping of construction debris and waste in wetland areas and</li> </ul>

			along surface runoff paths. – Preventing washout of soil, all debris and residual materials into low-lying areas - Avoiding prolonged exposure of loose soil surfaces to wind and surface runoff
– MANGROVE		N	No mangrove vegetations in the area
– ESTUARINE		N	
– BUFFER ZONE OF PROTECTED AREA		N	
– SPECIAL AREA FOR PROTECTING BIODIVERSITY		N	
<b>B. POTENTIAL ENVIRONMENTAL IMPACTS</b> WILL THE PROJECT CAUSE...			
– encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?		N	
– encroachment on precious ecology (e.g. sensitive or protected areas)?		N	

Screening Questions	Yes	No	Remarks
– alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site? –		<b>N</b>	
– deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?	<b>Y</b>		<p>There are possibilities to deterioration of the surface water quality due to silt runoff from the construction site during the rainy season.</p> <p>The impacts can be mitigated during the construction period adopting following mitigation measures</p> <ul style="list-style-type: none"> <li>– Avoiding rainy periods for construction.</li> <li>– Avoiding erecting temporary structures, stockpiling or tipping of materials, dumping of construction debris and waste in wetland areas and along surface runoff paths.</li> <li>– Preventing washout of soil, all debris and residual materials into low-lying areas</li> <li>- Avoiding prolonged exposure of loose soil surfaces to wind and surface runoff</li> </ul>
– increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	<b>Y</b>		<p>These activities will be carried out outside the project area. The cutting and filling vehicle movement, could contribute to the increasing of particulate matters. Also vehicle movement in the project area could increase the air pollutant. Emission of Volatile Organic compound is possible from the asphalt plants.</p> <ul style="list-style-type: none"> <li>- Erection of dust barriers, watering the surfaces which can emit dust, using exact amount of chemicals for bitumen processing siting the asphalt plants well away</li> </ul>

			from protected areas and sensitive sites such as settlement areas, temples and schools will mitigate the impacts from asphalt plants.
– Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation during project construction and operation?	Y		<p>Construction activities could create accidental physical damages during the excavation, materials handling, machineries and equipments, handling and transportation,. Exposure to asphalt may create health hazards.</p> <ul style="list-style-type: none"> <li>- It is proposed to prepare a separate health and safety plan to be implemented during road maintenance period and a regular monitoring schedule to be proposed under close supervision and coordination of a professional Safety Officer of the Project Implementation Consultant.</li> </ul>
– Noise and vibration due to blasting and other civil works?	Y		<p>It is proposed that the project activities of the proposed road will be restricted to overlay and maintain to given standards. Vibrators may be used for the surface compaction. There is a possibility to damage properties located near the road sides specially in the Madampe Old Town, the building are located almost in the boundary of the ROW. Noise may be generated due the concrete mixture.</p> <ul style="list-style-type: none"> <li>- Crack survey should be conducted for the structures potential to damage prior to the commencement of the project.</li> <li>- Operation of concrete mixture should be limited to day time only.</li> <li>- Pre-mix concrete should be used as much as possible.</li> </ul>

– Dislocation or involuntary resettlement of people?		<b>N</b>	No dislocation or resettlement will be taken place as the project is plan to implement within the ROW of the road
– Dislocation and compulsory resettlement of people living in right-of-way?		<b>N</b>	Most of the structures are temporary and moveable. Dislocation and compulsory resettlement of people living in right-of-way is not envisaged.
– Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		<b>N</b>	
– Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress?	<b>Y</b>		During the construction period, emission of excursive dust and other air-borne pollutants from the construction related activities and elevated vibration and noise will have minor impacts on the community and their living conditions. Such impacts can be mitigated following good construction practices.
– hazardous driving conditions where construction interferes with pre-existing roads?	<b>Y</b>		<p>Hazardous driving could happen during the transportation of material (asphalt, gravel, aggregates, spoils etc.) and movement of construction machinery and vehicles due to careless and drunken driving to site areas through pre-existing roads.</p> <ul style="list-style-type: none"> <li>- Strict instructions and proper awareness should be given to all the construction staff including drivers in order to minimize hazardous driving conditions along pre-existing roads.</li> <li>- Contractors are advised to use alternative roads as much as possible to avoid roads which are heavily used by the public.</li> </ul>
– Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases (such as STI's and HIV/AIDS) from workers to local populations?	<b>Y</b>		Poor sanitation conditions could be expected due to lack of adequate sanitary facilities, overflow of septic tank and soakage pits, improper waste

			<p>disposal due to lack of adequate waste bins and disposal arrangements.</p> <p>The chances of transmission of communicable diseases from workers to local population is very remote as the local people are well aware of the STI'S and HIV/AIDS.</p> <ul style="list-style-type: none"> <li>- Adequate sanitary facilities and waste bins should be provided in the labor camps</li> <li>- Local labor should be used to the extent possible.</li> <li>- Proper instructions should be given to the workers on sanitation and proper disposal of waste (wastewater and solid waste including construction waste) and communicable diseases.</li> <li>- Regular monitoring by the PIC and PIU</li> </ul>
– Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents?	Y		<p>Improper management labor camps, garbage disposal sites, stagnation of water in the borrow pits and material storage yards provide favorable conditions of breeding habitats for vectors such as mosquitoes, flies, rats and other parasites</p> <ul style="list-style-type: none"> <li>- Proper maintenance of labor camps</li> <li>- Avoiding stagnation of water</li> <li>- Proper solid waste management will prevent such breeding habitats.</li> </ul>
– Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials?	Y		<p>Heavy traffic in the proposed road could be observed during the peak hours. There is a possibility of toxic material spills during bituminous material transport due to increased traffic. This could be minimized by:</p> <ul style="list-style-type: none"> <li>- Proper transport vehicle should be used and ensures there is no leaks in</li> </ul>



			<p>the vehicle</p> <ul style="list-style-type: none"> <li>- Proper instruction should be given to the drivers on the safety and hazardous nature of the bitumen</li> <li>- Spills/leakages should be prevented and/or cleaned up appropriately for which strict instructions should be provided.</li> <li>- First aid facilities and firefighting equipment should be provided in the transport vehicle and at the working sites.</li> </ul>
<p>– Increased noise and air pollution resulting from traffic volume?</p>	Y		<p>Increased noise and air pollution is possible during construction, due to increased traffic volumes.</p> <ul style="list-style-type: none"> <li>- Construction vehicles should be serviced and maintained appropriately to conform to Standards.</li> <li>- Strict speed limits will be adopted for all construction vehicles.</li> <li>- Wetting of exposed areas and gravel roads will prevent air-borne dust.</li> <li>- Materials should be covered during the transportation</li> <li>- Regular monitoring of noise levels and air quality is needed to review the effectiveness of mitigation measures.</li> </ul>
<p>– Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road?</p>	Y		<p>Large no. of vehicle movement will be expected during the construction period. Therefore, there is a possibility to a risk of water pollution from oil, grease and fuel spills due to the vehicle movement.</p> <ul style="list-style-type: none"> <li>- Proper vehicle maintenance will reduce such risks.</li> <li>- Running repairs and vehicle washing should not be allowed in the road sides or near the water</li> </ul>

			<p>bodies.</p> <ul style="list-style-type: none"> <li>- Any maintenance repair, vehicle washing and servicing should only be carried out at the licensed places.</li> </ul>
- Social conflicts if workers from other regions or countries are hired?		<b>N</b>	<p>The workers will be recruited from the local area as much as possible. If outside workers are recruited, they will be in the same culture and will be made aware of the maintaining the discipline with the local people.</p>
- Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)?		<b>N</b>	
- Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	<b>Y</b>		<p>Risks to community health and safety due to the transport, storage, and use of fuel and bitumen could be expected. No explosive will be used.</p> <ul style="list-style-type: none"> <li>- Toxic material should be properly stored with proper safety instructions provided for workers who are connected with asphalt material handling.</li> <li>- Spills/leakages should be prevented and/or cleaned up appropriately for which strict instructions should be provided.</li> <li>- First aid facilities and firefighting equipment should be provided for all transport vehicle and the at the work sites.</li> </ul>
- community safety risks due to both accidental and natural causes, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning.		<b>N</b>	

<b>Climate Change and Disaster Risk Questions</b> The following questions are not for environmental categorization. They are included in this checklist to help identify potential climate and disaster risks.	<b>Yes</b>	<b>No</b>	<b>REMARKS</b>
- Is the Project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes (see Appendix I)	<b>y</b>		<b>Most of the area in the project area is vulnerable to flooding during the rainy season.</b>
- Could changes in temperature, precipitation, or extreme events patterns over the Project lifespan affect technical or financial sustainability (eg., increased erosion or landslides could increase maintenance costs, permafrost melting or increased soil moisture content could affect sub-grade).	<b>Y</b>		<b>High precipitation in the area could erode shoulders of the road.</b>
- Are there any demographic or socio-economic aspects of the Project area that are already vulnerable (eg., high incidence of marginalized populations, rural-urban migrants, illegal settlements, ethnic minorities, women or children)?		<b>N</b>	
- Could the Project potentially increase the climate or disaster vulnerability of the surrounding area (e.g., by encouraging settlement in areas that will be more affected by floods in the future, or encouraging settlement in earthquake zones)?		<b>N</b>	

Note: Hazards are potentially damaging physical events.

**Proposed Environmental Classification: B**

**REA Checklist Prepared By:** \_\_\_\_\_  
Name & Signature

**Date Prepared:** \_\_\_\_\_

**ANNEX I.2:  
Environmental Checklist**

## INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD)

**Name of Road:** Peliyagoda – Puttalam Road (A003) from 38 to 76 km Rehabilitation and Improvement Project

Province	District	DS Division	No. of GN Divisions
North Western Province	Puttalam	Wennappuwa	26
		Naththandiya	11
		Mahawewa	13
		Madampe	08
		Chilaw	14
		<b>Total</b>	<b>72</b>

The list of GNDs are given in **Annex III-1 – Location of the Administrative areas**

**Total Length of the Road:** 38. km

### A. Climatic Conditions

Temperature	High: 30 °C      Low: 25 °C
Humidity	High: 90%      Low: 70%
Rainfall	Average: 1,200 to 2,000 mm/year
Rainy Season	Rainy season is from October to January

### B. Location of the Road and Generic description of Environment

No.	Type of Ecosystem	Yes	No	Explanation
1.	Type of Terrain (Plain/ Undulating/ Mountainous etc.)	√		Altitude: 6.6833 (MSL) Undulating
2.	Forest Area / Mangrove / Other natural habitats		X	Type of Vegetation: No forest reserves are found in the area. Chilaw lagoon is located about 300 m from the proposed road. Declared mangrove forest in Kakapallya area in the Chilaw lagoon is available. High dense mangrove forest could be seen around the Chilaw Lagoon.

3.	Inhabited Area	√		Generally, the entire project area occupied by the human settlements including houses, government buildings and business establishment except some pockets where the inhabitants are less. 59+700 to 61+700 no houses or buildings available in both sides. The area is mainly used for paddy cultivation. 62+500 to 66+000 consists of less buildings and 67+300 to 70+ 7000 has very less houses. After passing 62+500 trees could be seen either sides of the road at the edge of the road within the ROW.
4.	Agricultural Land	√		The road does not run through agricultural land but paddy lands available from 59+900 to 63+100 on the left side of the road. Other than that, home gardens are located throughout the
5.	Barren Land	√		Except negligible number of land plots located in the vicinity of the road all other land plots are used for residential, agricultural or business purposes. Therefore, Barren land is insignificant feature of land in the road's vicinity.

### C. Specific description of the Road Environment

(Note: Questions number 1, 4, 5, 7 and 8 must be answered after discussions with the local community people)

No.	Parameter/ Component	Yes	No	Explanation										
1	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		X	Erosion is common feature observed in the soft shoulders of the either sides of the road. Soft shoulders in about 90% of the road length is eroded.										
2	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)	√		<div>The main water bodies cross the proposed roads are Maha Oya, Gin Oya, Maha Wewa, Karambalan Oya (Lunu Oya) and Thinapitiya Wewa</div> <table><tr><th>Water body</th><th>Location</th></tr><tr><td>Maha Oya</td><td>38 km post</td></tr><tr><td>Gin Oya</td><td>Between 41 – 42 km posts</td></tr><tr><td>Maha Wewa (R)</td><td>Between 59 – 60 km posts</td></tr><tr><td>Karabalan Oya (Lunu</td><td>Between 61 – 62 km posts</td></tr></table>	Water body	Location	Maha Oya	38 km post	Gin Oya	Between 41 – 42 km posts	Maha Wewa (R)	Between 59 – 60 km posts	Karabalan Oya (Lunu	Between 61 – 62 km posts
Water body	Location													
Maha Oya	38 km post													
Gin Oya	Between 41 – 42 km posts													
Maha Wewa (R)	Between 59 – 60 km posts													
Karabalan Oya (Lunu	Between 61 – 62 km posts													

No.	Parameter/ Component	Yes	No	Explanation	
				Oya)	
				Thinipitiya Wewa	Between 61 – 62 km posts
3	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)	√		Two kilometer of the road section of the Karambalan Oya area from 69+800 to 61+700 is experiencing frequent flooding. The FGD with the GN indicated that road levels to be raised to avoid the over topping and flooding of the water. Apart from these, several places are subject to local flooding due to poor drainage and culvert management.	
4	Are there any trees with a girth of 600 mm or more at breast height within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side	√		Refer <b>Annex IV_11_A003 Roadside trees</b>	
5	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas?	√		The vegetations in the rivers and water bodies supports the breeding of birds and other fauna.	
6	Along the road and within 100 m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered species?	√		<ul style="list-style-type: none"> <li>- A total of 85 Floral species observed were belonging to 39 families. Majority of plant species recorded in the study site are trees (51), followed by herbs (15), shrubs (8) and aquatic species (4). Among the recorded species about 33% are introduced, exotic, or invasive to Sri Lanka. None of the recorded species are unique or restricted to the project area.</li> <li>- Out of the total 85 floral species recorded, no any species is endemic to Sri Lanka. One plant species (<i>Phyllanthus emblica</i>) recorded on the proposed project site belongs to 'Vulnerable' category (VU) in 2012 Red List. 64 Least concern (LC), two Near Threatened (NT) and one Data Deficient (DD) species with 18 introduced species were recorded from the study area.</li> </ul>	

No.	Parameter/ Component	Yes	No	Explanation
7	Are there any utility structures <sup>1</sup> within 2 m on either side from the centre line of the road alignment or within the existing ROW of the road? (If yes, attach list with chainage)	√		Refer <b>Attachment 01</b>
8	Are there any religious, cultural or community structures/buildings within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		Refer <b>Attachment- 2</b>

#### **D. Public Consultation**

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. (Attach list of people met and dates)	X		<b>Given in Annex VI-3</b>
2.	Any suggestion received in finalizing the alignment and road related environmental issues	X		The suggestion provided by the community consultations will be included in the detailed engineering design.
3.	If suggestions received, were they incorporated into the design?	X		These suggestions will be considered by the Design preparation team.

#### **E. Please attach the following:**

##### **I. List of utility structures indicating location (left or right side of the road) and chainage (as required under C. 7)**

See Attachment 1

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<sup>1</sup> Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures



**II. List of social structures indicating location (left or right side of the road) and chainage (as required under C.8)**

See Attachment 2

**III. Project Map**

Attached to this document Annex III.2

**IV. Photographs of the project area showing at least 10 m on either side from centre line of road alignment.**

See Annex IV.2

**V. List of trees with 600mm of girth (at breast height) or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.**

Refer Annex IV.14

**VI. Water bodies located along the road**

Refer Annex IV.5

**ATTACHMENT\_01:**  
**Utility Lines (Electrical, Telecommunication) Along the A3 Road – Kochchikade Bridge To Chilaw**

From	To	Left				Right			
		Medium -voltage lines	Low- voltage e lines	Telecommunication s lines	Transformer s	Medium -voltage lines	Low- voltage e lines	Telecommunication s lines	Transformer s
38 Km	39 km	21	10	18	0		28	34	0
39 Km	40 km	20	15	18	1		18	48	2
40 Km	41 km	21	16	20	1	1	12	50	1
41 Km	42 km	17	14	13	2	0	17	45	1
42 Km	43 km	17	6	17	1	0	22	57	1
43 Km	44 km	14	11	35	2	6	32	43	1
44 Km	45 km	0	31	55	1	23	17	22	0
45 Km	46 km	0	17	46	4	22	7	24	2
46 Km	47 km	1	19	35	3	22	6	23	1
47 Km	48 km	1	30	34	0	34	15	17	0
48 Km	49 km	3	37	20	0	25	24	19	0
49 Km	50 km	0	20	17	1	19	22	16	0
50 Km	51 km	3	38	20	1	25	24	12	1
51 Km	52 km	0	30	25	0	27	24	8	0
52 Km	53 km	21	24	18	1	15	42	27	0
53 Km	54 km	31	42	5	2	0	39	33	0
54 Km	55 km	35	39	4	0	0	36	37	0

From	To	Left				Right			
		Medium -voltage lines	Low- voltage e lines	Telecommunication s lines	Transformer s	Medium -voltage lines	Low- voltage e lines	Telecommunication s lines	Transformer s
55 Km	56 km	33	31	3	0	0	37	33	0
56 Km	57 km	27	34	4	1	0	40	36	0
57 Km	58 km	31	42	2	0	1	40	31	0
58 Km	59 km	8	30	22	0	20	32	15	1
59 Km	60 km	0	52	46	0	38	18	5	0
60 Km	61 km	0	23	17	0	13	18	0	0
61 Km	62 km	12	25	17	0	15	23	10	0
62 Km	63 km	0	36	33	0	0	27	0	0
63 Km	64 km	14	34	10	0	0	37	20	0
64 Km	65 km	18	12	5	0	0	18	13	0
65 Km	66 km	12	27	5	1	0	43	20	0
66 Km	67 km	10	18	0	0	0	25	17	0
67 Km	68 km	17	22	0	0	0	27	20	0
68 Km	69 km	18	19	0	0	0	25	23	0
69 Km	70 km	27	28	0	0	0	31	33	0
70 Km	71 km	28	29	0	2	0	41	31	0
71 Km	72 km	31	23	4	0	0	31	33	0
72 Km	73 km	28	22	3	1	0	28	32	0
73 Km	74 km	9	27	24	3	24	23	17	0
74 Km	75 km	0	14	12	0	17	9	5	2
75 Km	76 km	0	23	18	0	23	13	2	0
<b>TOTAL COMPONANTS</b>		<b>528</b>	<b>970</b>	<b>625</b>	<b>28</b>	<b>370</b>	<b>971</b>	<b>911</b>	<b>13</b>

**ATTACHEDMENT-2**  
**Social Structures of A003 Road – Kochchikade Bridge to Chilaw**

No	Cording	Side of the road (From Kochchikade side)	Name	Approximate Distance from main road at end of ROW (m)
1	7°16'19.22"N 79°51'50.41"E	L	Thopputhota Filling station	21.8
2	7°16'24.91" N 79°51'43.53"E	L	D.A.W.Thilakeratne filling station	11.2
3	7°16'28.46"N 79°51'43.59"E	R	Small and Medium Enterprises banking centre, Bank of Ceylon	3.5
4	7°16'35.74"N 79°51'37.53 "E	R	Waikkala Post Office	2
5	7°16'37.85"N 79°51'28.82"E	L	St. Xavier's Church	27
6	7°16'50.15"N 79°51'17.07"E	R	St Marie's	2
6	7°16'52.01"N 79°51'20.27"E	L	St. Benedict's church	2
7	7°16'59.16"N 79°51'17.79"E	R	Chilaw/ Wennappuwa/ Waikkala/ Primary School	Right Adjacent to RDA reservation
8	7°18'1.55"N 79°51'0.72"E	L	Nainamadama Cemetery	1
9	7°18'21.78"N 79°50'57.80"E	R	Chilaw/ Wennappuwa/ Waikkala/ National School	3
10	7°19'9.47"N 79°50'45.35"E	L	St. Nicholas Church	Right adjacent to RDA Reservation
11	7°19'35.59"N 79°50'38.59"E	L	Wennappuwa Depot	5
12	7°19'38.71"N 79°50'42.87"E	L	Lanka Filling station	5
13	7°19'44.32"N 79°50'43.97"E	R	Hebron Church	30
14	7°20'773"N 79°50'39.29"E	R	Co-operative rural bank	10
15	7°20'12.06"N 79°50'38.57"E	R	Bank of Ceylon, Wennappuwa	20
16	7°20'12.55"N 79°50'36.72"E	L	Commercial Bank, Wennappuwa	5
17	7°20'14.97"N 79°50'35.67'E	L	Wennappuwa Pradeshiya sabha	Right adjacent to RDA Reservation
18	7°20'18.79"N 79°50'37.11"E	L	St. Joseph vaz Collage	Right adjacent to RDA Reservation
19	7°20'20.65 "N 79°50'35.94"E	R	Life care hospital	40
20	7°20'22.53"N 79°50'34.83"E	R	Police station Wennappuwa	50
21	7°20'22.45"N 79°50'34.21"E	R	Sampath Bank	5

No	Cording	Side of the road (From Kochchikade side)	Name	Approximate Distance from main road at end of ROW (m)
22	7°20'25.48"N 79°50'31.21"E	L	St Joseph's church	50
23	7°20'25.95"N 79°50'32.95"E	R	Holy Family Nursery	50
24	7°20'32.47"N 79°50'30.67"E	R	Wennappuwa Post Office	27
25	7°20'35.84"N 79°50'28.62"E	L	Sanasa Development Bank	10
26	7°20'37.63"N 79°50'26.00"E	L	People's bank Wennappuwa	10
27	7°20'38.88"N 79°50'25.85"E	L	National Development Bank	5
28	7°20'42.75"N 79°50'31.43"E	R	Hatton National Bank Wennappuwa	20
29	7°20'41.86"N 79°50'24.76"E	L	CDB Bank, Wennappuwa	8
30	7°20'43.07"N 79°50'25.53"E	R	Wennappuwa Petrol Station	5
31	7°20'44.90"N 79°50'23.24"E	L	Union Assurance	3
32	7°20'47.57"N 79°50'23.53"E	R	Pan Asia Bank	9
33	7°20'48.28"N 79°50'21.84"E	L	Seylan Bank	10
34	7°20'58.08"N 79°51'16.44"E	L	Lourdes Church	30
35	7°21'0.60"N 79°50'16.68"E	L	Commercial Bank	7
36	7°21'1.83"N 79°50'14.78"E	L	Sussex Collage, Wennappuwa	50
37	7°21'30.60"N 79°50'6.79"E	R	Dematapitiya Filling station	4
38	7°21'39.82"N 79°50'261"E	L	Seylan Bank, Katuneriya	8
39	7°21'47.54"N 79°50'014"E	L	Bank of Ceylon, Katuneriya	3
40	7°21'49.86"N 79°49'59.70"E	L	Jesus is every thing Church	5
41	7°21'51.34"N 79°49'59.53"E	L	Katuneriya Sub post office	5
42	7°21'53.39"N 79°49'58.74"E	L	St. Sebastian Primary School	5
43	7°21'56.27"N 79°50'5.15"E	R	St. Sebastian Church	180 (Although the church is 180 m from road, church entrance might get blocked with road improvement work).
44	7°21'11.41"N 79°49'53.65"E	L	Ceypetco Filling station	5
45	7°23'234.99"N 79°49'56.09"E	R	Coconut Cultivation Board Regional Office	7
46	7°23'37.12"N 79°49'56.11"E	R	Base Hospital, Katuneriya	3
47	7°23'52.56"N 79°49'53.43"E	R	Land and District Registry Marawila	2

No	Cording	Side of the road (From Kochchikade side)	Name	Approximate Distance from main road at end of ROW (m)
48	7°23'53.68"N 79°49'53.48"E	R	Post office, Mudukatuwa	10
49	7°24'13.31"N 79°49'52.67"E	L	Mudukatuwa Ceypetco Filling Station	5
50	7°24'41.48"N 79°49'52.35"E	R	Marawila Library	5
51	7°24'42.86"N 79°49'51.63"E	R	CDB Bank Marawila	5
52	7°24'41.62"N 79°49'51.02"E	L	Bank of Ceylon	10
53	7°24'55.38"N 79°49'51.84"E	R	St. Xavier's Central Collage	5
54	7°24'47.74"N 79°49'50.38"E	L	Lanka Sathosa	5
55	7°24'49.29" N 79°49'50.56"E	L	Marawila Ceypetco filling station	10
56	7°24'50.63"N 79°49'50.46"E	R	Hatton National Bank, Marawila	10
57	7°24'52.35"N 79°49'49.19"E	R	Union Bank, Marawila	10
58	7°25'00.4"N 79°49'49.19"E	L	Sampath Bank	25
59	7°25'0.76"N 79°49'49.53"E		National Saving Bank	
60	7°25'1.69"N 79°49'49.28"E	L	Commercial Bank	15
61	7°25'13.46"N 79°49'48.87"E	L	LIOC Filling Station	10
62	7°25'45.61"N 79°49'54.35"E	R	Nattandiya District Office	60
63	7°26'16.27"N 79°49'50.42"E	L	Halpanwila Temple	Right Adjacent to ROW
64	7°26'20.79"N 79°49'51.88"E	R	Darshana EAP Film Hall	15
65	7°26'30.55"N 79°49'48.71"E	L	Lyon Football Club	5
66	7°26'52.03"N 79°49'43.72"E	L	Thaniwella Devalaya	30
67	7°27'22.64"N 79°49'36.95"E	L	Divisional Secretariat Office Mahawewa	5
68	7°27'26.04"N 79°49'36.32"E	R	People's Bank	3
69	7°27'32.00"N 79°49'34.09"E	R	Lanka IOC	5
70	7°28'39.43"N 79°49'49.01"E	R	Thaniwalla Devalaya	30
71	7°28'50.29"N 79°49'42.13"E	L	Madampe Mosque	Right Adjacent to ROW
72	7°28'57.70"N 79°49'37.98"E	L	Senanayake Aaramaya	5
73	7°29'1.71"N 79°49'34.43"E	R	St. Sebestian Collage	5
74	7°28'58.51"N 79°49'35.24"E	R	Madampe Filling station	20
75	7°29'9.54"N 79°49'31.24"E	R	Cemetery	5
76	7°29'54.35"N 79°49'36.28"E	L	Ceylon Pentecostal Mission -	50

No	Cording	Side of the road (From Kochchikade side)	Name	Approximate Distance from main road at end of ROW (m)
			Madampe	
77	7°30'33.21"N 79°49'44.93"E	L	Lanka Filling Station	20
78	7°32'13.13"N 79°49'11.81"E	R	Ceypetco Filling Station	50
79	7°32'35.15"N 79°48'52.73"E	L	Ave Maria Church	Right Adjacent to ROW
80	7°33'35.04"N 79°48'18.77"E	L	St. Luke's Church, Merawala	30
81	7°34'6.76"N 79°47'59.24"E	R	Parama Dhamma Piriwena	10
82	7°34'11.93"N 79°47'56.58"E	L	Chilaw Cemetery	Right Adjacent to ROW
83	7°34'15.70"N 79°47'54.84"E	L	Ananda National Collage	5
84	7°34'50.69"N 79°47'53.12"E	L	Public Car park	50
85	7°34'21.12"N 79°47'50.19"E	R	District General Hospital Chilaw	Right Adjacent to ROW
86	7°34'22.66"N 79°47'49.77"E	R	Sampath Bank and ATM	8
87	7°34'24.07"N 79°47'49.14"E	R	Pan Asia Bank	10
88	7°34'24.91"N 79°47'48.68"E	R	NDB Bank	5
89	7°34'25.97"N 79°47'48.13"E	R	Commercial Bank	10
90	7°34'33.08"N 79°47'48.68"E	R	Sri Vijayarama Viharaya	3
91	7°34'34.71"N 79°47'46.19"E	L	Chilaw bus stand	10
92	7°34'38.20"N 79°47'42.92"E	R	Public Ayurvedic Clinic	50
93	7°34'39.45"N 79°47'40.44"E	L	Jesus statue	5
94	7°34'46.36"N 79°47'42.20"E	R	Post office Chilaw	Right Adjacent to ROW
95	7°34'49.19"N 79°47'43.49"E	R	Nasriya Central Collage	Right Adjacent to ROW
96	7°34'50.20"N 79°47'42.57"E	L	Chilaw Jumma Masjid	Right Adjacent to ROW
97	7°34'54.36"N 79°47'43.61"E	L	St Maries Collage	Right Adjacent to ROW
98	7°34'55.69"N 79°47'46.53"E	R	Sri Lanka Telecom Regional Office Chilaw	5

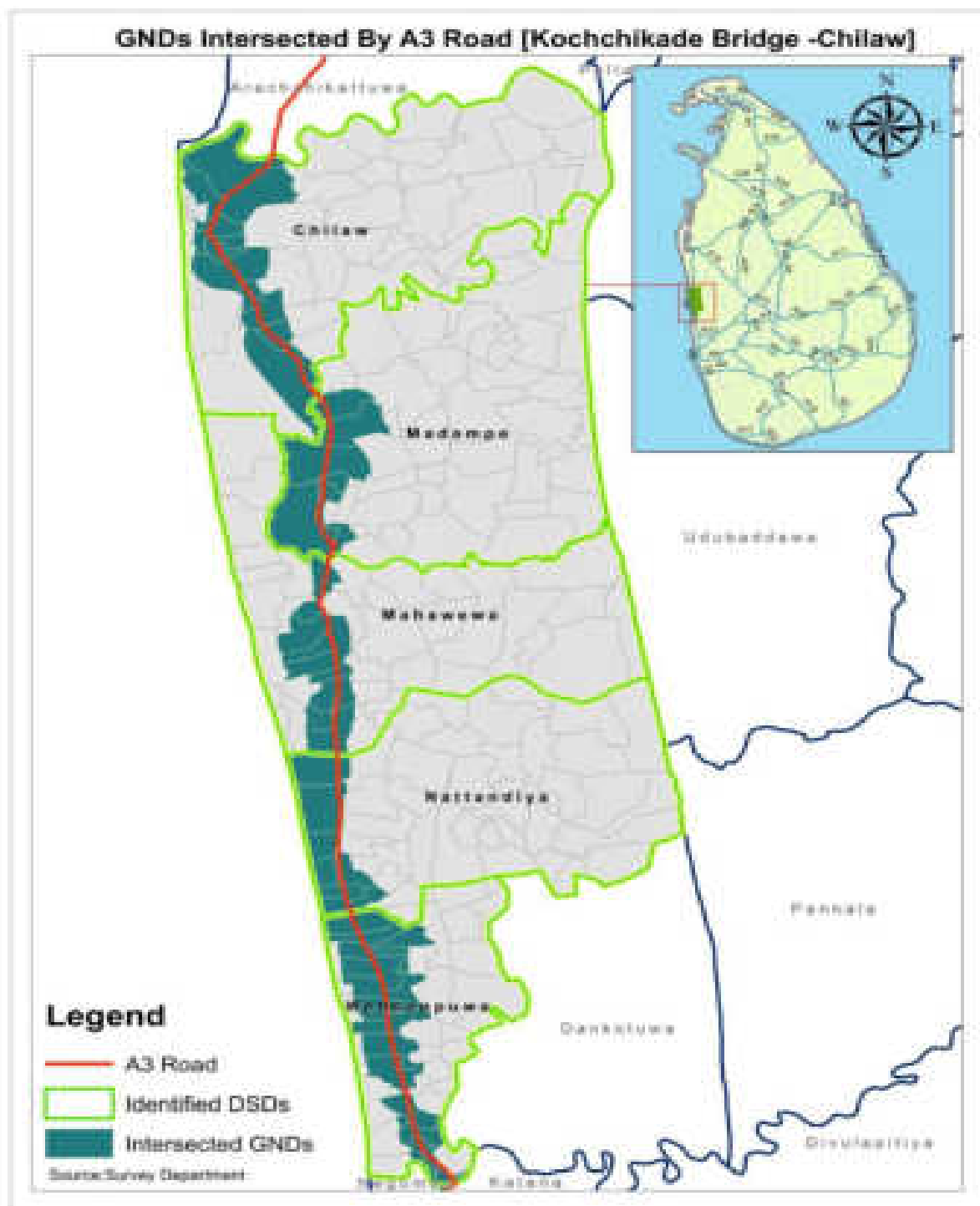


**ANNEX: III.1-**  
**Details of Administration Locations**

Details of Administration Locations		
Province: North Western Province		
District: Puttalam		
DSD	No	GND
Wennappuwa	1	Thopputhota
	2	Bolana
	3	Waikkala South
	4	Waikkala North
	5	Angampitiya West
	6	Angampitiya East
	7	Rangammulla
	8	Nainamadama West
	9	Nainamadama East
	10	Hanathotupola
	11	MedaNainamadama
	12	Dummaladeniya South
	13	Dummaladeniya East
	14	MedaDummaladeniya
	15	Dummaladeniya North
	16	Ulhitiyawa South
	17	Wennappuwa South
	18	Wennappuwa West
	19	MedaUlhitiyawa
	20	Ulhitiyawa North
	21	MedaWennappuwa
	22	Wennappuwa North
	23	Kolinjadiya East
	24	Kolinjadiya South
	25	Kolinjadiya North
	26	Kolinjadiya West
Sub total	26	
Naththandiya	1	Meegahawala
	2	PahalaKatuneriya South
	3	MedaKatuneriya
	4	MedaPahalaKatuneriya
	5	PahalaKauneriya North
	6	Bulugahawewa
	7	Nebadagahayaya
	8	Lansigama
	9	Mudukatuwa South
	10	Mudukatuwa North
	11	Mudukatuwa East
Sub total	11	
Mahawewa	1	Maravila Town

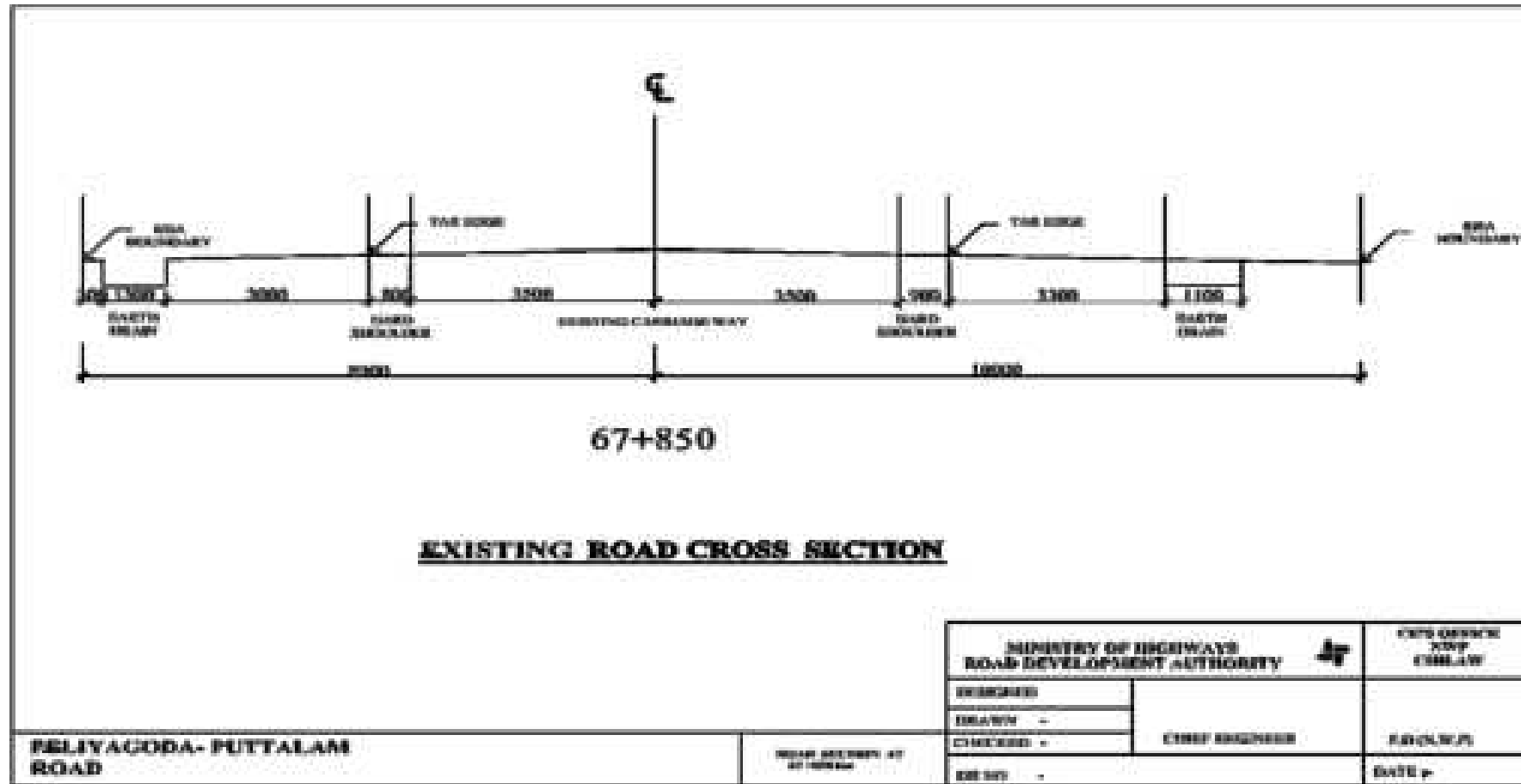
	2	Horagolla South
	3	Maravila North
	4	MedaHattiniya
	5	PahalaHattiniya
	6	Halpanvila West
	7	MedaKoswadiya
	8	IhalaKoswadiya
	9	PahalaKoswadiya
	10	IhalaMahawewa
	11	Maligawatta
	12	MedaMahawewa
	13	PahalaMahawewa
Sub total	13	
Madampe	1	Marakkalagama
	2	Mahabaddegama
	3	Egodayagama
	4	Irattakulama South
	5	Irattakulama North
	6	Galahitiyawa
	7	Pambala South
	8	Pambala
Sub total	8	
Chilaw	1	Kakapalliya
	2	Olidaluwa
	3	Inigodawela
	4	Merawala
	5	Maikkulama
	6	Pitipana North
	7	Pitipana East
	8	Melpura
	9	Ichchampitiya
	10	Pitipana South
	11	Aluthwatta**
	12	Wattakkalliya
	13	Thimbilla
	14	Deduruoya
<b>Sub total</b>	<b>14</b>	
Grand Total	72	

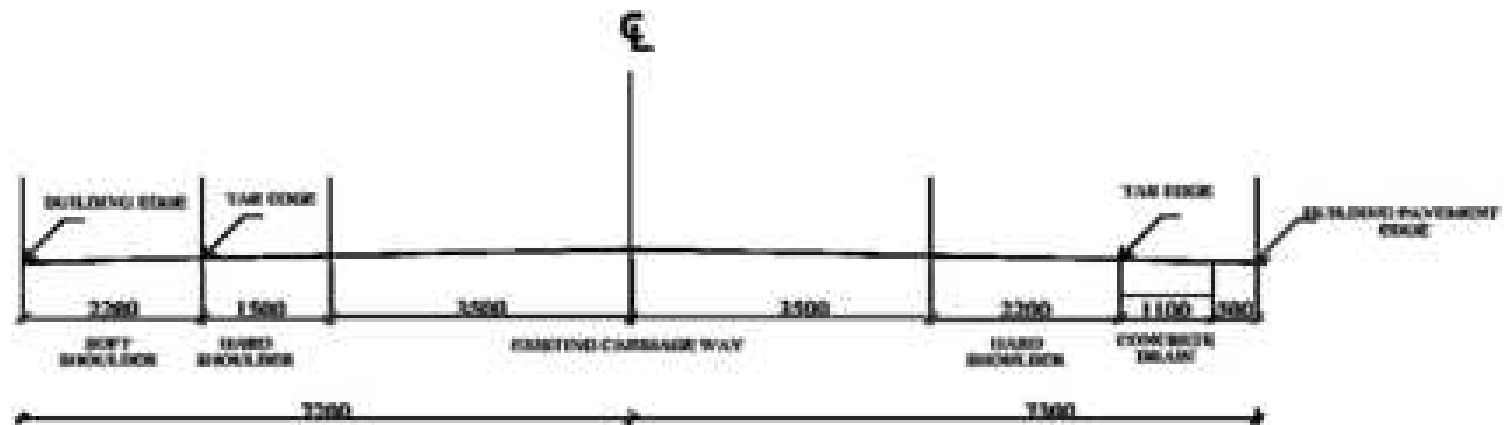
**ANNEX III-2**  
**Map of GNDs in the project area**



**ANNEX III.3:**  
**Existing Cross section of the Road**

### Annex III-3 – Existing Cross Section of the Road





62+200  
MADAMPE TOWN

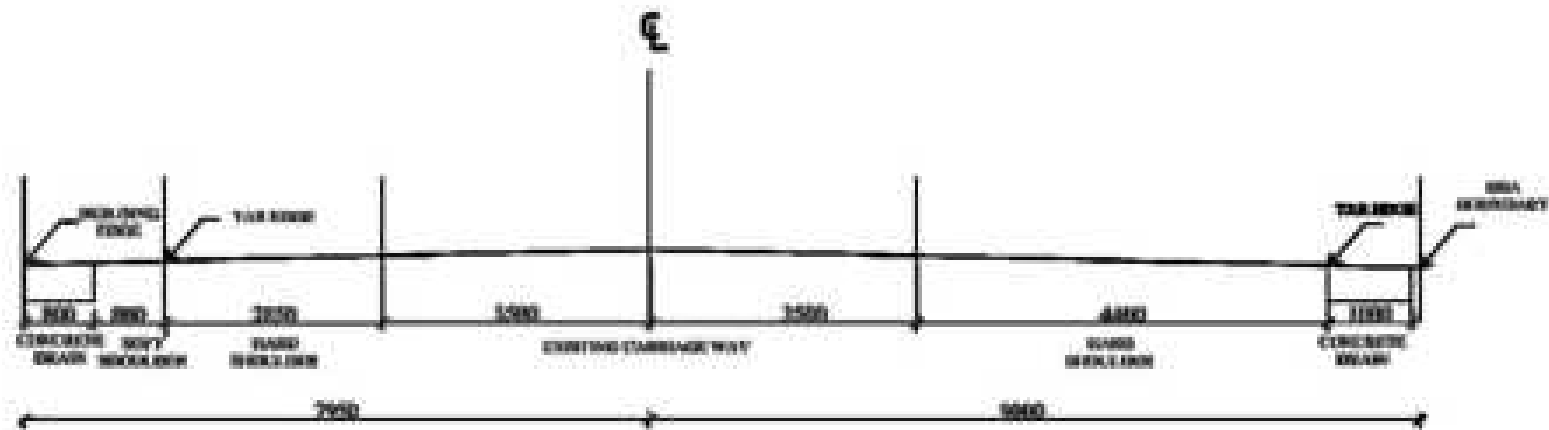
**EXISTING ROAD CROSS SECTION**

**PELIYAGODA- PUTTALAM  
ROAD**

ROAD SECTION AT  
62+200.00

MINISTRY OF HIGHWAYS ROAD DEVELOPMENT AUTHORITY		CITY OFFICE RDP CHILAW
DESIGNED:-	CHIEF ENGINEER	P.D.R.A.P.
DRAWN :-		
CHECKED:		
DATE:-		DATE:-

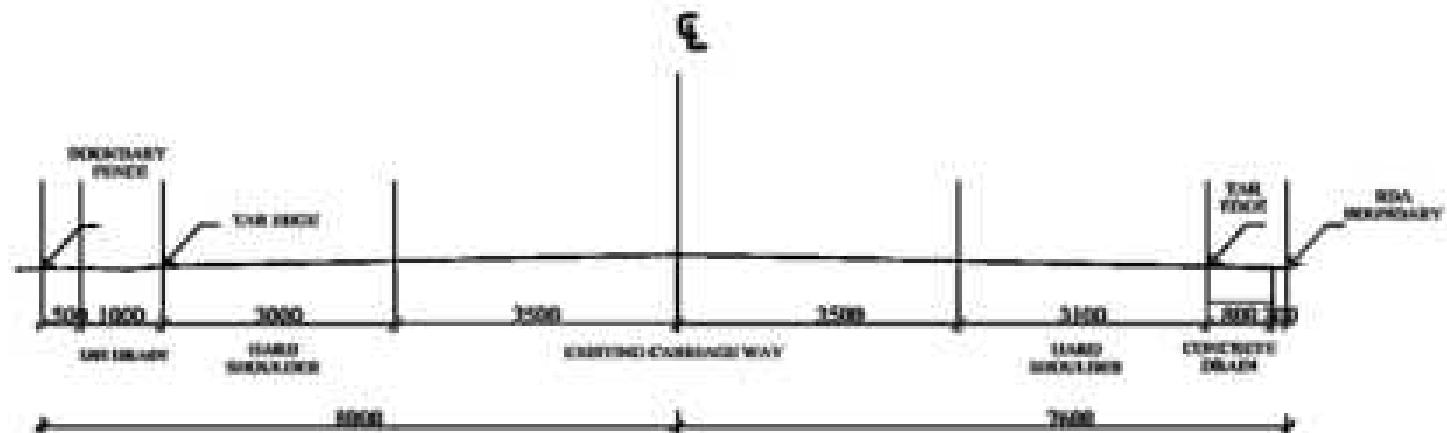




59+690  
(MAHAWEWA TOWN)

EXISTING ROAD CROSS SECTION

PELIYAGODA-PUTTALAM ROAD		MINISTRY OF HIGHWAYS ROAD DEVELOPMENT AUTHORITY		CES-OFFICE NWP CHILAW
		DESIGNED -	CHIEF ENGINEER	PO (NWP)
		DRAWN -		
		CHECKED -		
ROAD SECTION AS SHOWN		DATE		DATE




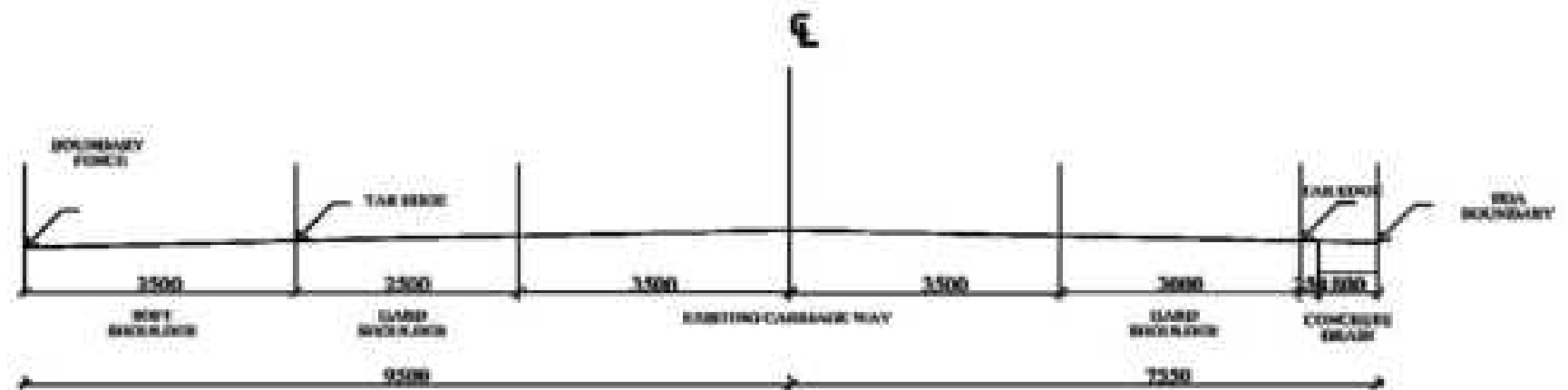
54+310  
(MARAWILA TOWN)

**EXISTING ROAD CROSS SECTION**

**RELIYAGODA - PUTTALAM  
ROAD**

ROAD NUMBER 47  
Kilometers

MINISTRY OF HIGHWAYS ROAD DEVELOPMENT AUTHORITY			CH/NO OFFICE NWP CH/NO
DESIGNED	CHIEF ENGINEER		P.D. (NWP)
DRAWN -			
CHECKED -			
DATE		DATE	




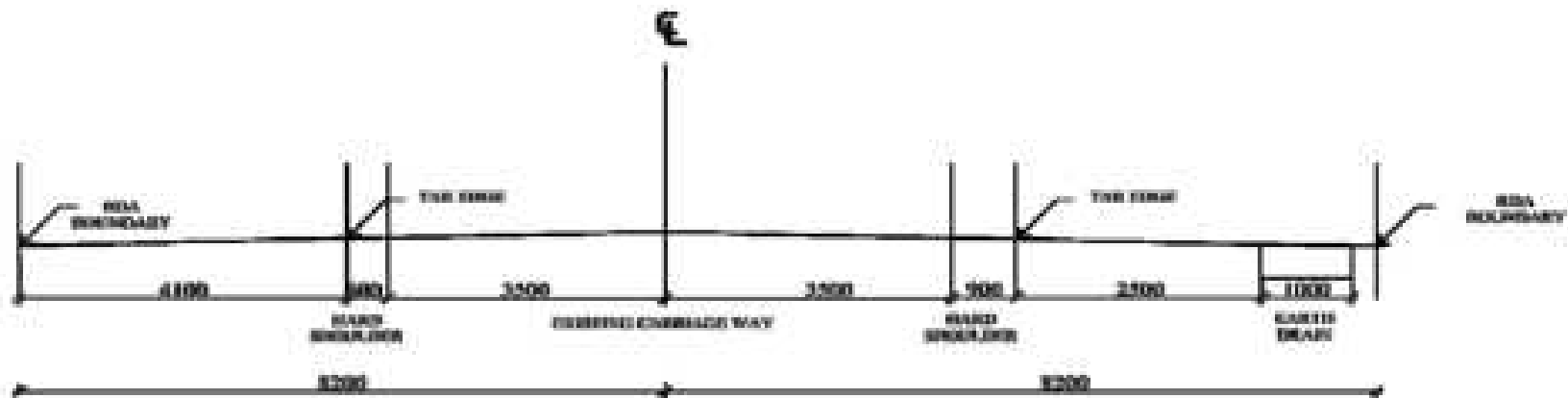
46+600  
(WENNAPPUWATOWN)

**EXISTING ROAD CROSS SECTION**

**PELIYAGODA-PUTTALAM  
ROAD**

ROAD SECTION AT  
STATION 46+600

MINISTRY OF HIGHWAYS ROAD DEVELOPMENT AUTHORITY			CITY OFFICE SMP CHIRAW
DESIGNED	CHIEF ENGINEER		P.D.(N.W.P)
DRAWN -			
CHECKED -			
DATE -			DATE -




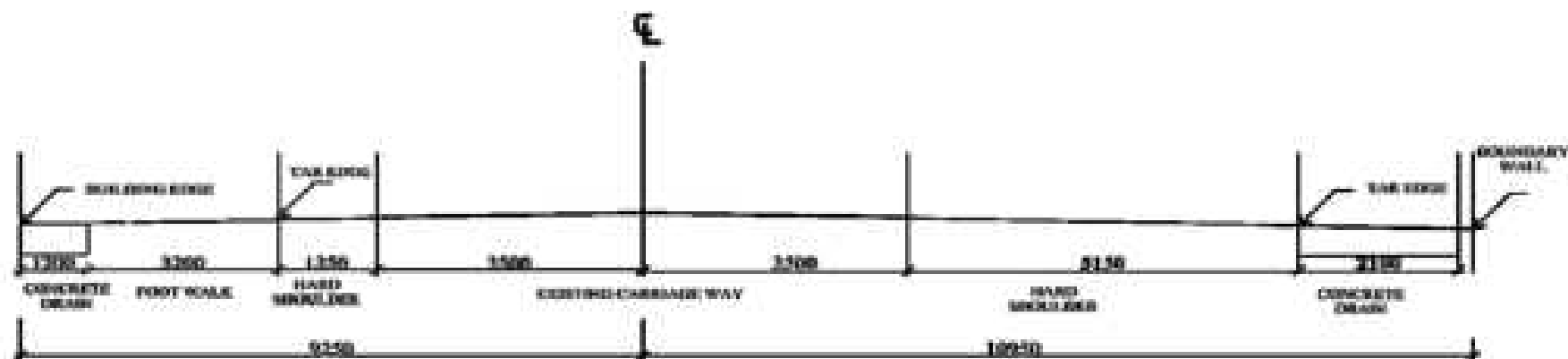
38 | 150

**EXISTING ROAD CROSS SECTION**

**PELVAGODA-PUTTALAM  
ROAD**

ROAD SECTION AT  
Km 10.500

MINISTRY OF HIGHWAYS ROAD DEVELOPMENT AUTHORITY			CHIEF OFFICE NWP CHIRAW
DESIGNED	CHIEF ENGINEER		P.D (N.W.P)
DRAWN			
CHECKED			
DATE			



73+950  
(CHILAW TOWN)

**EXISTING ROAD CROSS SECTION**

**PELIYAGODA-PUTTALAM  
ROAD**

ROAD DESIGN AT  
STATION

MINISTRY OF HIGHWAYS ROAD DEVELOPMENT AUTHORITY		CHILAW DISTRICT
DESIGNED	CHIEF ENGINEER	P.D. (H.W.P.)
DRAWN		
CHECKED		
DATE		DATE

**ANNEX III.4:**  
**Available Borrow pits**

NO	Catagory	Mining License No	NIC No	License Holder	Address		Mineral	District	D.S.Division	G.S.Area	Name of the Land	Coodinate N	Coodinate E
1	IML	IML/B/HO/6209/LR/3	517070130V	R.G.JAYAWATHIE	155,Katugasulpotha,Padiyathalawa.	0729136077	Gravel	Ampara	Padiyathalawa	Kirawana 140/C	Welikumbura Lot 01	242829	249540
2	IML	IML/B/HO/6194/LR/3	763012859V	M.M.A.WAHAB	182B,Mai 6th Rd,Vilinydi Rd,Sammanthurai	773621623	Gravel	Ampara	Irakkamam	Irakkamam 07	Thirodai Lot2	230793	309591
3	IML	IML/A/HO/12949	543275034V	W.KURUNERU	Sudharshana Mw, Kimbulakada, Srawashthipura	0716822627	Gravel	Anuradhapura	Madyama Nuwaragam Palatha	Yahalagama 236	Yahalagama Mukalana	375577	160274
4	IML	IML/C/HO/13069/0/1	573442032V	S.A.W.WIJEWARDHANA	No 100, Ellawewa, Galenbiduwewa	0727300012	Gravel	Anuradhapura	Galenbidunuwewa	Ellawewa 178	Dunumadalewe	347199	193618
5	IML	IML/A/HO/N/13424	607923124V	G.W.Karunarathne	Lolugaswewa, Etaweeragollewa	0717239082	Gravel	Anuradhapura	Medawachchiya	48 Anekattiya	State Land	378651	163004
6	IML	IML/A/HO/13096	655933689V	S.N.SIRIWARDHANA	Kidawarankulama, Poonewa		Gravel	Anuradhapura	Medawachchiya	Kidawarankulama 42	Goda Idama	383168	164379
7	IML	IML/A/HO/13498	662892971V	S.THULPIC	MUSLIM HALMILLEWA, PUNEWA	0714193801	Gravel	Anuradhapura	Medawachchiya	48 Anekattiya	Goda Idama	379602	162420
8	IML	IML/B/HO/N/13364	670870960V	S.A.H.K.Satharasinghe	No.129, Oruthota, Gampaha	0718184263	Gravel	Anuradhapura	Thirappane	539 Wellamudawa	State Land	331899	168212
9	IML	IML/C/HO/7100/0/4	750834035V	K.A.D.K.PIYATHISSA	Hiriwadunna, Habarana	0722043733	Gravel	Anuradhapura	Palugaswewa	Hiriwaduna	Hiriwadunna State	312345	197042
10	IML	IML/B/HO/11098/LR/1	780281901V	G.G.W.Banda	No.592/B, Janasirigama, Hurulunikawewa, Galenbidunuwewa	0776658136	Gravel	Anuradhapura	Galenbidunuwewa	Janasirigama 174	Divulwewawatta Lot 2	340354	198609
11	IML	IML/C/HO/N/13362	811484164V	S.R.G.R.RATHNAYAKE	Neelaharithagama, lhalagama, Nochchiyagama,	0776773165	Gravel	Anuradhapura	Nochchiyagama	337 Mudibagama	State Land	339410	140468
12	IML	IML/B/HO/13178	825390740V	H.M.S.K.HERATH	Pahala Halmillewa, lhal halmillewa, Eppawela	0712375984	Gravel	Anuradhapura	Thalawa	Mawathawewa 377	Siyabalagaswewa Forest	333098	163758
13	IML	IML/C/HO/13161/0/1	853011894V	V.L.PATHIRANA	12/A, Sandaresgama, Eppawala	0771266732	Gravel	Anuradhapura	Mihinthale	Kurundankulam Thulana	Kurundankulama Mukalana	349109	165284
14	IML	IML/C/HO/9480/0/2	921081502V	K.R.JAYALATH	Paragahamula kade Bare, Paspolakanda, Alawwa	0719229316	Gravel	Anuradhapura	Kahatagasdigiliya	Kurukkuragama 234	Diwoliwawa Forest	362999	190415
15	IML	IML/B/HO/13302	Consulting	CONSULTING ENGINEERS &	423, Nawala Road, Rajagiriya	0773470484	Gravel	Anuradhapura	Palugaswewa	Horiwila	State	318049	190279
21	IML	IML/B/HO/12873	590660540V	S.A.N.C.K.SAKALASOORIYA	131/1, Meerigama Road, Maradagahamula	0770045963	Gravel	Gampaha	Divulapitiya	Palliypitiya 83	Horakele Estate	228044	111303
22	IML	IML/A/HO/12674	732761250V	K.P.A.FERNANDO	62/D/4, Mosas, Avenue, Bogamuwa, Kalagedihena		Gravel	Gampaha	Mirigama	Danowita	Kalukandakele Lot 03	223619	134848
23	IML	IML/B/HO/13309	733490730V	W.D.J.R.KUMARA	No,143/24,Sirisumanathissa Mw,Nawagamuwa,Ranala	0714498309	Gravel	Gampaha	Dompe	Meegahawatta 410/B	Kelagahawatta Alias Kahatagahawatta	198160	125471
24	IML	IML/B/HO/13370	738550722V	W.A.R.N.FERNANDO	03/01, Mullayaya, katana	0777446016	Gravel	Gampaha	Divulapitiya	Godigamuwa 57 A	Dematawatta (Previus No	230110	111481
25	IML	IML/B/HO/12780	772000120V	G.S.Nandasiri	NO.75/10, Malindha, Kapugoda	0773071986	Gravel	Gampaha	Biyagama	Kanduboda West	Alubogahalanda & Marapetiyaakele	196643	115790
26	IML	IML/B/HO/13394	772000120V	G.S.Nandasiri	NO.75/10, Malindha, Kapugoda	0773071986	Gravel	Gampaha	Weke Kirindiwela	377 Pingamuwa	Bulungahawatta/llluk gollawatta	206359	132633
27	IML	IML/B/HO/13047	813581990V	W.A.D.S.A.WIDANAGE	No 106/2, Kapugoda	0773936496	Gravel	Gampaha	Dompe	Pingamuwa	Belungalewatta	206551	132410
28	IML	IML/A/HO/13440	196336502660	C.Warnakulasuriya	438/10A South, Dakunuwewa Para, Kurunegala	0719840959	Gravel	Kurunegala	Ridigama	538 Udatthapola Pahala	Pinnagolleyaya Alias Galkuruyaye Hena	264479	172908
29	IML	IML/B/HO/13455	197518101810	K.S.S.Perera	Thabbowa, Naththandiya	0777433603	Gravel	Kurunegala	Pannala	1596 Gallahamulla	Kahatagahahena & Imbulgahawatta	244466	107294
30	IML	IML/B/HO/12734	551093298V	T.B.U.RATHNASIRI	No 30, Artigala Mawatha, Piliyandala	0722797685	Gravel	Kurunegala	Mallawapitiya	Katupita South 748	Katupitiya Estate	245488	156757
31	IML	IML/B/HO/13346	711812997V	J.P.C.JAYAWEERA	Thambakanda, Sandalankwa	0777679187	Gravel	Kurunegala	Pannala	Kohombapola	Punchiweridiya Waththa	234532	119094
32	IML	IML/C/HO/11979/0/1	712652004V	G.G.R.KUMARA	3rd Lane, Uyandana, Kurunegala		Gravel	Kurunegala	Mallawapitiya	Manel Oluwa 743	Doratiyawa Estate Lot 2	249459	158087
33	IML	IML/B/HO/13341	751811810V	K.S.S.PERERA	270/1, Mada Thabbowa, Naththandiya	0777433603	Gravel	Kurunegala	Mahawa	Muttibandiwiila	Kalimulla Estate	250568	101403
34	IML	IML/A/HO/13459	760501131V	B.T.S.P.Jayawardhana	Rockview Estate, Mathawa, Kohilegedara	07119234479	Gravel	Kurunegala	Mallawapitiya	754 Mahagama	Kethhawetunugalehe na	244540	155846
35	IML	IML/B/HO/13494	766223354V	P.P.D.D.	240 Kandegedara, Wewagama	0776740419	Gravel	Kurunegala	Kuliypitiya West	1099 Kandegedara	Kandegarada	246318	123031
36	IML	IML/B/HO/11256/LR/1	770782678V	W.A.D.R.S.PRIYADHARSHANA	171, Udakanampella, Pugoda	0777629177	Gravel	Kurunegala	Mallawapitiya	Waththegedara 755	Hettiyawatta Alias Kohilegedara Watta	244300	155900
37	IML	IML/B/HO/12533	780163356V	P.N.ROHANA	Pelawatta, Metiyagane	0777030031	Gravel	Kurunegala	Alawwa	Wilgamuwawatta 984	Wilgamuwatta	241381	138236
38	IML	IML/B/HO/13363	791060842V	G.D.S.A.SANDARUWAN	166/4, Ambagahalanda, Dodangaslanda	0724902888	Gravel	Kurunegala	Ridigama	Udakendawela	Damunugahamulawatta Alias	269578	173175
39	IML	IML/B/HO/12767	792903843V	A.P.K.M.DISSANYAKE	No 6, Nagahalanda, Thalammehera, Pannala	0776249864	Gravel	Kurunegala	Pannala	Pannala 1549	Debaraliyedda Estate	237456	118968
40	IML	IML/B/HO/13230	831570555V	W.P.S.KARUNARATHNE	Jayasundara Gedara, Wariyapola	0771498277	Gravel	Kurunegala	Bamunakotuwa	Demataluwa 1206	Katugahahena	257679	147117
41	IML	IML/B/HO/12603	833114875V	A.H.M.T.D.B.HERATH	Finance Watta, Saragama, Kurunegala	0714432259	Gravel	Kurunegala	Kurunegala	Kudumbuwa 826	Hingurugolle Hena	244080	155492
42	IML	IML/B/HO/13006	860323109V	A.M.D.P.N.ADHAKARI	Bowatta, Bingiriya	0702943805	Gravel	Kurunegala	Mawathgama	Pilessa lhalagama 695	Pileekadawatta	250703	159619

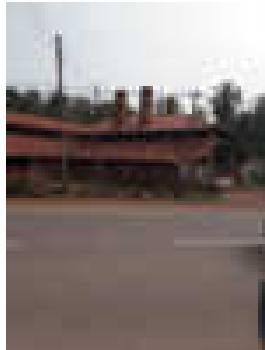


43	IML	IML/B/HO/11463/LR/1	860631113V	S.T.K.P.WERALUGOLLA	Weralugolla, Wattegedara, Kohilegedara	0718078943	Gravel	Kurunegala	Kurunegala	Mathawa	Galagawahena Alias Medikellayaya Lot 2	246390	153660
44	IML	IML/B/HO/13396	882470504V	Samarawicrama Iddamalgod Viduranga	No 122, Colombo Road, Pothuhera	0771007271	Gravel	Kurunegala	Mallawapitiya	755 Waththegedara	Kohegedara Watta	245058	155849
45	IML	IML/A/HO/12013/LR/1	Olympus Corn	OLYMPUS CONSTRUCTION PVT LTD	362, Colombo Road, Pepiliyana, Boralesgamuwa		Gravel	Kurunegala	Alawwa	Pallekekulawala	Kekulawalawattta	231182	133860
46	IML	IML/A/HO/N/13463	Sierra	SIERRA CONSTRUCTION PVT LTD	No.23, Havelock Road, Colombo 05	0718720808	Gravel	Kurunegala	Narammala	119 Handapanagala	Handapanagala Estate	236688	131177
47	IML	IML/A/HO/11197/LR/1	Western Auto	WESTERN AUTOMOBILE ASSEMBLY PVT LTD	Mahanugalanda Estate, Labuyaya, Kuliyaipitiya	0718659687	Gravel	Kurunegala	Udubaddawa	Henegedara 1522	Henegedara Estate Lot 1 & 3	251052	108861
53	IML	IML/C/HO/11968/O/1	623161030V	Y.S.H.T.DE SILVA	Punchivilaththawa, Mugunuwatawana	0777750389	Gravel	Puttalam	Madampe	Mahagama North 547A	Karukkuliya Estate Lot 2	264127	102659
54	IML	IML/B/HO/13017	682273496V	M.J.PREMASIRI	Govi Janapadaya, Mahakumbukkadawala	0779277288	Gravel	Puttalam	Anamaduwa	Wedigamagawa	State	294812	113582
55	IML	IML/B/HO/12759	710495114V	K.A.RUWANSIRI	Aluthwattha, Kirimdawa	0724880700	Gravel	Puttalam	Puttalam	Kaladiya	Goda Idama Lot 01	309369	106391
56	IML	IML/B/HO/12913	711812016V	W.A.R.WICKRAMASINGH E	Nelumwila Watta, Pahala Bujjampola, Dankotuwa	0777929340	Gravel	Puttalam	Dankotuwa	Mellawa 463	Nelumwila Estate	236690	106136
57	IML	IML/B/HO/13465	756371002V	L.D.U.W.Liyanage	Sen Sebasthian Road, Kanda	0722560818	Gravel	Puttalam	Mahakumbukkadawala	612/A Adigama	Daminnagahayaya	286892	106918
58	IML	IML/B/HO/13475	760214302V	A.H.M.Upali	63/1, Sembukuliya, Mahakumbukkadawala	0716614678	Gravel	Puttalam	Mahakumbukkadawala	613 Kawayankulam	Palugahakele	296452	106076
59	IML	IML/B/HO/13011	807740385V	S.M.S.FERNANDO	No 51, Station Road, Puttam	0778311864	Gravel	Puttalam	Mahakumbukkadawala	Kivula	Kivula kele	307476	104053
65	IML	IML/C/HO/N/13391	198200205199	W.D.N.Wicramapala	Nedunkulam, Vauniya	0774527900	Gravel	Vavunniya	Vavunia South	Maruthamadu C209	State Land	223218	230878
66	IML	IML/B/HO/13211	581323425V	W.P.P.SOZSA	Puhudiwila, Etaweeragollewa	0772026667	Gravel	Vavunniya	Vavunia South	Maradanmaduwa C/209/C	Maradanmaduwa State Land	375704	154875
67	IML	IML/A/HO/13067	721663345V	W.G.S.KUMARA	41/2, Mile Post, Nawasirigama, Rajanganaya	0776239557	Gravel	Vavunniya	Vavunia South	Maradanmaduwa C/209/C	Maradamadu State	375373	154717
68	IML	IML/A/HO/N/13491	790044673V	D.RATHNASIRI	No 98/6, Wanniyankulama, Anuradhapura	0716748410	Gravel	Vavunniya	Vengalachcheddikulam	211/A Cheddikulam	State Land	382744	150800
69	IML	IML/A/HO/12696/LR/1	962852343V	S.PAVITHIRAN	179, Thetkiluppaikulam, Vavniya	0775583472	Gravel	Vavunniya	Vavunia South	Maruthankulam	Kayankulamkadu Lot 01	403369	172194
70	IML	IML/A/HO/13326	Nelso Eng	NELSON ENGINEERING PVT LTD	No 179, Thetkiluppaykulam, Vavniya	0774469018	Gravel	Vavunniya	Vavunniya	Periyathambanai 207/A	State	396720	142045

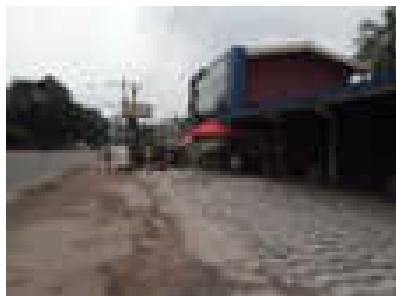
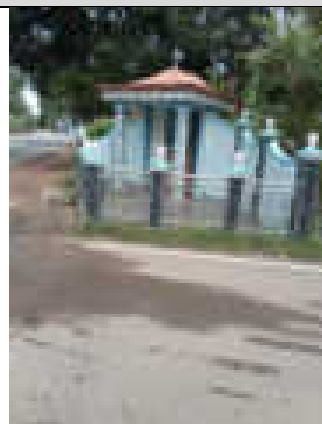

Source: Geological Survey and Mines Bureau, Sri Lanka






**ANNEX IV.1:**  
**Land Use Pattern along the A3 Road – Kochchikade Bridge to  
Chilaw**




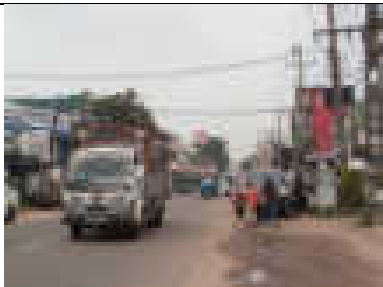

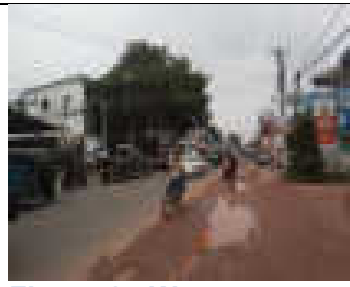
### LAND USE PATTERN ALONG THE A3 ROAD – KOCHCHIKADE BRIDGE TO CHILAW





Section		Length	Township Details		Land use Details		
From	To		Type	Covering Area			
K38	K40	2	Transition Zone	Waikkala	<b>1. Description of Land use</b>	<ul style="list-style-type: none"><li>– The land use pattern could be identifying as mixed land use combined with residential, commercial activities either side of A003 road. In Waikkala home gardens and residential houses and business establishments are observed.</li><li>– Iron works and roof tile factories are located along the road.</li></ul>	
					<b>2. Important land uses</b>		
					<b>Social and cultural</b>	<b>Religious uses</b>	<b>School or Government</b>
						St.Thomas church	Waikkala Kanista School
						Ave Maria Church	
					<b>3. photographs</b>		
							
<b>Figure 1 : Tile factory</b>			<b>Figure 2 : Waikkala</b>		<b>Figure 3 : Iron Works in Waikkala</b>		
K40	K41	1	Transition Zone	Anganpitiya –Bolawatta	<b>1. Description of Land use</b>	<ul style="list-style-type: none"><li>– The Anganpitiya- Bolawatta township area comes next to the Waikkala town area as transition zone where most of the land uses identified as Residential, roof tile factories, commercial complexes and</li></ul>	




					restaurants in isolation.		
					2. Important land uses		
					Social and cultural and Banks	Religious uses	School or Government
					People bank	Religious base statues observed either side of road.	
					3. photographs		
							
					Figure 4 : Town and road view	Figure 5 : Ave Maria statue	Figure 6 : Road view
K41	K42	1	Transiti on Zone	Rangamulla	1. Description of Land use	<ul style="list-style-type: none"><li>– This transition zone also includes the activities observed in Bolawatta zone. Mainly, Roof tile factories, several garages and vehicle service centers are found.</li><li>– Residential establishment with home garden spread along the road in most of the parts.</li><li>– Hotel (Mareena garden) and commercial complex-based activities also taken place end of the town boundary</li></ul>	
					2.Important land uses		
					Social and cultural	Religious uses	School or Government
					Rangamulla public Cemetery	Religious base statues observed either side of road.	
					3. photographs		

					 <p>Figure 1 : Surrounding road view</p>	 <p>Figure 2 : St. Sebastian statue</p>	 <p>Figure 3: Road view</p>
K42	K44	1	Transiti on Zone	Nainamada ma	<b>1. Description of Land use</b> <ul style="list-style-type: none"> <li>– The Nainamadama town covers the commercial establishment (shops, hardware, car sales and hotels). After the township majority are residential activities. Religious based structures along with commercial establishments along the A003 road are observed. The edge of the town boundary where transition zone identified before Wennappuwa town engaged with car sales, rent a car service, Garages and vehicle service centers.</li> <li>– Further, the transition zone has been recognized with home garden based residential activities as well.</li> </ul>		
					<b>2. Important land uses</b>		
					<b>Social and cultural</b>	<b>Religious uses</b>	<b>School or Government</b>
					CRB Nainamadama	The Lady of Sorrow	Chinthana Training center
					Cemetery Police station	St. Maries Church Nainamadama St. John Church	Nainamadama Maha Vidyala  St. James Pre-School Jennings International school

					<b>3. photographs</b>		
							
					Figure 1 : Nainamadama public Cemetery	Figure 2 : Town area	Figure3 : Town street view
							
					Figure 4 : Home garden	Figure 5 : Bare land with coconut	
K44	K48	1	Urban Zone	Wennappuwa	<b>1. Description of Land use</b>		
					<ul style="list-style-type: none"> <li>– This is a one of the major townships along the A003 road within the Project area. The urban characterized based activities are starting from 45+000 but intermediate zone (Kosgass Junction) starting from 44+000. As typical towns; this town also covering large numbers of commercial based establishments, fueling stations, banks (almost major banks are available), hardware, hotels, Food city, Sathosa, Damro and Arpico.</li> <li>– Residents with home gardens, Floriculture based activities and roof tile factories are also observed after 47 +000 boundary</li> </ul>		
					<b>2. Important land uses</b>		
					<b>Social and cultural</b>	<b>Religious uses</b>	<b>School or Government</b>




					Sri Lanka Police – Wennapuwa	St. Joseph's Church Religious based statues are available	St. Joseph Vas school John Paul II institution for Higher education
					<b>3. photographs</b>		
							
							
K48	K51	1	Transiti on Zone	Katuneriya	<b>1. Description of Land use</b>	Katuneriya town falls under the transition zone with majority of residential based uses while commercial establishment are functioning in isolation along the road. Floriculture based shops were identified in some places. The Bandikade junction area is a landmark with fruit shops. The area covered between 50 +000 and 51+000 mostly engaged with residential activities with	




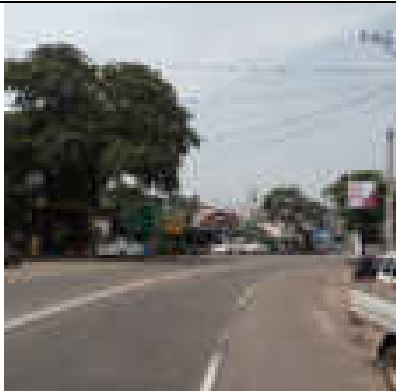


					home gardens.	
					2. Important land uses	
				Social and cultural	Religious uses	School or Government
				St.Joseph home for Elders	St.Sebastian Shrine	Sebastian Primary school St. Anthony's College
					3. photographs	
						
				Figure 1 : Katuneriya town area with street view	Figure 2 : Katuneriya town area with street view	Figure 3 : Katuneriya town area with street view
						
				Figure 4 : Lottery Ticket Stands	Figure 5: Katuneriya town area with street view	
K51	K54	1	Transiti on Zone	Muddukotu wa Marawila	1. Description of Land use <ul style="list-style-type: none"><li>- This Muddukotuwa town consists with large numbers of coconut plantation with highly residential based activities (large scale housing scheme)</li><li>- Along the A003 road fuel station, meat shops and commercial establishments are also identified.</li></ul>	
					2. Important land uses	

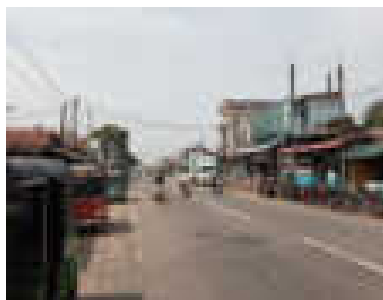

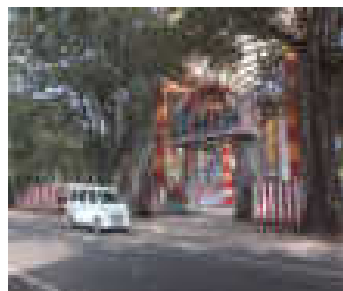
					<b>Social and cultural</b>	<b>Religious uses</b>	<b>School or Government</b>
					Base hospital		MOH Office
					Dental hospital		Model school
							Register General office
					<b>3. photographs</b>		
							
					<b>Figure 9 : Muddukotuwa street view</b>	<b>Figure 10 : Muddukotuwa street view</b>	<b>Figure 11 : A Hotel in Muddukotuwa</b>
<b>K54</b>	<b>K55</b>	<b>1</b>	<b>Urban Zone</b>	<b>Marawila Town</b>	<b>1. Description of Land use</b>	– This area covers Marawila urban characterized region as other typical towns in Sri Lanka with a landmark of clock tower in center of Town. The urban zone covers large numbers of commercial establishments, banking institutions, government and institution setting ups, health cares, financial and insurance companies and food city.	
					<b>2. Important land uses</b>		
					<b>Social and cultural</b>	<b>Religious uses</b>	<b>School or Government</b>
							St.Xavior colloge
					<b>3. photographs</b>		












					 <p>Figure 1 : Marawila urban area with street view</p>	 <p>Figure 2 : Marawila urban area with street view</p>	 <p>Figure 3 : Marawila urban area with street view</p>
					 <p>Figure 4 : Marawila urban area with street view</p>	 <p>Figure 5 : Marawila urban area with street view</p>	 <p>Figure 12 : Marawila clock tower</p>
K55	K56	1	Transiti on Zone	Horagala Marawila	-	1. Description of Land use	– This area is mostly involved with coconut cultivation and coconut based industries. The residential activities and floriculture shops are also observed along the main road.
					2. Important land uses		
					Social and cultural	Religious uses	School or Government
K56	K57	1	Transiti on Zone	Hattiniya Marawila	-	1. Description of Land use	As mentioned above, this area also includes some land use pattern. Further, pavement block works, garages and food

					corners are identified.	
				2. Important land uses		
				Social and cultural	Religious uses	School or Government
				Hal Panwila public market		Hattiya Pradeshiya Sabha sub office
				3. photographs		
						
				Figure 1 : A store in Hattiniya	Figure 13 : Hattiniya street view	Figure 14 : Hattiniya street view
K57	K61	1	Urban Zone	Mahawewa	1. Description of Land use <ul style="list-style-type: none"><li>The Mahawewa urban zone covers large numbers of commercial establishments, banking institutions, government and institution setting ups, health cares, financial and insurance companies and food city. It involved with coconut cultivated and coconut factories-based uses from 58+000 to 60+000 while the residential activities and floriculture shops observed along the main road. The floriculture activities, hotels and metal work shops are also noted.</li><li>The paddy cultivations, food stalls, king coconut selling huts and hotel-based activities are observed from 60+000 to 61+000. A few numbers of residential based activities are also observed.</li></ul>	
				2. Important land uses		
				Social and cultural	Religious uses	School or Government
				Koswadiya Co-op	Vihara in Koswadiya	Saraswathi mahavidyalaya




							DS office Broad vision international school
<b>3. photographs</b>							
							
							
<b>K61</b>	<b>K68</b>	<b>1</b>	<b>Urban Zone</b>	<b>Madampe</b>	<b>1. Description of Land use</b>	– The paddy cultivations, food stalls, king coconut selling huts and hotel-based activities are observed from 61+000 to 62+000 before the Madampe old town. Large numbers of	

						<p>commercial establishments, meat shops, mixed uses such as residential and commercial, religious structure are identified in old Madampe town.</p> <ul style="list-style-type: none"><li>– After passing the Madampe old town, religious based activities are observed from 65+000 to 66+000.</li><li>– Coconut plantation and coconut estates are located from 64+000 to 65+000.</li><li>– Some large scale hotel are also identified.</li><li>– A limited numbers of residential based activities with home gardens and floriculture shops also identified along this section.</li></ul>
<b>2. Important land uses</b>						
<b>Social and cultural</b>		<b>Religious uses</b>		<b>School or Government</b>		
Madampe public cemetery		Madampe mosque at old town		St.Sebastian college		
		Senanayake Aramaya				
		Thaniwalla Develaya				
		Madampe Murugan Kovil				
<b>3. photographs</b>						
						
				<p><b>Figure 1 : Madampe town area with commercial activities</b></p>	<p><i>Figure 2 : Madampe Mosque</i></p>	<p><b>Figure 3 : Madampe Murugan Kovil</b></p>

							
					Figure 20 : Thaniwalla Develaya	Figure 5 : Paddy field along A3 road	Figure 5 : Madampe urban area
							
					Figure 6 : A3 road view after Madampe town	Figure 7 : Paddy field along A3 road	Figure 8 : Street view
K68	K72	1	Transiti on Zone	Kakkapalliy a	1. Description of Land use	– The coconut plantation and coconut estate were observed with residential activities. Commercial establishments are mainly located along the road sides.	
					2. Important land uses		
					Social and cultural	Religious uses	School or Government
							Holy rosary church
3. photographs							

					 Figure 1 : Coconut plantation in Kakkapalliya	 Figure 2 : Coconut plantation in Kakkapalliya	 Figure 3 : Street view along A3 road at Kakkapalliya
K72	K75	1	Urban Area	Chilaw Town	1. Description of Land use	<ul style="list-style-type: none"><li>- The Chilaw town fallen between 73 km to 75 km boundary where banking institutions, commercial establishments, hotels, restaurants, auto motors, investment companies, Damro etc are observed. The urban zone involved with large numbers of commercial based activities, public health-based activities and public transportation services along the road.</li><li>- Traffic congestion and high density activities are observed.</li></ul>	
					2.Important land uses		
					Social and cultural	Religious uses	School or Government
					Muslim Burial Ground	St.Anthonys Church	St.marys college
					Chilaw hospital	St.luke's Church	Ananda college
					Public cemetery Public ground	Parama Dhamma Piriwena	DS office Post office Police station
					3. photographs		

					 <p>Figure 1 : Chilaw general hospital</p>	 <p>Figure 21 : Chilaw urban zone with street view</p>	 <p>Figure3: Chilaw urban zone with street view</p>
					 <p>Figure 4 : Chilaw urban zone with street view</p>	 <p>Figure5 : Chilaw urban zone with street</p>	 <p>Figure 6 : Parama Dhamma Piriwena</p>
					 <p>Figure 7 : Chilaw urban zone with street view</p>	 <p>Figure 8 : Chilaw urban zone with street view</p>	
K75	K78	1	Transiti		1. Description of Land use	– The transition zone comes after Chilaw urban zone includes	

			on Zone			coconut cultivation lands, low lands (Marshy lands, Ayurveda shops and notable residential base activities)
					<b>2. Important land uses</b>	
					<b>Social and cultural</b>	<b>Religious uses</b>
						<b>School or Government</b>
						Nasriya central college
						Agriculture and Agrarian insurance
					<b>3. photographs</b>	
					 <p>Figure 1 : Coconut plantation along A3 road</p>	 <p>Figure 2 : Street view after Chilaw town</p>
						 <p>Figure3: 76 Mile stone</p>








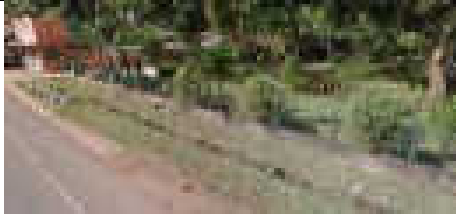
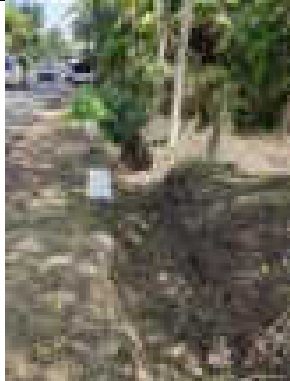

**ANNEX IV.2:**  
**Drainage Chainage along the A3 Road – Kochchikade Bridge to Chilaw**

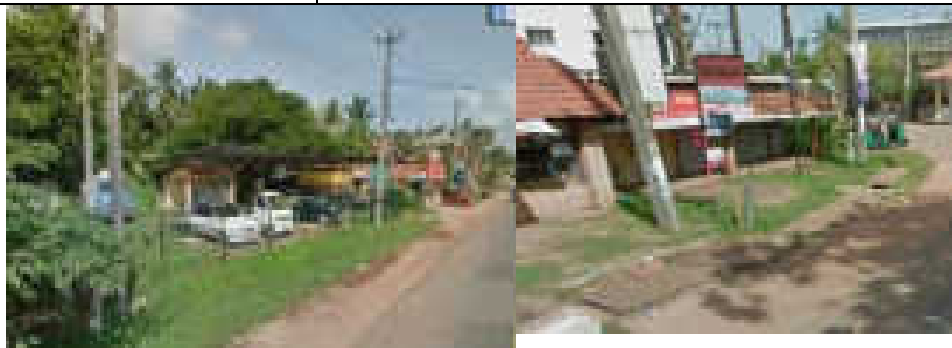

### DRAINS ALONG THE A3 ROAD – KOCHCHIKADE BRIDGE TO CHILAW



**Note:** The locations are given in tentative chainages. The drain details are given purely on the environmental aspects and based on the eye observation. It is suggested to conduct details study for detailed engineering design



Left side				Right Side			
1. Covering From (KM):	38 Km	To:	39 Km	1. Covering From (KM):	38 Km	To:	39 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
○ D1	38+250	38+300	50 m	○ D1	38+80m	38+130m	50m
○ D2	38+840	38+890	50m	○ D2	38+250m	38+325m	75m
○ D3				○ D3			
3. Condition	D1 - 50m length, located Infront a fuel station. Concrete covered box drains discharges to the nearby bare land D2 - 50m length, connected to culvert 39/1, earth drain, partly silted, water reaches about 2m - 3m to the road due to the stagnation and insufficient capacity of the road drain			3. Condition	D1–Covered with concrete slab from the Thoppuwa Junction bend towards chilaw Infront of existing vegetable market  D2 – 75m length earth drain available in opposite to the fueling station in Waikkala. Box drain, the right side of the wall is damaged. Need improvement.		

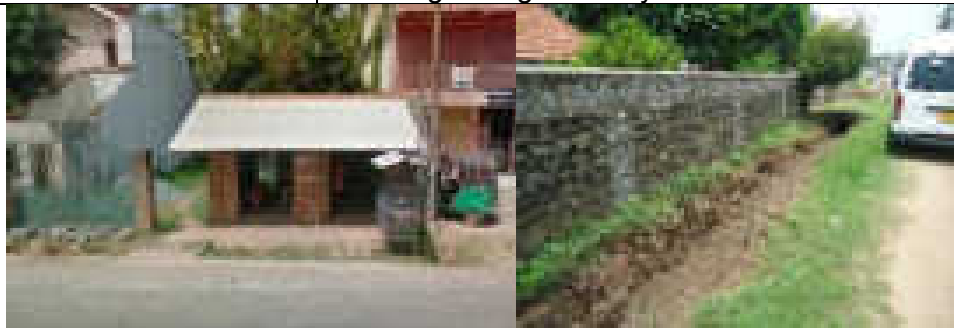



Left side				Right Side			
1. Covering From (KM):	39 Km	To:	40 Km	1. Covering From (KM):	39 Km	To:	40 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
○ D1	39+500m	39+525	25m	○ D1	39+500m	39+570m	70m
○ D2	39+900	39+950	50m	○ D2	39+850m	40+050m	200m
○ D3	39+950	40+220	270m	○ D3			
<b>3. Condition</b>	<b>D1</b> - 25 m length, box drain, partly silted, no major issues of flooding <b>D2</b> - 50 m box concrete drain, good condition water overtopping up to 2-3m to the road. Water stagnated due to the erosion of the soft shoulder is observed intermitted places. <b>D3</b> – 300m length earth drain available.			<b>3. Condition</b>	<b>D1</b> - 70m length open earth drain available <b>D2</b> - The part of the drain is construct structured and covered by vegetation with partly damaged.		
							

Left side				Right Side			
1. Covering From (KM):	40 Km	To:	41 Km	1. Covering From (KM):	40 Km	To:	41 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
○ D1	39+950	40+220	270m	○ D1	40+000	40+375	375m
○ D2	40+560	40+585	25m	○ D2	40+400	40+475	75m
○ D3				○ D3	40+800	40+850	50m
3. Condition	D1 - water overtopping up to 2-3m to the road. Water stagnated due to the erosion of the soft shoulder is observed intermitted places. D2 - 25 m length, box drain, partly silted, the slabs are damaged			3. Condition	D1 - Open concrete drain structure is available. D2 – Open concrete drain structure, found some garbage disposal nearby. D3 – Open and covered with concrete. Initially, the drain was covered with concrete slab, but currently, part of drain damaged and silted.		
							



Left side				Right Side			
1. Covering From (KM):	41 Km	To:	42 Km	1. Covering From (KM):	41 Km	To:	42 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
○ D1	No Drain			○ D1	41+300	41+390	90m
○ D2				○ D2	41+850	42	150m
○ D3				○ D3			
3. Condition				3. Condition	<b>D1</b> - Open concrete drain structure in available. <b>D2</b> - Open concrete drain structure in available.		
							

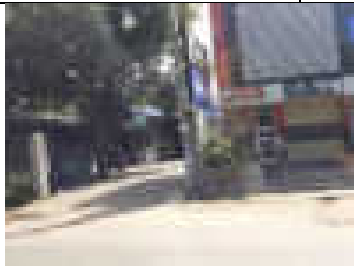

Left side				Right Side			
1. Covering From (KM):	42 Km	To:	43 Km	1. Covering From (KM):	42 Km	To:	43 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
○ D1	42+740	42+790	50m	○ D1	42+150	42+250	100m
○ D2				○ D2	42+400	40+550	150m
○ D3				○ D3			
3. Condition	D1 - 50m length, connected to culvert42/2, Earth drain and concreted, partly silted,			3. Condition	D1 - Concrete drain network available at this town area (Nainamadama town), part of the drainage is damaged and silted D2 - Open concrete drain structure partly silted		
							

Left side				Right Side			
1. Covering From (KM):	43 Km	To:	44 Km	1. Covering From (KM):	43 Km	To:	44 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
○ D1				○ D1	No Drain		
○ D2	43+525m	43+550	25m	○ D2			
○ D3				○ D3			
3. Condition	D1 - 25 m earth drain, silted and covered with vegetation. No lead way drain. Water stagnated. Flooding during the rainy season			3. Condition			
							



Left side				Right Side			
1. Covering From (KM):	44 Km	To:	45 Km	1. Covering From (KM):	44 Km	To:	45 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
○ D1	No drain			○ D1	44+900	45	100m
○ D2				○ D2			
○ D3				○ D3			
3. Condition				3. Condition	D1 - Open and covered with concrete slab drain. Basically, the drain was fully covered with concrete slab but currently, part of drain damaged and Silted.		
							




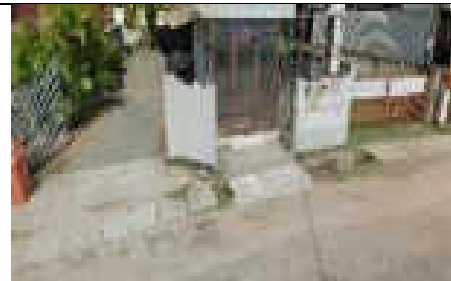

Left side				Right Side			
1. Covering From (KM):	45 Km	To:	46Km	1. Covering From (KM):	45 Km	To:	46Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
○ D1	No drain			○ D1	45+000	45+280	280m
○ D2				○ D2			
○ D3				○ D3			
3. Condition				3. Condition	D1 - Open and covered with concrete. Basically, the side walls are damaged and silted.		
							



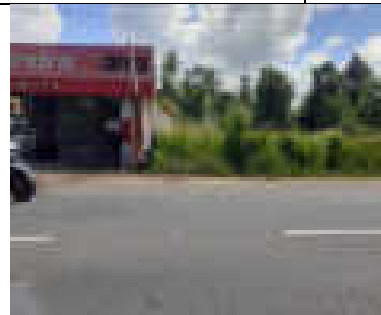
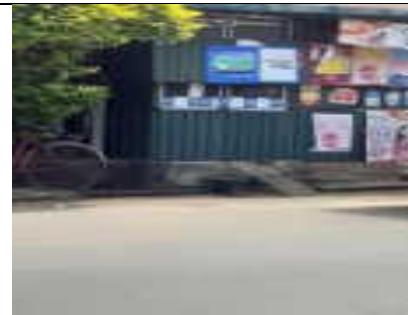
Left side				Right Side			
1. Covering From (KM):	46 Km	To:	47 Km	1. Covering From (KM):	46 Km	To:	47 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	46	46+550	550m
iii. D2				iv. D2	46+575	46+650	75m
v. D3				vi. D3			
3. Condition				3. Condition	D1 - Covered drain is covering the entire Wennappuwa town area. Majority of drain system was fully covered and some are "V" Ditch type drain		
							

Left side				Right Side			
1. Covering From (KM):	47 Km	To:	48 Km	1. Covering From (KM):	47 Km	To:	48 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	No drain		
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition				Condition			

Left side				Right Side			
1. Covering From (KM):	48 Km	To:	49Km	1. Covering From (KM):	48 Km	To:	49Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	48+300	48+400	100m	ii. D1	48+330	48+380	50m
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition	D1 - 100 Box drain, good condition, end part silted. Need improvements			3. Condition	D1 - Open concrete drain structure. Partly damaged and silted. This drain is located in the market area. Dumping of solid waste into the drain is observed.		
							

Left side				Right Side			
1. Covering From (KM):	49 Km	To:	54 Km	1. Covering From (KM):	49 Km	To:	54 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	No drain		
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition				Condition			

Left side				Right Side			
1. Covering From (KM):	54 Km	To:	55 Km	1. Covering From (KM):	54 Km	To:	55 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	54+330	54+460	130m	ii. D1	54+400	54+550	150m
iii. D2				iv. D2	54+600	54+650	50m
v. D3				vi. D3			
3. Condition	D1 - 130m, Box drain, most of the area is covered. However, certain areas are kept open. The open drain has a threaten to the safety of the pedestrians. The drain turns to Church road towards left side			3. Condition	D1 - Concrete drain structure (Marawila Town Area). In some segment that open is observed with some of damaged system and silted. D2 - Concrete v ditch drain system continue with D1		
							
Left side				Right Side			
1. Covering From (KM):	55 Km	To:	59 Km	1. Covering From (KM):	55 Km	To:	59 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	No drain		
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition				Condition			




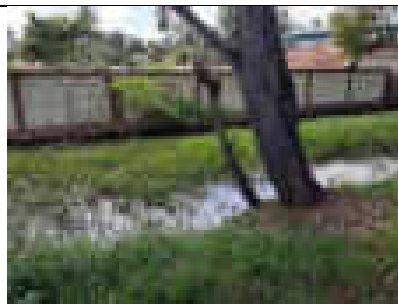

Left side				Right Side			
1. Covering From (KM):	59 Km	To:	60 Km	1. Covering From (KM):	59 Km	To:	60 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	59+140	59+340	200m	ii. D1	59+360	59+440	80m
iii. D2	59+390	59+700	410m	iv. D2	59+450	59+625	175m
v. D3	59+720	59+760	40m	vi. D3			
3. Condition	<p><b>D1</b> - 200m box drain, in good condition, partly silted, part of the drain is covered. Located near Mahawewa. Water directed to Left side through the DS office.</p> <p><b>D2</b> - Open box drain. The drain start at 62/3 culvert and ends at the Doduwawa Junction and continue to Left hand side of the Duduwawa road. The access to the houses and shops are covered with the slabs. In good condition. Overflowing is not reported.</p> <p><b>D3</b> - Continue from the right hand side of the Duduwawa road and end at the bridge 62/3. Box culvert, open and access to the shops are covered.</p>			Condition	<p><b>D1</b> - Earth Drain (Near the Mahawewa) and silted.</p> <p><b>D1</b> - Open and covered concrete drain. This segment covers Mahawewa Town where commercial activities are taking a place. Majority of drain systems are damaged and silted.</p>		
							
							

Left side				Right Side			
1. Covering From (KM):	60 Km	To:	61 Km	1. Covering From (KM):	60 Km	To:	61 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	No drain		
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition				Condition			

Left side				Right Side			
1. Covering From (KM):	61 Km	To:	62 Km	1. Covering From (KM):	61 Km	To:	62 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	61+710	61+720	10m	ii. D1	61+750	62	250m
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition	<b>D1</b> - Box drain. Covered for access for the houses and shops. Located in the Old Madampe Town. Waste water from the houses are discharged to this drain. The drain connects to culvert 62/1. Mosquito breeding is observed. Bad smell from the stagnated water was felt.			3. Condition	<b>D1 – part of the drain is covered.</b> This segment covers Madampe Town. Drains are damaged and silted.		


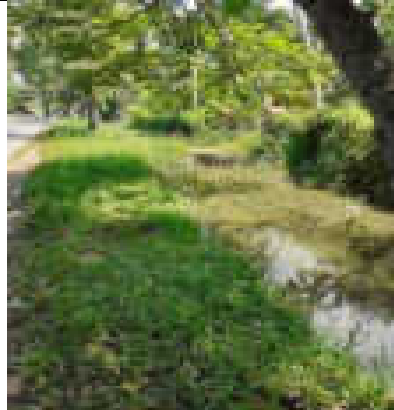




Left side				Right Side			
1. Covering From (KM):	62 Km	To:	63 Km	1. Covering From (KM):	62 Km	To:	63 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	62+340	62+400	60m	ii. D1	62+380	62+830	450m
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition	D1 - Located at the end of Old Madampe town. Open drain damaged. Water from houses and shops discharge to the drain. This drain ending in a paddy land			3. Condition	D1 - The main earth drain start from Madampe Junction and continue. The drains are damaged. The main earth drain starts at the point as mentioned above and it continued. Majority of drain area was silted, particularly, the cemetery area coming next to the junction and Madampe Murugan Kovil areas were fully silted.		


							
							
Left side				Right Side			
1. Covering From (KM):	63 Km	To:	64 Km	1. Covering From (KM):	63 Km	To:	64 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
D1	63+300	63+390	90m		63	64	
D2	63+950	64+000	50m				
3. Condition	D1 - Earth drain, covered with vegetation			3. Condition	D1 – This drain continues from previous section. Earth drain about 1.5 m width. Water stagnated due to lack of lead way darins .		

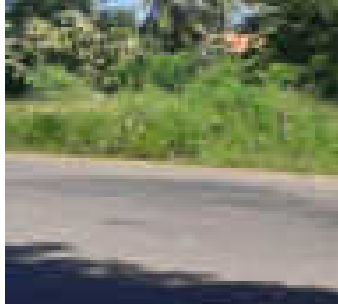







Left side				Right Side			
1. Covering From (KM):	64 Km	To:	65 Km	1. Covering From (KM):	64 Km	To:	65 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	64	64+800	800m
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition				3. Condition	D1 - Madampe murugan kovil religious places covered within this area. Open earth drain. Bunds are damaged		
							


Left side				Right Side			
1. Covering From (KM):	65 Km	To:	66 Km	1. Covering From (KM):	65 Km	To:	66 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	65+750	66	250m	ii. D1	65	66	1km
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition	Earth drain			3. Condition	D1 – Earth drain, silted. Stagnation of water.		
							

Left side				Right Side			
1. Covering From (KM):	66 Km	To:	67 Km	1. Covering From (KM):	66 Km	To:	67 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	66	66	1km
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition				3. Condition	D1 – Earth drain, silted. Above drain continued		
							



Left side				Right Side			
1. Covering From (KM):	67 Km	To:	68 Km	1. Covering From (KM):	67 Km	To:	68 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	67	67+200	200m
iii. D2				iv. D2	67+500	67+860	360m
v. D3				vi. D3			
3. Condition				3. Condition	D1 - Earth drain, covered with vegetation and silted.		
							

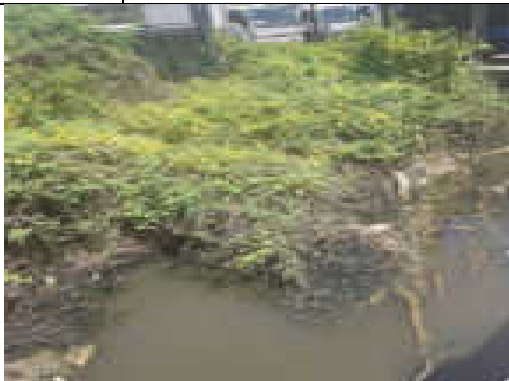
Left side				Right Side			
1. Covering From (KM):	68 Km	To:	69 Km	1. Covering From (KM):	68 Km	To:	69 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	68+125	68+550	425m
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition				Condition	D1 - Earth drain - End in Culvert drain No -69/1 and further continues		
							



Left side				Right Side			
1. Covering From (KM):	69 Km	To:	70 Km	1. Covering From (KM):	69 Km	To:	70 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	69+220	69+370	150m
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition				Condition	D1 - D1 - Earth drain road side wall is concreted. Partly covered with vegetation and silted.		
							



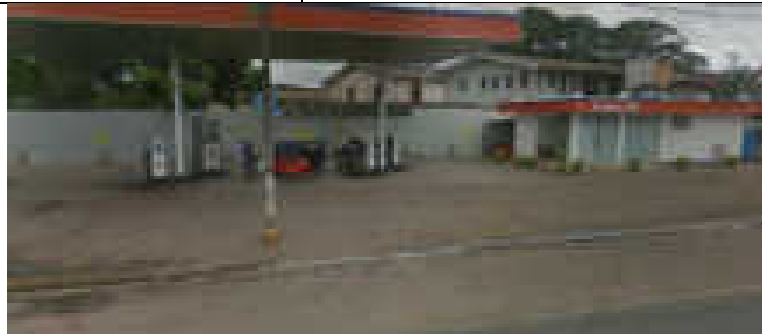
Left side				Right Side			
1. Covering From (KM):	70 Km	To:	71 Km	1. Covering From (KM):	70 Km	To:	71 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	70+700	70+900	200m	ii. D1	70+300	71+200	100m
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition	Earth Drain. Boundary wall constructed along the left-hand side			Condition	D1 - Earth drain was available -covered by vegetation and silted.		
							




Left side				Right Side			
1. Covering From (KM):	71 Km	To:	72 Km	1. Covering From (KM):	71 Km	To:	72 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	71+690	71+915	225m	ii. D1	71+200	71+660	460m
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition	A bout 50m drain has concreted and covered for the access purposes			Condition	D1 - Earth drain -End in Culvert drain No - 72/1 and continue		
							
							



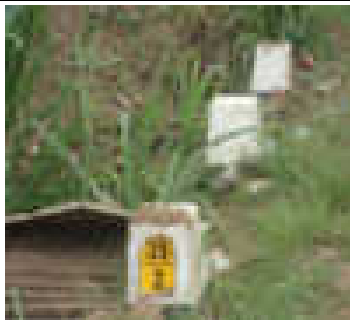


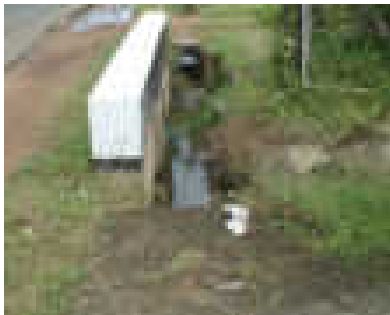


Left side				Right Side			
1. Covering From (KM):	72 Km	To:	73 Km	1. Covering From (KM):	72 Km	To:	73 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	No drain			ii. D1	72	72+100	100m
iii. D2				iv. D2	72+100	72+570	470m
v. D3				vi. D3			
3. Condition				Condition	<b>D1</b> - Earth drain -covered by vegetation and silted. <b>D2</b> - Earth drain		
							







Left side				Right Side			
1. Covering From (KM):	73 Km	To:	74 Km	1. Covering From (KM):	73 Km	To:	74 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	73+520	73+975	455m	ii. D1	73+600	73+825	225m
iii. D2				iv. D2	73+900	74+150	250m
v. D3				vi. D3			
3. Condition	D1 - The Drain is located within the Chilaw town. Concrete drain with covered slab. Starts from Ananda Mawatha and ends at 72/3 culvert			Condition	D1 - The located within the Chilaw town. D2 - Concrete drain partly covered with concrete slab. Siltered		
							

Left side				Right Side			
1. Covering From (KM):	74 Km	To:	75 Km	1. Covering From (KM):	74 Km	To:	75 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	74+480	74+675		ii. D1	74+400	74+500	100m
iii. D2	74+965	75+105		iv. D2			
v. D3				vi. D3			
3. Condition	D1 - Box drain, open drain, covered only for the access. Certain points the drain is damaged. Need improvement.  D2 - Concrete Drain			Condition	D1 - Concrete v ditch		
							
							





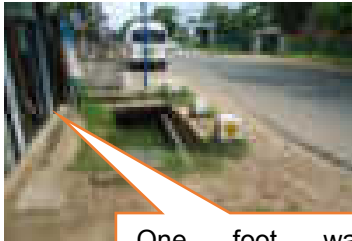

Left side				Right Side			
1. Covering From (KM):	75 Km	To:	76 Km	1. Covering From (KM):	75 Km	To:	76 Km
2. Details of Drainage	Start	End	Length	2. Details of Drainage	Start	End	Length
i. D1	75+110	75+150	40m	ii. D1	No drain		
iii. D2				iv. D2			
v. D3				vi. D3			
3. Condition	D1 - Earther Drain			Condition			
							


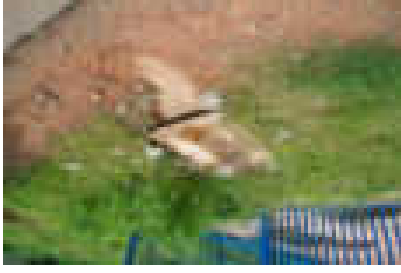





**ANNEX IV.3**  
**Culvert Conditions**

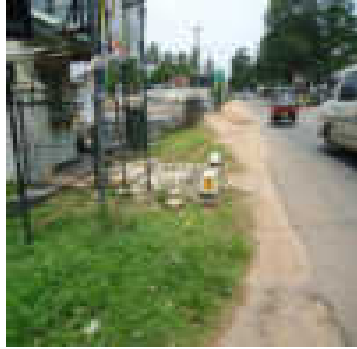


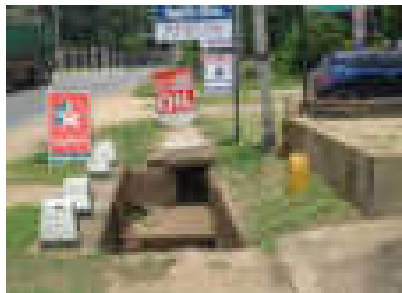
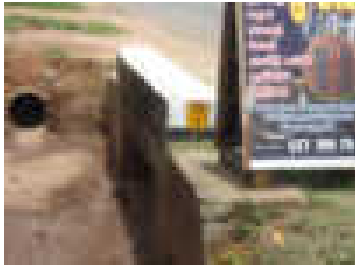

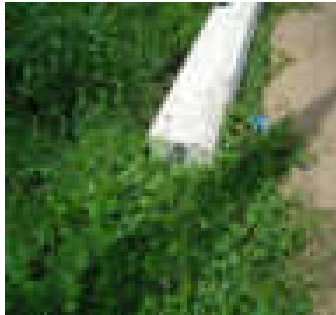

Culvert No.	Chainage	Left	Right
39/1		Lead way drain partly blocked, Water stagnated	Culverts blocked and water stagnating
Culvert with two Hume pipe each about 1m dia, One completely blocked	38+100		
39/2		Completely silted	Inlet clear
About 1 m diameter Hume pipe culvert, 4 m length	38+400		
40/1		Partly silted	Stagnation of water due to siltation in the culvert
Two box culverts, each 1.25 span. About 4 m length	39+500		
			
40/2		Partly silted. Stagnation of water due to siltation of road drains	Partly silted. Stagnation of water due to siltation in the culvert. The feeding canal is blocked by vegetation









Culvert No.	Chainage	Left	Right
1m diameter Hume pipe culvert, the structure is in good conditions	39+800		
40/3		lead canal partly blocked, Water stagnated	Culvert partly blocked due to siltation. Water stagnated
Hume pipe. .75 dia	39+900		
40/4		Completely silted and blocked by dumping of construction materials by the near by resident. Lead way drain completely blocked and silted	The culvert is feed only from northern side. Silted
1m dia Hume pipe			



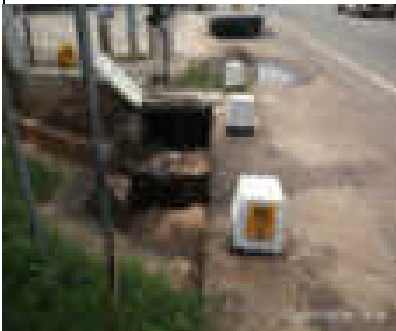
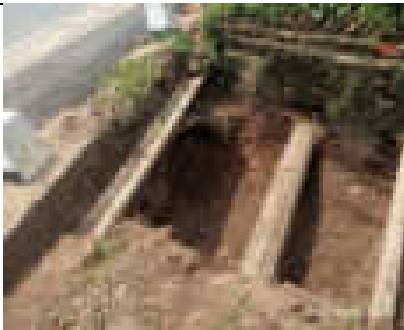













Culvert No.	Chainage	Left	Right
			
41/1		The drain is covered by the shop owner. The water goes along the Bolawatte Junction where there is no proper drainage. Flooding during the rainy season	Partly blocked by due to siltation
Box culvert 5 m length	40+200		
41/3		Completely Blocked due to siltation. The neighboring shops and house get flooded up to one foot at the shop and two feet at the houses. Details included in the flood report	The culverts are blocked
	40+800	 <div> <p>One foot wall constructed to avoid water entering to the shop</p> </div>	
42/1		Culvert could not be seen	The covert is completely closed









Culvert No.	Chainage	Left	Right
Culvert could not be seen about 2 m length	41+100		
42/2		Completely blocked. Lead way drain goes through a private property	Completely blocked with siltation and vegetation
Size can not be seen	41+400		
42/3		The walkway has been damaged and threaten to the pedestrians who are using the bridge.	The R side is in good condition
Gin Oya Bridge, 100m length, the surface has some damages. The bridge joints are exposed			
	41+600		
43/1		Completely blocked by the concrete cover by the private party	Partly silted.


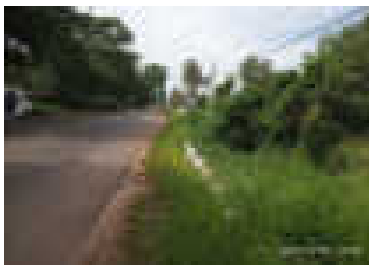
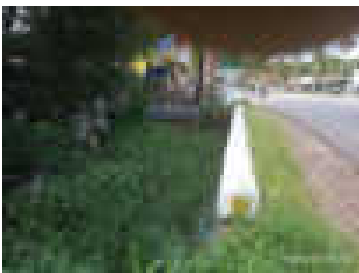


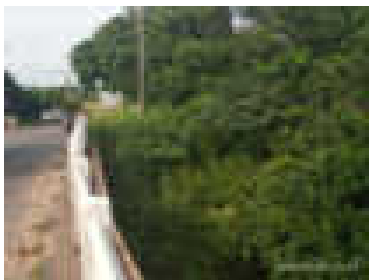


Culvert No.	Chainage	Left	Right
Hume pipe culvert. 1 m dia. Culvert is in good condition	42+100		
43/2		Cleaned recently.	Cleaned and good condition
1m dia, home pipe, 3 m length	42+400		
43/3		Level different. Outlet drain is higher than the culvert outlet. Siltation observed.	The inlet drains in both sites silted. Possibility of overtopping water
Box culvert. About 1 m span. Good condition	42+700		
48/1		Half drain silted	No flow, stagnation of water
Box culvert. About 1 m span. Good condition	47+800		

Culvert No.	Chainage	Left	Right
			
50/1		Completely silted. Water stagnation like a pit.	Completely silted
About 3 meter length. Culvert type could not be seen. No lead drain. According to the people in the vicinity a water supply pipe line is going through this culver.	49+300		
51/1		completely Blocked	Completely Blocked
No culvert could be seen. About 3 meter length. No lead drain.			
54/1		Completely Blocked	Completely Blocked
The culvert could not be seen. About 4m length	54+000		
56/1		Completely Blocked	Completely Blocked



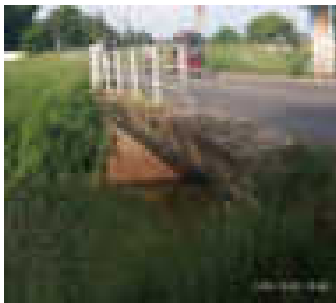

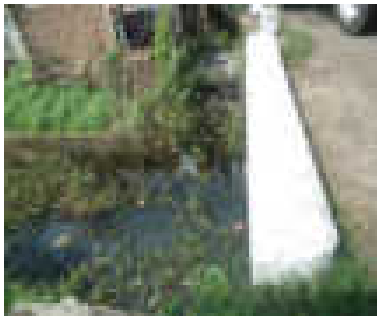

Culvert No.	Chainage	Left	Right
The culvert could not be seen	55+600		
60/2		Half of the culvert Blocked.	Completely Blocked. Recently clean the inlet drain
Located in the Mahawewa town. Hume pipe 1m dia.	59+300		
			
60/3		Covered by the shop owner	Outlet clean, no stagnation
1m dia Hume pipe, good condition	59+500		
60/4		Partly silted and vegetation covered in the lead canal	Blocked with water hyacinth





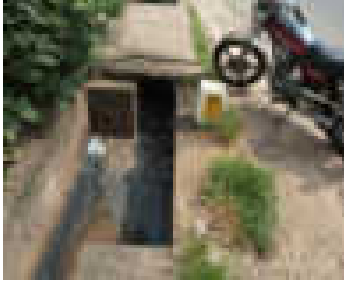

Culvert No.	Chainage	Left	Right
Bridge about 5 m span. Good condition	59+700		
			Left blank intentionally
61/1			
Bridge. 30 m length, in good condition	60+100		
			



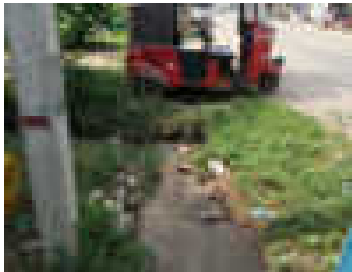
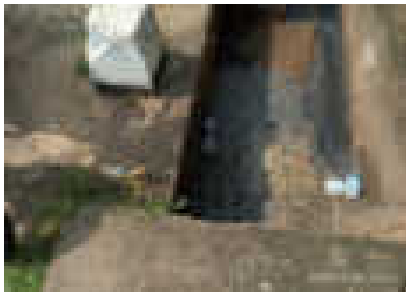

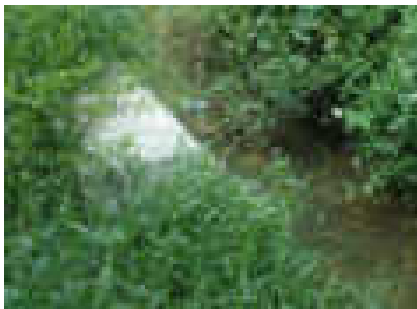
Culvert No.	Chainage	Left	Right
			
61/2		Half silted	Covered with vegetation
Bridge. About 8m length.	60+200		
61/3			
5 m length. Span 3 m. Box culvert	60+300		
61/4		Partly silted	Covered with vegetation
10 m length. Three Hume pipe culvert	60+600		



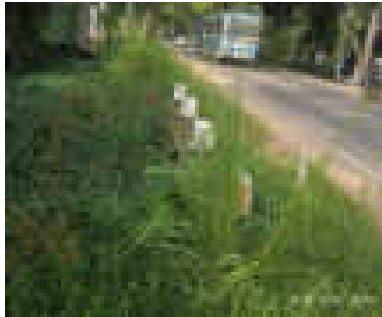
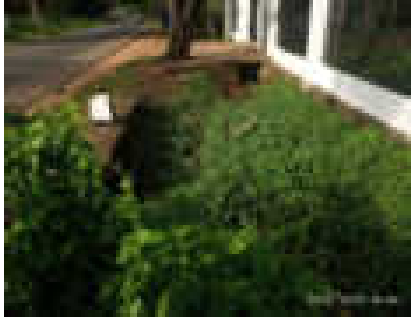


Culvert No.	Chainage	Left	Right
			
61/5		Completely silted and blocked. Covered with vegetation	Partly blocked and covered with vegetataion
4 Box culverts, about 15 m length	60+800		
62/1		Blocked with vegetation	Blocked with vegetation
Karabalan Oya (Lunu Oya), Bridge about 80 m. Bridge surface has some small potholes			
62/2		Blocked with vegetation	Blocked with vegetation
several small culverts, 100 m	61+300		
62/3		Blocked with vegetation	Partly open




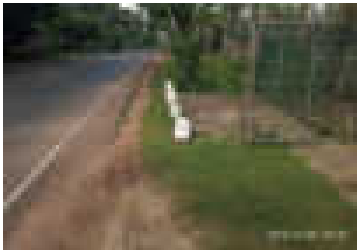











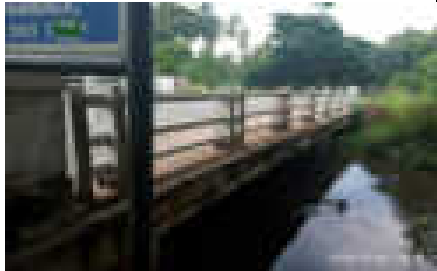




Culvert No.	Chainage	Left	Right
5 m dia culverts. Good conditions. 10 m length	61+300		
62/4		Partly block by the vegetation, hand drains damaged	No blocks attached to the Thinipitiya wewa
Bridge-spill from Thinipitiya wewa is discharge through this bridge for the downstream paddy cultivation. 10 m length	61+500		
62/5		Completely stagnated. The wastewater from the Old Madampe town is directed to the canal	A slues structure is available to regulate the Thinipitiya Wewa water
Located near Madampe Town. The bridge is used for the discharge of water from the Thinipitiya Wewa for agricultural purposes	61+600		

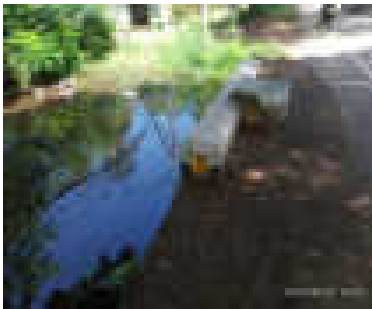


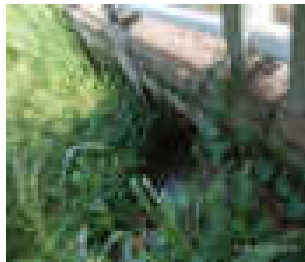
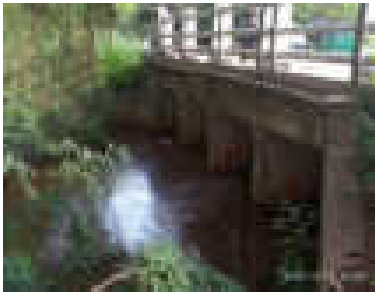



Culvert No.	Chainage	Left	Right
			
62/6		Completely blocked and the stagnation of wastewater from the near by residence and shops discharges in to the road drain	Completely blocked and the stagnation of wastewater from the near by residence and shops discharges in to the road drain
0.75 dia Hume pipe culvert.	61+800		
63/1		Covered. Block with the sludge due to waste water discharge	Covered. Block with the sludge due to waste water discharge
Infront of Madampe town, about 3 m length. 07.57 dia Hume pipe	62+100		
63/2			





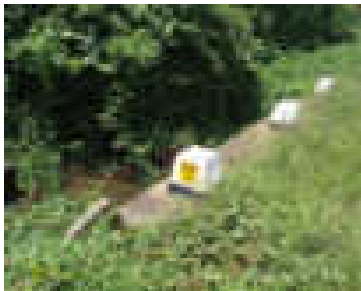



Culvert No.	Chainage	Left	Right
Located in the near Madampe Town. 2m length. Type of culvert could not be seen due to the bridge is used for the discharge of water from the Thinipitiya Wewa for agricultural purposes	62+200		
63/3		The culvert could not be seen	Covered. Culvert Could not be seen
Located in the Old Madampe Town. The drains are filled with the sludge from the waste water discharged from the Houses and shops	62+300		
63/4		The culvert is partly silted and water stagnation is observed	Covered with vegetation. Water stagnation
Box Culvert. About 3 m long.	62+800		
64/1		lead drain blocked. Water flow ,limited	inlet canal silted. Water stagnated.

Culvert No.	Chainage	Left	Right
5m length, 3 Hume pipes	63+200		
64/2		Completely blocked by the vegetation	Completely Blocked
Culvert could not be seen due to the coverage of vegetation	63+300		
65/1		Partly blocked	
Box culvert, 1.5 m span, good condition, 5 m length	64+010		
65/2		Partly blocked and water stagnated	Partly blocked





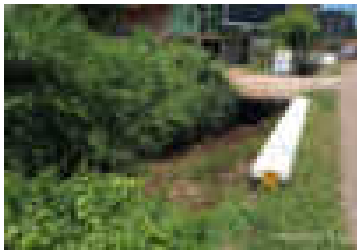

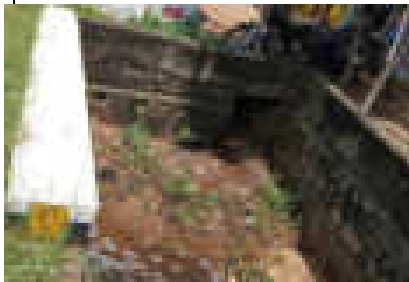



Culvert No.	Chainage	Left	Right
4 Hume pipe culverts, 10 m length	64+500		
65/3		Blocked. Covered with covered slues	
2 Hume pipes, .75 m dia	64+700		
65/4		Partly blocked	Partly Blocked
Box culvert, 1 m span, good condition, 3 m length	64+900		
66/1		Silted and blocked by the vegetation	Blocked by the vegetation
Box culvert. 1.5 m span	65+600		
67/1		Silted and blocked by the vegetation	Silted and blocked by variation





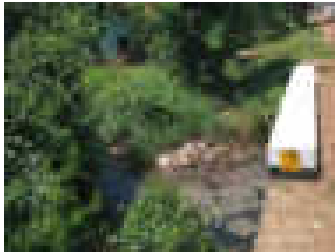


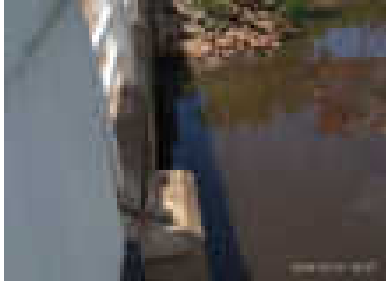
Culvert No.	Chainage	Left	Right
2 Hume pipes, 1 m dia, 6 m length	66+200		
			
67/2		Blocked by the vegetation	Cleaned. Water stagnation
Bridge 6m length	66+600		
			
			


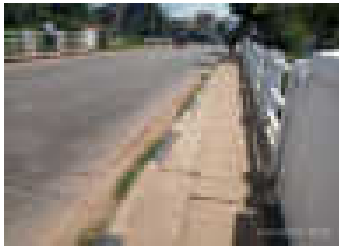





Culvert No.	Chainage	Left	Right
67/3		Blocked	Clean water not flowing
Box culvert 2m span, 4 m length	66+700		
67/4		Block with siltation	Clean but, no water flow and stagnated
4 Box culvert each 2m span, 8m length	66+900		
			
67/5		Covered with vegetation	Completely silted
Box culvert, 4 m length	66+970		
67/6			


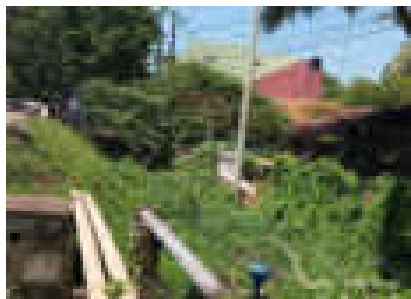






Culvert No.	Chainage	Left	Right
			
68/1		Covered with vegetation	Covered with vegetation
Covered with vegetation	67+200		
68/2		Covered with vegetation	Cover with Vegetation
5m length, Box culvert.	67+700		
69/1		Partly Silted, and covered with vegetation	Stagnation of water observed.
4m length, Box culverts	68+500		













Culvert No.	Chainage	Left	Right
			
69/2		Completely covered with vegetation	Completely covered with vegetation
5m length, Type of culvert could not be seen	68+600		
70/1		Partly silted	Partly silted
6 m length, Box culvert	69+300		
70/2		Good condition. No blockage major siltation	Good condition. No blockage major siltation
5 m Box culvert	69+600		
70/3			
5m length	69+900		

Culvert No.	Chainage	Left	Right
71/1		Lead drains is clear.	Lead drains is clear.
5m length, Box culvert	70+800		
72/1		Feeding Darin silted and water stagnated in the area	Lead canel siltered and polluted water stagnated
10 length, 3 hume pipe	71+200		
72/2		Lead Darin silted and water stagnated in the area	Feeding canal silted and water stagnated
5m box culvert. Waterwater from the near by residence discharge to the canal and bad smell felt.	71+500		
72/3		Lead drains is clear.	Feading canal clear and water flow was observed
Bridge, 15m length, surface is in good condition, Walkway in good condition	71+970		

Culvert No.	Chainage	Left	Right
			Left blank intentionally
			
73/1		Lead Canal Stagnated	Inlet clear
5m length	72+200		
73/2		partly silted	Partly silted. Vegetaion cover also observed
5m length	72+600		

Culvert No.	Chainage	Left	Right
			
73/3		partly silted	partly silted, water stagnation is observed
5m length	72+960		
			
74/1		Some cracks observed in the wall	Good conditions
3m length	73+400		
			Left blank intentionally

Culvert No.	Chainage	Left	Right
74/2		Partly silted	Completely silted
Bridge, 10m length located in the Chilaw Town	73+800		
76/1		Damage embankment	Completely covered with vegetation
50m, Bridge,	75+200		
			Left blank intentionally
76/2		Partly silted	Partly silted
About 6 m, Bridge			

Culvert No.	Chainage	Left	Right
76/3		Filled with water and water plants	Covered with vegetation
Hume pipe culvert, could not see the size due to stagnation of water			
			Left blank intentionally

**ANNEX IV.4**  
**Rain Fall Data at the Marawila Rainfall Station**

### Rain fall data at the Marawila Rainfall station

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<b>1995</b>	NA	NA	NA	NA	NA	NA	0	26	38	153	483	14
<b>1996</b>	0	159	24	197	132	101	71	159	55	198	254	133
<b>1997</b>	0	5	47	158	148	74	171	10	263	585	358	152
<b>1998</b>	0	0	88	213	180	65	24	99	44	258	144	271
<b>1999</b>	53	22	0	136	169	15	16	10	26	550	209	3
<b>2000</b>	41	102	166	116	64	57	0	133	117	104	63	106
<b>2001</b>	110	93	0	250	106	20	6	18	158	107	158	69
<b>2002</b>	0	8	79	330	158	43	0	16	77	537	266	105
<b>2003</b>	122	19	166	144	90	175	71	7	93	340	142	1
<b>2004</b>	0	1	10	127	148	94	78	29	212	414	424	113
<b>2005</b>	30	24	152	127	123	90	86	2	17	348	357	103
<b>2006</b>	105	2	79	55	214	143	25	146	83	668	NA	49
<b>2007</b>	3	0	56	217	131	86	27	93	88	211	73	174
<b>2008</b>	12	80	189	133	79	47	88	61	652	652	193	47
<b>2009</b>	25	29	196	182	50	85	57	56	156	66	325	193
<b>2010</b>	1	0	51	185	221	75	41	7	157	91	406	168
<b>2011</b>	9	18	38	172	98	66	25	45	48	269	187	60
<b>2012</b>	0	75	42	172	1	86	25	69	52	409	242	NA
<b>2013</b>	116	60	103	78	215	132	50	30	98	93	78	26
<b>2014</b>	17	0	81	74	151	102	71	101	151	190	198	226
<b>2015</b>	0	0	140	139	157	135	0	2	183	259	279	266
<b>2016</b>	0	57	48	44	268	63	39	4	NA	89	174	12
<b>2017</b>	13	12	133	0	60	142	21	23	214	228	206	47
<b>2018</b>	10	53	76	261	495	91	10	32	44	314	192	163
<b>2019</b>	0	44	4	57	223	185	59	204	NA	NA	NA	NA
<b>Mean</b>	<b>28</b>	<b>36</b>	<b>82</b>	<b>149</b>	<b>153</b>	<b>90</b>	<b>42</b>	<b>55</b>	<b>131</b>	<b>297</b>	<b>225</b>	<b>109</b>

**Note;** NA- Note available

**Source:** Metrological Department



**ANNEX IV.5**  
**Details of Water Bodies in the project area**

## Details of Water Bodies in the project area

Figure 1- Maha Oya



Figure 2- Location of the Gin Oya

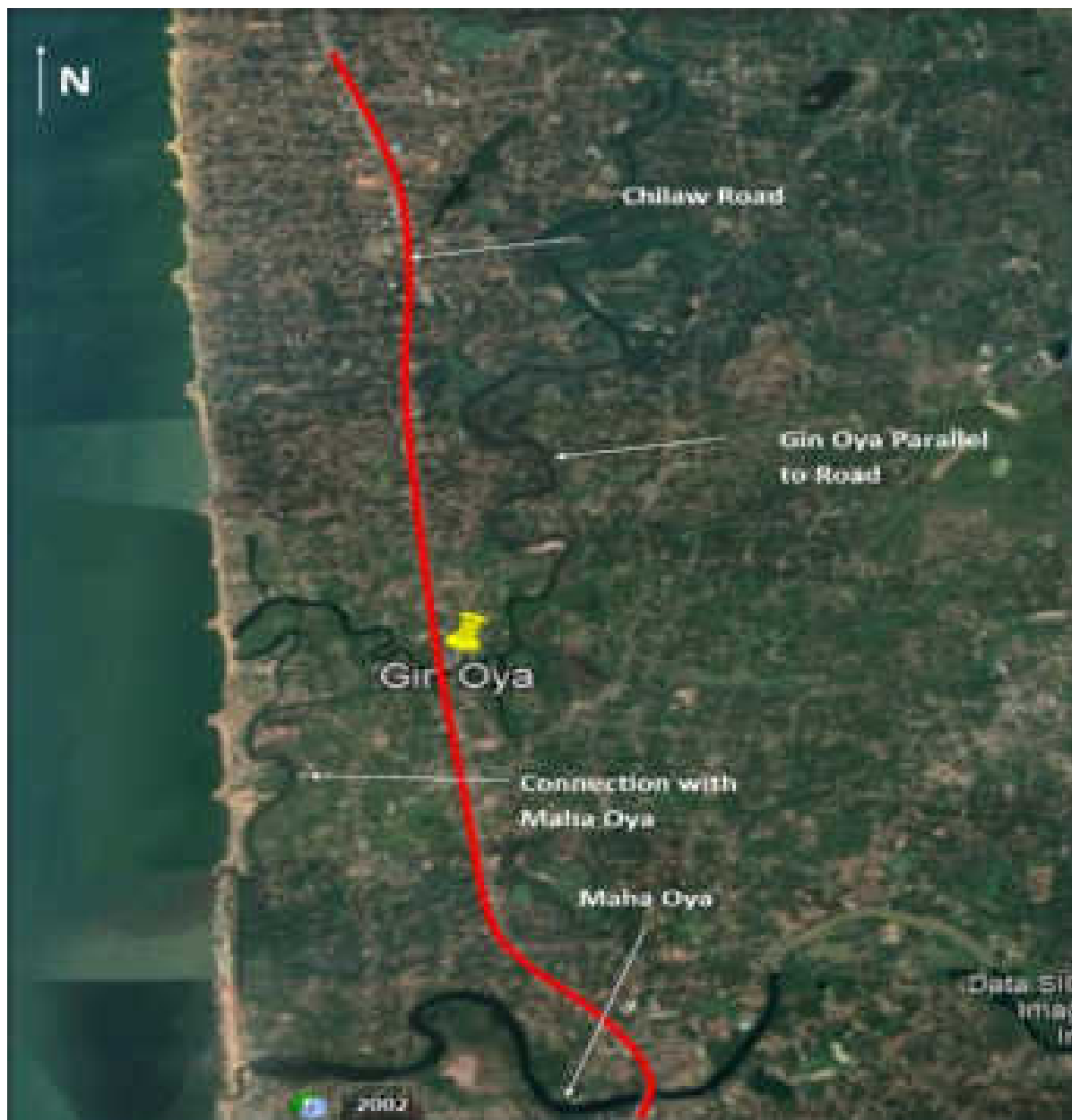
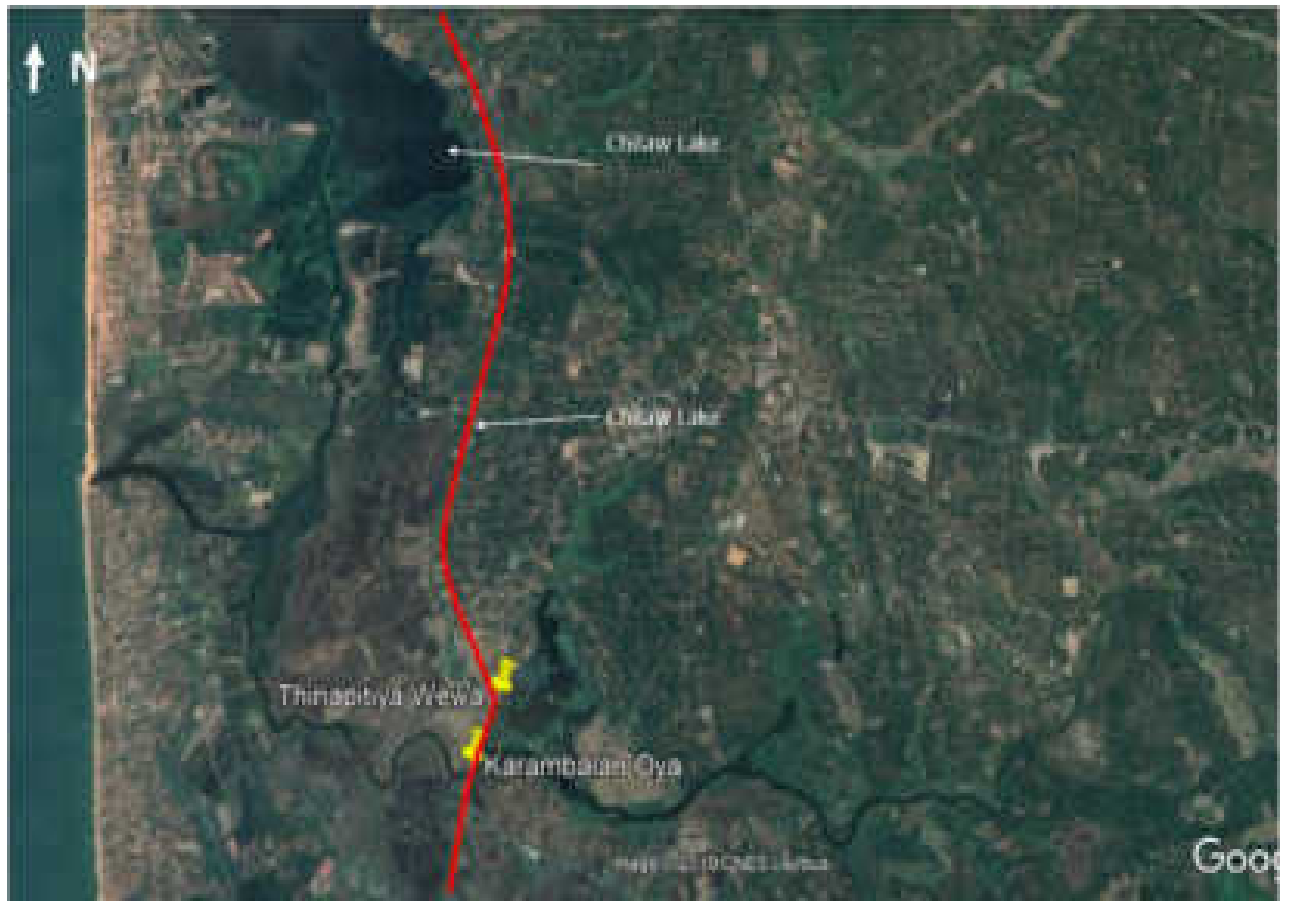


Figure 3- Location of the Karambalan Oya



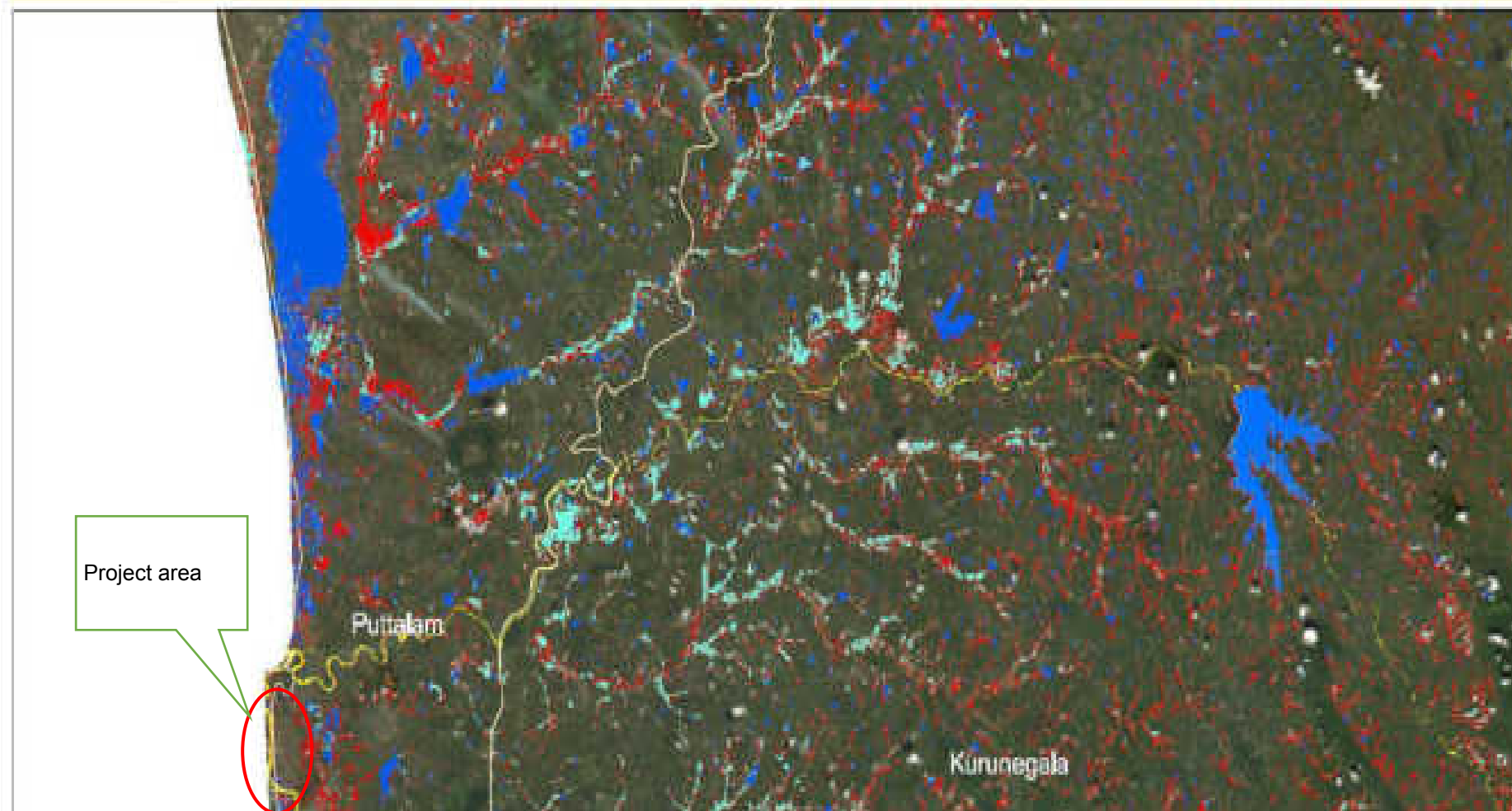
**ANNEX IV.6**  
**Flood Map Puttalam District - 2006**

1000

[illegible]

**ANNEX IV.7**  
**Flood map Puttalam Disdtrict 2018**

## Flood Situation of Gampaha, Puttalam, and Kurunegala district on 23&25 May, 2018





ANNEX IV.8  
**Water Quality Reports**

**Baseline Environmental (Water Quality) Monitoring Report**  
**Rehabilitation and Improvement of Peliyagoda-Puttalam Road (A 003)**

Prepared for

EML Consultants,  
6/30, Raja Maha Vihara Road,  
Puttalam.

Conducted by



On

18 October 2019.

CEA Registered Consultant / Specialist (07/LM/Cons/76/2011)

Reference No: 10101803739

  
Contact to Mr.

manager@labenvi.com, manager.elcs@gmail.com,

www.labenvi.com

0113684342, 0712733779, 0778351657, 0716400365, 0775174778

  
Environmental Laboratory  
& Consultancy Services (ELCS),  
205/173, Mandana Road,  
Colombo 15, Sri Lanka.  
Tel: 0112388342



# **Water Quality Monitoring**

## **Surface Water**

### **&**

## **Groundwater Monitoring**

## 6. Surface Water and Groundwater Quality Monitoring

Table 11: Sampling of Surface Water

18 October 2019	18 October 2019
Ground Water @ 8 <sup>th</sup> Lane, Malpura, Rumangala Road, Orissa	Surface Water @Therapathya Taluk (Wynad), Near 62 KM Post
N 7.377375, E 79.846	N 7.475175, E 79.88028
	
18 October 2019	18 October 2019
Ground Water @ Welahasthya Road, Malpura near School	Surface Water @ Van Cope Bridge
N 7.425310, E 79.880192	N 7.47517, E 79.914



19 October 2019	
Ground Water @185 A, Happonakata East, Nukuunono	
N 7.1754, E 16.505	
	

TABLE - I



**Environmental Laboratory  
& Consultancy Services (ELCS)**

ISO 9001:2015 Certified Laboratory & Consultancy

ISO Registered No. 0221005467/0221005467/0221005467/0221005467



ISO 9001:2015  
0221005467

Lab Reference No. 1000000000

### Test Report

Date Reported: 07<sup>th</sup> October 2019

Customer Name	: ELCS Consultants,	Collected By	: SI Separation - ELCS		
Address	: No. 6/15, Naga Mahal Vihar Road, 3rd Jayawanthipuram, Kothur	Date & Time of Lab	: 04.10.2019 @ 10:00hrs		
Sample Point	: Effluent - Wash	Date Analysis Started	: 25.10.2019		
Date & Time Sampled	: 18.10.2019 @ 10:00hrs	Date Analysis Completed	: 01.11.2019		
Item	: Ground Water	Weather @ Site	: Sunny		
		Appearance	: Slightly Turbid		
Parameters	Unit	Test Method	Test Results	ISIRI	ISIRI (K-1)
pH @ Site		APHA 4500 H <sub>2</sub> O	6.9	5.0-9.0	6.00
Temperature @ Site	°C	APHA 2550 B	27.3	5-40	1.86
Dissolved Conductivity (µS/cm)	µS/cm	APHA 2510 B	2010	0-10000	2.2
Dissolved Oxygen at Site	mg/l	APHA 4500 O <sub>2</sub> C	0.13	1.0	1.8
Total Dissolved Solids at 180°C	mg/l	APHA 2540 C	540	0	1.80
Dissolved Oxygen Demand	As mg O <sub>2</sub> /l	APHA 5210 D	0.4	20-100	0.47
Biochemical Oxygen Demand	mg/l	APHA 5210 B/ 5210 D/ 5210 E	0.0	0-1000	1.00
Oil & Grease	mg/l	APHA 5520 B/ 5520 D	<0.2	0.2	1.00
Total Phosphate as PO <sub>4</sub> -P	mg/l	ISO 6469:2005	0.00	-	-
Total Nitrate as NO <sub>3</sub> -N	mg/l	ISO 6469:2005	0.0	-	-
TSS	mg/l	ISO 5963 Part 1:2013	<1000	-	-
Percent Solids	mg/l	ISO 5963 Part 1:2013	100	-	-

Parameters in Bold do not cover accreditation, ISO - Test of detection, SI Expanded Uncertainty

- Sampling as per APHA 2200 A, B & C of 1995 Edition, 1917
- APHA Standard Methods for the Examination of Water and Wastewater, 19<sup>th</sup> Edition, 2012
- ISO, Below Detection Limit

Analysis were carried out by Chief Chemist S.S. Srinivasulu

Chief Chemist

Laboratory Manager  
S. Subramanyam

Authorised Signatory, ISO  
Lead Auditor

Content of this report shall not be published in total or part without written approval of Laboratory Manager, ELCS

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© 2006 Blackwell Publishing Ltd *Journal of Internal Medicine* 260: 393–400

**David M. Weisberg**

• Customer Name	100, Consultants	• Collected By	Dr. Desalegn - 01/25
• Address	No. 4/10, Raju Water Office Road, Ad. Bageremariam, Addis	• Date & Time in Lab	19.07.2019 @ 10:10hrs
• Sample Point	Thrombolytic Tank (Internal)	• Date Analysis Started	19.07.2019
• Date & Time Analyzed	19.12.2019 @ 14:00hrs	• Date Analysis Completed	19.12.2019
• Item	Surface Water	• Weather @ Site	Sunny
		• Appearance	Slightly Turbid

Parameter	Unit	Test Method	Test Results	SDS	Std (10-20)
pH @ Site	-	APHA 8000B, B	6.99	7.0-8.0	6.0-8.0
Temperature @ Site	°C	APHA 7500 B	27.2	5-30	5-30
Electrical Conductivity (EC)	µS/cm	APHA 7510 B	280	0-10000	0-5
Dissolved Oxygen @ Site	mg/l	APHA 4500 O-0	6.7	0.0	1.5
Total Dissolved Solids @ 180°C	mg/l	APHA 7500-C	179	0	0.00
Chlorine Residual Demand	mg/l Cl <sub>2</sub>	APHA 8210 B	0	0.5-5.0	0.0-1
biochemical Oxygen Demand	mg/l	APHA 5210 B/ 5210 C	0	0.000	0.00
Oil & Grease	mg/l	APHA 5520 B/ 5510 C	0.0	0.1	0.00
Total Phosphate as PO <sub>4</sub> -P	mg/l	ASAP-09, 2003	0.77	-	-
Total Nitrate as NO <sub>3</sub> -N	mg/l	ASAP-09, 2003	0.01	-	-
EC @	APHA 2510B	6.9-8.0 (APHA 2012)	0.000	-	-
Residual Chlorine	APHA 7510B	0.1-0.05 (APHA 2012)	0.00	-	-

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- a. *APDS Standard Methods for the Examination of Water and Wastewater*, 19<sup>th</sup> Edition, 2005

Reactions were carried out by Chel Chemists Ltd. Birmingham



Operating Manager  
M. Subramanian

Authorized Signature, ASD  
and Identification

Consent of the report shall not be published or used in any other written document of the company without the consent of the company's management.

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# **Environmental Laboratory & Consultancy Services (ELCS)**

ISO 9001:2015 Certified for Environmental Management



Member since  
2018

ISO Registered No: 807045, 807046, 807047, 807048 & 807049 (rev) / 747011

Lab Reference No: ELCS/0001790

Date Reported: 07<sup>th</sup> October 2019

## **Test Report**

Customer Name	ELCS Consultancy	Collected By	N. Rajaguru - ELCS
Address	No. 1215, Raja Moha Vikasa Road, Giriparambathur, Kallur	Date & Time to Lab	24.09.2019 @ 10:00hrs
Sample Point	Widhathupuzha Road, Pottuvayyil Road	Tests Analyzed Started	25.09.2019
Date & Time Sampled	25.09.2019 @ 11:45hrs	Tests Analyzed Completed	01.10.2019
Item	Drinking Water	Weather at Site	Sunny
		Appearance	Slightly Turbid

Parameter	Unit	Test Method	Test Results	ISIRI	ISIRI 9-03
pH of Site		APHA 9205 B	6.3	6.5-8.5	6.5-8.5
Temperature of Site	°C	APHA 9205 B	28.3	1-30	1-30
Chemical Oxygen Demand (COD)	mg/l	APHA 9205 B	462	4-1000	2.5
Dissolved Oxygen at Site	mg/l	APHA 9205 C	5.28	2.0	2.5
Total Dissolved Solids at 180°C	mg/l	APHA 9205 C	100	9	1.0
Chemical Oxygen Demand	mg/l	APHA 9205 B	11	10-100	4-17
Biological Oxygen Demand	mg/l	APHA 9205 B / 9205 C	6.8	0-100	0.5-6
Chlorine Residual	mg/l	APHA 9205 B / 9205 C	0.2	0.2	1.5-6
Total Phosphate as P <sub>2</sub> O <sub>5</sub> - P	mg/l	ISO 6469:2005	0.78	-	-
Total Nitrate as NO <sub>3</sub> - N	mg/l	ISO 6469:2005	0.7	-	-
Lead	mg/l	APHA 9205 B / 9205 C	100	-	-
Fluoride	mg/l	APHA 9205 B / 9205 C	100	-	-

Parameters in italic are not under investigation, LTR = limit of detection, NA = Expanded Uncertainty

- Sampling as per APHA 9205 A, B & C of 19-04 Edition, 2017
- APHA Standard Methods for the Examination of Water and Wastewater, 19<sup>th</sup> Edition, 2017

Analyses were carried out by ELCS/0001790/0001790

Chief Analyst

Laboratory Manager  
N. Rajaguru

Authorized Signatory  
N. Rajaguru

Content of this report is valid only if published in relation with written approval of Laboratory Manager, ELCS

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**Environmental Laboratory  
& Consultancy Services (ELCS)**  
807045, Giriparambathur Road,



Lab Reference No: ETC/MS/001/01/2018

Date Reported: 07/10/2018

**Test Report**

• Customer Name	MM Consultants	• Collected By	A. Permatasari - ETC
• Address	No. 4/50, Raja Mulya Office Road, Jl. Hutanmelayu, Kerteh	• Date & Time in Lab	18.10.2018 @ 10:00 AM
• Sample Point	Subaya Bridge	• Date Analysis Started	19.10.2018
• Date & Time Sampled	18.10.2018 @ 10:00 AM	• Date Analysis Completed	19.10.2018
• Site	Surface Water	• Weather @ Site	Sunny
		• Appearance	Slightly Turbid

Parameter	Unit	Test Method	Test Results	SDS	LM (B-1)
pH @ 25°C	-	APHA 2550 D	6.5	5.5-8.5	6.5
Temperature @ Site	°C	APHA 2550 D	29.0	5 - 30	29.0
Electrical Conductivity @ 25°C	µS/cm	APHA 2590 B	110	0-1000	110
Dissolved Oxygen @ Site	mg/L	APHA 8000 D	5.8	0.0	5.5
Total Dissolved Solids - at 180°C	mg/L	APHA 2540 C	90	0	100
Chemical Oxygen Demand	As mg O <sub>2</sub> /L	APHA 5210 D	90	20-100	4.87
Biochemical Oxygen Demand	mg/L	APHA 5210 D/5000 D	40	0-100	5.50
Oil & Grease	mg/L	APHA 1631/1631 B	0.2	0.2	1.00
Total Phosphate as P <sub>2</sub> O <sub>5</sub> - F	mg/L	ISO 6469:2000	0.01	-	-
Total Nitrogen as N <sub>2</sub> - A	mg/L	ISO 6469:2000	1.0	-	-
ECOL	APHA 2000	ISO 2461 Part 2000	<1000	-	-
Fungal Coliform	APHA 2000	ISO 2461 Part 2000	1000	-	-

Abbreviation in table do not mean abbreviation, (SDS) - Set of Standards, LM Expanded Uncertainty

- Sampling as per APHA 2000 A, B & C of 19th Edition, 2012
- APHA Standard Methods for the Examination of Water and Wastewater, 19th Edition, 2012

Analyses were carried out by Chief Chemist E&CS Laboratory

*[Signature]*  
Chief Chemist

*[Signature]*  
Laboratory Manager  
G. Subasinghe

*[Signature]*  
Regional Engineer, ETC  
S. Subasinghe

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Page 2

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**ANNEX IV.9**  
**Air Quality reports**

Annex 18.2

**Baseline Environmental (Air Quality) Monitoring Report**  
**Rehabilitation and Improvement of Peliyagoda-Puttalam Road (A 003)**

Prepared for

EMB Consultants,  
6/10, Raja Maha Vihara Road,  
Pitakotte

Conducted by



On

18 October 2019

CEA Registered Consultant / Specialist (07/LM/Cons/76/2011)

Reference No: 19101801775



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Colombo 10, Sri Lanka  
Tel: 0112684242

## Table of contents

1.0	Introduction
2.0	Site Description
3.0	Methodology and Guidance
4.0	Air Quality Monitoring

## 1. Introduction

Environmental Laboratory and Consultancy Services (ELCS) is an accredited (ISO 17025:2005) laboratory registered with central environmental authority since 2016. ELCS is a lifetime member of Sri Lanka Association of Testing Laboratories (SLATL). ELCS provides comprehensive services on environmental field that includes analysis of water/wastewater, monitoring of environmental/ occupational noise, monitoring of stack dust / gaseous emissions, monitoring of ambient air / dust and offering consultancy on industrial pollution control. We undertake to conduct environmental studies (EIA/EE), environmental audits and preparing of reports in relation to ISO 9001 and ISO 14001.

(EM Consultants Pvt) Ltd requested ELCS to conduct environmental testing for ambient air quality to establish a baseline environmental database for the area that can be affected under rehabilitation / improvement of Polysagoda-Puttalam Road (A 003) project.

## 2. Site Description

Selected sites for air quality monitoring are located in Madamp, Chinn and Wemappuss along the Polysagoda-Puttalam Road (A 003).

## 3. Methodology and Guidelines

Environmental monitoring was conducted in accordance with Central Environmental Authority (CEA) norms and guidelines stipulated in National Environmental Regulations on 18 and 19 October 2019 by a team of ELCS. Representatives from the (EM) Consultants witnessed environmental monitoring. Please see tables and photographs given below.

Air quality monitoring was conducted for 24 hours of the day.

Ambient air quality sampling duration was 24 hrs and sampling height is around 1.5 m. Air sampling rate for SO<sub>2</sub>, NO<sub>2</sub> and O<sub>3</sub> were 0.5 ltr / min and it is 16 ltr / min for particulate matter (PM 10 & PM 2.5). CO measurements were taken at the site and collected air samples for SO<sub>2</sub>, NO<sub>2</sub> and O<sub>3</sub> were taken to the laboratory in a temperature controlled cool box. Dust collected filters were taken to the laboratory in filter cassettes for PM 10 and PM 2.5 analysis.

# **Air Quality Monitoring**

#### 4. Air Quality Monitoring

Table 1




18 October 2019	18 October 2019
Madangin	Chilaw
7.48000 N, 79.82527 E	7.57648 N, 79.79022 E
	
19 October 2019	None taken intentionally
Wondupane	
7.19902 N, 79.50612 E	
	



Table 2: Air Quality Results @ Madamp

08 October 2019					
Pollutant	Sampling Time (hr)	Measured Results	Unit	Method	CA Standard
Particulate Matter (PM <sub>10</sub> )	24	5.2	µg / m <sup>3</sup>	High Volume Sampling with Selective Sampling unit & Gravimetric (HVS, 4 µg/m <sup>3</sup> )	100
Particulate Matter (PM <sub>2.5</sub> )	24	04	µg / m <sup>3</sup>	High Volume Sampling with Selective Sampling unit & Gravimetric (HVS, 4 µg/m <sup>3</sup> )	90
Sulfur Dioxide (SO <sub>2</sub> )	24	<0.2	µg / m <sup>3</sup>	Passive Diffusion Method (PDM, 1.0 µg/m <sup>3</sup> )	80
Nitrogen Dioxide (NO <sub>2</sub> )	24	47	µg / m <sup>3</sup>	Colorimetric using Saltzman method (HVS, 5.0 µg/m <sup>3</sup> )	100
Carbon Monoxide (CO)	8	<1000	µg / m <sup>3</sup>	Electrochemical Cell	1000
Ozone (O <sub>3</sub> )	1	<2	µg / m <sup>3</sup>	Photometry (HVS, 2 µg/m <sup>3</sup> )	200

Table 3: Air Quality Results @ Onkwa

28 October 2019					
Pollutant	Averaging Time (hr)	Measured Results	Unit	Method	CSA Standard
Particulate Matter (PM10)	24	39	ug / m <sup>3</sup>	High Volume Sampling with Selective Sampling inlet & Gravimetric (MOS, 4 ug/m <sup>3</sup> )	100
Particulate Matter (PM2.5)	24	10	ug / m <sup>3</sup>	High Volume Sampling with Selective Sampling inlet & Gravimetric (MOS, 4 ug/m <sup>3</sup> )	30
Sulfur Dioxide (SO <sub>2</sub> )	24	<0.5	ug / m <sup>3</sup>	Potassium Dichromate Method (MOS, 0.8 ug/m <sup>3</sup> )	80
Nitrogen Dioxide (NO <sub>2</sub> )	24	<0.5	ug / m <sup>3</sup>	Chemometric using Saltsman method (MOS, 0.8 ug/m <sup>3</sup> )	100
Carbon Monoxide (CO)	8	<1000	ug / m <sup>3</sup>	Nonaqueous Chemical Cell	10000
Ozone (O <sub>3</sub> )	1	<3	ug / m <sup>3</sup>	Passive (MOS, 2 ug/m <sup>3</sup> )	100

Table 4: Air Quality Results @ Werragpappa

29 October 2018					
Pollutant	Averaging Time (hr)	Measured Results	Unit	Method	ORA Standard
Particulate Matter (PM <sub>10</sub> )	24	8.3	µg / m <sup>3</sup>	High Volume Sampling with Selective Sampling Unit & Gravimetric (MMS, 4 µg/m <sup>3</sup> )	100
Particulate Matter (PM <sub>2.5</sub> )	24	4.2	µg / m <sup>3</sup>	High Volume Sampling with Selective Sampling Unit & Gravimetric (MMS, 4 µg/m <sup>3</sup> )	50
Sulfur Oxides (SO <sub>x</sub> )	24	<0.6	µg / m <sup>3</sup>	Passive Diffusion Method (MMS, 5.0 µg/m <sup>3</sup> )	80
Nitrogen Oxides (NO <sub>x</sub> )	24	<0.9	µg / m <sup>3</sup>	Colorimetric using Saltzman method (MMS, 5.0 µg/m <sup>3</sup> )	100
Carbon Monoxide (CO)	8	<1000	µg / m <sup>3</sup>	Electrochemical Cell	10000
Ozone (O <sub>3</sub> )	1	<3	µg / m <sup>3</sup>	Fluorescence (MMS, 3 µg/m <sup>3</sup> )	180

Table 5: Analysis of Ambient Air Quality Monitoring Results

Analysis of Ambient Air Quality Monitoring Results			
	Stallange	Online	Werragpappa
1	All measured parameters were below the limits.	All measured parameters were below the limits.	All measured parameters were below the limits.
2	Ground level ozone is not a primary pollutant and is generated from photochemical reactions between nitrogen oxides (NO <sub>x</sub> ) and volatile organic compounds (VOC) in the presence of sunlight.		
3	As identified above monitoring points, air quality may differ from time to time with atmospheric conditions (prevailing wind directions, wind speed and atmospheric stability).		

**ANNEXIV.10**  
**Noise report**

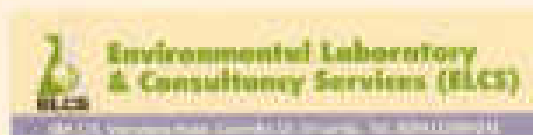
84402-14-9

**Baseline Environmental (Noise) Monitoring Report**  
Rehabilitation and Improvement of Peliyagoda-Puttalam Road (A-003)

Prepared for

ENL Consultants,  
6/10, Raja Maha Vittala Road,  
Puttalam.

Conducted by



On

18 October 2019

CEA Registered Consultant / Specialist (07/LM/Cons/76/2011)

Reference No: 19101803776

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### Table of contents

1.0	Introduction
2.0	Site Description
3.0	Methodology and Guidance
4.0	Noise level Monitoring

## **1. Introduction**

Environmental Laboratory and Consultancy Services (ELCS) is an accredited (ISO 17025:2005) laboratory registered with central environmental authority since 2010. ELCS is a lifetime member of Sri Lanka Association of Testing Laboratories (SLATL). ELCS provides comprehensive services in environmental field that includes analysis of water/wastewater, monitoring of environmental/ occupational noise, monitoring of stack dust / gaseous emissions, monitoring of ambient air / dust and offering consultancy on industrial pollution control. We undertake to conduct environmental studies (SIA/EI), environmental audits and preparing of reports in relation to ISO 9001 and ISO 14001.

EMC Consultants (Pvt) Ltd requested ELCS to conduct environmental testing for noise level to establish a baseline environmental database for the area that can be affected under rehabilitation / improvement of Polygoda-Puttalam Road (A 003) project.

## **2. Site Description**

Selected sites for noise level monitoring are located in Madampen, Chikwa, Wernepurawa along the Polygoda-Puttalam Road.

## **3. Methodology and Equipment**

Environmental monitoring was conducted in accordance with Central Environmental Authority (CEA) norms and guidelines stipulated in National Environmental Regulations. Noise level monitoring were conducted on 18 and 19 October 2019 by a team of ELCS. Representatives from the EMC Consultants witnessed environmental monitoring. Please see tables and photographs given below.

Noise levels was monitored 15 minutes of each hour around the clock.

Casella 344 noise level meters and calibrator Casella CEI 120/2) used for this noise survey. Both have been factory calibrated. In addition, performance of the noise level meter was confirmed by the Institution for Industrial Technology (ITI). Field calibration was performed after each measurement and no deviation in calibration level was noted. During all measurements the microphone was held approximately 1.2m above the ground level. Instrument was set up for  $L_{eq}$  readings, time weighting set for Fast (F) frequency weighting set for (A) and range was set to 50-100 dB (A).

## **4. Noise Level Monitoring**

Casella 344 and Cerner-ISE 393 noise level meters and calibrator Casella CEI 120/3) were used for this noise survey. Both have been factory calibrated. In addition, performance of the noise level meter was confirmed by the Institution for Industrial Technology (ITI). Field calibration was performed before and after each measurement and no deviation in calibration level was noted.

# Noise Level Monitoring



Table 3: Noise Level Monitoring Locations


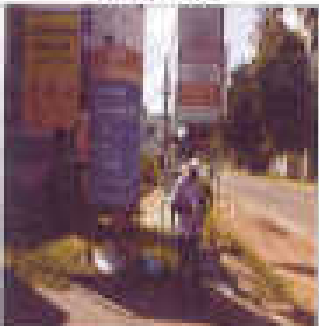
18 October 2019	18 October 2019
Madison	Chilea
P.408621 N, 76.625273 E	P.470646 N, 76.796221 E
	
19 October 2019	
Wentzhausen	
P.33917, 76.50412	
	Report shared Internationally

Table 2: Noise Levels

S	Noise Level Monitoring Locations	Day			Night		
		L10	L50	L90	L10	L50	L90
1	Mallampalle	77	75	75	66	64	60
2	Chiluvu	74	68	72	66	58	60
3	Wemmagama	72	70	71	70	64	61

Table 3: Analysis of Noise Level Monitoring Results

Analysis of Noise Level Monitoring Results			
1	Noise levels at Mallampalle	Noise levels at Chiluvu	Noise Level at Wemmagama
2	Noise levels resulted from road traffic.	Noise levels resulted from road traffic.	Noise levels resulted from road traffic.
3	65 dB (A) is the allowable limit for municipality area during day time. However, higher than 65 is allowed for a construction sites.		
4	L10 is the noise level exceeded for 10% of the time of the measurement duration.		
5	L50 is taken to be the ambient or background noise level as used (BS 4142).		
6	All above noise levels are given in dB(A).		

**ANNEX IV\_11**  
**List of Road-side Trees of A003 road within the ROW**

### List of Road-side Trees of A003 road within the ROW.

Abbreviations used: **RS**–Road side, **L**–Left side, **R**–Right side, **NCS**-National Conservation Status, **NT**-Near Threatened, **VU**-Vulnerable, **LC**-Least Concern, **NL**-Not Listed.

\*Girth Classes (**1.** 10-30cm, **2.** 30-60cm, **3.** 60-90cm, **4.** 90-120cm, **5.** 120-150cm, **6.** >150cm).

\*Side of the tree location from Colombo to Puttalam direction on A003 highway road sides.

#Red List (Ministry of Environment, 2012)

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
1	39	Anacardiaceae	<i>Mangifera indica</i>	Amba	3	R	NL
2	39	Annonaceae	<i>Polyalthia longifolia</i>	Owila	2	R	LC
3	39	Annonaceae	<i>Polyalthia longifolia</i>	Owila	2	R	LC
4	39	Annonaceae	<i>Polyalthia longifolia</i>	Owila	2	R	LC
5	39	Annonaceae	<i>Polyalthia longifolia</i>	Owila	2	R	LC
6	39	Annonaceae	<i>Polyalthia longifolia</i>	Owila	2	R	LC
7	39	Annonaceae	<i>Polyalthia longifolia</i>	Owila	2	R	LC
8	39	Annonaceae	<i>Polyalthia longifolia</i>	Owila	2	R	LC
9	39	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
10	39	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
11	39	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
12	39	Malvaceae	<i>Berrya cordifolia</i>	Halmilla	2	R	LC
13	42	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	L	NL
14	42	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
15	42	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
16	42	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
17	42	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
18	42	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
19	43	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	R	NL
20	43	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
21	43	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
22	43	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
23	44	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
24	44	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
25	44	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	R	NL
26	44	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
27	45	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
28	46	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
29	47	Fabaceae	<i>Tamarindus indica</i>	Siyambala	5	L	NL
30	47	Muntingiaceae	<i>Muntingia calabura</i>	Jam	1	L	NL
31	48	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
32	48	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
33	48	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
34	48	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
35	49	Annonaceae	<i>Polyalthia longifolia</i>	Owila	2	R	LC
36	49	Moraceae	<i>Artocarpus heterophyllus</i>	Kos	3	L	NL
37	50	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
38	50	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
39	50	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
40	50	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
41	50	Fabaceae	<i>Leucaena leucocephala</i>	Ipil-ipil	2	L	NL
42	50	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
43	50	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
44	50	Sapindaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	LC

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
45	50	Sapindaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	LC
46	50	Sapindaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	LC
47	51	Combretaceae	<i>Terminalia catappa</i>	Kottamba	4	L	NL
48	51	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
49	51	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	LC
50	51	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	LC
51	51	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	LC
52	51	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
53	51	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
54	51	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
55	51	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
56	51	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	L	NL
57	51	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	L	NL
58	51	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	L	NL
59	51	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
60	52	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
61	52	Fabaceae	<i>Albizia lebbek</i>	Hewan-mara	4	L	NT
62	52	Fabaceae	<i>Cassia fistula</i>	Ehela	3	L	NL
63	52	Fabaceae	<i>Cassia fistula</i>	Ehela	3	L	NL
64	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	2	R	NL
65	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	2	R	NL
66	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	2	R	NL
67	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	2	R	NL
68	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	2	R	NL
69	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	2	R	NL
70	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	2	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
71	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
72	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
73	52	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
74	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
75	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
76	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
77	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
78	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
79	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
80	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
81	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
82	52	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
83	53	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
84	53	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
85	53	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
86	53	Fabaceae	<i>Albizia lebbbeck</i>	Hewan-mara	4	L	NT
87	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
88	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
89	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
90	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
91	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
92	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
93	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
94	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
95	53	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
96	53	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
97	54	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
98	54	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
99	54	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
100	54	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
101	54	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
102	54	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
103	54	Fabaceae	<i>Albizia saman</i>	Para-mara	6	R	NL
104	54	Fabaceae	<i>Albizia saman</i>	Para-mara	6	R	NL
105	54	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	R	NL
106	55	Anacardiaceae	<i>Mangifera indica</i>	Amba	4	R	NL
107	55	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
108	55	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
109	55	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
110	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
111	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
112	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
113	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
114	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
115	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
116	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	NL
117	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
118	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
119	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
120	55	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
121	56	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
122	56	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL



Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
123	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
124	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
125	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
126	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
127	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
128	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
129	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
130	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
131	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
132	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
133	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
134	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
135	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
136	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
137	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
138	56	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
139	56	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
140	56	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
141	56	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
142	56	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
143	56	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
144	56	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
145	56	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
146	56	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
147	56	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
148	57	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
149	57	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
150	57	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
151	57	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
152	57	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
153	57	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
154	57	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
155	57	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
156	57	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
157	57	Fabaceae	<i>Cassia fistula</i>	Ehela	2	L	NL
158	57	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
159	57	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
160	57	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
161	57	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	L	NL
162	57	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
163	57	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
164	58	Apocynaceae	<i>Alstonia scholaris</i>	Rukattana	2	R	LC
165	58	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
166	58	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
167	58	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
168	58	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
169	58	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
170	58	Fabaceae	<i>Leucaena leucocephala</i>	Ipil-ipil	1	R	NL
171	58	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
172	58	Malvaceae	<i>Thespesia populnea</i>	Gan suriya	1	R	LC
173	59	Anacardiaceae	<i>Mangifera indica</i>	Amba	2	L	NL
174	59	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
175	59	Fabaceae	<i>Delonix regia</i>	May-mara	3	L	NL
176	59	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	3	L	LC
177	59	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	3	L	LC
178	59	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	LC
179	59	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	LC
180	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
181	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
182	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
183	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
184	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
185	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
186	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
187	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
188	59	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
189	59	Sapindaceae	<i>Schleichera oleosa</i>	Kon	2	R	LC
190	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
191	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
192	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
193	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
194	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
195	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
196	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
197	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
198	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
199	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
200	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
201	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
202	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
203	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
204	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
205	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
206	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
207	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
208	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
209	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
210	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
211	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
212	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
213	60	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
214	60	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
215	60	Combretaceae	<i>Terminalia catappa</i>	Kottamba	4	L	NL
216	60	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
217	60	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
218	60	Moraceae	<i>Ficus religiosa</i>	Bo	5	L	NL
219	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
220	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
221	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
222	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
223	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
224	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
225	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
226	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
227	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
228	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
229	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
230	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
231	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
232	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
233	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
234	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
235	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
236	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
237	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
238	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
239	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
240	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
241	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
242	61	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
243	61	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	3	R	NT
244	61	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	3	R	NT
245	61	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
246	61	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	L	NL
247	61	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
248	61	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	R	NL
249	62	Anacardiaceae	<i>Mangifera indica</i>	Amba	3	L	NL
250	62	Anacardiaceae	<i>Mangifera indica</i>	Amba	3	L	NL
251	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
252	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
253	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
254	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	L	LC
255	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
256	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
257	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
258	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
259	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
260	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
261	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
262	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
263	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
264	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
265	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
266	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
267	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
268	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
269	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
270	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
271	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	L	LC
272	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
273	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
274	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
275	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
276	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
277	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
278	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
279	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	L	LC
280	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
281	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
282	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
283	62	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
284	62	Combretaceae	<i>Terminalia bellirica</i>	Bulu	2	R	LC
285	62	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
286	62	Combretaceae	<i>Terminalia catappa</i>	Kottamba	4	L	NL
287	62	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
288	62	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
289	62	Fabaceae	<i>Albizia saman</i>	Para-mara	4	L	NL
290	62	Fabaceae	<i>Millettia pinnata</i>	Karanda	3	L	LC
291	62	Rhamnaceae	<i>Ziziphus mauritiana</i>	Debara	2	R	LC
292	62	Rhamnaceae	<i>Ziziphus mauritiana</i>	Debara	2	R	LC
293	63	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
294	63	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
295	63	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
296	63	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
297	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
298	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
299	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
300	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
301	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
302	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
303	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
304	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
305	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
306	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
307	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
308	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
309	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
310	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
311	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
312	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
313	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
314	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
315	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
316	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
317	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
318	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
319	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
320	63	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
321	63	Fabaceae	<i>Albizia saman</i>	Para-mara	5	R	NL
322	63	Fabaceae	<i>Albizia saman</i>	Para-mara	6	R	NL
323	63	Fabaceae	<i>Albizia saman</i>	Para-mara	6	R	NL
324	63	Fabaceae	<i>Albizia saman</i>	Para-mara	6	R	NL
325	63	Fabaceae	<i>Albizia saman</i>	Para-mara	5	L	NL
326	63	Fabaceae	<i>Albizia saman</i>	Para-mara	6	L	NL
327	63	Fabaceae	<i>Albizia saman</i>	Para-mara	6	L	NL
328	63	Fabaceae	<i>Albizia saman</i>	Para-mara	6	L	NL
329	63	Fabaceae	<i>Albizia saman</i>	Para-mara	6	L	NL
330	63	Fabaceae	<i>Albizia saman</i>	Para-mara	6	L	NL



Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
331	63	Fabaceae	<i>Cassia fistula</i>	Ehela	2	L	NL
332	63	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	L	LC
333	63	Sapotaceae	<i>Manilkara hexandra</i>	Palu	4	L	VU
334	64	Apocynaceae	<i>Alstonia scholaris</i>	Rukattana	2	R	LC
335	64	Apocynaceae	<i>Alstonia scholaris</i>	Rukattana	2	R	LC
336	64	Apocynaceae	<i>Alstonia scholaris</i>	Rukattana	2	R	LC
337	64	Apocynaceae	<i>Alstonia scholaris</i>	Rukattana	2	R	LC
338	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
339	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
340	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
341	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
342	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
343	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
344	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
345	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
346	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
347	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
348	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
349	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
350	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
351	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
352	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
353	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
354	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
355	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
356	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
357	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
358	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
359	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
360	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
361	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
362	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
363	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
364	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	5	R	NL
365	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	5	R	NL
366	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	5	R	NL
367	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	5	R	NL
368	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	5	R	NL
369	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	5	R	NL
370	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	5	R	NL
371	64	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	5	R	NL
372	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
373	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
374	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
375	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
376	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
377	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
378	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
379	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
380	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
381	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
382	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
383	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
384	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
385	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
386	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
387	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
388	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
389	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
390	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
391	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
392	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
393	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
394	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
395	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
396	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
397	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
398	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
399	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
400	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
401	64	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
402	64	Combretaceae	<i>Terminalia catappa</i>	Kottamba	4	R	NL
403	64	Combretaceae	<i>Terminalia catappa</i>	Kottamba	4	R	NL
404	64	Combretaceae	<i>Terminalia catappa</i>	Kottamba	4	R	NL
405	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
406	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
407	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
408	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
409	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
410	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
411	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
412	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
413	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
414	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
415	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
416	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
417	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	5	R	NL
418	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	5	R	NL
419	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	5	R	NL
420	64	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
421	64	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	5	R	NT
422	64	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	4	L	NT
423	64	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	4	L	NT
424	64	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	5	L	NT
425	64	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	5	L	NT
426	64	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	5	L	NT
427	64	Fabaceae	<i>Delonix regia</i>	May-mara	4	R	NL
428	64	Fabaceae	<i>Delonix regia</i>	May-mara	4	R	NL
429	64	Fabaceae	<i>Leucaena leucocephala</i>	Ipil-ipil	2	L	NL
430	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	R	NL
431	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	R	NL
432	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	R	NL
433	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
434	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
435	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
436	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
437	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
438	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
439	64	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
440	64	Lamiaceae	<i>Tectona grandis</i>	Tekka	1	L	NL
441	64	Meliaceae	<i>Azadirachta indica</i>	Kohomba	1	R	NL
442	64	Meliaceae	<i>Chukrasia tabularis</i>	Hik	3	L	NT
443	64	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
444	64	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
445	64	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
446	65	Combretaceae	<i>Terminalia catappa</i>	Kottamba	4	R	NL
447	65	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
448	65	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
449	65	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
450	65	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
451	65	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
452	65	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
453	65	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
454	65	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
455	65	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	L	NL
456	65	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	L	NL
457	65	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
458	65	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
459	65	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
460	65	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
461	65	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
462	65	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
463	65	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
464	65	Fabaceae	<i>Delonix regia</i>	May-mara	4	R	NL
465	65	Fabaceae	<i>Delonix regia</i>	May-mara	4	R	NL
466	65	Fabaceae	<i>Delonix regia</i>	May-mara	4	R	NL
467	65	Fabaceae	<i>Delonix regia</i>	May-mara	3	L	NL
468	65	Fabaceae	<i>Delonix regia</i>	May-mara	3	L	NL
469	65	Fabaceae	<i>Delonix regia</i>	May-mara	4	L	NL
470	65	Fabaceae	<i>Delonix regia</i>	May-mara	3	L	NL
471	65	Fabaceae	<i>Delonix regia</i>	May-mara	3	L	NL
472	65	Fabaceae	<i>Leucaena leucocephala</i>	Ipil-ipil	1	L	NL
473	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
474	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
475	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
476	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
477	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
478	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
479	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
480	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
481	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
482	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
483	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
484	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
485	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	R	NL
486	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	4	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
487	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	4	R	NL
488	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	4	R	NL
489	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	4	R	NL
490	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	4	R	NL
491	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	4	R	NL
492	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	4	L	NL
493	65	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	4	L	NL
494	65	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
495	65	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
496	65	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
497	65	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
498	65	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
499	65	Moraceae	<i>Ficus benghalensis</i>	Maha nuga	6	R	LC
500	65	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	4	R	LC
501	66	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
502	66	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
503	66	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
504	66	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
505	66	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	R	NL
506	66	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
507	66	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	4	L	NL
508	66	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	4	L	NT
509	66	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
510	66	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
511	66	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
512	66	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
513	66	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
514	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
515	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
516	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
517	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
518	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
519	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
520	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
521	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
522	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
523	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
524	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
525	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
526	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
527	66	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
528	66	Fabaceae	<i>Delonix regia</i>	May-mara	4	R	NL
529	66	Fabaceae	<i>Delonix regia</i>	May-mara	4	R	NL
530	66	Fabaceae	<i>Delonix regia</i>	May-mara	2	L	NL
531	66	Fabaceae	<i>Delonix regia</i>	May-mara	3	L	NL
532	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
533	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
534	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
535	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
536	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
537	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
538	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL



Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
539	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
540	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
541	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
542	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
543	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
544	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
545	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
546	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
547	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
548	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
549	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
550	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
551	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
552	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
553	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
554	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
555	66	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
556	66	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	4	R	LC
557	67	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
558	67	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
559	67	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
560	67	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
561	67	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
562	67	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
563	67	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC
564	67	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	4	R	LC

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
565	67	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
566	67	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
567	67	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
568	67	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
569	67	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
570	67	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
571	67	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
572	67	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
573	67	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
574	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
575	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
576	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
577	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
578	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
579	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
580	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
581	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
582	67	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
583	67	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	1	L	NL
584	67	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
585	67	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
586	67	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
587	67	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
588	67	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	1	R	LC
589	67	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
590	67	Moraceae	<i>Artocarpus heterophyllus</i>	Kos	1	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
591	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	4	R	LC
592	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	4	R	LC
593	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	3	R	LC
594	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	3	R	LC
595	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	3	R	LC
596	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	4	R	LC
597	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	4	R	LC
598	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	4	R	LC
599	67	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	4	R	LC
600	68	Anacardiaceae	<i>Mangifera indica</i>	Amba	1	R	NL
601	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
602	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
603	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
604	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
605	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
606	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
607	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
608	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
609	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
610	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
611	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
612	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
613	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
614	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
615	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
616	68	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
617	68	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
618	68	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
619	68	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	5	R	LC
620	68	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
621	68	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
622	68	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	5	R	NT
623	68	Fabaceae	<i>Albizia lebbeck</i>	Hewan-mara	5	R	NT
624	68	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
625	68	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
626	68	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
627	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
628	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
629	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
630	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
631	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
632	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
633	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
634	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	1	R	LC
635	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
636	68	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	R	LC
637	68	Fabaceae	<i>Millettia pinnata</i>	Karanda	2	R	LC
638	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
639	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
640	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
641	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
642	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
643	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
644	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
645	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
646	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
647	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
648	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
649	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
650	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
651	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
652	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
653	68	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
654	69	Arecaceae	<i>Borassus flabellifer</i>	Tal	2	R	NL
655	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
656	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
657	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
658	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
659	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
660	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
661	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
662	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
663	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
664	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
665	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
666	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
667	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
668	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
669	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
670	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
671	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
672	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
673	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
674	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
675	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
676	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
677	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
678	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
679	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
680	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	R	NL
681	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
682	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
683	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
684	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
685	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
686	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
687	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
688	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	3	R	NL
689	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
690	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
691	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	4	R	NL
692	69	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosia	2	L	NL
693	69	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
694	69	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
695	69	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
696	69	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
697	69	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
698	69	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
699	69	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
700	69	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
701	69	Fabaceae	<i>Albizia saman</i>	Para-mara	6	R	NL
702	69	Fabaceae	<i>Albizia saman</i>	Para-mara	6	R	NL
703	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
704	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
705	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
706	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
707	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
708	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
709	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
710	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
711	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
712	69	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
713	69	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
714	69	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
715	69	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
716	69	Fabaceae	<i>Millettia pinnata</i>	Karanda	3	R	LC
717	69	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	R	NL
718	69	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	R	NL
719	69	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
720	69	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
721	69	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
722	69	Rubiaceae	<i>Mitragyna parvifolia</i>	Helamba	1	R	LC
723	70	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
724	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
725	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
726	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
727	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
728	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
729	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
730	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
731	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
732	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
733	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
734	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
735	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
736	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
737	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
738	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
739	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
740	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
741	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
742	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
743	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
744	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
745	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
746	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL



Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
747	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
748	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
749	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
750	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
751	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
752	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
753	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
754	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
755	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
756	70	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
757	70	Fabaceae	<i>Cassia fistula</i>	Ehela	1	L	NL
758	70	Fabaceae	<i>Cassia fistula</i>	Ehela	1	L	NL
759	70	Fabaceae	<i>Cassia fistula</i>	Ehela	1	L	NL
760	70	Fabaceae	<i>Cassia fistula</i>	Ehela	1	L	NL
761	70	Fabaceae	<i>Cassia fistula</i>	Ehela	2	L	NL
762	70	Fabaceae	<i>Cassia fistula</i>	Ehela	2	L	NL
763	70	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
764	70	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
765	70	Fabaceae	<i>Delonix regia</i>	May-mara	2	R	NL
766	70	Fabaceae	<i>Delonix regia</i>	May-mara	2	L	NL
767	70	Fabaceae	<i>Delonix regia</i>	May-mara	2	L	NL
768	70	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
769	70	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
770	70	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	3	L	NL
771	70	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
772	70	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
773	70	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
774	70	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
775	70	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
776	70	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
777	70	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
778	70	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
779	70	Malvaceae	<i>Thespesia populnea</i>	Gan suriya	1	L	LC
780	70	Malvaceae	<i>Thespesia populnea</i>	Gan suriya	1	L	LC
781	70	Moraceae	<i>Ficus benjamina</i>	Nuga	2	L	NL
782	71	Bignoniaceae	<i>Stereospermum personatum</i>	Dunu madala	1	R	NL
783	71	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	2	R	LC
784	71	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	2	R	LC
785	71	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
786	71	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	3	R	LC
787	71	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	R	NL
788	71	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	R	NL
789	71	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
790	71	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
791	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
792	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
793	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	1	R	NL
794	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
795	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
796	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
797	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
798	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
799	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	R	NL
800	71	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	L	NL
801	71	Fabaceae	<i>Albizia saman</i>	Para-mara	6	R	NL
802	71	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
803	71	Fabaceae	<i>Delonix regia</i>	May-mara	3	R	NL
804	71	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
805	71	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
806	71	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
807	71	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
808	71	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
809	71	Moraceae	<i>Ficus benjamina</i>	Nuga	2	R	NL
810	71	Moraceae	<i>Ficus benjamina</i>	Nuga	2	R	NL
811	71	Sapindaceae	<i>Schleichera oleosa</i>	Kon	1	L	LC
812	71	Sapindaceae	<i>Schleichera oleosa</i>	Kon	1	R	LC
813	72	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
814	72	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
815	72	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
816	72	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
817	72	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
818	72	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	L	NL
819	72	Fabaceae	<i>Cassia fistula</i>	Ehela	1	R	NL
820	72	Fabaceae	<i>Cassia fistula</i>	Ehela	1	L	NL
821	72	Fabaceae	<i>Cassia fistula</i>	Ehela	1	L	NL
822	72	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	2	L	NL
823	72	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
824	72	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
825	72	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
826	72	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
827	72	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
828	72	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
829	72	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
830	72	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
831	72	Moraceae	<i>Ficus benjamina</i>	Nuga	2	L	NL
832	72	Myrtaceae	<i>Syzygium cumini</i>	Ma dan	3	R	LC
833	72	Rubiaceae	<i>Morinda coreia</i>	Ahu	2	L	LC
834	72	Sapindaceae	<i>Schleichera oleosa</i>	Kon	1	R	LC
835	73	Anacardiaceae	<i>Mangifera indica</i>	Amba	1	L	NL
836	73	Combretaceae	<i>Terminalia catappa</i>	Kottamba	3	L	NL
837	73	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
838	73	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
839	73	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
840	73	Fabaceae	<i>Tamarindus indica</i>	Siyambala	3	L	NL
841	73	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
842	73	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
843	73	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
844	73	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
845	73	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	L	NL
846	74	Annonaceae	<i>Polyalthia longifolia</i>	Owila	4	L	LC
847	74	Casuarinaceae	<i>Casuarina equisetifolia</i>	Kasa	4	L	NL
848	74	Combretaceae	<i>Terminalia catappa</i>	Kottamba	2	L	NL
849	74	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	3	L	NL
850	74	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
851	74	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
852	74	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	2	R	NL
853	74	Fabaceae	<i>Pithecellobium dulce</i>	Andara	4	R	NL
854	74	Fabaceae	<i>Tamarindus indica</i>	Siyambala	4	L	NL
855	74	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
856	74	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
857	74	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	L	NL
858	74	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
859	74	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
860	74	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
861	74	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	R	NL
862	75	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
863	75	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
864	75	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
865	75	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
866	75	Fabaceae	<i>Cassia fistula</i>	Ehela	2	R	NL
867	75	Fabaceae	<i>Filicium decipiens</i>	Pihimbiya	2	L	NL
868	75	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	L	NL
869	75	Meliaceae	<i>Azadirachta indica</i>	Kohomba	2	R	NL
870	76	Fabaceae	<i>Cassia fistula</i>	Ehela	3	R	NL
871	76	Fabaceae	<i>Cassia fistula</i>	Ehela	3	R	NL
872	76	Fabaceae	<i>Cassia fistula</i>	Ehela	3	R	NL
873	76	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
874	76	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
875	76	Meliaceae	<i>Azadirachta indica</i>	Kohomba	4	L	NL
876	76	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL

Index	km	Family	Species	Local Name	Girth Class*	RS+	NCS <sup>#</sup>
877	76	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
878	76	Meliaceae	<i>Azadirachta indica</i>	Kohomba	3	L	NL
879	76	Moraceae	<i>Ficus sp.</i>	Nuga	4	L	LC
880	76	Rubiaceae	<i>Morinda coreia</i>	Ahu	2	R	LC
881	76	Rubiaceae	<i>Morinda coreia</i>	Ahu	2	R	LC

**ANNEX IV.12**  
**List of Overall Flora Species Recorded in the Proposed Project  
Site during the Study**

**List of overall flora species recorded in the proposed project site during the study (Road side within ROW and 50 m from the ROW).**

Abbreviations used: **LC**- Least Concern, **NL**- Not Listed, **I**- Introduced, **N**- Native, **DD** - Data deficient, **NT** – Near Threatened, **VU** – Vulnerable, **TS** – Taxonomic Status, **NCS** – National Conservation Status

Index	Family	Scientific name	Common name (Sinhala)	Habit	TS	NCS
1	Amaranthaceae	<i>Alternanthera sessile</i>	Mukunuwenna	Herb	I	NL
2	Amaranthaceae	<i>Aerva lanata</i>	Pol Pala	Herb	N	LC
3	Anacardiaceae	<i>Anacardium occidentale</i>	Kaju	Tree	I	LC
4	Anacardiaceae	<i>Mangifera indica</i>	Amba	Tree	I	LC
5	Annonaceae	<i>Polyalthia longifolia</i>	Owila	Tree	N	LC
6	Apocynaceae	<i>Alstonia scholaris</i>	Rukattana	Tree	N	LC
7	Arecaceae	<i>Borassus flabellifer</i>	Thal	Tree	I	LC
8	Asclepiadaceae	<i>Calotropis gigantea</i>	Wara	Shrub	N	LC
9	Asclepiadaceae	<i>Wattakaka volubilis</i>	Aguna Kola	Climber	N	LC
10	Asteraceae	<i>Eupatorium odoratum</i>	Podisinnamaran	Shrub	I	LC
11	Asteraceae	<i>Tridax procumbens</i>		Herb	I	NL
12	Asteraceae	<i>Vernonia cinerea</i>	Monara Kudumbiya	Herb	N	LC
13	Asteraceae	<i>Vernonia cinerea</i>	Monara kudumbiya	Herb	N	LC
14	Asteraceae	<i>Syndrella nodiflora</i>		Herb	I	NL
15	Bignoniaceae	<i>Stereospermum personatum</i>	Dunu madala	Small tree	N	NL
16	Bignoniaceae	<i>Tabebuia rosea</i>	Robarosiya	Tree	I	LC



17	Boraginaceae	<i>Cordia dichotoma</i>	Lolu	Tree	N	LC
18	Capparaceae	<i>Cleome viscosa</i>	Wal Aba	Herb	N	LC
19	Casuarinaceae	<i>Casuarina equisetifolia</i>	Kasa	Tree	I	NL
20	Combretaceae	<i>Terminalia arjuna</i>	Kumbuk	Tree	N	LC
21	Combretaceae	<i>Terminalia catappa</i>	Kottamba	Tree	I	NL
22	Combretaceae	<i>Terminalia berillica</i>	Bulu	Tree	N	LC
23	Commelinaceae	<i>Commelina diffusa</i>	Gira Pala	Herb	N	LC
24	Convolvulaceae	<i>Argyreia osyrensis</i>		Climber	N	LC
25	Cyperaceae	<i>Fimbristylis acuminata</i>		Herb	N	LC
26	Euphorbiaceae	<i>Acalypha indica</i>	Kuppameniya	Herb	N	LC
27	Euphorbiaceae	<i>Excoecaria agallocha</i>		Small tree	N	LC
28	Euphorbiaceae	<i>Flueggea leucopyrus</i>	Katu Pila	Shrub	N	LC
29	Euphorbiaceae	<i>Macaranga peltata</i>	Path-kenda	Small tree	N	LC
30	Fabaceae	<i>Acacia auriculiformis</i>	Acasia	Tree	I	NL
31	Fabaceae	<i>Albizia saman</i>	Para mara	Tree	I	LC
32	Fabaceae	<i>Albizia lebbek</i>	Hewan-mara	Tree	N	NT
33	Fabaceae	<i>Bauhinia racemosa</i>	Maila	Tree	N	LC
34	Fabaceae	<i>Cassia auriculata</i>	Ranawara	Tree	N	LC
35	Fabaceae	<i>Cassia fistula</i>	Ehela	Tree	N	LC
36	Fabaceae	<i>Delonix regia</i>	May-mara	Tree	I	NL
37	Fabaceae	<i>Desmodium triflorum</i>	Heen-Undupiyali	Prostrate herb	N	LC
38	Fabaceae	<i>Leucaena leucocephala</i>	Ipil Ipil	Tree	I	LC
39	Fabaceae	<i>Millettia pinnata</i>	Magul Karanda	Tree	N	LC

40	Fabaceae	<i>Mimosa pudica</i>	Nidikumba	Herb	I	LC
41	Fabaceae	<i>Peltophorum pterocarpum</i>	Kaha-mara	Tree	I	NL
42	Fabaceae	<i>Pithecellobium dulce</i>	Katu andara	Tree	N	LC
43	Fabaceae	<i>Senna spectabilis</i>	Kaha-kona	Small tree	N	NL
44	Fabaceae	<i>Tamarindus indica</i>	Siyambala	Tree	I	LC
45	Lamiaceae	<i>Hyptis suaveolens</i>		Shrub	I	NL
46	Lamiaceae	<i>Tectona grandis</i>	Tekka	Tree	I	NL
47	Meliaceae	<i>Azadirachta indica</i>	Kohomba	Tree	N	LC
48	Meliaceae	<i>Chukrasia tabularis</i>	Hik	Tree	N	NT
49	Malvaceae	<i>Berrya cordifolia</i>	Halmilla	Tree	N	LC
50	Malvaceae	<i>Ceiba pentandra</i>	Kotta pulun	Tree	N	LC
51	Malvaceae	<i>Thespesia populnea</i>	Gan suriya	Tree	N	LC
52	Malvaceae	<i>Urena sinuata</i>	Heen- epala	Erect herb	N	LC
53	Melastomataceae	<i>Clidemia hirta</i>		Shrub	I	NL
54	Meliaceae	<i>Swietenia macrophylla</i>	Mahogany	Tree	I	NL
55	Moraceae	<i>Artocarpus incises</i>	Del	Tree	I	LC
56	Moraceae	<i>Artocarpus hetarophyllus</i>	Kos	Tree	N	LC
57	Moraceae	<i>Ficus benghalensis</i>	Maha Nuga	Tree	N	LC
58	Moraceae	<i>Ficus benjamina</i>	Nuga	Tree	I	NL
59	Moraceae	<i>Ficus religiosa</i>	Bo	Tree	N	LC
60	Muntingiaceae	<i>Muntingia calabura</i>	Jam	Small tree	I	NL
61	Myrtaceae	<i>Syzygium cumini</i>	Madan	Tree	N	LC

62	Nelumbonaceae	<i>Nelumbo nucifera</i>	Nelum	Aquatic	N	LC
63	Nymphaeaceae	<i>Nymphaea pubescens</i>	Olu	Aquatic	N	LC
64	Phyllanthaceae	<i>Breynia vitis-idaea</i>	Gas-Kayila	Shrub	N	LC
65	Phyllanthaceae	<i>Bridelia retusa</i>	Ketakala	Tree	N	LC
66	Phyllanthaceae	<i>Phyllanthus emblica</i>	Nelli	Tree	N	VU
67	Polygonaceae	<i>Persicaria hydropiper</i>		Herb	N	DD
68	Pontederiaceae	<i>Eichhornia crassipes</i>	Japan-jabara	Aquatic	I	NL
69	Rhamnaceae	<i>Ziziphus mauritiana</i>	Debara	Shrub	N	LC
70	Rubiaceae	<i>Mitragyna parvifolia</i>	Helamba	Tree	N	LC
71	Rubiaceae	<i>Morinda coreia</i>	Ahu	Tree	N	LC
72	Rubiaceae	<i>Nauclea orientalis</i>	Bakmee	Tree	N	LC
73	Rutaceae	<i>Limonia acidissima</i>	Divul	Tree	N	LC
74	Salviniaceae	<i>Salvinia molesta</i>		Aquatic	I	NL
75	Sapindaceae	<i>Cardiospermum halicacabum</i>	Wel-penela	Climbing herb	N	LC
76	Sapindaceae	<i>Filicium decipiens</i>	Phimbiya	Tree	N	LC
77	Sapindaceae	<i>Schleichera oleosa</i>	Kon	Tree	N	LC
78	Sapotaceae	<i>Manilkara hexandra</i>	Palu	Tree	N	LC
79	Typhaceae	<i>Typha angustifolia</i>	Hambu pan	Marsh herb	N	LC
80	Ulmaceae	<i>Trema orientalis</i>	Gadumba	Medium tree	I	LC
81	Verbenaceae	<i>Lantana camara</i>	Gandapana/Hinguru	Shrub	I	LC

**ANNEX IV.13**  
**List of Fauna Species Recorded During the Study**

### List of Fauna species recorded during the Study

Abbreviations used: **LC** - Least Concern, **N** - Native, **M** - Migrant, **R** - Resident, **EN** -Endangered, **NT** - Near Threatened, **TS** – Taxonomic Status, **NCS** – National Conservation Status

Index	Family	Scientific name	Common name(English)	TS	NCS
<b>Birds</b>					
1	Accipitridae	<i>Accipiter badius</i>	Shikra	R	LC
2	Accipitridae	<i>Haliastur indus</i>	Brahminy kite	R	LC
3	Accipitridae	<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	R	LC
4	Aegithinidae	<i>Aegithina tiphia</i>	Common lora	R	LC
5	Alaudidae	<i>Eremopterix grisea</i>	Ashy-crowned Sparrow Lark	R	LC
6	Alcedinidae	<i>Alcedo atthis</i>	Common Kingfisher	R	LC
7	Alcedinidae	<i>Ceryle rudis</i>	Pied Kingfisher	R	LC
8	Alcedinidae	<i>Halcyon smyrnensis</i>	White breasted kingfisher	R	LC
9	Anatidae	<i>Dendrocygna javanica</i>	Lesser whistling-duck	R	LC
10	Apodidae	<i>Cypsiurus balasiensis</i>	Asian Palm Swift	R	LC
11	Ardeidae	<i>Egretta garzetta</i>	Little egret	R	LC
12	Ardeidae	<i>Bubulcus ibis</i>	Cattle egret	R	LC
13	Ardeidae	<i>Ardea purpurea</i>	Purple heron	R	LC
14	Charadriidae	<i>Venellus indicus</i>	Red-wattled lapwing	R	LC
15	Cisticolidae	<i>Cisticola juncidis</i>	Zitting Cisticola	R	LC
16	Cisticolidae	<i>Prinia inornata</i>	Plain Prinia	R	LC

17	Columbidae	<i>Columba livia</i>	Rock Pigeon	R	LC
18	Columbidae	<i>Stigmatopelia chinensis</i>	Spotted dove	R	LC
19	Coraciidae	<i>Coracias benghalensis</i>	Indian Roller	R	LC
20	Corvidae	<i>Corvus levaillantii</i>	Large-billed Crow	R	LC
21	Corvidae	<i>Corvus splendens</i>	House Crow	R	LC
22	Cuculidae	<i>Centropus sinensis</i>	Southern coucal	R	LC
23	Cuculidae	<i>Clamator jacobinus</i>	Pied Cuckoo	R	LC
24	Cuculidae	<i>Eudynamys scolopaceus</i>	Asian koel	R	LC
25	Dicruidae	<i>Dicrurus macrocercus</i>	Black Drongo	R	LC
26	Jacanidae	<i>Hydrophasianus chirurgus</i>	Pheasant-tailed jacana	R	LC
27	Meropidae	<i>Merops orientalis</i>	Green Bee-eater	R	LC
28	Muscicapidae	<i>Copsychus saularis</i>	Oriental magpie-robin	R	LC
29	Muscicapidae	<i>Saxicoloides fulicata</i>	Indian Robin	R	LC
30	Nectariniidae	<i>Nectarina asiatica</i>	Purple Sunbird	R	LC
31	Oriolidae	<i>Oriolus xanthornus</i>	Black-hooded oriole	M	LC
32	Passeridae	<i>Passer domesticus</i>	House Sparrow	R	LC
33	Phalacrocoracidae	<i>Phalacrocorax niger</i>	Little cormorant	R	LC
34	Ploceidae	<i>Ploceus philippinus</i>	Baya Weaver	R	LC
35	Pycnonotidae	<i>Pycnonotus cafer</i>	Red-vented bulbul	R	LC
36	Rallidae	<i>Amaurornis phoenicurus</i>	White breasted water hen	R	LC

37	Rallidae	<i>Porphyrio porphyrio</i>	Purple swamp hen	R	LC
38	Ramphastidae	<i>Megalaima zeylanica</i>	Brown-headed Barbet	R	LC
39	Sturnidae	<i>Acridotheres tristis</i>	Common myna	R	LC
40	Sylviidae	<i>Orthotomus sutorius</i>	Common tailor bird	R	LC
41	Threskiornithidae	<i>Threskiornis melanocephalus</i>	Black-headed Ibis	R	LC
42	Timalidae	<i>Turdoides affinis</i>	Yellow-billed Babbler	R	LC
43	Turnicidae	<i>Turnix suscitator</i>	Barred Button-quail	R	LC
<b>Butterflies</b>					
44	Danaidae	<i>Parantica aglea aglea</i>	Glassy Tiger	N	LC
45	Danaidae	<i>Danaus chrysippus</i>	Plain Tiger	N	LC
46	Lycaenidae	<i>Castalius rosimon</i>	Common Pierrot	N	LC
47	Lycaenidae	<i>Everes lacturnus</i>	Indian cupid	N	LC
48	Lycaenidae	<i>Elymnias hypermnestra fraterna</i>	Lesser Grass Blue	N	LC
49	Nymphalidae	<i>Euploea core</i>	Common Indian crow	N	LC
50	Nymphalidae	<i>Junonia lemonias vaisya</i>	Lemon Pansy	N	LC
51	Nymphalidae	<i>Ypthima ceylonica</i>	white four ring	N	LC
52	Nymphalidae	<i>Neptis hylas</i>	Common sailor	N	LC
53	Nymphalidae	<i>Elymnias hypermnestra</i>	Common palm fly	N	LC
54	Nymphalidae	<i>Mycalesis perseus</i>	Common bush-brown	N	LC
55	Nymphalidae	<i>Parantica aglea</i>	Glassy tiger	N	LC
56	Nymphalidae	<i>Euploea core asela</i>	Common Indian Crow	N	LC

57	Papilionidae	<i>Graphium agamemnon</i>	Tailed jay	N	LC
58	Papilionidae	<i>Pachliopta aristolochiae ceylanica</i>	Common Rose	N	LC
59	Papilionidae	<i>Pachliopta hector</i>	Crimson Rose	N	LC
60	Papilionidae	<i>Papilio demoleus demoleus</i>	Lime Butterfly	N	LC
61	Papilionidae	<i>Papilio polytes romulus</i>	Common Mormon	N	LC
62	Pieridae	<i>Appias libythea libythea</i>	Striped Albatross	N	LC
63	Pieridae	<i>Colotis amata modesta</i>	Small Salmon Arab	N	LC
64	Pieridae	<i>Delias eucharis</i>	Common Jezebel	N	LC
65	Pieridae	<i>Eurema hecabe</i>	Common grass yellow	N	LC
66	Pieridae	<i>Leptosia nina</i>	Psyche	N	LC
67	Pieridae	<i>Delias eucharis</i>	Common jezebel	N	LC
68	Satyridae	<i>Elymnias hypermnestra fraterna</i>	Common Palmfly+	N	LC
69	Satyridae	<i>Ypthima ceylonica</i>	White Four-ring	N	LC
<b>Reptiles</b>					
70	Agamidae	<i>Calotes versicolor</i>	Common garden lizard	N	LC
71	Agamidae	<i>Calotes calotes</i>	Garden lizard	N	LC
72	Varanidae	<i>Varanus salvator</i>	Water monitor	N	LC
73	Varanidae	<i>Varanus bengalensis</i>	Land monitor	N	LC
74	Scincidae	<i>Eutropis macularia</i>	Bronze-green little skink	N	LC
75	Natricidae	<i>Xenochrophis piscator</i>	Checkered keelback	N	LC
<b>Amphibians</b>					



76	Bufo	<i>Duttaphrynus melanostictus</i>	Common toad	N	LC
77	Rana	<i>Fejervarya limnocharis</i>	Common paddy field frog	N	LC
78	Rana	<i>Hylarana temporalis</i>	Common wood frog	N	NT
79	Rana	<i>Euphlyctis hexadactylus</i>	Six-toed green frog	N	LC
80	Rana	<i>Euphlyctis cyanoplyctis</i>	Indian skipper frog	N	LC
<b>Mammals</b>					
81	Herpestidae	<i>Herpestes edwardsii</i>	Indian grey mongoose	N	LC
82	Muridae	<i>Bandicota bengalensis</i>	Mole rat	N	LC
83	Muridae	<i>Rattus rattus</i>	Common rat	N	LC
84	Sciuridae	<i>Funambulus palmarum</i>	Palm squirrel	N	LC
<b>Dragonflies</b>					
85	Coenagrionidae	<i>Ischnura senegalensis</i>	Marsh bluetail	N	LC
86	Coenagrionidae	<i>Pseudagrion microcephalum</i>	Blue sprite	N	LC
87	Libellulidae	<i>Neurothemis intermedia</i>	Paddyfield parasol	N	NT
88	Libellulidae	<i>Orthetrum pruinosum</i>	Pink skimmer	N	NT
89	Libellulidae	<i>Orthetrum sabina</i>	Green skimmer	N	LC
<b>Freshwater Fish</b>					
90	Anguillidae	<i>Anguilla bicolor</i>	Mada aandha	N	LC
91	Cyprinidae	<i>Amblypharyngodon melettinus</i>	Soraya	N	LC
92	Cyprinidae	<i>Puntius vittatus</i>	Bandi thiththaya	N	LC
93	Cyprinidae	<i>Rasbora dandiya</i>	Kudamassa	N	LC

**ANNEX IV-14**  
**Industries in Wennappuwa, Nattandiya, Mahawewa, Madampe and Chilaw Divisional Secretariat Divisions**

### Industries in Wennappuwa, Nattandiya, Mahawewa, Madampe and Chilaw Divisional Secretariat Divisions

Type of the industries	Wennappuwa		Nattandiya		Mahawewa		Madampe		Chilaw	
	Lar ge	S&M Industries	Lar ge	S&M Industries	Lar ge	S&M Industries	Lar ge	S&M Industries	Lar ge	S&M Industries
Roofing Tiles	14	60	1	7						1
Fishing Net	1			1						
Clothing and textile	3	1	2	13	1	9	2	5		4
Cement	1			2		1				1
Coir	4	16		31		11	1	52		40
Wall tiles	1									
Coconut oil and coconut related products	1	3	1	5	1	5	1	11		5
Ice	2		1			1		1		1
Chips/ Activated carbon	1	1	1				1	3		
Construction Iron Steel		3	1	3		4	1	4		
Ornamental plants		2		1		1				
Cardboard and Plastic products		1	1	2						
Wood and related		3		5		3		4		1
Pots and bricks		3				5		1		
Food and Beverages	4	2	3	20	1	10	1	6		3
Rubber products		1		1						
Sand				2		1				
Printing graphic services				3						
Limestone products				2		2				
Bottled drinking water				2		2				
Vehicle repair				1				1		1
Electric items				1		1				3

Export Industries located in Wennappuwa, Nattandiya, Mahawewa, Madampe and Chilaw Divisional Secretariat Divisions

Type of Industry	Wennappuwa	Nattandiya	Mahawewa	Madampe	Chilaw
Coir and ropes		2	2	6	1
Wood and Wooden items				1	
Textile			1	1	
Coconut oil			1	1	
Food and beverage		2		1	2
Ornamental plants and fish	1				3

**ANNEX VI-1**

**Table 1 : Environmental Management Plan for Design and Pre-construction stage**

**Table 1 : Environmental Management Plan for Design and Pre-construction stage**

**Province : North Western Province**

**No. of RDA road and total length : A003 National Highway. Length 38 km from 38+000 to 76+000**

S.No	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
1.	General						
1.1	Delays in Initiation of project and Poor environmental management by the contractor	H (-)	<ul style="list-style-type: none"> <li>- Appoint a full-time environment specialist, by the contractor who will be in-charge of coordination with PIC/PIU for updating this IEE and implementing the EMP and EMoP, including the conducting of all surveys and monitoring actions etc. He will also ensure that the necessary conditions are included for the environmental management in the tender documents as in the EARF.</li> <li>- Ensure that updated EMP and any conditions of environmental clearance are included</li> </ul>	<p>Appointment Environment al specialist Once before commencing the project</p> <p>Inclusion of necessary conditions in the tender doc.</p>	<p>Added to the project cost</p> <p>No cost inquired</p>	<p>Procurement specialist/ PMU</p> <p>Procurement Specialist/PMU</p>	<p>Tender board</p> <p>PMU/Tender Board</p>

S.N o	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
			<p>in the tender/bid and contract documents, including the requirement for contractor to prepare an EMAP (based on EMP) for approval before commencement of the construction activities. The EMAP will demonstrate the manner (location, responsibilities, schedule/ timeframe, budget, etc.) in which the contractor will undertake the works and implement required mitigation measures.</p> <p>- The contractor will prepare the following documents as a part of the EMAP.</p> <ol style="list-style-type: none"> <li>1. Waste Management Plan</li> <li>2. Spoil Disposal Plan</li> <li>3. Drainage</li> </ol>	<p>Availability of Plans Once before the commencement of construction</p>	<p>Should include in the construction cost</p>	<p>Contractor by hired consultants</p>	<p>PIC/PIU/PU M</p>

S.N o	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
			Management Plan 4. Erosion and Siltation Control Plan 5. Traffic Management Plan 6. Hazardous Materials Management Plan 7. Occupational hygiene and safety Plan including any apidemic or pandemic conditions 8. Emergency Response Plan 9. Quarry extraction and rehabilitation plan.				
1.2	Shifting and re- shifting of temporary structurs	M (-)	<ul style="list-style-type: none"> <li>- A re-shifting plan should be prepared, including the location, means of relocation, whereto, when and by whom,</li> <li>- Prior notice should be given and adequate time period should be allowed to those, who need to remove, shift and adjust their</li> </ul>	No of temporary structures/ entire stretch of the project are/ during the construction and completion of construction	To be included in the contract	Contractor	PIC/PIU/PM U



S.No	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
			encroachment. - Providing labor for shifting and resettling				
1.3	Shifting, reinstalling and removal of public utilities	M	<ul style="list-style-type: none"> <li>- Proper coordination with relevant agencies, such as NWSDB, CEB, and SLT is vital to reduce such impacts.</li> <li>- Well trained, experienced workers and machine operators should be employed to reduce the damage to public utilities as well as private properties during the removal and re-establishment process.</li> <li>- To mitigate the impacts on local community due to interruption of electricity, communication facilities or water supply (if applicable) advance notices should be given verbally as well as</li> </ul>	No. of utilities to be shifted, No. of experience worker recruited, / entire road stretch project and contractors office/ before construction starts	No cost involved	Contractor with the assistance of PIU/PIC	PIC/PIU/PMU

S.N o	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
			<p>through the media. Also, interruption of these facilities should be done during specific time periods to minimize the effect.</p> <ul style="list-style-type: none"> <li>- The contractor along with the RDA should prepare a working schedule with consultation of the other relevant authorities to remove/shift and reestablish public utilities. RDA is responsible to pay the cost for the removal/shifting &amp; re-establishment of public utilities.</li> </ul>				
1.4	<b>Resources Mobilization/</b> site for storage of materials, establishment of labor camps, and for	M	<ul style="list-style-type: none"> <li>- Temporary lands are readily available in the surrounding project area and must be selected. These should be at least 500m away from residential areas,</li> </ul>	Reports and approvals	To be added the construction contract	Contractor	PIC/PMU

S.N o	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
	construction equipments		<p>water bodies, cultivated lands and socially sensitive areas, such as schools, temples, kovils, churches and mosques, and governmental offices and establishments,</p> <p>- Conduct site specific environmental assessment for the selected site, including the physical environmental, topography, availability of natural drains, ecological assessment, whether any diggings/cuttings to be made, etc., social assessment, like distance to the socially sensitive area, and plan to avoid any significant impacts,</p> <p>- Approvals from relevant authorities must be obtained to use temporary lands in order to comply with</p>				

S.N o	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
			<ul style="list-style-type: none"> <li>- national laws and regulations, preparation of the temporary lands and access road must be carried out in such a way as to minimize disturbances to natural vegetation cover,</li> <li>- recruitment of laborers, both unskilled and skilled, from the locality, will reduce the need for having large labor camps and will lead to lesser impacts due to such labor camps during the construction stage.</li> </ul>				
1.5	<b>Natural hazards aggravated by the project and impacts to the road due to natural hazards</b>	L	<ul style="list-style-type: none"> <li>- Surface water hydrology along the road with special attention to these flood-prone locations shall be deeply studied during the detailed design stage and the pre-construction phase.</li> </ul>	Hydrological report, including details of all flooding area and the necessary mitigation. During the	Should include in the PIC contract	During the study period/ Hydrological report	PIU/PMU

S.N o	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
			<p>Possible mitigation measures for the above issues shall be provided, and the types and sizes of cross drainage structures, road finish level (RFL), adequacy of lead-away / tail canals, flow connectivity issues and the surface treatment shall be decided accordingly in rehabilitating the road.</p> <p>- Close coordination with Department of Irrigation, Department of Agrarian Services and Disaster Management Center (DMC) shall be maintained in this regard to obtaining information on high flood levels, their return periods, respective retention periods and other recommendations to support the final</p>	design period			

S.N o	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
			design. The public consultation will also be used to verify the findings.				
1.6	<b>Health and safety due to the Construction of Labor camps</b>	M (-)	<ul style="list-style-type: none"> <li>- Provision of proper and adequate drinking water and toilet facilities. At least 1 toilet should be provided for every 15 workers.</li> <li>- Provision of enough dust bins to collect the dry and wet waste.</li> <li>- All electrical installation should in accordance with the construction safety guidelines</li> <li>- Labors should be trained for solid waste disposal, usage of water and toilet facilities, health care practices. (This will help to avoid/ land and water pollution and avoid unhygienic conditions).</li> <li>- Labors should be</li> </ul>	Leaniness Accidences	Should included in the contractor's contract	Contrator	PIC/PMU

S.N o	Project Actions/ Environmental Attributes	Level of Impacts (H- high, M- Moderate, L-Low)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by;	Monitoring By
			<p>provided with safety equipment to prevent the accidental hazards.</p> <p>- Regular health checkup camps, pest control programs, safety trainings shall be held to avoid unhygienic and mismanagement conditions in labor colony.</p>				

Note: PIC- Project Implementation Consultant, EMP- Environmental Management Plan, EO- Environmental Officer, PMU- Project Implementation Unit, EARF- Environmental Assessment Frame Work, RDA- Road Development Authority, NWSDB- National Water Supply and Drainage Board, SLT-Sri Lanka, Telecom, DMC- Disaster Management Centre

**Table 2 : Environmental Management Plan for Construction stage**

Province : North Western Province

No. of RDA road and total length: A003 National Highway. Length 38 km

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
1.0	<b>Physical Impacts and Mitigation</b>						
1.1	<b>Anticipated impacts due to disposal of waste generated from the land preparation activities (removal of vegetation, land clearing, residue disposal, dredging, filling, etc.)</b>						
1.2	1. Construction debris and spoil disposal:	M (-)	<ul style="list-style-type: none"> <li>Suitable sites shall be selected for the entire stretch of the proposed project area for the temporary collection of debris and spoils. Necessary approvals should be obtained from the relevant local Authority, CEA, and other relevant agencies,</li> <li>proper engineering design shall be followed to minimum land clearance, avoiding cutting of any trees, soil erosion during the rainy season and spreading of dust</li> </ul>	<p>Approvals from the CEA, Local authority and other relevant agencies.</p> <p>Construction practices,</p> <p>Selected sites, disposal sites</p> <p>Daily during the construction period</p>	To be added to the construction cost	Contractor	PIC/ PIU



S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<ul style="list-style-type: none"> <li>- to the surrounding area, re-use of debris is a good option to reduce the quantity of debris. Wherever possible, surplus spoil will be used to fill eroded gullies, quarries, and depressed areas, etc. Metal, soil, and sand are reusable raw materials, which can be used for backfilling, leveling and amenity planting at intersections. Wood debris can be used as fuel for worker camps or distributed to local people free of charge,</li> <li>- all construction wastes should be properly stored with suitable covers, like polythene sheets, tarpaulin, or jute to prevent the spreading of dust,</li> <li>- spoils shall not be disposed on sloping areas, farm land, marshy land, forest areas, especially, natural drainage path, canals and other infrastructures. The temporary debris storage sites shall not be located</li> </ul>				

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>closer to residential or ecologically sensitive areas,</p> <ul style="list-style-type: none"> <li>- necessary toe and retaining walls will be provided to protect the disposal of soil,</li> <li>- topsoil will be reused as far as possible in maintaining green vegetation once the construction is over,</li> <li>- the remaining non-reusable construction debris shall be dumped properly in approved dumping sites. Prior approval for the disposal site shall be obtained from the LAs of the area, after the disposal, the site will be provided with proper drainage, vegetation and adequate protection against erosion.</li> </ul>				
1.3	<u>Municipal solid waste:</u>	L(-)	<ul style="list-style-type: none"> <li>- Selection of the location for labor camps shall be approved by the Engineer and comply with guidelines/recommendations</li> </ul>	<p>Availability of bins in Labor camps.</p> <p>Dumping of waste along the road sides</p>	To be added to construction cost	Contractor	PIC/PIU, random check by PHI and CEA

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<ul style="list-style-type: none"> <li>issued by CEA and Las, contractor shall make every effort to handle and manage waste generated from the construction/labor camps without causing a nuisance to the neighborhood,</li> <li>contractor should provide adequate color bins to segregate the MSW in the labor camps, national color code for segregated waste are blue, orange, red, brown and green for Paper and card boards, Polythene and plastic, Glass and bottle, Metal and Bio degradable waste respectively. All recyclable waste should be stored separately and sold out for local recycle materials collectors in the area,</li> <li>all bio-degradable waste should be handed over to the garbage collection trucks of the LA,</li> <li>site inspections and proper disposal of wastes should be</li> </ul>	<p>of the project</p> <p>Daily along the project sites/ once a week for labor camps,</p>			

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>ensured by the environmental officer/ safety officer of the contractor,</p> <ul style="list-style-type: none"> <li>- proper collection and disposal of waste will ensure avoidance of negative environmental and social impacts, apart from ecological impacts, public health and negative impacts on scenic beauty.</li> </ul>				
1.4	<u>Wastewater disposal and proper sanitation:</u>	L (-)	<ul style="list-style-type: none"> <li>- All wastewater generated from the labor camps should be discharged into properly constructed septic tanks and soakage pits.</li> <li>- No wastewater should be allowed to stagnate in the camp site</li> </ul>	<p>Proper Disposal of wastewater, Stagnation of waste water in the camp promises and surroundings.</p> <p>Once in a week/ Camp site</p>	To be provided in the construction cost	Contractor	PIC/PIU, random check by PHI and CEA
1.5	<u>Overflow of Septic tank in the area</u>	L(-)	<ul style="list-style-type: none"> <li>- Prepare an inventory of existing septic tanks</li> <li>- Discuss with relevant local authorities and make arrangement to empty when required and the collected wastes should be properly disposed.</li> <li>- Alternatively, services of a</li> </ul>	During the construction period	Added to the contractor's cost	Contractor	PIC/PMU/CEA/PHI

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>gully bowser could be arranged to clear the filled septic tanks and dispose the effluent</p> <p>-</p>				
1.6	<b>Impacts on natural flow and existing drainage pattern and hydrology</b>	M(-)	<ul style="list-style-type: none"> <li>- The contractor shall take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear at all times.</li> <li>- Temporary storage of material will be made only in approved sites by the PIC where natural drainage is not disturbed.</li> <li>- All wastes will be disposed at locations approved by the Local Authority.</li> <li>- If flooding or stagnation of water is caused by contractor's activities, the contractor shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property.</li> <li>- Severe rain intensities are observed during inter-monsoon and monsoon</li> </ul>	<p>Stagnation of water, inundation of surrounding area, dumping of solid waste and debris,</p> <p>Daily during rainy season, or when ever rains.</p>	No cost involved	Contractor	PIC/PMU

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>seasons and thus timing of construction during dry flow period as a mitigation measure is highly recommended.</p> <ul style="list-style-type: none"> <li>- No material including excavated soil will be allowed to be disposed near water bodies or in paddy lands, even on a temporary basis, to curtail any undue wash off of soil and debris to nearby water bodies and paddy lands. The contractor will ensure that not to damage or block any manmade drainage canal even on a temporary basis.</li> <li>- If any natural drainage path unintentionally blocked, the contractor should remove such debris without any delay.</li> <li>- The contractor shall schedule his construction activities in compliance with the rainfall pattern of the project area and activities which will induce soil erosion shall be planned to avoid heavy rainy periods.</li> </ul>				

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
1.7	Impacts on Water Quality due to erosion and Silt Runoff,	M (-)	<ul style="list-style-type: none"> <li>- Removal of vegetation cover should be minimized by considering alternative locations and paths,</li> <li>- natural drainages in the construction area must not be blocked to facilitate free flow of water,</li> <li>- carry out construction works in any erodible area during dry season as much as possible,</li> <li>- if any civil works are to be carried out during rainy days, enough silt traps, sludge pumps and interceptor drains should be incorporated in the construction site as much as possible,</li> <li>- silt traps should be provided as much as possible where possible runoff is observed,</li> <li>- cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid obstruction or destruction to natural drainages,</li> <li>- site specific soil erosion</li> </ul>	<p>Availability of silt traps, Blockages, silt in the natural drainages</p> <p>Visual inspection during the rainy season and rehabilitation of culverts</p>	To be included in the contractor's contract	contractor	PIC/PIU Irrigation Department and Local Authority

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			control measures, such as (rubber masonry, concrete retaining walls, etc.,) must be taken to protect embankment slopes, - exposed areas should be covered during the rainy seasons and turfing and terracing work should be done after the constructions.				
1.8	<b>Extraction, Transportation and Storage of Construction Materials</b>	H (-)	<ul style="list-style-type: none"> <li>- construction materials could be extracted from existing quarries, crushers and borrow pits in the nearby areas,</li> <li>- the contractor/s shall only obtain material from resource locations which has proper licenses and approvals GS&amp;MB and CEA</li> <li>-if new quarries are operated by the construction contractor;</li> <li>- quarries should not locate in any environmentally sensitive areas, or in vicinity to archaeological / cultural or religious places, schools and settlements,</li> <li>- excavation operations and</li> </ul>	<p>Noise levels, dust emission, vibrations.</p> <p>Conduct by a Laboratory registered with the CEA</p> <p>Boundary of the borrow pits and metal quarries</p> <p>Once in three months during the operation period and if any complaints are received</p>	To be included in the contractor's contract	. Contractor	PIC, PIU, GSMB, CEA, DS and LAs



S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>rock mining / blasting activities near schools, hospitals or religious places (500m away) should be done in accordance with agreeable time periods in consultation with relevant stakeholders in a mutually understandable manner,</p> <ul style="list-style-type: none"> <li>- hydrology report (from a qualified hydrologist) &amp; test blast report (GS&amp;MB/ITI/CEA) should be obtained prior to mining activities. Standard and site specific precautionary measures and conditions stipulated in an EPL &amp; IML should be adhered during blasting operations,</li> <li>- sand, gravel and other dust causing construction materials must be transported in covered trucks and sprinkling of water over the construction materials prior to transport to minimize dust emissions. Spraying of water along the material transport road sections where settlements exist in order</li> </ul>				

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>to minimize the dust dispersion due to vehicular movement,</p> <ul style="list-style-type: none"> <li>- after the constructions borrow pits must be restored by the contractor or relevant authorities. The restoration should include re-vegetation of the sites with landscaping and facilitating to re-growth of natural vegetation,</li> <li>- material storage sites should not be established closer to residential areas, beside the roads, around the water bodies etc.</li> </ul>				
1.9	<b>Impacts on Local Road Network</b>	M (-)	<ul style="list-style-type: none"> <li>- it is necessary to obtain permission from the relevant local authorities and the Director, Motor Traffic to use such local roads prior to construction begins,</li> <li>- all existing high ways &amp; local road network used by the vehicle of the contractor, or/and any of his sub-contractors or/and suppliers of materials and new roads,</li> </ul>	<p>Traffic congestion Deposition of dust/mud/ in the transport route, damages to the roads</p> <p>Traffic daily during the peak hours/</p> <p>Others, once a week visual observation of</p>	No cost involved	Contractor	PIC, PIU, RDA, CEA and relevant Local authorities

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>which are being used by traffic, shall be kept clean and clear of all dust/mud/extraneous materials dropped by the said vehicles or tyres,</p> <ul style="list-style-type: none"> <li>- similarly, all dust/mud/extraneous materials from the works spreading on these high ways shall be immediately cleared by the contractor. Clearance shall be affected immediately by manual sweeping and debris shall be removed entirely from the road surface,</li> <li>- if necessary or/and directed by the engineer or other relevant officials, the road surface shall be hosed or watered using suitable equipment,</li> <li>- contractor should properly maintain all road surfaces, which will utilize for the construction related activities in better or similar conditions at all times and after the construction work, the</li> </ul>	the road net work of transport route.			

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>contractor must rehabilitate all structural damages caused to the particular local roads at contractor's expense,</p> <ul style="list-style-type: none"> <li>- public access roads to quarries should be subject to "before and after" condition surveys in conjunction with the RDA and the Engineer with the contractor being held liable for damage caused by the extraordinary traffic as is provided by the Condition of Contract.</li> </ul>				
1.10	<b>Impacts due to Dust and Air Quality and Noise and Vibration due to construction activities</b>						
	<b>Impacts on Air Quality</b>	-	<ul style="list-style-type: none"> <li>- Quarries, crushers and asphalt plants must be located at least 500m away from the residential or other public sensitive areas.</li> <li>- Spray water before loading and transportation of soil and sand, particularly during windy conditions. Dust causing materials must be covered with tarpaulin during</li> </ul>	<p>Dust levels according to the National Environmental Act, tested by a Laboratory registered with CEA</p> <p>Wetting of the dust generating area, Covering of dust generating materials</p>	To be included in the contractor's contract	Contractor	PIC, PIU, CEA and relevant local Authorities

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<ul style="list-style-type: none"> <li>transportation</li> <li>- Dust emissions must be minimized at working areas, excavated areas, quarry sites and crusher sites by spraying of water regularly.</li> <li>- Ground surface of sites where the crusher plant, concrete batching plant and asphalt plant are located should be covered by tar layer to minimize the dust generation due to vehicle moving.</li> <li>- Apart from the regular wet method for the jaw area, wet rubble can be fed, drum of the crusher can be covered by maintaining the appropriate height and conveyer belts also can be covered without disturbing to the process in order to minimize the dust generation. Dust generating from the crusher plant, loading of raw materials to the asphalt plant &amp; batching plant should be controlled up to the National ambient air quality</li> </ul>	<p>storage, Deposition of dust in the surrounding areas,</p> <p>Project road section, quarry site, crusher site, batching plants and premix site,</p> <p>Visual inspection daily,</p> <p>Dust measurement report once in three months until complete the project,</p>			

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>standards (Gazette Notification No. 1562/22 of 15th August 2008).</p> <ul style="list-style-type: none"> <li>- Conveyer belts of the asphalt plant also should be covered.</li> <li>- Sitting of crusher plants, asphalt hot-mix plants should be downwind of close sensitive receptors.</li> <li>- Construction materials must be stored in covered places or must be covered with a suitable covering to prevent dust emissions due to wind.</li> <li>- Protective blasting should be carried out to minimize dust and other gas emissions. Chemical blasting is the best option, which does not cause any noise or dust emissions.</li> <li>- Temperature of the Hot-mix plant should be controlled at appropriate level in order to control exhaust gasses to comply relevant emission standards.</li> <li>- Use well-maintained construction and</li> </ul>				

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<ul style="list-style-type: none"> <li>equipment fleet</li> <li>- Regulate vehicle movement speed when moving along unpaved area.</li> <li>-</li> </ul>				
1.11	<b>Impacts due Noise and vibration</b>	M(-)	<ul style="list-style-type: none"> <li>- Construction machinery should be operated only during the day time.</li> <li>- Contractor shall equip properly tuned and well maintained heavy construction equipment and vehicles.</li> <li>- Suitable noise controlling devices, such as exhaust silencers can be used to control noise.</li> <li>- Noise level must not exceed 75 db during the day time (The maximum permissible noise levels at boundaries in the land in low noise areas range from 75 LacqT, during the daytime and 50 LacqT, during the night time for construction activities).</li> <li>- All construction vehicles, machinery and equipment must</li> </ul>	<p>Noise levels at the boundary of the project area. But in the case of township areas the buildings are located at the edge of the ROW. Therefore, measurements to be conducted at the ROW.</p> <p>Vibration levels as per the CEA Proposed standards.</p> <p>Crake survey.</p> <p>Selected points of the proposed roads,</p>	To be included in the contractor's contract	Contractor	PIC, PIU, CEA and relevant local authorities

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<ul style="list-style-type: none"> <li>- be properly maintained to comply with the National Emission Standards.</li> <li>- Sitting of crusher plants, concrete batching plant &amp; asphalt plant should be done as much away from the residential areas.</li> <li>- Jaw of the crusher can be installed in a sound proof area without disturbing the material feeding, and also drum can be covered maintaining appropriate height between mesh &amp; the cover and conveyer belts also can be covered.</li> <li>- Contractor is highly responsible to take precautionary measures to ensure that, the construction works do not result in damaging to adjacent properties due to vibrations.</li> <li>- If vibration levels exceed the permissible levels, contractor shall modify the method of construction until compliance with the acceptable level.</li> <li>- If heavy vibrators are used, a</li> </ul>	<p>If contractor operates the Borrow areas, quarry site, premix plant and Batching plant, boundary of the such plants.</p> <p>Noise levels once in three months and receiving of complaints.</p> <p>Building crack survey, one before the construction commenced.</p>			



S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>crack survey should be conducted for the close by residences specially in the Madamape old town, where the buildings are in the boundary of the ROW, and some building, the access are constructed within the ROW.</p> <p>- Vibration level should be maintained according to the “Proposed Air-Blast Over Pressure and Ground Vibration Standards for Sri Lanka” by the CEA</p> <p>- Use of heavy machinery and equipment for constructions must be done only during the day time (from 6.00 am to 6.00 pm). When constructions are carried out near public sensitive areas, such as schools, hospitals or religious places the contractor must schedule the construction activities in consultation with the relevant authorities to avoid any inconvenience.</p>				

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
1.12	Impacts due to Traffic	M(-)	<ul style="list-style-type: none"> <li>- A detail traffic impact assessment should be carried out in consultation with the relevant Police offices in the area and with the local community to identify the status of traffic and find alternatives to reduce traffic congestions.</li> <li>- A traffic management plan must be prepared based on the Traffic Impact Assessment and implemented.</li> <li>- An advance notice should provide to local communities about the schedule of construction activities.</li> <li>- Proper alternative roads should be identified and inform well before the construction commences.</li> <li>- Traffic regulations, such as speed limits, time of transportation (especially night time) should enforce during transportation of materials and equipment and machinery.</li> <li>- Condition of road and bridges to be surveyed and</li> </ul>	Road congestions /near the construction site Daily/Visual observation,	To be included in the construction contract	Contractor	PIC, PIU, Local Motor traffic

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<ul style="list-style-type: none"> <li>- documented prior to activities. Installation of traffic warning signs, temporary traffic lights or traffic control personnel, where construction and associated traffic has created significant impacts.</li> </ul>				
2.0	<b>Ecological Impacts and Mitigation</b>						
2.1	<b>Impacts due to removal of roadside trees</b>	L (-)	<ul style="list-style-type: none"> <li>- Identify the no. of tree to be cut as per the detailed design. The approval of DS and Forest Department should be obtained for the cutting of such trees. Based on the approval, make arrangement with the State Timber Corporation to cut and remove the trees.</li> <li>- The tree replanting program should be carried out within the ROW and at locations with public importance (such as schools and other government institutes) according to the necessity. Fruits and medicinal plant species, which are native to the project area, to be</li> </ul>	<p>No of trees are cut./ Location based on the detailed design,</p> <p>No of trees planted</p> <p>Once during the cutting of trees.</p> <p>Once in a month at tree planting sites until completion of project</p>	To be included in the construction contract	Contractor	PIC/PIU, Forest Department, DS and State Timber Corporation

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			selected, if replanting to be undertaken outside the ROW. The continuous supervision and maintenance during the operational stage are essential to ensure the survival of trees. Planting of 1:3 of trees as suggested in the EARF shall be carried out.				
	<b>Impacts on and Flora Fauna</b>	L (-)	<ul style="list-style-type: none"> <li>- The core project boundaries must be clearly demarcated and informed the workers.</li> <li>- Hunting, fishing, collecting firewood, fauna and flora, washing and cleaning of vehicles, construction instruments should be strictly prohibited, and workers should be educated through an awareness program.</li> <li>- Disposal of solid waste, waste water, chemicals, such as tar, cement etc. into water bodies should not be allowed and must be strictly monitored.</li> <li>- When construction works are carrying out closer to bordering freshwater habitats,</li> </ul>	<p>No of incidence of prohibited activities.</p> <p>Dumping of waste materials</p> <p>Near water bodies and wet lands in the project area</p> <p>Daily by visual observation until completion of the construction</p>	To be included in the construction contract	Contractor	PIC, PIU

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>suitable engineering and biological measures must be taken to prevent aquatic pollution. E.g. to prevent entering pollutants with the surface runoff into the water source, a buffer zone can be created by planting fast growing plant species in between the road and the water source. Collecting all the pollutants using traps and treated at one point or use of soakage pits is a suitable engineering measure to prevent aquatic pollution.</p> <p>- Warning and sign boards must be displayed near the sensitive aquatic habitats to prevent throwing garbage or any kind of pollutants to the water body.</p>				
3.0	<b>Socio-economic Impacts and Mitigation</b>						
3.1	<b>Social impacts due to the Establishment</b>	M (-)	- Labor camps, shall be established in suitable locations away from the houses,	Complaints from the community,	To be included in the	Contractor	PIC/PIU

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
	of labor camps		<ul style="list-style-type: none"> <li>- business establishments and other sensitive institutions, such as schools, religious centers, etc. and the laborers to be made aware to behave appropriately in a manner not to become nuisance to others in the neighborhood.</li> <li>- Conduct regular awareness program to the laborers on the social behavior, spreading of communicable diseases like HIV/AIDs and Covid-19 and proper handling of wastes.</li> </ul>	No. of awareness program conducted	construction contract		
3.2	<b>Disruption to traffic</b>	L(-)	<ul style="list-style-type: none"> <li>- Adopting proper traffic management plan at construction sites.</li> <li>- One side of the road may be used for construction at a time while the other side is kept for the road users.</li> <li>- Regular/continuous arrangements to manage the traffic near construction sites shall be implemented methodically.</li> </ul>	Local Traffic  Daily during the construction	To be included in the construction contract	Contractor	Local traffic police, PIC/PIU

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
3.3	<b>Impacts to cultural Festivals</b>	L(-)	<ul style="list-style-type: none"> <li>- Temporarily terminating the project activities based on the need</li> <li>- Properly provide safety signs for the construction area</li> <li>- Preventing people to walk in the partly constructed area mainly drains and culverts.</li> </ul>	Local traffic  During the festive season	No cost involved	Contractor	Local traffic police, PIC/PIU
3.4	<b>Risk of child labor</b>	L(-)	<ul style="list-style-type: none"> <li>- Special safeguard measures and a special clause in the contract need to be incorporated into the contract documents.</li> <li>- The Project needs to be in contact with the Labor Officers to monitor the recruitments by the contractors and to incorporate mitigatory measures.</li> </ul>	Child labor at work places  daily	No cost	Contractor	PIC/PIU
3.5	<b>Personal safety</b>	M (+)	<ul style="list-style-type: none"> <li>- Placing warning and sign boards, speed limits and signs, barricades, must be placed in all construction sites in Sinhala, Tamil and English languages.</li> <li>- An awareness program should be done about the personal</li> </ul>	Availability of boards, Usage of Personal Protective gears, availability of first aid box,  Construction sites	To be included in the contractor's construction cost	Contractor	PIC/PIU

S.No	Project Activities/ Environmental Impacts	Level of Impacts (H- high, M- Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitored by
			<p>safety of the workers and general public in the area.</p> <ul style="list-style-type: none"> <li>- The contractor must provide protective gears, such as footwear, ear muffers, helmets, goggles, eye-shields and clothes to workers</li> <li>- Adequate ventilation for chemical storage should be kept to avoid accumulation of fumes and offensive odor that could be harmful to workers.</li> <li>- Onsite first aid facilities and emergency transport facilities to the nearest hospital should be made available at construction sites at any time in order to ensure safety of workers and public in any case of an accident.</li> </ul>	Daily during the construction period			

PIC- Project Implementing Consultants, EMP- Environmental Management Plan, EO- Environmental Officer, PMU- Project Implementation Unit, EARF- Environmental Assessment Frame Work, RDA- Road Development Authority, NWSDB- National Water Supply and Drainage Board, SLT-Sri Lanka, SLT-Telecom, DMC- Disaster Management Centre, CEA- Central Environmental Authority, LA- Local Authority, GSMB- Geological Survey and Moines Beure , ITI – Industrial Technology Institute, EPL – Environmental Protection Licence, DS- Divisional Secretariat.



**Table 3 : Environmental Management Plan for Post Construction/ Operational stage**

**Province : North Western Province**

**No. of RDA road and total length : A003 National Highway. Length 38 km from 38+000 to 76+000**

No	Project Activities/ Environmental Impacts	Level of Impacts (H-high, M-Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitoring Responsibility
1.	Encroachment of ROW	M(-)	<ul style="list-style-type: none"> <li>- Place boundary mark stones</li> <li>- Enforcement of rules and regulations</li> </ul>	Encroachment to ROW Along the project area Continuedly	To be provided in the RDA recurrent budget	RDA regional offices	Local Authority/ RDA
2.	Stagnation of Water	H(-)	<ul style="list-style-type: none"> <li>- Continuous maintenance should be carried out by the RDA</li> <li>- People living near the drains should be educated to avoid dumping and discharging of wastes</li> </ul>	Flooding areas  Along the project area  During the rainy season	To be provided in the RDA recurrent budget	RDA regional offices	Local Authority/ RDA
3.	Noise and air pollution	L(+)	<ul style="list-style-type: none"> <li>- Maintenance of green corridors and their beneficial impact on air and noise pollution control.</li> <li>- Speed limits shall be strictly enforced together with restriction in the use of horns shall be</li> </ul>	Excessive noise and dust  Along the project area  When complaints received from the community	To be provided in the RDA recurrent budget	RDA regional offices	Local Authority/ RDA/CEA

No	Project Activities/ Environmental Impacts	Level of Impacts (H-high, M-Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitoring Responsibility
			<p>restricted near mosques, hospital, schools and densely populated settlements.</p> <p>- Ensure the National Environmental (Vehicle Horns) Regulations, No. 1 of 2011.</p>				
4.	Impacts on Road Safety	M(-)	<p>- Speed limits, warning and sign boards must be placed near sensitive areas and identified places, which are susceptible to accidents.</p> <p>- Road furniture and road marking should be done immediately after the construction work.</p> <p>- Bus bays and payments must be constructed properly.</p> <p>- Edge delineation should be carried out on wider pavements. Guard railing and chevron markers should be placed on bends, sealed</p>	<p>Availability of the road safety</p> <p>Regularly</p>	To be provided in the RDA recurrent budget	RDA regional offices	Local Authority/ RDA/CEA

No	Project Activities/ Environmental Impacts	Level of Impacts (H-high, M-Moderate, L-Low) (+ Positive, - Negative)	Mitigation Measures	Parameter to be Monitored/ Locations/ Frequency	Cost	Implemented by	Monitoring Responsibility
			<p>shoulders should be provided where the places of cycle and other slow and non-motorized traffic is significant.</p> <p>- Ker bed footpaths should be placed at the town limits settlement areas.</p>				

Note: PIC- Project Implementing Consultants, PMU- Project Implementation Unit, RDA- Road Development Authority, ESDD\_ Environment and Social Development Division

**ANNEX VI\_2**  
**Environmental Monitoring plan**

## Environmental Monitoring Plan- Pre-construction Stage

Province : North Western Province

No. of RDA road and total length : A003 National Highway. Length 38 km from 38+000 to 76+000

Environmental Aspect	Monitoring Parameter	Applicable Standard	Monitoring Method	Monitoring Locations	Monitoring Frequency	Monitoring Responsibility	Cost (Rs)
<b>Inland surface water quality</b>	pH, Temp, Conductivity, DO, BOD, Ammonia, Nitrates, Iron, PO <sub>4</sub> , TSS, Fecal Coliform, Total Coliform;	Proposed ambient water quality (surface water); standards proposed by the CEA	Sample collected and analyzed by laboratory registered with CEA	5 locations Mahaoya, Gin Oya, Maha Wewa, Karabmalan Oya, Thinipitiya Wewa (ref. <b>Appendix 1</b> )	Once before the commencement of the project	CC	30,000X5 X=150,000/=
<b>Vibration</b>	Crack survey	Existing condition	Take measurements and photographic records. Number all defects	At-risk buildings and structures as decided by the PIC/PIU	Once before the commencement of the project	CC	1,000,000/=

Note 1: Ground water quality, background noise levels and the air quality measurements conducted for the preparation of this IEE report could be considered for the setting of existing environmental conditions.

Note: CC -Construction Contractor, DO- Dissolved oxygen, BOD Biological Oxygen Demand, PO<sub>4</sub>.Phosphate, CEA-Central Environmental Authority, PIC- Project implementation Consultants, Project Implementation Consultant, PIU- Project Implementation Unit.

### Environmental Monitoring Plan- Construction Stage

**Province : North Western Province**

**No. of RDA road and total length : A003 National Highway. Length 38 km from 38+000 to 76+000**

Environmental Aspect	Monitoring Parameter	Applicable Standard	Monitoring Method	Monitoring Locations	Monitoring Frequency	Monitoring Responsibility	Cost (Rs)
<b>Inland surface water quality</b>	pH, Temp, Conductivity, DO, BOD, Ammonia, Nitrates, Iron, PO <sub>4</sub> , TSS, Fecal Coliform, Total Coliform;	Proposed ambient water quality by the CEA	Sample collected and analyzed by laboratory registered with CEA	5 locations Mahaoya, Gin Oya, Maha Wewa, Karabmalan Oya, Thinipitiya Wewa (ref. <b>Appendix 1</b> )	Once in 6 months	CC	30,000X5 X4 <sup>2</sup> =600,000/=
<b>Groundwater quality</b>	pH, Temp, Conductivity, DO, BOD, Ammonia, Nitrates, Iron, PO <sub>4</sub> , TSS, Fecal Coliform, Total Coliform;	SLS Drinking water quality	Sample collected and analyzed by laboratory registered with CEA	3 locations (wells) as given in the <b>Appendix 2</b>	Once in 6 months	CC	30,000X3 X4 =360,000/=

<sup>2</sup> Considering the project period is 2 years

Environmental Aspect	Monitoring Parameter	Applicable Standard	Monitoring Method	Monitoring Locations	Monitoring Frequency	Monitoring Responsibility	Cost (Rs)
<b>Air quality (Dust)</b>	Fugitive dust.	Fugitive Dust Emission standards	Gravimetric Method, Sample collected and analyzed by laboratory registered with CEA	3 locations as in the <b>Appendix 2</b>	Once in 6 months	CC	20,000 x 3 x 4 =240,000/=
<b>Ambient Air quality</b>	PM <sub>10</sub> , PM <sub>2.5</sub> , NO <sub>2</sub> , SO <sub>2</sub> , O <sub>3</sub> and CO	The National Environmental (Ambient Air Quality) Regulations	Sample collected and analyzed by laboratory registered with CEA	3 Locations as in the <b>Appendix 2.</b>	Once in 6 months	CC	25,000 x3 x4 = 300,000
<b>Noise</b>	Day and night time ambient noise dB(A) LAeq	The National Environmental (Noise Control) Regulations No.1 1996	Portable noise meter (range 0-120 dB(A)) conducted by laboratory registered with CEA.	3 locations as in the as in <b>the Appendix 2.</b>	Once in 6 months	CC	25,000 x 3x 4 = 300,000/=

Environmental Aspect	Monitoring Parameter	Applicable Standard	Monitoring Method	Monitoring Locations	Monitoring Frequency	Monitoring Responsibility	Cost (Rs)
<b>Crack survey</b>	Cracks and other structural weakness of at risk buildings	Any changes causing structural weakness or risk since baseline pre-construction records	Take measurements and photographic records. Number all defects	At-risk buildings and structures as identified from field observations; and any locations from which there are complaints;	During / after construction on complaints	CC	500,000/=
Provisional sums for the monitoring activity on public complaints							1,000,000/=

Note: CC -Construction Contractor, DO- Dissolved oxygen, BOD Biological Oxygen Demand, PO<sub>4</sub>- Phosphate, PM<sub>10</sub>,- Particulate Matters Micron size 10, PM<sub>2.5</sub> Particulate Matter Micron size 2.5, NO<sub>2</sub> - Nitrogen Dioxide, SO<sub>2</sub>– Sulfur dioxide , CEA-Central Environmental Authority, PIC- Project implementation Consultants, Project Implementation Consultant, PIU- Project Implementation Unit.



### Environmental Monitoring Plan- Operational Stage

Province : North Western Province

No. of RDA road and total length : A003 National Highway. Length 38 km from 38+000 to 76+000

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Environmental Aspect	Monitoring Parameter	Applicable Standard	Monitoring Method	Monitoring Locations	Monitoring Frequency	Monitoring Responsibility	Cost (Rs.)
<b>Inland surface water quality</b>	pH, Temp, Conductivity, DO, BOD, Ammonia, Nitrates, Iron, PO <sub>4</sub> , TSS, Fecal Coliform, Total Coliform;	Proposed ambient water quality (surface water); standards proposed by the CEA	Sample collected and analyzed by laboratory registered with CEA	5 locations Mahaoya, Gin Oya, Maha Wewa, Karabmalan Oya, Thinipitiya Wewa (ref. <b>Appendix 1</b> )	Once after one year of completion of the project	RDA/ES DD	30,000X5 =150,000/=
<b>Air quality</b>	NO <sub>2</sub> , SO <sub>2</sub> , O <sub>3</sub> and CO;	The National Environmental (Ambient Air Quality) Regulations	Sample collected and analyzed by laboratory registered with CEA	3 Locations as in the <b>Appendix 2</b>	Once after one year of completion of the project	RDA/ES DD	3 x 25,000 =75,000/=
<b>Noise</b>	Day and night time ambient noise dB(A) LAeq	The National Environmental (Noise Control) Regulations No.1 1996	Portable noise meter (range 0-120 dB(A))	3 Locations as in the <b>Appendix 2</b>	Once after one year of completion of the project	RDA/ES DD	25,000x 3 =75,000/=
Provisional sums for the monitoring activity on public complaints							1,000,000

Note: RDA- Road Development Authority, ESDD- Environment and Social Development Division, DO- Dissolved oxygen, BOD Biological Oxygen Demand,  $\text{PO}_4$  - Phosphate,  $\text{PM}_{10}$ ,- Particulate Matters Micron size 10,  $\text{PM}_{2.5}$  Particulate Matter Micron size 2.5,  $\text{NO}_2$  - Nitrogen Dioxide,  $\text{SO}_2$  – Sulfur dioxide , CEA-Central Environmental Authority, PIC- Project implementation Consultants, Project Implementation Consultant, PIU- Project Implementation Unit.

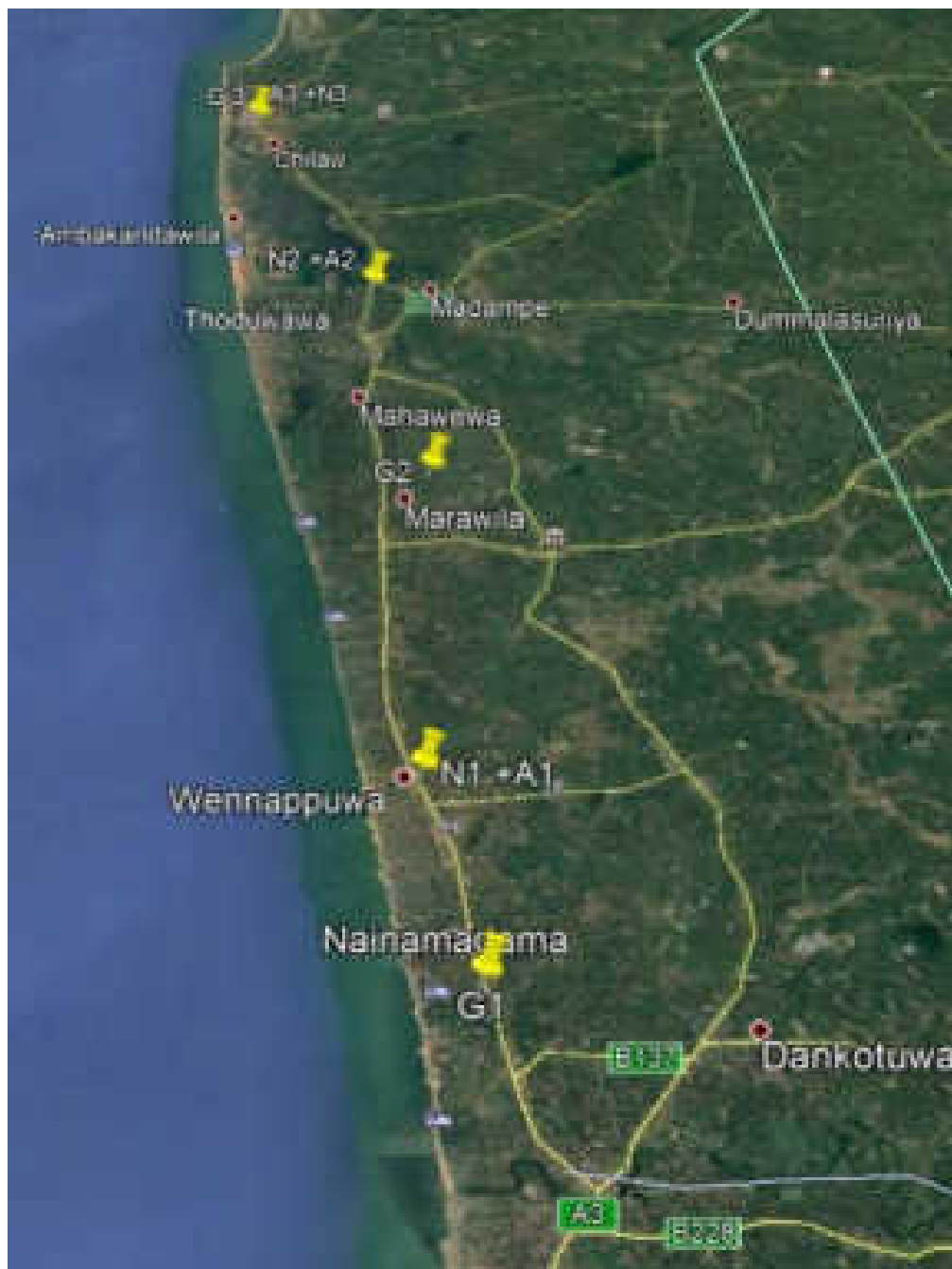
## APPENDIX 1

### Surface water sampling locations



## APPENDIX 2

### Ground water, Air Quality and Noise Levels measurement sites



Note 1: Location of Sampling Points; G-ground water, N-Noise Levels and A- Air quality  
2; More details on the locations are given in the relevant section of this report in Chapter IV.

**ANNEX VI-3**  
**FGD, KII and GN Consultation program**

**PROVIDING SERVICES FOR PREPARATION OF ENVIRONMENTAL SOCIAL SAFEGUARD DOCUMENTS OF PELIYAGODA-PUTTALUM ROAD (A003) FROM KOCHCHIKADE BRIDGE TO CHILAW FROM 38 TO 76 KM FOR REHABILITATION AND IMPROVEMENT UNDER ROAD MANAGEMENT CONTRACT**

**Focus group discussions**

**Date** – 16<sup>th</sup> October 2019

**Venue** – DSD Office Wennappuwa

**Consultation with GNs in Wennappuwa Divisional Secretariat Division**

1. What are the current problems of road
  - a. There is no proper drainage system to drain out storm water
  - b. There is an unauthorized build area in Lunuwila junction, a private businessman build a car park which blocks the drains and road sides. Because of that the area is inundating for a small rain too. However, they were complained before 9 months ago no action was taken up to date.
  - c. The carpet is cracked and uneven therefore high possibility for accidents
  - d. Drainage systems is not constructed in a proper system
  - e. Even though the day to day maintenance are doing by the pradeshiya sabha, there is no maintenance by the RDA
  - f. There are number of unauthorized buildings
  - g. Mr. M.M. Ajith Fernando, GN, West Wennappuwa and West Kolonjaliya GN divisions stressed out that, West Kolonjaliya and Randiyagama colony is currently flooded. Even though the water is taking out from the motors it is in very slow progress. And water draining very slowly. In West wennappuwa GN division, RDA constructed the drain system via police road and bring the storm water to Wennappuwa lake. A big environment impact is happening due to that. Wennappuwa lake was buildup by King VI Parakrmabhahu and even in drought seasons lake is functioning and serve to the rural people. The drains are directed to the lake due to the political influences. Also he proposed an alternative to the problem; construct drainage next to the convent and send the storm water to sea. Unless they are ready to take legal actions.
2. Issues for road users both vehicles and pedestrians
  - a. About 25 – 30 trucks full of waste for Aruwakkalu landfill are travelling daily and it makes bad odor in the surrounding areas. Also due to that road damages are occurring. Though they are travelling in night road is not wide enough to overtake those trucks if necessary.
  - b. Some people park vehicles near the road crossings therefore both pedestrians and other vehicles can't see the crossing properly.
  - c. Front parts of some buildings are constructed within the RDA reservation
  - d. Bus halts are too close to the road and if a bus stopped at a halt there is a huge traffic behind the bus
3. What do you think about the current RDA maintenance practices

- a. There is absolutely no maintenance. There is high vehicle density and two schools in Wennappuwa town. It is better to have a pedestrian overpass. In the border of Nainamadama West and East there is carpentry workshop and there is high traffic also when flooding over 5-6 ft inundation.
- b. After the construction / carport the roads Water board and or electricity board doing, do the wiring and or lay pipelines that will damage the road. There is no proper coordination or mechanism to avoid that.
- c. Road crossings are not visible the crossing lanes are faded away, the lifetime of a crossing lines are about 3 months. Pedestrian lines are not visible at all.
4. What are the improvements that can suggest for current plan
  - a. Pedestrian overpass – in front of church/ convent
  - b. If you provide a in detail road map/ plan we can suggest the improvements in GN level
  - c. Establish side mirrors on Waikkala junction
  - d. Build security fences on roads especially in town areas to avoid pedestrian crossings from everywhere.
  - e. Increase the number of lanes in city boarder
  - f. Walk track is necessary because of the traffic (not a jogging track)
5. Issues that can arise during construction period
  - a. Aware business owners
  - b. Propose alternate routes
  - c. Reservation area is not clear therefore make available a map in Divisional secretariat
  - d. Make short the construction period as much as possible
  - e. Consult residence before the construction
  - f. It is highly recommended to show the new road plan, including culverts, bridges, drainages, causeways to the general public.



## Attendance List








සූර්යාසහයක පුනරුද්ධි සංවිධානයේ සභාපති ඩී.එ. 38 සිට 75 දක්වා කාලයකදී පුරාණ-ආතරණ සහ වැඩි දියුණු කිරීම පදනම සහ වෘත්තීය අධ්‍යයන පිටුවක සභාපති

ಪ್ರಾಥಮಿಕ ಹಂತದ ಪಾಠ್ಯಪುಸ್ತಕ : **ಮೊದಲನೆಯ**

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ക്രമ നമ്പർ	പേര്	ജന്മ തീയതി	സംസ്ഥാനം	സംസ്ഥാന നമ്പർ	സംസ്ഥാന നമ്പർ
1.	കെ. എ. സിദ്ദീഖ്	1980	കേരളം	0774284471	<u>Handwritten</u>
2.	എ. എ. സിദ്ദീഖ്	1980	കേരളം	077/5803870	<u>Handwritten</u>
3.	കെ. എ. സിദ്ദീഖ്	1980	കേരളം	076723590	<u>Handwritten</u>
4.	എ. എ. സിദ്ദീഖ്	1980	കേരളം	0767197219	<u>Handwritten</u>
5.	കെ. എ. സിദ്ദീഖ്	1980	കേരളം	0772023940	<u>Handwritten</u>
6.	എ. എ. സിദ്ദീഖ്	1980	കേരളം	0774709931	<u>Handwritten</u>
7.	എ. എ. സിദ്ദീഖ്	1980	കേരളം	077-8917000	<u>Handwritten</u>



කි.පි.	නම	ප්‍රති විද්‍යාත්මක නම	දුරකථන අංකය	අත්සන
8	D.S. සේනාරත්න	ප්‍රබාස රාජාචාර්ය	0776166493	
9	H.M.K. P.V. Jayasinghe	ආර්ථික විද්‍යාඥයා	0718036351	
10	H.M.S. සේනාරත්න	ව්‍යවස්ථාපිත විද්‍යාඥයා	0718414107	
11	සුමත්තිකානු රත්නසිරි	ආර්ථික විද්‍යාඥයා	096-4404031	
12	S.M.D. උදයසේන	ආර්ථික විද්‍යාඥයා	0777-286042	
13	D.L.A. සේනාරත්න	ආර්ථික විද්‍යාඥයා	0770934147	
14	N.C.T.P. Jayasinghe	ආර්ථික විද්‍යාඥයා	0776271541	

**PROVIDING SERVICES FOR PREPARATION OF ENVIRONMENTAL SOCIAL SAFEGUARD DOCUMENTS OF PELIYAGODA-PUTTALUM ROAD (A003) FROM KOCHCHIKADE BRIDGE TO CHILAW FROM 38 TO 76 KM FOR REHABILITATION AND IMPROVEMENT UNDER ROAD MANAGEMENT CONTRACT**

**Focus group discussions**

**Date** – 16<sup>th</sup> October 2019

**Venue** – DSD Office Nattandiya

**Discussion with Grama Niladaris**

1. What are the current problems in road
  - a. It is really difficult to use the road in rainy season, flooding in Nainamadama area
  - b. Culverts are completely blocked
  - c. Drains are not properly constructed
  - d. Lunuwila junction, Katuneria school, main street, Sebastian school, Jubily lane in Katuneria, Marawila are inundation
  - e. No maintenance at all
  - f. Roads are blocking due to structures and buildings constructed in road sides
  - g. After the construction / carport the roads Water board and or electricity board doing, do the wiring and or lay pipelines that will damage the road. There is no proper coordination or mechanism to avoid that.
2. Issues due to physical condition of the road
  - a. Pilgrims of Kochchikade church heavily use the road therefore Install color lights in traffic areas
  - b. Drainages are not properly constructed (කාණු කැට නැත)
  - c. Culverts and drainages are not visible when inundate, a school child fell in to the drian on an inundated day
  - d. Lansi gama in front of prawn Ceylon, pulun gas junction, Bulugaha wewa road, near Katuneriya church, Kumara weediya are inundating
  - e. Road damages
  - f. When the school times, school children all over the road, make pedestrian walk
  - g. Because of the Marawila රාත්‍රී පොළ, Kurusa palliya are crowded. The road is blocking due to clock tower
  - h. Bus halt are very close to each other in either sides of the road
3. What do you think about road maintenance
  - a. Road edges are damaged
  - b. No maintenance are happening
  - c. Accidents happening due to road damages
  - d. Road damages are in the joint place, main road and by road (by road to divisional secretariat division), it is unclear who is responsible for the maintenance and damage repair for that section, either RDA or divisional secretariat

- e. Goadawela junction, Marawila hospital, St. Xavier's College, Marawila and petrol shed areas are inundating,
- f. Road side gravels are not properly compacted therefore they are washing away in a small rain too  
Eg: there is a big gap (between Road and shoulder) in Dematapitiya junction, Katuneriya therefore it is difficult to drive.  
Suggested to lay carpet or tar in shoulder areas too as in Marawila town
- e. Better if there are drainages in road sides

4. What are your suggestions to improve the proposed road plan?

- a. proposed widen the road
- b. increase the number of lanes to 4, in Negambo Chilaw road
- c. it takes 1 – 1 1/2hr to pass the Kochchikade town due to the traffic
- d. proposed a flyover bridge in Kochchikade town
- e. although Kochchikade bridge was constructed that does not make much impact on the traffic condition
- f. Katuneriya maha vidyalaya, Wennappuwa high traffic in school time therefore, proposed a pedestrian overpass
- g. Heavy traffic in school leaving time near the convent - there are over 3000 school children
- h. Thummodara road was carpeted however bridge is narrow, therefore there is traffic
- i. After the construction / carport the roads Water board and or electricity board doing, do the wiring and or lay pipelines that will damage the road. There is no proper coordination or mechanism to avoid that.

5. Issues that can arise during construction period

- a. Issues may arise due to illegal constructions in ROW
- b. Aware general public on alternate routes
- c. Objections may rise from private land owners
- d. Proposed to do the construction in night time to avoid the traffic
- e. There may be dust , vibration impact to residencies
- f. Gravel can mine, buy from Koswatta/ Kirimetiya and Dankotuwa areas
- g. Workers/ labours/ drivers are available in the area
- h. Cable tunneling has to consider during the construction stages
- i. In some times, telephone, light poles on road
- j. There are clay pits in grama niladari divisions, there borrowed materials can be fill in to that clay pits for that please contact grama niladari

6. Impacts after the road construction

- a. Positive –facilitate for fast drive , time saving, good for vehicles
- b. Negative – accidents due to speed, after the construction, some institutes, like water board, telecom damage the road for their services and not repair properly.

7. How do you proposed to solve any issues rise during the construction

- a. Inform the RDA through divisional secretariat in written
- b. There are some people who does not like to inform in written, in some cases like, siltation or debris in culverts and contractor does not clean. How could they inform to RDA? Proposed: open a telephone line/ number

- c. No awareness among people on to whom complain if there any matter during the road construction or maintenance










# FGD held in DSD Office Nattandiya

සූර්යාගේ ප්‍රතිලාභ සේවයේ සේවකයන් සඳහා 80 ප්‍රතිලාභ දේශීය ම.ම. 38 සිට 76 දක්වා සේවකයන් ප්‍රතිලාභයක් ලෙස දැන දැන සේවක සේවක හා සේවකයන් සේවක සේවකයන් සඳහා

ප්‍රාදේශීය ප්‍රතිලාභ සේවකයන් : සේවකයන්

දිනය: 2019 අගෝස්තු 15 - පැමිණිලි ප්‍රතිලාභ

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W.H. ප්‍රතිලාභ	ප්‍රතිලාභ ප්‍රතිලාභ	සේවක ප්‍රතිලාභ	077-181171	
W.H. ප්‍රතිලාභ	ප්‍රතිලාභ ප්‍රතිලාභ	සේවක ප්‍රතිලාභ	077-644575	
W.H. ප්‍රතිලාභ	ප්‍රතිලාභ ප්‍රතිලාභ	සේවක ප්‍රතිලාභ	077-645875	
W.H. ප්‍රතිලාභ	ප්‍රතිලාභ ප්‍රතිලාභ	සේවක ප්‍රතිලාභ	077-977018	

නම	තනතුර	ග්‍රෑම් නිලධාරී සංවිධානය	දුරකථන අංකය	අත්සන
එ.පී.සේනානායක	ප්‍රධාන භූමි	දි/සංවිධානය	0776171026	පී.පී.
ක.ආ.ලක්මනායක	ප්‍රධාන භූමි	දි/සංවිධානය	0771566424	කේ.ආ.
සුභාසිරිසේන	ප්‍රධාන භූමි	සමස්ත සේවක ව/සංවිධානය	0761950533	සු.ස.
එම්.ඩී.ඊ.එම්.පී.	ප්‍රධාන භූමි	දි/සංවිධානය	0764001699	එම්.ඩී.
එම්.ආ.සේනානායක	ප්‍රධාන භූමි	සමස්ත සේවක	0719140091	එම්.ආ.
කේ.ආ.සේනානායක	ප්‍රධාන භූමි	සමස්ත සේවක	0772389977	කේ.ආ.
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එම්. ඩී. සේනානායක  
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071-8451380








අත්සන

අදාළයාගේ ප්‍රචලිත සිංහල නමින්ම පමණක් සඳහන් වන අයුරින් 38 සිට 76 අයුරින් නමින්ම ප්‍රති-ක්ෂේපයක් හෝ එහි දිගු කලක් පැවති හෝ පවතින අයුරින් පමණක් සඳහන් වේ.

ප්‍රාදේශීය අර්ධ සංවිධානය : කොළඹ 05

දිනය: 2019 ඔක්තෝබර් 15 - පැය 4:00 පමණක්

නම	පාර්ශ්ව	ප්‍රති-ක්ෂේපයේ නම	දුරකථන අංකය	අත්සන
D. H. S. / මහා	ප්‍රති-ක්ෂේපය	S. H. M. / මහා	077-2356700	
M. P. S. / මහා	ප්‍රති-ක්ෂේපය	499-A S. S. S. S. S.	077-5534233	
S. H. S. S. / මහා	ප්‍රති-ක්ෂේපය	S. H. S. S. S.	077-4697871	
G. A. / මහා	ප්‍රති-ක්ෂේපය	510/14 E. / මහා	071-3792408	
T. M. / මහා	ප්‍රති-ක්ෂේපය	500/A / මහා	071-9141959	
S. T. S. / මහා	ප්‍රති-ක්ෂේපය	506/B / මහා	071-5186921	
W. H. S. / මහා	ප්‍රති-ක්ෂේපය	494/B / මහා	077-6267991	

නම	සංඝ්‍රාම	දුරකථන අංකය	දුරකථන අංකය	අත්සන
සී. ඩී. රිච්මන්ඩ්	ප්‍රාග් ජාතික	506/A, 1/10/2000	076-4481390	
P.H.A.D. සමාජ	ප්‍රාග් ජාතික	495/D, 1/10/2000	0773-420189	
K.E.L. සමාජ	ප්‍රාග් ජාතික	510 E/10/2000	010009512	
M.L.D.N. සමාජ	ප්‍රාග් ජාතික	496/A ප්‍රාග් ජාතික 474/A ප්‍රාග් ජාතික	0771384422	
E.L.A.L. සමාජ	ප්‍රාග් ජාතික	497-4/10/2000	091-7072190	
Y.P.S.V. සමාජ	ප්‍රාග් ජාතික	502-10/2000 503A - 10/2000	071564681	
R.P.S.M. සමාජ	ප්‍රාග් ජාතික	500 - 10/2000	077-8866733	

R.O.T. සමාජ ප්‍රාග් ජාතික 503 සමාජ (ප්‍රාග් ජාතික) 076-0517382  
 J.N. සමාජ ප්‍රාග් ජාතික 497A-10/2000 077-0101859

  
 S.



**PROVIDING SERVICES FOR PREPARATION OF ENVIRONMENTAL SOCIAL SAFEGUARD DOCUMENTS OF PELIYAGODA-PUTTALUM ROAD (A003) FROM KOCHCHIKADE BRIDGE TO CHILAW FROM 38 TO 76 KM FOR REHABILITATION AND IMPROVEMENT UNDER ROAD MANAGEMENT CONTRACT**

**Focus group discussions**

**Date** – 16<sup>th</sup> October 2019

**Venue** - Mahawewa Divisional Secretariat office

**Discussion with Grama Niladari**

1. Why do you think this road need to construct?
  - a. Road surface is not even
  - b. Not wide enough
  - c. Lots of accidents are happening
  - d. Pavements are damaged
  - e. High traffic
  - f. They were asked how much road will be widened.
  - g. No proper drainage system
  - h. They are ready to write to the newspapers about the road, road is in critical condition. Need to repair/ construct soon
  - i. From Mahawewa transformer to bridge, St. Xavier's College, Mahawewa town and Lunu wila inundation even to small rains
  - j. It is better to have two lane road at least in town areas
2. What do you proposed to include to the plan?
  - a. Requested 4 lanes in between RDA, reservation
  - b. They were questioned on whether there will be land acquisition
  - c. Color light in major junctions
  - d. They are ok for the land acquisition if road will be widened
  - e. Plant trees on road sides
  - f. If road level increased up there will be flooding on road sides so proper culverts and drainages are needed
  - g. Build fences in insecure areas like, Mahawewa
  - h. Bus halts on either side near Mahawewa temple are close to each other therefore if buses stopped in both sides at a same time there will be high traffic
3. Issues that can be raised during the construction period
  - a. Road will be blocked
  - b. Use alternative roads eg: Beach road (Werala para), Old road
  - c. There will be dust problems due to heavy vehicle movements, water spray to control dust
  - d. ROW is bordering to private lands so it is difficult for pedestrians to use the road.
  - e. Shift light, telephone poles
  - f. Better to make one way road

- g. Lay the wires under the road, man holes preparation properly
- h. There is a shop in Marawila town which has a low case and still it cannot acquire
- i. Medagoda Yatakalana road, culverts are places but not finished, gravel and top soil wash away. Therefore there is no access road to the village. One person died recently due to a road accident in the area. Culverts are not filled (not finished) so a temporary by road was prepared.
- j. By the time of road construction there was a committee “Mesiwili Kamituwa” however it was not functioned latter. They agreed to place drainages in flooding areas but did not do. Trees were felled. Road constructions officials or divisional secretariats were not involved with the “Masivili kamituwa”. Therefore proposed to establish committee for the new project in collaboration with divisional secretariat
- k. It is doubttful whether this road will be constructed or not
- l. What will happened to mobile businessmen who do businesses in ROW
- m. No trust on i-road projects they will take a long time for construction










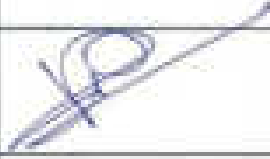






# FGD held in Mahawewa Divisional Secretariat office

මහවැලි ප්‍රදේශීය සංවර්ධන පදනම මගින් 03 ප්‍රදේශ (මුළු ව.ව. 38 80 76 ක්‍රමයට) සංවර්ධන ක්‍රියා-කටයුතු සහ වැඩ වැඩුණු වීම් පදනම මගින් සහ සම්බන්ධ අයෙකු සම්මන්ත්‍රණය








ක්‍රමයේ ප්‍රධාන සාමාජිකයා : මහත්මා

දිනය: 2019 ඔක්තෝබර් 16 - පැරණි ප්‍රදේශය

නම	පෞරුෂ	ප්‍රති නිලධාරී සාමාජිකයා	දුරකථන අංකය	අත්සන
මහත්මා S.T. ප්‍රදේශ	ප්‍රධාන	සහ මහත්මා. කුමාර	077-7000779	
M.P.H.C. ප්‍රදේශ	ප්‍රති නිලධාරී	සහ - ද/ප්‍රධාන	011-5306026	
V.P.L.B. ප්‍රදේශ	ප්‍රති නිලධාරී	සහ මහත්මා. කුමාර සහ/සා මහත්මා - ප්‍රධාන	0777848209	
M.P.H.C. ප්‍රදේශ	ප්‍රති නිලධාරී	සහ/සා ප්‍රධාන	0777808002	
M.P.H.C. ප්‍රදේශ	ප්‍රති නිලධාරී	සහ මහත්මා. කුමාර	011 8032210	
M.P.H.C. ප්‍රදේශ	ප්‍රති නිලධාරී	සහ - ප්‍රධාන	0771654973	
P.A.N.S.P. ප්‍රදේශ	ප්‍රධාන	සහ - ප්‍රධාන	0712079018	

නම	තනතුර	ප්‍රති ජිලියම් නොට්ටයකර	දුරකථන අංකය	අත්සන
ප්‍රනාන්දු පුල්ලි සාමාන්‍ය	ආරාධිකාරී	522/ප්‍රතිජිලියම්	0777937401	
ඒ.පී.කේ. දිසානායක	ප්‍රධාන උපදේශක	522/ප්‍රධාන උපදේශක	077-8011777	
බී.ටී.එස්. සමරසිංහ	ප්‍රධාන උපදේශක	527 ඒ/ප්‍රධාන උපදේශක	071 8791980	
M.A.K. සමරසිංහ	ආරාධිකාරී	525 ප්‍රතිජිලියම්	0775846480	
S.H. සමරසිංහ	ප්‍රධාන උපදේශක	523/ප්‍රධාන උපදේශක	077-6137827	
M.A.T. සමරසිංහ	ප්‍රධාන උපදේශක	522/ප්‍රධාන උපදේශක	077-6493555	
බී.ටී.එස්. සමරසිංහ	ප්‍රධාන උපදේශක	521/A ප්‍රධාන උපදේශක	077 6499443	



නම H. D. R. සමසිල්ල	තනතුර ග්‍රාම නිලධාරී	ග්‍රාම නිලධාරී සංවිධානය 229 කොට්ඨාසය	දුරකථන අංකය 076-2309980	අත්සන 
ආ. ආ. ප. සේවක	ග්‍රාම නිලධාරී	522/8, වත්ත	072-9251742	
ක. ස. ධර්ම පාලික	ග්‍රාම නිලධාරී	522 වැනි කොට්ඨාසය	077-9728476	
ස. ආ. ජ. සමසිල්ල	ග්‍රාම නිලධාරී	518/8, පොත්පොත	072-438447	
ආ. ආ. ජ. සමසිල්ල	ග්‍රාම නිලධාරී	522/8 පොත්පොත	077-4602142	
A. P. Suman	ග්‍රාම නිලධාරී	522 කොට්ඨාසය	072-594666	
S. L. Suman	ග්‍රාම නිලධාරී	518/8 කොට්ඨාසය	0703464484	IL
L. K. Suman	ග්‍රාම නිලධාරී (ප්‍ර. නි.)	518/8 කොට්ඨාසය කොට්ඨාසය	0716682220	

**PROVIDING SERVICES FOR PREPARATION OF ENVIRONMENTAL SOCIAL SAFEGUARD DOCUMENTS OF PELIYAGODA-PUTTALUM ROAD (A003) FROM KOCHCHIKADE BRIDGE TO CHILAW FROM 38 TO 76 KM FOR REHABILITATION AND IMPROVEMENT UNDER ROAD MANAGEMENT CONTRACT**

**Focus group discussions**

**Date** – 23<sup>rd</sup> October 2019

**Venue** - Madampe Divisional Secretariat office

**Discussion with Grama Niladari**

1. Why do you think it is necessary to maintain this road
  - I. It is important to get the information from the people live adjacent to the road to get the clear understanding.
  - II. It will reduce the traffic and leads to save time in travelling.
2. What are the prevailing problems with this road
  - I. In the road in “Mahaoya” road edges are not properly constructed, it is difficult for the cyclists to ride in the road.
  - II. There are failures in Bridge in “Lunuoya” which should be constructed.
  - III. Drainage system should be properly designed and constructed.
  - IV. Shoulders of the roads are not up to standards
  - V. Road should be widened in the necessary areas rather than spending money for unnecessary sections. Especially in the town areas where shops are located.
  - VI. There are unsafe areas where risks of accidents are high.
  - VII. White lines demarcation should be drawn besides the road
  - VIII. Pedestrian crossings are marked near bus halts which are high risks of accidents.
  - IX. By roads should be identified and communicate to the public before the construction starts.
  - X. Bus halts are constructed almost in the road area, those should be designed with in correct boundary.
  - XI. It is recommend to remove encroached shop owners besides road.
  - XII. Pambala to Suludeewara institute road get flood in rainy days.
  - XIII. Form the “Lunuoya bridge “ to “Thaniwella dewalaya” road get flood.
  - XIV. Number of vehicle are increases hence it is required to widen the road.
  - XV. There should be proper transportation for the public.
3. What are the circumstances caused by the earlier mentioned problem in road?
  - I. Bus halts near pedestrian crossing leading to traffic congestion
  - II. Road drainage system are not cleaned and mosquitos grow there.
  - III. When the road get flood it is difficult for the transportation.
  - IV. Rood accidents.
  - V. Problems in transportation when the roads get flood “Lunuoya bridge “ to “Thaniwella dewalaya”
  - VI. Difficulties in transportation of Agri products ex- vegetables
  - VII. Traffic congestion in Old town area.
  - VIII. In old town – Madampe to Mahawewa ,there are unauthorized structures – shops.

- IX. Muslim community doesn't pay any attention for laws .
4. Is there any maintenance for Road done by RDA
  - I. No ,road maintenance is not done by RDA.
  - II. 10km road section which was repaired by RDA in Madampe was not done properly according to correct standards.
  - III. Drains besides road were not cleaned well – ex Pattiyagama,Minipitiya
  - IV. Potholes on road are repaired by filling with premix which last for a short time.
  - V. Old trees which are not safe to remain should be removed before any damage occur.  
Ex- Galahitiyawa also pruning should be done properly.
5. What are the suggestion to improve this project plan
  - I. While awarding the contract of the road construction, it should be handed over to reputed company which works with quality and finishes the work .ex- Suduwella ,Mukunuatuwana road was not finished
  - II. Drainage system should be properly designed.
  - III. Infrastructure like water, electricity ,telecommunication should be planned for its expansion of redesigns before the road construction starts ,proper communication with these organizations to aware on their future plans is a priority before commencing any work.
  - IV. Public information should be taken to produce project concepts.
6. What would be the future difficulties
  - I. Transportation problems
  - II. Land acquire problems
  - III. Losing people's day to day income sources.
  - IV. People live besides roads will get negative effects.
  - V. Paying proper compensations will eliminate issues with public.
  - VI. RDA should be responsible in taking actions against unauthorized structures
  - VII. Difficulties in removing large trees which are devoted by some of the general public .(Na tree)
  - VIII. Environmental problems like noise, dust can be managed.
  - IX. By roads should be repaired well before.
  - X. Though the suggestions were provided, there is know any execution at the construction period.
7. What would be the benefits of the maintenance of this road?
  - I. Reduce fuel cost
  - II. Manage the time well
8. How to avoid issues in construction period.
  - I. Provide options for the unauthorized owners.
  - II. By roads should be informed before hand
  - III. Public should be informed beforehand
  - IV. People's attitudes should be improved towards keeping the roads clean.
9. What is the proposed method of grievance handling
 

Concerns of public should be communicated via "Grama Niladari " to DS office ,where a committee appointed will be looked on to it.












# FGD held in Madampe DS office

ආරක්ෂක ප්‍රජාතන්ත්‍රවාදී පක්ෂයේ පාර්ලිමේන්තු මන්ත්‍රීවරයා වන ඩී.එස්. 38 සිට 76 දක්වා පාර්ලිමේන්තු මන්ත්‍රීවරයන්ගේ සහ මැතිවරණ කොට්ඨාස මණ්ඩල මට්ටමින් පවත්වන ලද සාකච්ඡා

ප්‍රභේදීත මැතිවරණ පදනම : ප්‍රජාතන්ත්‍රවාදී පක්ෂය

දිනය: 2019 ඔක්තෝබර් 28 - පැවැත්වූ මැතිවරණ කොට්ඨාස මට්ටමින්

නම	සමාජය	ප්‍රති ප්‍රවර්ධන පදනම	දුරකථන අංකය	අත්සන	
පී.පී.පී. ප්‍රසාද්	ප්‍රජාතන්ත්‍රවාදී පක්ෂය		011-0440145		F
එ.ආ.ආ. පී. අනුල්	ප්‍රජාතන්ත්‍රවාදී පක්ෂය	544/6-මල්වතුමාව	011-5183030		F
H.A.D. අනුල්	ප්‍රජාතන්ත්‍රවාදී පක්ෂය	545 - මල්වතුමාව	070 2663880		F
D.C.U. අනුල්	ප්‍රජාතන්ත්‍රවාදී පක්ෂය	543 - මල්වතුමාව	0777114239		M
එ.ආ.ආ. පී. අනුල්	ප්‍රජාතන්ත්‍රවාදී පක්ෂය	544 - මල්වතුමාව	0779967025		M
එ.ආ.ආ. පී. අනුල්	ප්‍රජාතන්ත්‍රවාදී පක්ෂය	541/0 මල්වතුමාව 544/6 මල්වතුමාව	0779449799		F
එ.ආ.ආ. පී. අනුල්	ප්‍රජාතන්ත්‍රවාදී පක්ෂය	543/1 - මල්වතුමාව 544/1 - මල්වතුමාව	0715270946		F








നാമം	തസ്തിക	ഇമി ട്രെയിനിങ്ങ് അഡ്മിഷൻ	ഫോൺ നമ്പർ	സൈൻ	
ടി.സി.പി. കുമാർ	ഇംഗ്ലീഷ്	554/A യർലാപുരം 534/6. വേലായുധപ്പള്ളി പട്ടണം	077642256		F
എ.എ.ജെ. സുരേഷ്	ഇംഗ്ലീഷ്	536. വേലായുധപ്പള്ളി 534. വേലായുധപ്പള്ളി	071-4164251		F
H.A. ഫാ. അബ്ദുൽ	ഇംഗ്ലീഷ്	557/266. കോട്ടയം	0717409855		M
<del>ശ്രീ. രാമകൃഷ്ണ മേനോൻ</del>		<del>557/1. വേലായുധപ്പള്ളി</del>	<del>077 65736152</del>	<del></del>	<del>M</del>
R.M. J. A. L. ഉദയൻ	ഇംഗ്ലീഷ്	557/L വേലായുധപ്പള്ളി	0715791580		F
H.P.B. ജി.എസ്.	ഇംഗ്ലീഷ്	554-വേലായുധപ്പള്ളി	071-7600636		F
S.T.R. അരുൺ	ഇംഗ്ലീഷ്	533/A - വേലായുധപ്പള്ളി	0718330655		F

පළමුවෙන්ම ප්‍රතිපත්ති මාර්ගයේ අනුමැතියේ පසුබිම 33 ප්‍රතිපත්ති දැක්වේ. 38 සිට 75 දක්වා අනුමැතියේ ප්‍රතිපත්ති-මාර්ගයන් සහ 120 පිළිගැනීමේ ප්‍රතිපත්ති සහිත හා පැතිරුණු ආරක්ෂා මාර්ගයේ ප්‍රතිපත්ති පැහැදිලිව දැක්වේ.

ପ୍ରାଚୀନ ଗ୍ରନ୍ଥର ସମୀକ୍ଷା : ଡ. ଶ୍ରୀମତୀ ପ୍ରମିଳା କୁମାରୀ

Revised: 2019 October 23-415 = 21,842-88-0130000

කම	කම	ප්‍රති පිළිබඳ කම	දුරකථන අංකය	අත්සන
ක.ප. සංවිධාන ප්‍රධාන	30 වැනි	204 / පාලන	076 - 2078230	Ruff.
ප.ප. ප්‍රධාන පාලන	ප්‍රති පිළිබඳ	241/11 පිළිබඳ	076 2870 840	Sub.
ක.ක. ප්‍රධාන	ප්‍රති පිළිබඳ	256 ද පාලන	077655622	Sub.
ක.ක. පාලන	ප්‍රති පිළිබඳ	257 පාලන	0713852594	Sub.
M.P.P.H. පාලන	ක.ප. පිළිබඳ	233 A පාලන	0775940211	Pte.
K.S.S. ප්‍රධාන	ප්‍රති පිළිබඳ	557R - පාලන	0775777361	Sub.
ක.ක. පිළිබඳ	30 වැනි	258 පාලන 259 පාලන	08029446	Sub.

නම	සහයුත	ප්‍රාථමික පාලකයාගේ නම	දුරකථන අංකය	අත්සන	
ආ. ආ. ආ. රාමනාද්‍රි	ප්‍රාථමික පාලකයා	5466/අ. රාමනාද්‍රි 555 අංකයක් ඇත.	076-4738357		F
R. L. M. ප්‍රනාන්දු	ප්‍රාථමික පාලකයා	540 - ආරාමය	0761108952		M
පී. ඩී. ඩී. බණ්ඩාර	ප්‍රාථමික පාලකයා	540/අ. පී. ඩී. බණ්ඩාර	0716235917		M
පී. ඩී. බණ්ඩාර	ප්‍රාථමික පාලකයා	540-අ. පී. ඩී. බණ්ඩාර	0766102285		M
ආ. ආ. ආ. රාමනාද්‍රි	ප්‍රාථමික පාලකයා	5466/අ. රාමනාද්‍රි අත්සන ඇත.	077-8994431		F
H. P. K. S. සාමරත්න	ප්‍රාථමික පාලකයා	540 ප්‍රාථමික පාලකයා	0777361399		F
පී. ඩී. බණ්ඩාර	ප්‍රාථමික පාලකයා	540/අ, පී. ඩී. බණ්ඩාර	071-3291304		M

පළාතෙහි ප්‍රතිපල 80%කට වැඩිවීමට පත්වූ 80 ප්‍රජාවන් අතුරින් 38 80 7% අතිරේක ප්‍රති-භවන-යා පැරි දිළිඳු කිරීම පදනම මගින් 25 කාර්මික සේවක පිරිසට පැමිණි

ಗ್ರಾಫಿಕ್ಸ್ ಸೃಷ್ಟಿ ಮಾಡುವುದು : [ಇಲ್ಲಿ ಕ್ಲಿಕ್](#) ಮಾಡಿ ನೋಡಿ

Revis: 2019-06-04/2019-06-04 - 02:00-03:00 a.g.

නම	සහභුද්	ලිපි ලිවීමේ සහතිකය	දුරකථන අංක	අත්සන	
A.S. S. S. S. S.	ලියා සිසිලානි	343 - අමර්දිග	077/687070		F
S.P.M.C. ප්‍රධානාය	ලියා සිසිලානි	547 - අමර්දිග	071 3771372		M
R.P. S. S. S.	ලියා සිසිලානි	052 - අමර්දිග	077 - 0765198		F
K.P.J.N. සිසිලානි	ලියා සිසිලානි	077/5834273	077 5834273		M
M.V.H. සිසිලානි	ලියා සිසිලානි	077-5031713	077-5031713		F
R.A.S. සිසිලානි	ලියා සිසිලානි	077-9671689	077-9671689		M
S.D. S. සිසිලානි	ලියා සිසිලානි	077-888443	077-888443		M

නම	තනතුර	ඉංජිනේරු නොවීමකට	දුරකථන අංකය	අත්සන
H.S. Sihan	ප්‍රධාන	54/A. 198/294	076 1774702	සහතික
B.P. ප්‍රදීප්	ප්‍රධාන භාණ්ඩ	501A - සහකාර	0772281502	ප්‍රදීප්
J.A.S.N. සිංහ	ප්‍රධාන නිලධාරී	534/L - සහකාර	0713791331	සහතික
M. සමරසිංහ	ප්‍රධාන නිලධාරී	534/A සහකාර 541/A සහකාර	078 9898164	Samatha

**PROVIDING SERVICES FOR PREPARATION OF ENVIRONMENTAL SOCIAL SAFEGUARD DOCUMENTS OF PELIYAGODA-PUTTALUM ROAD (A003) FROM KOCHCHIKADE BRIDGE TO CHILAW FROM 38 TO 76 KM FOR REHABILITATION AND IMPROVEMENT UNDER ROAD MANAGEMENT CONTRACT**

**Focus group discussions**

**Date** – 23<sup>rd</sup> October 2019

**Venue** – Chilaw Divisional Secretariat office

**Discussion with Grama Niladari**

**1. Why it is important to maintain the road**

- I. General public is not having positive attitude on In-road development project coordinated by RDA since the three I roads projects which were started few years back have not finished yet though the demarcation of the roads and purchase were done longtime back.
- II. Before 15 years ,lands were acquired by RDA for Peliyagoda- Puttalama road widening ,so again same should be done for new plan as well .It will generate problems for people who became victims of previous occasion.
- III. Compensation is not yet received for development of Round the bout
- IV. It is required to widen the road in to four lanes.
- V. Proper drainage system should be constructed.
- VI. Land acquiring has to be done.
- VII. Lands had been acquired for previous projects and new structures were built by people, to repeat the same would cause major problems to people.
- VIII. Compensation should be given for the market price.
- IX. Improper drainage cleaning leading to flash floods.
- X. Water/CEB/Telecom damage the newly constructed roads for their design changes ,thus clear communication should be taken place with those authorities.
- XI. Water pipes should be placed in a convenient position to save unnecessary damages to roads.
- XII. Damaged roads are repaired only with “Tar “ .
- XIII. Program for Road maintenance should be given by RDA
- XIV. Present I road projects – East Mungandaruwa- Karawita,Thissogama – Udayandala road

**2. Suggestions Given for the project development**

- I. Is there any plan to develop the Kochchikade road, it should be widened.
- II. Unauthorized shops are operating on Fridays where there is no supervision ,actions should be taken to manage it
- III. Flyover bridges should be designed and constructed in Railway crossings, Hospitals, Schools for pedestrian crossings.
- IV. To eliminate flood ,Bridges, culverts should be expanded
- V. Low laying grounds should be raised and constrict the roads to solve the flood problems. ex- Mahaoya – Madampe aprox-2km area getting flooded 2ft.



### **3. Problems in Construction phase**

- I. Environmental pollution
- II. Low and regulations problems
- III. Traffic congestions
- IV. Compensations should be given earlier to construction starts.
- V. Political influences.

#### **What would be the mode of communication of grievances of people.**

- I. A RDA offices should be located within 10-15km .
- II. People can bring their issues to DS office via Grama Niladari of the village .

පළමුවෙන් ප්‍රතිදීප් සේනෙට් සංවිධානයේ පැවැත් 80 පැවැත්ම පත්‍රික 48, 38 සිට 76 පත්‍රික සංඛ්‍යාවන් ප්‍රකාශනයට ගත් 010-3344 අංකයෙන් හෝ සබ්මිට් කළයුතුය. පිටුවෙන් පැවැත්ම

ಪ್ರಾಥಮಿಕ ಮಟ್ಟದ ಅನುವೇಷಣೆ :  $C = 1/1000$

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[illegible]

સંખ્યા	વર્ણન	ગ્રાહક નામ	ગ્રાહક સંખ્યા	ગ્રાહક સંખ્યા
૦૦૦૦૦૦૦૦	૦૦/૦૦૦૦૦૦૦૦	૦૦૦૦૦૦૦૦	૦૦-૦૦૦૦૦૦	૦૦૦૦

### **List of One to one Consultations**

Date: 05/10/2019

No	Name and Address	issues
1.	Mrs. Dulip Roi Fernando, Samanthika, Chilaw Road, Waikkala	<ul style="list-style-type: none"> <li>- Flooding their premises about two feet</li> <li>- No proper drains (left side) Infront of their premises</li> <li>- Erosion of soft shoulder creating holes and water get stagnating</li> <li>- Both sides of the railway lines are damaged and informed to RDA no action has been taken</li> <li>- Several accidents occurred due to the damage of the road</li> <li>- Road should be improved with proper drainage system</li> </ul>
2.	Mr Anton Fernando, Bolawatte, Junction, <b>Angampitya</b>	<ul style="list-style-type: none"> <li>- The culverts are not properly maintained</li> <li>- No proper drainage system</li> <li>- Vehicles spray water during the rainy season due to stagnation of water</li> <li>- Road surfaces are in good condition but improved better.</li> </ul>
3.	Mr Jude Francis Thamil 95A, Udurugammala, Waikkal	<ul style="list-style-type: none"> <li>- Road get flooding during rainy season</li> <li>- Pedestrians get spray water from the vehicle movement during the rainy season</li> <li>- The soft shoulders are eroded and stagnating water</li> <li>- Need improvements to the existing road</li> </ul>
4.	Mr G Jagath perera Janeesha Lorry Boddy Garage, Kolinjadiya, Wennappuwa	<ul style="list-style-type: none"> <li>- This location is in the right side.</li> <li>- Culvert 48/1 connects the left-hand side road drains</li> <li>- There is no lead way drains in the left side</li> <li>- The water gets stagnating his promise</li> <li>- The road side drains are not properly maintained</li> <li>- Sometime road gets flooded about two meters from the edge of the carriage way</li> <li>- Pedestrian and motorist faces difficulties</li> <li>- Need lead way drains in left side of the culvert and the road side drains to be updated and maintained.</li> </ul>
5.	Lady, Owner of the Mario Chicken shop, Little farm, Katunariya	<ul style="list-style-type: none"> <li>- Katunariya is subject to frequent floods due to lack of proper drainage system</li> <li>- Stagnation of water in the holes in the soft shoulder creating inconvenience to the pedestrians including school children</li> <li>- Proper drainage system should be provided</li> <li>- The holes in the edge of the roads should be covered and closed</li> <li>- Improvements to the existing road is needed</li> </ul>
6.	Mr H G Ariyaratna, Ihala marawila, Maharawila	<ul style="list-style-type: none"> <li>- Both side roads are flooding during the rainy season</li> <li>- Difficult walk</li> <li>- Need proper drainage system and culverts</li> </ul>
7.	Mr Chandralathe Medakoswatteandiya, Thamparawatte	<ul style="list-style-type: none"> <li>- Fruit seller in a movable structure</li> <li>- Road get flooded during the rainy season</li> <li>- The soft shoulders are eroded</li> <li>- Willing to shift the boutique but no space behind the boutique. Behind the boutique area are marshy lands.</li> </ul>
8.	Mr M P Dammika 11/2, Marawala Chilaw	<ul style="list-style-type: none"> <li>- Their house gets flood about two feet</li> <li>- It is difficult to walk in the road</li> <li>- Proper drainage and culverts are needed.</li> </ul>
		-



**Ministry of Roads and Highways**



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**SRI: Integrated Road Investment Program  
Road Maintenance Contract**

**Improvement, Rehabilitation and Maintenance of the  
section of Peliyagoda – Puttalam road (A003) from Chilaw  
to Puttalam**

**Initial Environmental Examination Report**

**Final Report**

**July 2020**

**Prepared by  
Master Hellie's Engineering Consultants Ltd**

**On behalf of  
Road Development Authority  
Ministry of Roads and Highways**

**Submitted to  
Asian Development Bank**

# **Initial Environmental Examination**

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Document Status: **Final Report**

Date: July 2020

## **Survey and Preliminary Engineering (SAPE) works for Integrated Road Investment and Development Program**

Rehabilitation and improvement of Peliyagoda – Puttalam Road (A003) from Chilaw to Puttalam (76 km to 126.8 km)

Prepared by Master Hellie's Engineering Consultants (Pvt) Ltd. for the Road Development Authority, Sri Lanka

## ABBREVIATIONS

ADB	-	Asian Development Bank
AMSL	-	Above Mean Sea Level
BIQ	-	Basic Information Questionnaire
BOD	-	Biochemical Oxygen Demand
CEA	-	Central Environmental Authority
DS	-	Divisional Secretary
EA	-	Executing Agency
EHS	-	Environment, Health & Safety
EIA	-	Environmental Impact Assessment
EMP	-	Environmental Management Plan
EMoP	-	Environmental Monitoring Plan
EPL	-	Environmental Protection License
FFPO	-	Fauna and Flora Protection Ordinance
FS	-	Feasibility Study
GHG	-	Greenhouse Gas
GN	-	Grama Niladhari
GoSL	-	Government of Sri Lanka
GRC	-	Grievance Redress Committee
GRM	-	Grievance Redress Mechanism
GSMB	-	Geological Survey and Mines Bureau
H&S	-	Health and Safety
H&SP	-	Health and Safety Plan
IA	-	Implementing Agency
IEE	-	Initial Environmental Examination
IFC	-	International Finance Corporation
iRoad	-	Integrated Road Investment and Development Program
IUCN	-	International Union for Conservation of Nature
MEWR	-	Ministry of Environment and Wildlife Resources
MoRH	-	Ministry of Roads and Highways
MSL	-	Mean Sea Level
NEA	-	National Environmental Act
NGO	-	Non-Governmental Organization
NWSDB	-	National Water Supply and Drainage Board
O&M	-	Operation and Maintenance
PAA	-	Project Approving Agency
PD	-	Project Director
PIC	-	Project Implementation Consultants
PIU	-	Project Implementation Unit
PPE	-	Personal Protective Equipment
RDA	-	Road Development Authority
REA	-	Rapid Environmental Assessment
RoW	-	Right of Way
SAPE	-	Survey and Preliminary Engineering
SPS	-	ADB, Safeguard Policy Statement 2009



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# EXECUTIVE SUMMARY

## 1. Background

- I. The absence of all-weather road connectivity is a severe problem in Sri Lanka's rural areas, preventing communities from accessing socioeconomic centers. Poor road infrastructure is strongly linked to poverty and affects economic growth in rural areas, agricultural productivity, and employment. The Government of Sri Lanka is addressing this problem through a countrywide rural road investment program aimed at providing all-weather road connectivity to eligible unconnected rural habitations. The country partnership strategy, 2018–2022 of the Asian Development Bank (ADB) for Sri Lanka aims to address the significant constraints to improving quality of growth and is closely aligned with the government's priorities. The country partnership strategy reconfirms continued ADB assistance for developing transport sector, including rural roads, which are critical for rural development in providing access to markets, health, education, and administrative services.
- II. The Integrated Road Investment Program (iRoad) supports the government's sector objective to improve connectivity between Sri Lanka's rural communities and socioeconomic centers. The immediate outcome will be increased transport efficiency on project roads. The programme includes two types of civil works contracts as; conventional road contracts (CRC) and Road Maintenance Contracts (RMC). Selected set of national roads are to be rehabilitated and maintained under RMC package. Chilaw to Puttalam A003 road from 76<sup>th</sup> km to 126.8 km section in North Western Province have been selected under RMC
- III. Rapid Environmental Assessment (REA) was carried out for this sections and the project is classified as category B on environment aspects. Therefore an Initial Environment Examination (IEE) needs to be carried out for the road.

**Rehabilitation and Improvement of Peliyagoda - Puttalam road (A 003) :** the selected road section is between 76<sup>th</sup> km to 126.8<sup>th</sup> km from Chilaw to Puttalam with length of 50.8km.

## 2. Category of the project

- IV. The project of rehabilitation and improvement of A003 road from Chilaw to Puttalam has been categorized as category "B", according to the Rapid Environmental Assessment (REA) checklist as provided in the Environmental Assessment and Review Framework (EARF), SRI: Integrated Road Investment Program, May 2014. Therefore, an Initial Environmental Examination (IEE) is required to be conducted before the commencement of interventions.

## 3. Need for the Project

- V. The section of Peliyagoda – Puttalam road (A003) from Chilaw to Puttalam (76th km to 126.8th km) is the main highway connecting Colombo and Puttalam. Considerable traffic including public transport buses, heavy vehicles which transport goods and other traffic could be observed. On the other hand, the road provides connectivity between Colombo and Mannar, Colombo and Anuradhapura etc via Puttalam. The connectivity between these areas does not occur smoothly as inferior conditions of

the A003 road, especially the selected section of the road do not support the steady flow of the traffic. This road section will be further degraded if not rehabilitated and maintained urgently.

#### **4. Magnitude of Operations**

- VI. The project comprises of rehabilitation and improvement works along the section of Peliyagoda - Puttalam road (A003) from Chilaw to Puttalam (76 km to 126.8 km) as a Road Management Contract (RMC), where the work will be carried out for two (2) years and maintained for another five (5) years. These roads have been proposed to rehabilitate and upgrade to standard two-lane configurations. The project will not involve the acquisition of additional lands, and all improvement activities will be restricted to the existing ROW. The proposed typical cross section consists of the carriageway (3.5 m x 2), hard shoulder (2 m x 2), soft shoulder (1 m x 2) and side drain (0.9 m x 2).

##### **4.1 Project activities**

- VII. The scope of work proposed under the RMC include clearing and grubbing; roadway excavation; channel excavation; excavation and backfill of structures; embankment construction; sub bases, capping layers, and bases; shoulder construction, asphalt overlay; roadside and leadaway drains; cleaning, desilting, and repairing of culverts.

#### **5. Existing Environment**

##### **5.1 Land Use**

- VIII. The selected section of A003 road is from Chilaw (76 km) to Puttalam (126.8 km) covering a length of 50.8 km. The whole section of the road falls within Puttalam district and traverses through flat terrain within 5 km from the Western coastal zone of the country. The road passes areas of urban, semi-urban and agricultural in nature. The road crosses several rivers and streams and the largest waterway intersected by the road section is Deduru Oya. The economy of the area is mainly dependant on fishery, agriculture, and industries. Coconut farms, other agricultural land can be seen on either side of the road.

##### **5.2 Existing condition of the carriageways, pavements, culverts, and bridges**

- IX. The existing carriageway of the road varies from 6.4 m to 7.0 m in width within the corridors. The existing bridges were found to be in a satisfactory condition from a structural point of view by the field evidence collected (note that this assessment has since been checked visually only, and detailed structural assessments are needed). A visual inspection showed that most of the existing culverts were deemed to be hydraulically and structurally satisfactory, but many of them were found to be silted and partially blocked.



### **5.3 Physical Environment**

#### **5.3.1 Climate, land use, terrain, and soil:**

- X. Based on major climatic zones of the country, the candidate road section of A003 Road falls within the area classified as the Intermediate Zone where the annual average rainfall is between 1,750 mm and 2,500 mm, and Dry Zone where the annual average rainfall is between 1,200 mm and 1,900 mm. Agro-ecological Zone is DL<sub>3</sub> and IL<sub>1b</sub>. The proposed candidate road section of A003 is situated in Puttalam District in the North western Province, lies within the first peneplain/lowermost and the second peneplains.

#### **5.3.2 Water Resources:**

- XI. The candidate road section, Chilaw – Puttalam Road (A003), crosses Deduru Oya (Stream) Rathambala Oya (Stream), Kalagamuwa Oya (Stream), Sengal Oya (Stream), Madurankuli Oya (Stream) river basins and several other small coastal/inland floodplain basins. Agriculture is comprehensively practiced in the project area situated within Dry/Intermediate climate zones. Therefore, irrigation tanks built to collect rainwater during monsoonal months with their associate channel networks are commonly observed. Some road sections are located in the close proximity of these irrigation tanks and their associated distributary canal networks. Dug wells are commonly observed within home gardens along the road, and shallow groundwater is used to fulfill domestic requirements by the households.

#### **5.3.3 Water Quality**

- XII. The project road traverses near to the western coastal zone of the country and almost flat terrains with several surface water bodies, where perennial water and rainwater runoff are collected. Sometimes the storm runoff is accompanied by large quantities of debris from upstream side. Chilaw to Puttalam section of the A003 road corridor mainly covered with the alluvial aquifer. These alluvial deposits occur over several diversified alluvial landforms such as coastal and inland flood plains, dissected and depositional river valleys and stream beds with shallow alluvial deposits, and inland valleys of varying shape, form, and size with fine and coarse depositional in-fill materials. The rivers such as Deduru Oya and Mi Oya, have broad and deep alluvial beds of variable texture and gravel content in their lower reaches.

#### **5.3.4. Air Quality and Noise**

- XIII. Since the project area is free from large scale industries high emissions of air pollutants could not be observed. The major atmospheric emission source in the road influence area is accumulated vehicular emissions in Chilaw to Puttalam due to frequent heavy traffic. Other emission sources which can influence the road corridor are industrial emissions from tile factories located in Bangadeniya area, standby generators in the townships and few boilers operated in small scale industries etc. The road section proposed for rehabilitation is located mainly within urban, semi-urban, residential and agricultural areas. Large number of vehicles pass this road

mainly during the daytime. Therefore, the noise levels may be higher than the permissible levels during busy hours.

### 5.3.5 Floods

- XIV. There are locations where the road stretch passes adjacent to seasonal/ intermittent freshwater bodies, which includes floodplains of irrigation tanks and main/minor streams/rivers. Some sections of A003 road are prone to yearly floods during heavy rain periods and the road gets overtopped at these locations and water is stagnated for several hours to several days.

## 5.4 Ecological Environment

- XV. The road section of A003, Chilaw -Puttalam approximately 50.8 km in length is runs mainly through the coastal area. Based on major climatic zones of the country, the road section falls within the areas classified as the Dry Zone and Intermediate Zone. In general, tropical mixed evergreen forests distributes within the zone and the study area is attributed to urban, semi-urban and agricultural set-up. The terrestrial and aquatic habitats in the proposed project area beside the road includes natural and manmade environment. The fauna & flora comprise majority of common species that are found associated with man modified habitats. The tree cover along the road traverse is dominated by *Terminalia catappa* (Kottamba), *Ficus benjamina* (Elu nuga), *Filicium decipiens* (Pihibiya), *Polyalthia longifolia* (Vilo), *Cassia fistula* (Ehela), *Schleichera oleosa* (Kon), *Azadirachta indica* (Kohomba), *Swietenia macrophylla* (Mahogani), *Samanea saman* (Para-mara), *Ficus benghalensis* (Maha nuga), *Ficus racemosa* (Attikka), *Ficus religiosa* (Bo), *Tectona grandis* (Thekka) etc.
- XVI. A considerable extent of lands beside the road is covered with coastal ecosystem, marshy areas, aquatic water bodies, irrigation canals and water ways. Deduru Oya (Stream) Rathambala Oya (Stream), Kalagamuwa Oya (Stream), Sengal Oya (Stream), Madurankuli Oya (Stream), Chilaw Lake, Nallan Wewa/ Munneswarama Wewa/Timbilla Wewa, Muttuwa lagoon, Kattapitiya Wewa, Mahamariaweriya Wewa, Archchikattuwa Wewa, Illakkattuwa Wewa, Anawilundawa Floodplains, Baththulu Oya/Kiriankalliya Oya floodplains, Akkarawelliya and Palliwasala Wewa, Mundel Lake Coastal Floodplains, Mundalama Wewa, Madurankuli Ara and associated floodplain, Unawelliya Wewa, Sembattai Floodplain, Kuruvi Kulam/Wewa, and Puttalam Lagoon could be observed as aquatic ecosystems, at proximity to the road traverse. Anawilundawa wetland is the important environment sensitive area located LHS at the vicinity of road between Chilaw and Baththuluoya.

### 5.4.1 Flora and Fauna of the project area

- XVII. A total number of 200 plant species belong to 64 families including 04 endemic {*Walidda antidysenterica* (Wal idda), *Garcinia quaesita* (Rat Goraka), *Argyreia populifolia* (Giri Tilla) and *Aporusa lanceolata* (Heen Kebella)} and 09 nationally threatened species were recorded from the study area during the field survey. Altogether 150 species of animals were recorded including 08 species of Snails, 16 species of Dragon flies, 28 species of Butterflies, 08 species of Fish, 05 species of

Amphibians, 19 species of Reptiles, 50 species of Birds and 16 species of Mammals. No endemic and threatened species recorded during the field survey.

## **5.5 Socio-Economic Environment**

- XVIII. **Connectivity of the Road:** The road sections originate from Chilaw town in Puttalam district. A003 road is connected Chilaw, Arachchikattuwa, Mundel and Puttalam DS Divisions and 34 number of GND Divisions. These road sections are much significant in terms their connectivity impacts.
- XIX. **Industries in Puttalam District:** Industry and Agriculture are the main livelihood activities of the population in road relevant DSDs and also in Puttalam District as whole. The data on persons involved in non-agriculture employments shows that nearly 74 % of the people within employable ages in DSDs are involved in different scale of private sector activities, including business, labor work and self-employments. The percentage of people involved in public sector employments is 10% and this is similar to the national situation (15%). The private sector employments in DSDs range from 29.8% to 51 %. This is nearly 40% in the country as a whole.
- XX. **Population in Road relevant DSDs:** The said road section fallen within Chilaw, Arachchikattuwa, Mundel and Puttalam Divisional Secretariat Divisions (DSDs). The population in the 4 DSDs is defined as the population in the influential road area. Therefore, the road influential area population is 247,595. This is about 32% of the total population in Puttalam district. Puttalam DSD has the highest population of 4 DSDs.
- XXI. **The ethnic diversity of population in DSDs:** Nearly 65% of the population in 6 DSDs is Sinhalese. The Muslim population is next to Sinhalese, and it is 21% of total population. The population under Tamil and others is 10% and 4% respectively.
- XXII. **Education levels of DSDs population:** Information on education in 4 DSDs shows a considerable level among the population. The percentage with no formal education ranges from 2 % to 4% among 4 DSDs. The percentage of the population with G.C.E (A/L) qualification ranges from 4% to 8%. The percentage obtained degrees ranges from 1% to 2%.
- XXIII. **Employment of the population in DSDs:** Industries Services and Agriculture are the main livelihood activities of the people in the project related 4 DSDs. Apart from those, the persons within employable ages are involved in other income generation activities.
- XXIV. **The project relevant Grama Niladhari Divisions (GNDs):** The road run across 34 GNDs. The total number of families in road relevant GNDs is 20,929. The people in GNDs can be defined as the population in the road corridors. About 65% of the people are Sinhalese. The percentage of Tamil population is 10%, and the Muslim population is 21%.

- XXV. **Income levels of the households:** The data on income levels are available only in some GND offices. Data on income are available at grama niladhari which is updated once in two years.

## **6. Anticipated Environmental Impacts and Proposed Mitigation Measures**

### **6.1 Impacts during Pre-construction phase and Mitigation**

- XXVI. The mitigation measures adopted during design or pre-construction phases are of preventive in nature with two basic objectives:

- Avoiding costly mitigation measures, and
- Increasing awareness among the stakeholders for environmental management of road construction, rehabilitation, and operation.

#### **6.1.1 Route selection and alternatives**

- XXVII. The project involves rehabilitation of Chilaw-Puttalam section of the existing A003 road, and therefore no alternative routes are considered.

#### **6.1.2 Impacts on encroached Land/Temporary Structures**

- XXVIII. The proposed rehabilitation work along the Chilaw-Puttalam section of the existing A003 road will not involve widening the existing ROW. All the interventions will be carried out within the existing ROW. Therefore, there will be no land acquisition. However, the proposed construction activities may affect parts of seven temporary structures that are projecting towards the existing ROW. These structures shall be shifted away from the new road reservation.

#### **6.1.3 Shifting of Utility Supply Lines**

- XXIX. There are utility supply lines, such as electricity and telecommunication lines, that are located within the existing Row. Some of these utility supply lines which are located close to the existing road pavement edge need to be shifted during pre-construction phase.
- XXX. Advance notice to the public shall be given, with the details of the time and the duration of the utility disruption to minimize public inconvenience and employing well-trained/experienced operators to reduce accidental risk/damage to public utilities, proper coordination with respective line agencies shall be carried out by RDA for the shifting of these lines.

#### **6.1.4 Mobilization of resources and selection of sites for temporary usage**

- XXXI. Resources such as material, machinery and labour have to be mobilized before construction commences, which storage need space/yards, land/building for site office, labor camps, and for parking of construction vehicles and storing and sheltering of machinery.
- XXXII. The site selection for temporary usage shall be done in close consultation with village leaders and the local authorities. Such sites shall be located away from waterlogged areas, and flood-prone areas, socially sensitive areas such as schools, temples,

kovils, churches and mosques and, governmental offices and establishments. Recruitment of laborers, both unskilled and skilled, from the locality, will reduce the need for having large labor camps and will lead to lesser impacts due to such labour camps during the construction stage.

#### **6.1.5 Flood Impacts to be mitigated during design stages**

- XXXIII. There are locations where the road stretch passes adjacent to seasonal/ intermittent freshwater bodies, which includes floodplains of irrigation tanks and paddy fields.
- XXXIV. Close coordination with Department of Irrigation, Agrarian Services Department, and Disaster Management Center (DMC) shall be maintained in this regard to obtaining high flood levels, their return periods, respective retention periods and other recommendations to support the final design. The public consultation will also be used to verify the findings. Extra care should be paid when dealing with major streams/rivers (including Deduru Oya), and further to peak discharges due to design rainfall intensities, possible spill outflow discharges of upstream tanks and reservoirs should also be taken into account in designing opening sizes and RFL levels.
- XXXV. The following locations are prone to floods during heavy rainy periods(April/May and from October to January) in the areas of Thimbilla Wewa, (77/1), Deduru Oya floodplain (79/1 & 80/1), Kattapitiya Wewa (83/2), Mahamariameriya Wewa (83/4), Sengal Oya floodplains (88/2), Rathambala Oya floodplains (92/3), Baththulu Oya floodplains (94/4), Mundel Lake floodplains, Sembattai floodplains, and Kuruvi Kulam & Puttalam Lagoon floodplains

#### **6.1.6 Ecological Impacts during the pre-construction phase**

- XXXVI. In pre-construction stage project activities may create number of direct and indirect ecological impacts. Clearing of road side vegetation including trees and land clearing will be undertaken for temporary facilities from identified locations mainly for stockpiles of aggregates, yards for machinery & equipment, vehicle parking and construction of labour camps etc. are the main impact during pre-construction phase. Loss of different tree species, land use changes, loss of ecosystem services and fugitive dust emissions is a direct impact during pre-construction phase of the project and this is directly link with the destruction and disturbance of roosting and foraging habitats of several avifaunal & mammalian species. In addition, aesthetic value of the area will be reduced due to removal of trees and green cover vegetation.

### **6.2 Construction phase**

#### **6.2.1 Anticipated impacts due to land preparation activities**

- XXXVII. Debris shall be generated due to site clearance, excavation, and dredging activities. If this debris is not properly disposed of significant negative impacts are anticipated on public health and safety and scenic beauty of the project area. If spoil material and vegetation collected during land preparation, construction and demolition waste and other types of waste are accumulated alongside the road, it will cause public inconvenience by dust dispersion, reduced visual quality, and safety and health hazard. Other waste related issues may arise from, (i) municipal solid waste

generated from labor camps and offices, and (ii) wastewater that is generated at labor camps and storage yards.

- XXXVIII. Such waste shall be removed from the project site immediately after the land clearing and construction work and dumped in an approved site according to the current rules and regulations. The contractor shall identify and select suitable and safest locations for the dumping or landfill sites with sufficient capacity and approvals shall be obtained from relevant Local Authorities and Project Implementing Consultant (PIC). Proper engineering design (including drainage and erosion control facilities) shall be prepared by the contractor, and written approval shall be obtained from the PIC before dumping at the each identified site. Re-use of debris is a good option to reduce the quantity of debris. Metal, soil, and sand are reusable raw materials, which can be used for backfilling, leveling and amenity planting at intersections. Wood debris can be used as a fuel for worker camps or distributed to local people free of charge. The temporary debris storage sites shall not be located closer to residential or ecologically sensitive areas. MSW shall be properly collected in bins provided with lids and handed over to the garbage collection trucks of the LA. Garbage bins shall be provided to all worker camps, and construction sites, a site inspection by Public Health Inspector (PHI) in the area shall be facilitated. Proper sanitation and sewerage facilities should be provided to all site offices and construction/labor camps. Also comply with National Institute of Occupational Safety and Health and IFC EHS Guidelines on Occupational Health and Safety and other guidelines on occupational health and safety issued time to time by other government institutes/agencies of Sri Lanka.

#### **6.2.2 Road-side landscape**

- XXXIX. Landscape degradation relates particularly to poorly designed or monitored activities resulting from indiscriminate dumping of spoil material, improper cut, and fill, borrow and quarrying operations. Road induced activities may lead to the generation and mismanagement of wastes in the roadsides and create scars on the landscape. All debris, piles of unwanted earth, spoil materials, temporally structures shall be cleared away from the roadsides and from other workplaces and disposed at locations designated or acceptable to the PIC.

#### **6.2.3 Impacts on natural flow and existing drainage pattern and hydrology**

- XL. The rehabilitation or reconstruction of culverts may require temporarily diversion of streams, disturbing the natural drainage pattern and it may lead to creating flooding conditions in adjacent areas. Improperly stored construction materials can also block natural drainage pattern. Leveling, filling, excavations, and formation of temporarily or permanently raised embankments in the ROW may block natural flow patterns and cause localized flooding effects in the immediate downstream. The contractor will take all measures necessary and as directed by the PIC to keep all drainage paths and always drains clear. Temporary storage of material will be made only in approved sites by the PIC where natural drainage is not disturbed. If flooding or stagnation of water is caused by contractor's activities, the contractor shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property.



#### **6.2.4 Impacts on Water Quality**

- XLII. Soil erosion, sedimentation, and siltation can occur any time during the rainy season due to construction activities such as material extraction and storage, land clearing, cut and fill operation, construction or reconstruction of new culverts, causeways, and construction of earth and line drains
- XLIII. Only the shrubs and bushes will be cut, and the wetland habitat will not be disturbed. The cut material during the excavation of drainage canals will be used as fill material at the site. Fills shall be compacted as soon as they are laid to an appropriate degree of compaction. Erosion control practices shall be implemented during construction to limit turbidity and silt transport off the site premises. Temporary barriers such as soil mounds, temporary drains, silt traps will be considered to control soil washing away to the streams. Suitable local drainage facilities shall be established properly to drain water in the construction areas.

#### **6.2.5 Effect on the local road network and disruption to traffic**

- XLIII. Transportation through local roads, which are mainly provincial council roads and rural roads (some are gravel roads), will cause inconveniences to other road users and households living in these areas.
- XLIV. The contractor shall be provided with any restrictions related to sizes and lengths of vehicles, allowable axial loads, speed limits, no entry zones and time limits (near schools). The contractor's written consent abiding him to follow these restrictions shall be mandatory. If construction vehicles are likely to cause damage to public roads, provision shall be made for their repair and restoration as part of the contract. Proper signage and advance notice to road users and roadside communities about the schedule of construction activities, provision of safe and convenient passage to the vehicles and passengers especially during construction of culverts, bridges and causeways, implement traffic management plans in construction areas according to the traffic rules and regulations if necessary in close coordination with local communities/authorities and local police by the contractor.

#### **6.2.6 Impacts due to Noise and Vibration, Dust and Air Quality due to construction**

- XLV. Dust, noise, and vibrations generated from the project activities will impact the roadside communities and people who inhabit around material extraction sites and other haulage roads. If the work is carried out in dry season dust emission is likely to be significant. The release of air pollutants from vehicular movements, blasting and dust generated from clearing, grubbing, excavating, backfilling, dumping, mixing concrete, transportation of materials, storage of soil and metal piles, etc. can be taken place in the surroundings due to the wind. Vibration during compaction works could easily damage structures close to the roads.
- XLVI. Construction-related activities closer to sensitive public locations have to be scheduled in coordination with the relevant authorities (community leaders, school principals, high-priests or other respective officers) to avoid disturbance to day to

day activities of the people. No high noise generating machinery is encouraged. All machinery, equipment, and vehicles shall be maintained in good condition by engaging skilled mechanics and regularly maintained in compliance with regulations. The maximum permissible noise levels at boundaries of the land in which the sources of noise is located for construction activities are 75dB (A)  $L_{eq}$  and 50 dB (A)  $L_{eq}$  during daytime and nighttime respectively (Daytime: 6.00 am – 7.00 pm, night time: from 7.00 pm – 6.00 am). Enforcing speed limits to the vehicles is necessary to control dust emissions during transportation of construction materials. Dust can also be controlled by providing of dust barriers to sensitive public locations, spraying of water to quarry sites, construction sites, roads which will be used for the transportation of construction materials at regular intervals. Tarpaulin covering is mandatory on trucks/lorries which are used for transporting materials, and all construction materials (sand, gravel, metal).

- XLVII. The contractor shall conduct a pre-crack survey on all structures along the road on a corridor agreed with PIC. Any complaint from public on development of cracks due to construction works shall be investigated keeping the crack survey records as reference source. If it is concluded that crack damages were caused due to the construction works then the contractor shall rectify the damages through a third party insurance or by repairing the damage on their own cost.

#### **6.2.7 Extraction, Transportation, and Storage of Construction Materials**

- XLVIII. Large-scale extraction of materials can have negative impacts on the environment, notably noise, air, water, soil pollution and reduction of scenic beauty along with causing damage to ecosystems.
- XLIX. Selection of material suppliers who have proper EPLs will ensure proper environmental safeguards in material extraction. Extraction of construction materials shall only be from the approved mines and quarries by GSMB. Environmental requirements and guidelines issued by the CEA, GSMB, and LAs shall be followed concerning locating material extraction sites and other operations including rehabilitation of the extraction sites at the end of their use. If new material extraction sites need to be located, those shall exclude places which are close to the sensitive public locations (schools, religious places, hospitals) and environmentally sensitive areas.

#### **6.2.8 Ecological Impacts due to loss / destruction / fragmentation of habitats**

- L. The existing road traverses mainly through urban and sub urban areas and most of the existing habitats beside the road include commercial building in small, medium, and big scale, home gardens and residences, paddy fields, mix and monoculture cultivations. Although large number of roadside trees recorded within ROW, some of the trees which located close to the edges of the carriageway will be removed for the proposed construction. Since most of the road section, road reservations are sufficient for the improvement destruction to the roadside habitats and fragmentation of habitats will not expected. However, clearing of vegetation, removal of trees and or trimming of trees will be required. Loss of different tree species is a direct impact to the surrounding environment and the existing biodiversity in the area. This may, in turn, result in loss of soil moisture and soil, reduction of aesthetic value and loss of



shade. Destruction and disturbance to the roosting and foraging habitats of several avifaunal & mammalian species are the significant impact to the fauna.

- LI. Moreover, unnecessary removal of vegetation and felling of trees will be prevented by finalizing the tree list with the Environmental Specialist of PIC. Suitable native tree species shall be selected for the replanting purpose at 1:3 ratio. Suitable replanting locations shall be identified by the contractor with assistance from PIC and PIU.

#### **6.2.9 Impact on animal movement pathways**

- LII. Wild animal migration pathways are not recorded within proposed trace. However, roads can impede animal movements by direct mortality or avoidance behavior.

#### **6.2.10 Impact on aquatic fauna and flora**

- LIII. Roads construction have large, widespread effects on aquatic habitats. There will be soil erosion from construction sites, stockpiles due to rain and wind, excavation, oil, and grease from construction vehicles. Accumulation of these materials in water bodies such as tanks, streams and irrigation canals will cause an increase in turbidity level lower the water quality. This will lead to a reduction of light penetration and make it an undesirable place for aquatic fauna and flora. (wetlands / sensitive aquatic areas located near to the project area-Anawilundawa is a wetland sanctuary located near to the project area(500m), between coast and the Negombo-Puttalam railway in Puttalam district.)
- LIV. Further, due to the reduced light penetration to the water body, the primary productivity of the water body will be reduced resulting in increased mortality of aquatic organisms. Also, when these particles settle on the bottom, it will affect the breeding ground of aquatic animals. Pollution of water bodies will also adversely impact the inland fishery. Paved roads are impervious, they increase runoff and otherwise alter hydrological patterns.

#### **6.2.11 Impact on flora and fauna due to local air pollution, noise, and vibration**

- LV. Noise, vibration and dust from heavy machineries and equipment, excavation and compaction have potential impacts on disturbing behavior of faunal species, especially avifaunal species inhabit in marshy areas and associated aquatic habitats.
- LVI. In addition, other related construction activities and civil works will potentially impact on the behavior of common species birds, reptiles, amphibians, and mammals inhabit in cultivated lands, water bodies, home gardens, marshy areas, and road reservations. Impact to the aquatic fauna especially fish is also possible due to construction activities over water bodies. Plant communities are affected by dust deposition can interfere with physiological functions of trees including photosynthesis, respiration, transpiration and allow the penetration of phytotoxic gaseous pollutants.

#### **6.2.12 Ecological disturbances by workers and their camp operations**

- LVII. Chilaw- Puttalam road runs over number of natural water ways while some section runs close to the inland tanks including Anawilundawa sanctuary and close to the

coastal habitats at the end section. During the construction stage, possibilities of water quality degradation due to establishment of labour camps. . Therefore, the establishment of labour camps may have adverse impacts such as dumping of refuse, sanitary waste, and sewage into waterways, clearance of vegetation for worker campsites, hunting of animal species and collection of firewood from scrub areas may be particularly intense at campsites. This may cause several adverse impacts. Open dumping of garbage at these sites could also increase threats of mosquitoes, flies and the spread of rats and crows. Such garbage dumps can attract wild fauna, posing some threats to both humans and wildlife.

- LVIII. Local labour will be recruited as much as possible to minimize this impact. Fishing and poaching will not be allowed within the project area. Solid waste and sanitary waste arising from labour camps and other sites shall be properly collected and disposed of. Proper sewage disposal facilities shall be provided. Under no circumstances shall such waste be released untreated into the water bodies, near scrub areas.

#### **6.2.13 Social impacts due to Establishment of labour camps**

- LIX. The project may not require large-scale labor camps to be established. Majority of the labors work in the construction sites may come from the local area itself and therefore, there will be no need to provide them with accommodation facilities. However, if need emerge to establish labor camps, they shall be established in suitable locations away from the houses, business establishments and other sensitive institutions such as schools, religious centers etc. The labors shall be educated to behave in the camps decently without creating disturbances to others in the neighborhood. There can be conflicts between labors from outside areas and the local community members.

#### **6.2.14 Disruption to traffic/transportation**

- LX. The said road is heavily used by public buses and they will have serious disturbances. Regular road users such as school children, employees will have disturbances. The traffic-related disturbances will create specific impacts to the business establishments in the townships located along the roads. This issue shall only prevail during the construction period. Regular/continuous arrangements to manage the traffic near construction sites shall be implemented methodically. Most of the road construction contractors are well experience in these aspects due to their long-term exposure to similar projects on road improvements.

#### **6.2.15 Impacts due to transportation of construction materials**

- LXI. Transportation of construction material will create impacts beyond the area of the candidate road. The transportation of material in other roads in the area will contribute for the existing traffic congestion. The impacts can be minimized through decent behavior in driving their vehicles and also the time of transportation. They also shall follow all the rules that are required in transporting construction material to the sites.

#### **6.2.16 Impacts to roadside structures**

- LXII. There are seven temporary and moveable structures established adjacent to the road edges. These structures are being used by local community members to sell vegetables, fruits, and some other items to the road users. Need may arise to shift these temporary structures for the contractors to attend the required construction activities. The socio-economic study team interviewed all the owners of these structures and they are in agreement to shift the structures if need arises. The RDA will inform them in advance (about 30 days in advance) about the project and its construction schedule and also the needs of the shifting of the structures if required.

#### **6.2.17 Impact to due to obstruction to access**

- LXIII. Access to the houses, business establishments, institutions and by-roads will be temporarily disturbed during construction period. The contractors will explore all the possibilities to minimize such disturbances based on the specific situation of the road. The contractor will support to the affected persons to establish temporary access to reach their houses, business locations, institution, or by-road. Steel plates can be used to create temporary access. However, the construction contractors of the roads are well experience in handling these types of situations in road construction projects. The most essential need is to monitor whether contractors fulfill these needs with commitments.

#### **6.2.18 Impacts on the development activities in the vicinity**

- LXIV. The development activities at household or residential level (e.g., construction of new houses) presently carried in the area adjacent to the roads' edges will have disturbances. Possible disturbances to the access to such development sites would be the most critical impact. The road contractor can provide assistance to establish temporary access to the sites. However, the two parties, road contractor and the implementers of other projects shall get together and work out practical plan depending on the specific condition to create win-win situation.
- LXV. Other than these residential level constructions, there are not any major infrastructure developments along each road section.

#### **6.2.19 Safety of Workers and Public**

- LXVI. During construction, workers will be exposed to various risks and hazards. Potential impacts to health are respiration and eye diseases due to exposure to dust, the risk of accident during work. The nature of the work is such that such dangers are not very significant as compared to road construction work which needs heavy machinery.
- LXVII. Workers will be provided with first aid and health facilities. First aid training will be provided to field staff and social mobilizers and the foreman. It is mandatory that the Contractor shall comply with requirements for the safety of the workmen as per the ILO convention, the Factory Ordinance of Sri Lanka and IFC EHS. Group accidental insurance shall be considered for the workers.
- LXVIII. The safety of the public will be ensured by using relevant measures as mentioned in below,

1. The places with deep excavations and hazardous activities will be noticed and such places shall be barricaded to guide public away from such sites.
2. Spraying of water will be done during the construction period in order to minimize the dust generation.

### **6.3 Operational Phase**

#### **6.3.1 Impacts on Water Resources and Hydrology**

- LXIX. Improvements to the road drainage will result in improved stormwaterflows and reduce the tendency of blockages to occur in roadside drains. Risks to the public health caused by such stagnant water bodies by acting as disease vector breeding places will be reduced. By designing the drains to withstand appropriate storm events will reduce the risk of an operational failure of the drainage system and regular maintenance will further reduce the chances of failure.
- LXX. Regular maintenance of all drainage related structures and monitoring especially prior to/in the aftermath of major storm events/monsoonal seasons by the RDA/Local authority will be required to ensure proper functioning of the drainage structures and to avoid blockage to the channels, culverts, roadside drains, tail/leadaway canals due to siltation, debris accumulation, nuisance vegetation growth, etc.

#### **6.3.2 Pedestrian and Commuter safety**

- LXXI. Inadequate provisions of road safety measures like no provisions of signals and lack of enforcement of traffic rules during operation period may invite accidents. Rehabilitation of the roads will provide easy access to the area, however, will increase the number of vehicles and their speed due to the improved condition of roads.
- LXXII. Enforcement of speed limits, traffic rules and regulations and Installation of the warning signs, regulatory signs, and information signs. Applying appropriate road safety measures with the help of 3-Es, i.e., Engineering, Enforcement, and Education is needed.

#### **6.3.3 Noise, Air and Water Pollution**

- LXXIII. During the operation period, the noise level will increase due to the increased movement of vehicles. It is a general habit that the motorists tend to drive faster when the road condition is good. However, this will cause higher noise levels. The major factor that contributes to poor air quality in the project area at present is dust emission from gravel and sandy roads. Rehabilitation of roads will significantly reduce the existing dust emission after the proper surfacing of the roads. Air pollution due to vehicle movement, especially diesel vehicles will be of concern. The disposal of household waste and wastewater to roadside drains, oil, and grease from vehicles into water bodies may cause water pollution. Similarly, with the careless disposal of spoil and other construction material into water bodies during maintenance of road may also degrade the water quality.
- LXXIV. Community and road user awareness program will be organized to enhance public understanding on proper maintenance of roadside drains and importance of proper

MSW and wastewater disposal. Maintenance of green corridors and their beneficial impact on air and noise pollution control. Speed limits shall be strictly enforced together with restriction in the use of horns shall be restricted near mosques, hospital, schools, and densely populated settlements.

#### **6.3.4 Ecological Impacts and Mitigation**

- LXXV. Due to the improvement of road, during the operation, traffic volume and speed of the vehicles strongly influence for the movement of animal. Consequently, there is a potential of collision of animals such as reptiles, amphibians, bird, and mammals. Moreover, there are some domestic animals frequently approaching the roads during the nights. To reduce the mortality of animal speed limit reductions are essential for environment sensitive locations. Barriers beside the road in environment sensitive areas are needed to construct to guide animals to the culverts and other cross drainages. Increase the number of culverts is also essential for smaller animals, under roads that can allow for safe passage.

#### **6.3.5 Socio-economic Impacts and Mitigation**

- LXXVI. The potential for an increased accident in the post-project improvement period can be expected. Intensive monitoring of traffic with the active involvement of the traffic police in relevant police stations will have to be carried out at least for about 1-year period in critical locations of the road.

#### **6.4 Climate Change Adoption and Net Carbon Emissions**

- LXXVII. The TEEMP model output showed that the proposed improvement to existing road pavements will bring a reduction in CO<sub>2</sub> emission even with a growth of traffic. The total length of roads to be improved in this project is around 50.8 km and based on the minimum (0.4 T/km/year) and maximum (5.5 T/km/year) net change in CO<sub>2</sub> emissions or CO<sub>2</sub> savings of the proposed investment program in NWP will be between 480 and 6,600 Tons/year. However, this analysis is based on the assumption that the roughness of improved road surface will be maintained during the project life. Therefore, it is important that the road maintenance program is maintained throughout the project span (i.e., during operational stage).

### **7. Institutional Arrangements**

- LXXVIII. The Ministry of Roads and Highways is the Executing Agency (EA) and RDA is the Implementing Agency and within RDA there is be a Project Implementation Unit (PIU) for coordinating the iRoad programme. This PIU will be responsible for implementing the project and managing detailed design and supervision of the construction works and ensuring that all environmental safeguard requirements in accordance with this IEER are met. The PIU is to be headed by a full time Project Director (PD) and supported by a team of engineers from RDA. The PIU has a safeguards team with sufficient social and environment safeguards officers to cover the quantum and geographic distribution of works in all provinces under the investment program. The Project Implementation Consultants (PIC) appointed for the RMC package will

support the PIU for supervision of the design and construction works by the civil works contractor. The PIC team headed by a Team Leader will include an environment specialist for conduction of regular monitoring of safeguards implementation on site.

## **8. Environmental Management Plan and Monitoring**

### **8.1 Environmental Management Plan (EMP)**

- LXXIX. The EARF as well as the Environmental Safeguards Manual of RDA, outlines the requirements for an Environmental Management Plan (EMP) which is presented as a matrix developed based on best practices for environmental management. This EMP covers all impacts and mitigation measures identified within the project. However, contractor will be responsible for preparation of Site-Specific Environmental Management Action Plan (SSEMAP) based on the EMP given in this IEER. SSEMAP shall include site specific impacts related to site specific construction activities and relevant mitigation measures proposed to the particular locations to minimize relevant impacts. SSEMAP will be supported by site plans in which proposed mitigation measures are presented. Separate SSEMAPs will be prepared for the road. All costs for implementing the mitigation measures must be included in the Bill of Quantities (BOQ) by the contractor as implementation of the SSEMAP will be the responsibility of the contractor and the PIC will oversee the effectiveness of the implementation with the assistance of the PIU. In addition, in compliance with the EARF, ESDD is also responsible for monitoring of implementation of the SSEMAP biannually. ESDD also assists PIU in meeting safeguards compliance and will conduct training sessions to the safeguards staff of the contractor on safeguards considerations of iRoad. Contractors who implement RMC package will be responsible to keep the road in operational condition for a period of 5 years after rehabilitation. Therefore, the EMP has been modified accordingly paying more attention on the environmental impacts and mitigation measures during the operational stage together with rehabilitation stage.

### **8.2 Environmental Monitoring Plan (EMoP)**

- LXXX. Environmental monitoring is required to make sure that the anticipated adverse impacts are kept minimal with the implementation of mitigation measures as and when required. The monitoring objectives are therefore focused on the mitigation of likely impacts. The EMoP will be a useful tool to monitor the implementation of mitigation measures included to the EMP. Monitoring of the quality of water, air, and noise during the construction stage is a responsibility of the contractor by the approved Government Agency. All the monitoring activities such as site supervision, removal of trees, material extraction, verification of permits, etc. by the contractor will be supervised by the PICs. The environmental monitoring report prepared annually by PIC will be submitted to the PIU. This report shall include the results of environmental monitoring based on the construction activities carried out and this report shall be uploaded in to ADB as well as iRoad web page.



## **9. Grievance Redress Mechanism**

- LXXXI. In compliance with the EARF, grievances will be addressed at three levels depending on the nature and significance of the grievances or complaints. The first will be at the grass roots level where complaints will be directly received and addressed by the contractor, PIC or PIU representative on site. Grievances which are simple but still cannot be addressed at the grass roots level will be addressed at the Grama Niladhari (GN) level. More complex grievances which cannot be addressed at the GN level will be addressed at the Divisional Secretariat (DS) level. Different avenues shall be opened to receive suggestions, requests, and complaints from public.

## **10. Policy, legal and administrative framework**

- LXXXII. The National Environmental Act (NEA) No. 47 of 1980 is the key legislation of the country for matters pertaining to environmental safeguards. The environmental clearance process is implemented through the designated Project Approving Agency (PAA) as prescribed by the Minister under section 23 Y of the NEA. The procedure that should be followed for obtaining environmental clearance is described under section 23CC and 32 of the NEA. While the NEA is the key environmental legislation under GOSL there are several other environmental laws and regulations that are also applicable to the investment program (both CRC and RMC packages).

## **11. Public Consultation**

- LXXXIII. Public consultations were carried out covering all 4 DSDs falling under the influential road area. The methods used for public consultations include one on one interview with about 60 road users (Focus Group discussions were not conducted due to prevailing situation in the country due to Corona virus). The main aim of these consultations was to obtain the perception of the community about the project, any environmental and social problems prevailing in the project area.

## **12. Disclosure of information**

- LXXXIV. Based on the EARF approved for the iRoad Programme, the respective draft IEER will be disclosed before the Management Review Meeting (MRM) or equivalent meeting or approval of the respective project if there is no MRM. Signboards with project information including details on nature of construction works, road length, construction period, the name of the contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil, and English). For the national RMC roads, there will be sign boards on the period of works and contact information for reporting complaints or grievances in three languages.
- LXXXV. During project implementation, annual environmental monitoring reports will be prepared for the entire RMC package of iRoad and submitted to ADB and RDA for disclosure on their websites.

### **13. Conclusion and Recommendations**

- LXXXVI. The proposed road rehabilitation and construction activities (on A003) are restricted to the existing RoW and road reservation boundary lines. There is no need for land acquisition or resettlement of households. Anticipated positive socio-economic impacts of the project include reduction of transport costs and vehicle operation cost due to better road conditions and reduced travel time, an increase in income-generating activities, enhancement of road safety, less noise and air emissions due to improved road condition, reduced soil erosion and improved water quality due to better drainage facilities, etc.
- LXXXVII. Negative environmental impacts, which are mostly restricted to the construction stage, include extraction of construction materials, transportation, and storage of material, disposal of debris, deterioration of water quality, elevated levels of dust and particulate matter in the air, fumes and smoke and noise and vibration. Temporary blockage or alteration of surface runoff is the other anticipated impacts during the construction of bridges, culverts, and causeways. Realignment of services such as electricity, telecommunication, and water lines would cause inconveniences to the residents. These impacts can mostly be mitigated by following good construction practices and careful planning. The fauna and flora observed are common species that are found in rural and suburban areas. Only a few endemic and threatened species were recorded at the project site. None of the recorded endemic species are restricted to the project area. Other than the issues mentioned above the project will not have major adverse impacts on the habitats or fauna and flora in the proposed project site.
- LXXXVIII. A long-term maintenance program is essential for sustaining road in good condition. Thus periodic inspection, assessments, and proper maintenances strategies shall be implemented during operation stage. It is recommended that the design team shall be properly coordinated with future schedules regarding infrastructure development of line agencies to minimize structural damages to the road.
- LXXXIX. A proper Grievances Redress Mechanism shall be established to receive and resolve any public complaints regarding the project interventions and impacts. An Environmental Monitoring Plan shall be established to assess and evaluate the effectiveness of the mitigation strategies as outlined in the Environmental Management Plan. According to the analysis of existing baseline data and prediction of impacts, the proposed road rehabilitation, and construction activities fall under Environmental Category B based on the ADB Guidelines. Thus, a full Environmental Impact Assessment (EIA) for the project is not required. Concerning the National Environmental Act No.47 of 1980, amendment No.56 of 1988, and subsequent amendments, the project does not fall under the Prescribed Project Category.



# 1. INTRODUCTION

## A. Background

1. The absence of all-weather road connectivity is a severe problem in Sri Lanka's rural areas, preventing communities from accessing socioeconomic centers. Poor road infrastructure is strongly linked to poverty and affects economic growth in rural areas, agricultural productivity, and employment. The Government of Sri Lanka is addressing this problem through a countrywide rural road investment program aimed at providing all-weather road connectivity to eligible unconnected rural habitations. The country partnership strategy, 2018–2022 of the Asian Development Bank (ADB) for Sri Lanka aims to address the significant constraints to improving quality of growth and is closely aligned with the government's priorities. The country partnership strategy reconfirms continued ADB assistance for developing the transport sector, including rural roads, which are critical for rural development in providing access to markets, health, education, and administrative services.

2. The Integrated Road Investment Program (iRoad) supports the government's sector objective to improve connectivity between Sri Lanka's rural communities and socioeconomic centers. The immediate outcome will be increased transport efficiency on project roads.

3. The iRoad program is currently implemented in rural roads in Southern, Central, Sabaragamuwa, North Central, North Western Provinces and Kalutara District in Western Province. Civil work contractor in Uva, eastern, northern and western provinces have started under second iRoad program. Under iRoad (iRoad I) program five (5) national roads have been selected for rehabilitation and improvements. Total length of these road sections will be around 300km. The iRoad Program is identified as one of the critical components in the development of the road network to support and facilitate the activities in the enhancement of the economic and social status of the people living in rural areas of these provinces. Accordingly, it has received top priority in the development programs of the Government of Sri Lanka (GOSL), and funds are being provided by the Asian Development Bank (ADB). The iRoad program is a novel concept introduced recently into the country by the ADB. Rehabilitation of roads is followed by mandatory maintenance of the completed Provincial & Rural Roads for three years while the selected National Highways will be maintained and managed over a period of seven years through Road Management Contracts (RMC) concept. These national road sections will be developed as Road Management Contracts (RMC) where the rehabilitation and improvement works will be carried out for two (2) years and maintained for another five (5) years. This type of contract significantly expands the involvement and responsibility of private sector civil contractors in infrastructure development, from a simple execution of civil works to management and conservation of national assets (in this case the road infrastructure).

4. All the road projects included in Tranches from 1-4 have been classified as B in accordance with ADB's Safeguard Policy Statement. All tranche 4 financed projects have been appraised under tranches 1 and 2, and the Environmental Assessment and Review Framework (EARF), initial environmental examinations (IEE), and climate risk assessments remain valid. None of the project roads pass through the reserved forest or national parks, sanctuaries, or habitats of protected species, and none disturb any cultural heritage or monuments of cultural or historical importance. However, it is a condition of the Contract

Agreement that all bidding documents contain the location-specific environmental management plans, environmental monitoring plans, and road-specific environmental code of practice checklists, from which respective contractors prepare road-specific environmental management plans.

5. In line with the EARF and the IEEs carried out for other roads of the RMC Projects of iRoad Programme, a Rapid Environmental Assessment (REA) was carried out (See Appendix 1) and the project classification on environment aspects falls within the scope of Category B. Therefore, an Initial Environment Examination (IEE) needs to be carried out for the section of the candidate National Road, A 003 (Peliyagoda-Puttalam road) from 76 km to 126.8 km, located in the North Western Province of Sri Lanka.

This document presents the findings of the Initial Environment Examination (IEE) conducted for the National Road A 003 (Peliyagoda - Puttalam road) from 76 km to 126.8 km section in North Western Province which has been proposed to be developed under RMC package. Further, this IEE report discusses possible impacts (beneficial and adverse) that would arise due to proposed development and maintenance work on the selected road section.

## **B. Objectives of the proposed project**

6. Objectives of this project are:

- Facilitate increased mobility between the two cities Chillaw and Puttalam.
- To facilitate by way of providing access for establishing most essential social and economic centres in identified locations and giving access to primary community centres and villages within the Arachchikattuwa, Chilaw, Mundel and Puttalam DS Divisions in the Puttalam District
- To facilitate by way of providing improved roads in which small vehicles, light trucks, omnibuses and motor cars and other small vehicles can travel to facilitate the transfer of passengers and goods and to restore services as normal
- Improve connectivity between production centres and marketplaces and improve linkages with the other districts and provinces
- Open up backward areas for development
- Facilitate to generate efficiency gains by lowering the unit cost of individual producers through transport efficiency which will lead to increase their margins and profits thus making them producing another round of investments,
- To reduce the structural poverty through (a) creating opportunities for the poor to participate in the development programme, (b) strengthen the social protection system and (c) empower the poor and strengthen the right governance.

7. To achieve these objectives, the roads identified under the iRoad programme will be improved with the following:

- Improve the existing roads with proper two-lane facility
- Resurfacing the existing pavement with Asphalt Concrete (AC) if the present surface is weak

- Improve the horizontal alignment at selected locations to reduce acute curves to provide safe driving conditions
- Widen, repair, or reconstruct damaged culverts and bridges and construct new culverts at locations where the road will be placed on new embankments
- Remove any irregularities that are on the existing vertical profile, thereby improve the vehicle operating speeds while ensuring the safety of road users

8. The following secondary objectives are also expected:

- Savings in Vehicle Operating Costs (VOC's) taking into account the speed and travel time in the with- and without-project situations including the potential distance differential, surface quality, road congestion, etc.
- Benefits and costs for diverted traffic would be calculated differently as a percentage compared to the regular traffic.
- Savings of road maintenance costs
- Savings of travel time for passengers and goods in transit
- Reduction in the number as well as the severity of accidents and the related costs, although traffic safety assessment was not part of this evaluation.

### **C. Objectives of the Initial Environmental Examination**

9. The project comprises of carrying out of rehabilitation and improvement works along the A-class national road (A003) from Chilaw to Puttalam as a Road Management Contract (RMC) where the work will be carried out for two (2) years and maintained for another five (5) years. The Environmental Assessment for this road section is carried out as a requirement of the ADB Safeguard requirements outlined in the EARF<sup>1</sup> prepared for the iRoad. The scope of the study was determined by the specifications given by the ADB for conducting an Initial Environmental Examination (IEE), which are outlined below:

- Field data collection regarding physical, social, economic, and environmental background of the project area.
- Public consultation with affected people and other relevant authorities.
- Preparation of Basic Information Questionnaire (BIQ).
- Preparation of Rapid Environment Assessment (REA) Checklist for ADB categorization
- Assessment of potential environmental impacts and development of preventive and/or mitigation measures for significant impacts.
- Preparation of Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP).
- Preparation of institutional requirements and Grievance Redress Mechanism (GRM).

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<sup>1</sup>Environmental Assessment and Review Framework, SRI: Integrated Road Investment Program, May 2014

- Preparation of consolidated Initial Environmental Examination (IEE) report.

## Outline of the Assessment

10. This Environmental Assessment report provides general policies, guidelines, and procedures to be integrated into the implementation of all components under the Road Project Preparatory Facility. In preparing this document, following procedure has been adopted, in addition to requirements as specified in the EARF<sup>2</sup> prepared for iRoad:

- Safeguard Policy Framework (2009) of ADB<sup>3</sup> has been reviewed to identify environmental safeguard requirements and Policy of the ADB
- The Environmental assessment processes as outlined in the OM Section F1/OP (2013)<sup>4</sup> and the ADB's Environmental Policy (ADB, 2002) and Environmental Assessment Guidelines<sup>5</sup> have been reviewed to determine the environmental category of the proposed project, and the procedure to be adopted for conducting Environmental Assessments.
- Relevant environmental regulations, guidelines, and Policies of Sri Lanka have been reviewed.
- The review also included consultations with the associated technical personnel to identify the components of the proposed project activities.
- The assessment made an effort in identifying potential environmental impacts and proposed strategies to mitigate the potential adverse environmental impacts due to project activities

11. The assessment outlines environmental screening procedures, assessment methodologies, environmental management (mitigation, monitoring, and documentation), and reporting for actions proposed under the Project, and to specify institutional structure and mechanism to carryout compliance to the environmental management plan.

## D. Approach, Methodology, and Personnel Involved

12. The approach and methodology in conducting the present study are listed below:

- Liaise with the team of engineers working on the project to develop the understanding of the scope of expected engineering activities that will take place at the site as well as any sites outside by discussing the physical interventions finally proposed to be carried out at the site, construction methodologies, and equipment to be used, pre-construction activities, etc.

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<sup>2</sup>Environmental Assessment and Review Framework, SRI: Integrated Road Investment Program, May 2014

<sup>3</sup> Safeguard Policy Statement, Asian Development Bank, June 2009.

<sup>4</sup> Operations Manual Bank Policies (BP), Asian Development Bank, 2013

<sup>5</sup> Environmental Assessment Guidelines, Asian Development Bank, 2003

- ii. Carry out the Screening using the REA Checklist (See Appendix 2), included in the EARF<sup>6</sup>. The study corridor used for the study is a 2 m corridor on either side of the existing road width.
- iii. Carry out a Rapid Assessment to decide on the significant impacts and then to carry out the Environmental Assessment based on the TOR specified in the EARF.
- iv. Establish the general baseline conditions of the physical environment, which include a survey of invasive species to identify the potential flora species that can be introduced using borrow material.
- v. Carry out a scoping of environmental issues that may arise as a result of project activities: physical, biological/ecological, and social impacts. This scoping will also focus on key stakeholders, mainly the CEA, RDA, PRDA, NBRO, Department of Wildlife Conservation and Forest Department, etc.
- vi. Prepare a comprehensive Environmental Management Plans (EMP) for the Road, describing the proposed mitigation measures for each impact identified and the phase in which it shall be carried out, appropriate institutional arrangement to implement the proposed measures, reporting procedures and estimated costs for implementing mitigation measures to manage the onsite as well as off-site environmental impacts.
- vii. Prepare a comprehensive Environmental Monitoring Plan (EMoP) for the Road, with specifying monitoring indicators to measure the performance of each mitigation measure, monitoring mechanisms and frequency to support EMP. Environmental Monitoring Plan will be therefore separately prepared.
- viii. Identify the clearances/approvals needed by the project before its implementation.
- ix. Make conclusions and recommendations to the client on the environmental viability of the project based on the findings.

13. To meet the requirements of ADB, the IEE report follows the TOR given in the EARF prepared for the Integrated Road Investment Program. The structure of the IEE report is organized as follows:

- **Introduction:** Provides identification of the project and the project proponent, and an explanation of the Objectives of the proposed project. It also presents the Approach and the Methodology adopted by the IEE
- **Policy, Legal, and Administrative Framework:** This section summarizes the national and local legal and institutional framework within which the environmental assessment is carried out. It also identifies project-relevant international environmental agreements to which the country is a party. This chapter shall include: Applicable Laws, Regulations, Standards and Requirements, ADB Policy on Environmental & Social safeguards
- **Description of the Project:** In accordance with the ADB SPS (2009) and EA Guidelines (2003), this section provides the detailed description of the project, need of

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<sup>6</sup>Environmental Assessment and Review Framework, SRI: Integrated Road Investment Program, May 2014

the project, project location, and magnitude of the operation, the environmental category of the project and implementation schedule.

- **Description of the Environment:** Provides a description of the current environment of the project area. The summary is based on available documentation, statistical data, and meetings with government authorities, APs, field surveys, and investigations.
- **Screening of the Potential Environmental Impacts and Mitigation Measures:** Provides an assessment of potential impacts of the proposed road development in light of the existing conditions together with recommended actions to prevent and/or otherwise to mitigate unavoidable impacts.
- **Information Disclosure, Consultation, and Participation:** Information on public participatory workshops and consultations with experts and local administrative officers is presented in this section.
- **Grievance Redress Mechanism (GRM):** This section describes the grievance redress framework (both informal and formal channels), setting out the time frame and mechanisms for resolving complaints about environmental performance.
- **Institutional Requirements and Environmental Management Plan:** This section deals with the set of mitigation and management measures to be taken during project implementation to avoid, reduce, mitigate, or compensate for adverse environmental impacts. It also includes management plans and actions. Provides a description of responsible parties to implement, administration and supervision of the project and the procedure to address concerns, complaints, and grievances of the affected population.
- **Conclusion and Recommendations:** Findings of the study and recommendations which are finalized by the consultant are stated here with the analysis of currently available data. Conclusions section Outlines the result of the IEE and justification.

14. This IEE report has been prepared by a team of consultants representing Master Hellie's Engineering Consultants (Pvt) Ltd., led by Eng. Jagath Manatunge (Chartered Civil Engineer, Environmental Engineer) as the team leader and Eng. Tissa Liyanage (Transport and Highway Engineer), together with Mr. K. Jinapala (Sociologist) and Dr. P.M.C. Digana Bandara (Ecologist and Environmental Specialist). Some information related to Socio-economic environment for this IEER has been extracted from the Social Impact Assessment Report, which had been prepared by Mr. K. Jinapala and his team. The consultants of the report acknowledge the support of the staff at Master Hellie's Engineering Consultants (Pvt) Ltd. For their help and making available some information to compile this report. Also, the Consultants also wish to acknowledge the kind assistance of the Director and the Engineers attached to the iRoad Project, Road Development Authority for their support during the field visits and for providing information of the project interventions.



## **2 POLICY, LEGAL, AND ADMINISTRATIVE FRAMEWORK**

### **A. Applicable Laws, Regulations, Standards, and Requirements**

#### **A1. National Environmental Act and other applicable regulation**

##### **1. Environmental Protection and Management**

15. The commitment and responsibility of the Sri Lankan government and its citizens to environmental protection is enshrined in the country's constitution (GoSL 1978<sup>7</sup>). Chapter VI (Directive Principles of State Policy and Fundamental Duties), Sections 27 (14) and 28 (f) declares that: "The State shall protect, preserve and improve the environment for the benefit of the community" and "it is the duty of every person in Sri Lanka to protect nature and conserve its riches".

16. The Central Environmental Authority (CEA) was created in 1982 as the government regulatory and enforcement agency for environmental matters. This was followed by the establishment of a cabinet-level Ministry of Environment in 1990, which became the Ministry of Environment and Natural Resources (MENR) in 2001 and developed the National Environment Policy (NEP) in 2003. The environmental protection mandate passed to a new Ministry of Mahaweli Development and Environment in January 2015, with the mission to "manage the environment and natural resources to ensure national commitment for sustainable development for the benefit of the present and future generation."

17. The basic legislation governing protection and management of the environment is the National Environmental Act (NEA) No 47 of 1980, and its subsequent amendments, No 56 of 1988 and No 53 of 2000. The NEA includes two main regulatory provisions through which the environmental impacts of development are assessed, mitigated, and managed:

- (i) The Environmental Impact Assessment (EIA) procedure for major development projects - regulations published in Government Gazette Extraordinary No 772/72 of 24 June 1993 and in subsequent amendments.
- (ii) The Environmental Protection License (EPL) procedure for the control of pollution - regulations published in Government Gazette Extraordinary No 1533/16 of 25 January 2008.

##### **2. Environmental Impact Assessment**

18. The provision for EIA is contained in Part IV C of the NEA, which requires the submission of an IEE or EIA report in respect of certain "prescribed projects." These are specified in Gazette Extraordinary No 772/22 of 24 June 1993 and include the following:

- (i) Construction of national and provincial highways involving a length exceeding 10 kilometers

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<sup>7</sup> Government of Sri Lanka (1978, as amended): The Constitution of the Democratic Socialist Republic of Sri Lanka (Revised Edition 2015), 221 pp. (<http://www.parliament.lk/files/pdf/constitution.pdf>)

- (ii) Projects that fall within sensitive areas as defined in the National Environmental (Procedure for approval of projects) Regulations, No.1 of 1993.

It is unlikely that this project will require an IEE or EIA as the project areas do not fall under the any of the sensitive areas as defined by regulation no.1 of 1993, as cited above.

19. The EIA process is implemented through designated Project Approving Agencies (PAA), which are line ministries and agencies with responsibility and jurisdiction over the project. The appropriate PAA is determined by CEA by the following (unranked) criteria (with the proviso that the project proponent cannot also act as the PAA):

- The agency with jurisdiction over the largest area.
- The agency with jurisdiction over diverse or unique ecosystems.
- The agency within whose jurisdiction the environmental impacts (resource depletion) are likely to be the greatest; or
- The agency having statutory authority to license or otherwise approve the prescribed project.

20. The EIA process involves the following steps:

- (i) The proponent submits to the PAA preliminary information on the project in the form of a Basic Information Questionnaire (BIQ) provided by CEA.
- (ii) The PAA screens the project by the information provided, and informs the proponent within six days whether an EIA or IEE is required<sup>8</sup>;
- (iii) The PAA then determines the scope of the study, taking into account the views of CEA, and relevant state agencies and the public if appropriate. The PAA devises ToR specifying the nature and content of the IEE or EIA report, and provides these to the proponent in writing within 14 (IEE) or 30 (EIA) days of receipt of the preliminary information.
- (iv) If the PAA considers that the preliminary information provided by the proponent is sufficient for the purpose of an IEE report, the PAA proceeds as in (vi) below.
- (v) The proponent conducts the studies necessary to fulfill the ToR (or engages consultants to do so) and submits the number of copies of the final IEE or EIA report as may be required by the PAA.
- (vi) The PAA conducts a technical review of the report, within 21 days for an IEE and 30 days for an EIA.
- (vii) An EIA report is also subject to public review. In this case, the PAA submits a copy of the EIA report to CEA, and by the publication of a notice in the Gazette and one daily national newspaper in Sinhala, Tamil, and English languages, invites the public to inspect the report and make written comments.

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<sup>8</sup>An EIA is required for prescribed projects that involve complex environmental issues; and an IEE is required for projects that do not have complex environmental issues.



- (viii) The public forward any comments to the PAA within 30 working days and these are forwarded by the PAA to the project proponent. The proponent responds to the PAA in writing regarding all comments, within six days of completion of the public inspection.
- (ix) After the technical review (IEE/EIA), and within six days of receipt of the proponent's response to public comments on an EIA, the PAA either: a) grants approval for implementation of the project, subject to certain conditions; or b) refuses approval for project implementation, giving reasons for the decision.
- (x) Within 30 days of granting approval, the PAA submits to CEA a report containing a plan to monitor project implementation, which is then implemented after approval.

### **3. Environmental Protection License (EPL)**

21. The Environmental Protection License (EPL) scheme was introduced under the NEA in order to: prevent or minimize the release of discharges and emissions from industrial activities in compliance with national discharge and emission standards; provide guidance to industry on methods of pollution control; and encourage the use of new pollution abatement technologies, such as cleaner production, waste minimization, etc.

22. In Gazette Extraordinary 1533/16 of 25 January 2008, industries are classified into three categories (A, B or C) depending on their pollution potential. Part A comprises 80 high polluting industries, such as: Asphalt processing plants, Concrete batching plants having a production capacity of 50 or more cubic meters per day, Mechanized mining activities with multi bore hole blasting or single bore hole blasting activities with production capacity having 600 or more cubic meters per month, Hostels and similar dwelling places where occupancy level is exceeding 200 or more, Any industry where 200 or more workers per shift are employed, etc. Part B includes 33 medium level polluting activities, such as Hostels and similar dwelling places where occupancy level or 25 or more boarders and less than 200 borders, Concrete batching plants having a capacity less than 50 cubic meters per day, Single borehole blasting with industrial mining activities using explosives, having a production capacity of less than 600 cubic meters per month, Granite crushing (Metal crushing) industries having a total production capacity of less than 25 cubic meters per day excluding manual crushing operations using hand tools.; garages for vehicle repair and maintenance; etc. Part C includes 25 low polluting activities, such as vehicle filling stations; Mechanized cement blocks manufacturing industries; hotels and guest houses with 5-20 rooms; etc.

23. Licenses may also be required for some activities conducted on site during the construction period, including concrete batching, stone crushing, vehicle repair/maintenance and the accommodation camp for workers. These activities are classified as Part A or Part B, depending on their capacity or output. Part A and B licenses are obtained from the relevant Provincial or District Offices of the CEA.

### **4. A permit from the Geological Survey and Mines Bureau**

24. The Mines and Mineral Act No 33 of 1992 requires that mining and exploitation of minerals in Sri Lanka are licensed by the Geological Survey and Mines Bureau (GSMB).

This applies to earth and quarry materials excavated for use in construction, for which a permit must be obtained from the GSMB<sup>9</sup>, by the project proponent or contractor.

## **5. Archaeological Impact Assessment**

25. The Antiquities (Amendment) Act No 24 of 1998, and the implementing regulations published in Gazette Extraordinary No 1152/14 of 4 October 2000 require that an Archaeological Impact Assessment be conducted about every proposed development project with a land area of over 0.25 ha. The purpose of the assessment is to examine whether there are antiquities in the land, to determine the impact of the proposed development and to provide alternative measures if necessary.

26. The Government's Department of Archaeology (DOA) specifies the projects for which their written permission shall be obtained before implementation, and these include:

- To develop transport systems: (a) to construct national or provincial roads
- Excavations exceeding 500 m in length for laying pipes and conduits for drainage, water, gas, electricity, and telephone facilities.
- To quarrying and blasting stones to leach stone, gravel, minerals, or soil: (a) To identify reserves the exceed 0.25 ha on the crust of the land in the inner part of the country and do mining

## **6. Labour Laws and Occupational Health and Safety**

27. Sri Lankan legislation includes some laws, acts, and regulations designed to prevent the exploitation of workers and to protect their health and safety in the workplace (construction sites and operating facilities). These instruments are identified in the tender documents, and the contractor will be required to comply with all those listed and any others that may be applicable. It is not possible to review this legislation here, so the following sources are recommended for further information: Department of Labour<sup>10</sup>; Salary.lk<sup>11</sup>; National Institute of Occupational Safety and Health<sup>12</sup>; and for an international perspective, the World Bank's guidelines on Occupational and Community Health and Safety<sup>13</sup>.

## **7. Other Relevant Environmental Regulations, Guidelines and Policies of Sri Lanka**

28. The present Constitution of Sri Lanka came into operation in 1978 and also provides the basic principles of environmental protection and preservation through Chapter 4, Section 27, and Item 14; *"The State shall protect, preserve and improve the environment for the*

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<sup>9</sup> For GSMB Licensing procedure, see:

[http://www.gsmb.gov.lk/web/index.php?option=com\\_content&view=article&id=100&Itemid=68&lang=en](http://www.gsmb.gov.lk/web/index.php?option=com_content&view=article&id=100&Itemid=68&lang=en)

<sup>10</sup>[http://www.labourdept.gov.lk/index.php?option=com\\_content&id=65&Itemid=59&lang=en&limitstart=1](http://www.labourdept.gov.lk/index.php?option=com_content&id=65&Itemid=59&lang=en&limitstart=1)

<sup>11</sup><http://www.salary.lk/home/labour-law>

<sup>12</sup><http://www.niosh.gov.lk/>

<sup>13</sup><http://www.ifc.org/wps/wcm/connect/9aef2880488559a983acd36a6515bb18/2%2BOccupational%2BHealth%2Band%2BSafety.pdf?MOD=AJPERES>

*benefit of the community.*” Based on above principles, Government of Sri Lanka has laid down various Acts including National Environmental Act, No. 47 of 1980, to ensure environmental perseverance and protection.

**Table 2-1 : Laws and regulations applicable for the project activities**

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
National Environmental Act, No. 47 of 1980  National Environmental (Amendment) Act, No. 56 of 1988  National Environmental (Amendment) Act, No. 53 of 2000 and other Amendments	The NEA is a framework environmental statute that makes provision for the protection, management, and enhancement of the environment, for the regulation, maintenance, and control of the quality of the environment, and for the prevention and control of pollution by implementing the subproject.	Following Regulations related to NEA is applicable to all project components.
North Western Province Environmental Statute No. 12, of 1990	A statute to make provisions concerning protection, management, and enhancement of the environment and for the regulation, maintenance, and control the quality of the environment in North Western Province and the Country.	The provisions of North Western Province Environmental Statute No. 12, of 1990 and related Regulations apply to the road project proposed in Arachchikattuwa, Chilaw, Mundel and Puttalam DS located in the North-Western Province.
National Environment (Noise Control) Regulations 1996. Gazette Notification Number 924/12, dated 23rd May 1996.  National Environmental (Vehicle Horns) Regulations, No. 1 of 2011	Regulates maximum allowable noise levels for construction activities during subproject activities	Noise levels shall be strictly monitored for conformity, especially during excavations and backfilling.
National Environmental (Protection & Quality) Regulations, Gazette Notification, No. 1534/18 dated 01.02.2008.	This regulates the discharge and deposit of any kind of waste or emission into the environment.	Any effluent discharges and waste discharges (scheduled waste) shall conform to the Standards.
The activities for which Environmental Protection License (EPL) is required: Gazette Notification, No. 1533/16 dated 25.01.2008	The prescribed activities for which a license is required are set forth.	Certain project-related activities may need an EPL such as asphalt processing plant, concrete batching plants, treatment plants, sewerage networks, mechanized mining activities etc.
National Environment (Air Emissions, Fuel & Vehicle Importation Standards) Amended Regulations, No. 1 of 2003. Gazette Notification Number 1295/11 dated 30th June 2003.	This sets out the Vehicular Exhaust Emission limits for every motor vehicle in use in Sri Lanka.	All the project vehicles, machinery and equipment shall conform to the emission standards.
National Environment (Ambient Air Quality) Regulation 1994 and Amendment of Gazette Notification	Establishes permissible ambient air quality standards during proposed project activities	Ambient air quality shall be established prior to construction and be

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
Number 1562/22 dated 15th August 2008.		monitored during construction especially activities involving earthwork.
National Thoroughfares Act, No. 40 of 2008  Motor Traffic (Speed Limits) Regulations, No. 1 of 2012	The Act provides a framework for planning, design, construction, maintenance, and public roads. Section 26 prohibits any government department or local authority carry out any services on a road, public road, or a national highway without proper permissions	Permission of shall be obtained from RDA, PRDA, and LAs for rehabilitation and closure of roads.  Speed limits of all vehicles shall conform to speed limit regulations.
Motor Traffic Act, No. 14 of 1995, Amended by Act, No. 05 of 1998  The Motor Traffic (Construction of Vehicles) Regulations 1983 as amended in the Gazette Extraordinary No. 1842/32 of 29.01.2014	Establishes a regulatory framework for ownership, transfer and use of vehicles within Sri Lanka and defines the dimensions of any motor vehicle	All the project vehicles shall conform the provisions of the Act and shall not exceed the dimensions specified, especially heavy vehicles which transport equipment, machinery, and materials.
Fauna and Flora Protection Ordinance, 1937 (Chapter 469); Fauna and Flora Protection (Amendment) Act, No. 49 of 1993 and Fauna and Flora Protection (Amendment) Act, No. 22 of 2009)	Provide for the protection and conservation of the fauna and flora and their habitats; for the conservation of the biodiversity and to provide for matters connected there with or incidental there to.	Rehabilitation and construction work of the roads, quarrying and borrowing activities he roads, machinery, and materials yards, can have negative impacts on flora and fauna.
Felling of Trees Control Act, No. 09 of 1951 as Amended by Act No. 30 of 1953	This Act sought to prohibit and control the felling of specified trees.	No commercially and/or ecologically valuable tree species will be cut without proper approvals.
Geological Survey and Mines Bureau (GSMB) Act No. 33 of 1992  Removal of Sand Regulations, No. 1 of 2007  Regulation for Prohibition of use of Equipment for exploration, mining and extraction of Sand & Gems, Gazette Notification Number 1454/4 dated 17th July 2006  Explosive Act, No. 36 of 1976	Regulates the exploration for minerals, mining, transportation, processing, trading in export of mineral products and usage of quarries and sand mines in the country.  To provide the control of explosions and regulations of matters connected with explosive activities.	These are applicable for material suppliers for project activities.
National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009	Regulates dumping municipal solid waste along sides of any national highway or at any place other than places designated for such purpose by the relevant local authority during proposed project activities	MSW that arise during the project activities has to be properly collected, stored, and disposed.
Water Resources Board Act, No. 29 of 1964, Amendment No.42 of 1999 and Amendments made on 2017.03.16 by Gazette Notification No.2010/23)	Control, regulation, and development (including the conservation and utilization) of the water resources; the prevention of the pollution of rivers, streams, and other water resources; the	Approval from Water Resources Board is needed for use of groundwater resources for project activities (if any).

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
Irrigation Act, No. 23 of 1983 Agrarian Services Act, No. 58 of 1979	formulation of national policies relating to the control and use of the water resources.	Approvals from Irrigation Department/ Provincial Irrigation Department/Agrarian Services Department are needed for use of surface water resources for project activities (if any)
Soil Conservation Act, No. 25 of 1951 Amended in 24 of 1996	An act to make provisions for the enhancement and substances of productive capacity of the soil, to restore degraded land for the prevention and mitigation of soil erosion, for the conservation of soil resources and protection of land against damage by floods, salinity, alkalinity and drought and to provide for matters connected there with or incidental there to.	Approvals from Natural Resource Management Centre are needed if any borrow areas or any other project activities lead to soil erosion.
Flood Protection Ordinance, No. 4 of 1924 and No 22 of 1955	An ordinance for the protection of areas subjected to damage from floods. This includes declaration of flood areas, preparation of schemes for flood protection and other rules and regulations regarding flood in the country.	Approvals and consents from the Irrigation Department, Agrarian Services Department are needed if project activities lead to flooding.
Crown Land Ordinance Act No. 1947 Land Settlement Ordinance, No. 20 of 1931; Land Development Ordinance, No. 19 of 1935 as amended by land development (amendment) Act, No. 16 of 1969, No.27 of 1981, No. 22 of 1998, No. 22 of 1995; State Land Ordinance, No. 08 of 1947; Land Acquisition Act, No. 09 of 1950; State Land (Recovery of possession and divesting of State Land) Act, No. 07 of 1979; Land Grants (Special Provisions) Act, No. 43 of 1979; Title Registration Act, No. 21 of 1998	The act dealing with allocation and control of Crown lands In Sri Lanka for private and government activities.	Approvals and consents are needed from Commissioner General of Lands, District Secretary, Divisional Secretary, or any other government institutions for acquisition/lease of lands
The Antiquities (Amendment) Act No 24 of 1998, and regulations published in Gazette Extraordinary No 1152/14 of 4 October 2000	This require that an Archaeological Impact Assessment (AIA) to be conducted about every proposed development project with a land area of over 0.25 ha. The purpose of the assessment is to examine whether there are antiquities in the land, to determine the impact of the proposed development and to provide alternative measures if necessary.	Approval of the Department of Archaeology is needed (after conducting an Archaeological Impact Assessment (AIA)).
Municipal Council Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the Pradeshiya Sabha Act No. 15 of	These outlines the procedures in approval of building plans, approval of drainage management plans, etc., and regulations for disposal of municipal	Approvals for building plans, drainage management plans, and disposal of municipal

Laws and Regulations	Provisions and Main Content	Applicability to proposed project
1987	solid waste. In addition to environmental clearance, obtaining Trade license and Machinery Permits, involvement of MOH/PHI in matters related to public health and other approvals from the local authorities for site clearance; and consent from all relevant Pradeshiya Sabhas, Provincial Councils, and Divisional Secretaries shall be obtained before construction begins.	solid waste are needed. Trade license and Machinery Permits shall be obtained prior to commencement of any operations. Approvals of the MOH/PHI in matters related to public health are needed.
Labour Laws and Occupational Health and Safety  Legislation in Sri Lanka relating to Industrial, Employment and Labour relations included in the Labour Code of Sri Lanka	Sri Lankan legislation includes some laws, acts, and regulations designed to prevent the exploitation of workers and to protect their health and safety in the workplace (construction sites and operating facilities). The project proponent and all the subordinates including sub-contractors will be required to comply with all such laws and provisions that may be applicable.	Compliance required during pre-construction, construction, and decommissioning stages  The following sources provide further information: Department of Labour; National Institute of Occupational Safety and Health; and for an international perspective, the IFC guidelines on Occupational and Community Health and Safety.

29. Some of above legislations may not necessarily or directly be relevant to the road sector. The National Environmental Act, No.47 of 1980, amendment No.56 of 1988, and subsequent amendments provide a framework environmental statute for any components that are implemented under the proposed project. National Environmental (Protection & Quality) Regulations, No. 01 of 1990 provides standards for discharging effluents into the inland surface water during proposed project activities. National Environmental (Ambient Air Quality) Regulations (1994) establishes permissible ambient air quality standards during proposed project activities, and National Environmental (Noise Control) Regulations, No.1 of 1996 regulates maximum allowable noise levels during construction activities and during operations of proposed project activities.

## A2. Project-relevant International Agreements and Conventions

30. Sri Lanka has acceded to or ratified around 40 Multilateral Environmental Agreements and those that are relevant to this project are shown in Table 2-2.

**Table 2-2: Project-related international agreements to which Sri Lanka is a party**

Agreement	Ratification Date	Objectives
<b>Atmosphere</b>		
Vienna Convention for the Protection of the Ozone Layer (1985)	15 December 1989	Protection of the Ozone Layer through international cooperation in the areas of scientific research, monitoring and information exchange
Montreal Protocol on Substances That Deplete the	12 December 1989	Reduction and the eventual elimination of the consumption and production of Un-anthropogenic Ozone Depleting



Agreement	Ratification Date	Objectives
Ozone Layer (1987)		Substances
United Nations Framework Convention on Climate Change (UNFCCC-1992)	23 November 1993	Stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climatic systems
Kyoto Protocol (1997)	3 October 2002	The Annex 1 parties (Developed Countries) to reduce their collective emissions of greenhouse gases by at least 5% of the 1990 level by the period 2008 –2012
<b>Biodiversity and Cultural Heritage</b>		
International Plant Protection Convention (1951)	12 February 1952	To maintain and increase international cooperation in controlling pests and diseases of plants and plant products, and in preventing their introduction and spread across national boundaries
Plant Protection Agreement for Asia and Pacific Region (1956)	27 February 1956	To prevent the introduction into and spread within the region of destructive plants
Convention concerning the protection of the World Cultural and Natural Heritage (1972)	6 June 1980	To establish an effective system of collective protection of the cultural and natural heritage of outstanding universal value organized on a permanent basis and by modern scientific methods
CITES - Convention on International Trade in Endangered Species of Wild Fauna & Flora (1973)	4 May 1979	To protect certain endangered species from being over-exploited by adopting a system of import/export permits, for regarding the procedure
Convention on the Conservation of Migratory Species (1979)	6 June 1990	To protect those species of wild animals which migrate across or outside national boundaries
The Convention on Wetlands (Ramsar Convention) (1971)	15 October 1990	This is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources.
Convention on Biological Diversity (CBD-1992)	23 March 1994	Conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including appropriate access to genetic resources and by appropriate transfer of relevant technologies and appropriate funding
The UNESCO World Heritage Convention (1972)	06 June 1980	Convention concerning the protection of the World Cultural and Natural Heritage
<b>Land</b>		
United Nations Convention to Combat Desertification (UNCCD- 1994)	09 December 1998	To combat desertification and to mitigate the effects of drought in countries experiencing severe droughts and/ or desertification with the final aim being to prevent land degradation in the hyper-arid, arid, and semi-arid, dry subhumid areas in the countries that are parties of the Convention
<b>Chemicals</b>		
Basel Convention on the Control of Trans-boundary Movements of Hazardous	28 August 1992	To reduce transboundary movements of hazardous waste; to dispose of hazardous and other waste as close as possible to the source; to minimize the generation of hazardous waste; to

Agreement	Ratification Date	Objectives
Wastes and Their Disposal (1989)		prohibit shipments of hazardous waste to countries lacking the legal, administrative and technical capacity to manage & dispose of them in an environmentally sound manner; to assist developing countries in environmentally sound management of the hazardous waste they generate
Rotterdam Convention (1998)	19 January 2006	To promote shared responsibility and cooperative efforts in the international trade of certain hazardous chemicals, to protect human health and the environment; to contribute to the environmentally sound use of those hazardous chemicals by facilitating information exchange, providing for a national decision-making process on their import/export
Stockholm Convention on Persistent Organic Pollutants (POPs) (2001)	22 December 2005	To protect human health and the environment from persistent organic pollutants (POPs)

## B. ADB Policy on Environmental & Social safeguards

31. ADB's Environment Policy requires that environmental issues be considered in all aspects of the Bank's operations. The detailed requirements are defined in the Safeguard Policy Statement (2009), which builds upon the three previous policies on the environment, involuntary resettlement, and indigenous peoples, and brings them into a consolidated policy framework that enhances their effectiveness and relevance. The SPS affirms that ADB considers environmental and social sustainability as a cornerstone of economic growth and poverty reduction in Asia and the Pacific and is committed to ensuring the social and environmental sustainability of the projects it supports.

32. In this context, safeguards are operational policies that seek to avoid or reduce to acceptable levels adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. The objectives of ADB's safeguards are to:

- (i) avoid adverse impacts of projects on the environment and affected people, where possible.
- (ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people where avoidance is not possible; and
- (iii) help borrowers/clients strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

33. The Safeguard Policy Statement applies to all projects or components financed, administered or otherwise supported by ADB, regardless of whether ADB is the funder; and ADB will not finance projects that do not comply with the SPS and the host country's social and environmental laws and regulations.

34. Environmental safeguards are triggered if a project is likely to have potential environmental risks and impacts, and the objectives are to ensure the environmental soundness and sustainability of projects and support the integration of environmental considerations into the project decision-making process. The principal tool for achieving



these aims is an environmental assessment, which is a process of environmental analysis and planning to avoid or reduce the environmental impacts associated with a project. The nature of the assessment required depends on the significance of the environmental impacts, which are related to the type and location of the project; the sensitivity, scale, nature, and magnitude of its potential impacts; and the availability of cost-effective mitigation measures.

35. **Screening and Categorization:** ADB screens a project in the preparation stage to (i) reflect the significance of potential impacts or risks that the project might present; (ii) identify the level of assessment and institutional resources required for the safeguard process; and (iii) determine the requirements for public disclosure. Screening reviews basic information on project design and operation, the proposed project site/s, and the general environmental/social features, and is aided by ADB's Rapid Environmental Assessment (REA) checklists. By the significance of the potential environmental impacts and risks, projects are assigned into one of the following four categories:

- (i) **Category A:** projects likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented, and which may affect an area larger than the location subject to physical works. An Environmental Impact Assessment (EIA) is required.
- (ii) **Category B:** projects with potential adverse impacts that are less significant than those of Category A. Impacts are site-specific, few are irreversible, and in most cases, impacts can be mitigated more readily than those for Category A projects. An Initial Environmental Examination (IEE) is required.
- (iii) **Category C:** projects likely to have minimal or no adverse environmental impacts. No environmental assessment is required, although environmental implications are reviewed.
- (iv) **Category FI:** projects where ADB funds are invested in or through a Financial Intermediary (FI). ADB conducts safeguard due diligence of the FI's portfolio and requires an appropriate environmental and social management system (ESMS) in place, to address environmental or social risks.

36. **Environmental Assessment** conducted under the SPS is governed by a series of policy principles, which define the scale, content, and approach to the study. The specific requirements of the Environment Safeguard Policy are given in Appendix 1 of the SPS; and the Annex to Appendix 1 provides an outline of an EIA report, which includes guidance on the overall layout and the content of each section. Guidance on the practical approach to conducting the environmental assessment is provided in the Environment Safeguards Good Practice Sourcebook (ADB, 2012). EIA and IEE studies follow the same general approach as prescribed in these documents; and the SPS states that the level of detail and comprehensiveness of the study shall be commensurate with the significance of environmental impacts and risks, so an IEE may have a narrower scope. These documents were all consulted extensively in conducting this study and preparing this report.

37. **Public Consultation:** The SPS requires the borrower/client to carry out meaningful consultation with affected people and other stakeholders to facilitate their informed participation. This should: (i) begin early during project preparation and continue throughout the project cycle; (ii) provide timely disclosure of adequate, relevant and understandable information; (iii) be free of intimidation and coercion; (iv) be gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enable

incorporation of all relevant views into decision-making, including project design, impact mitigation, and sharing of project benefits and opportunities. The SPS specifies that for a Category A project, at least two consultation exercises are needed: the first at the early stage of EIA fieldwork; and the second when the draft EIA is available. The results of the consultation process are documented in the environmental assessment report.

38. **Information Disclosure:** The SPS requires the borrower to make relevant environmental information available to affected people and other stakeholders promptly, in an accessible place and in an understandable form and language(s). This normally involves providing the draft, and final IEE/EIA reports in public buildings in the study area, but for complex studies, brochures, leaflets, etc. can also be used, along with non-written communication methods if any stakeholders are illiterate. ADB also requires the borrower to provide the following for dissemination to a wider audience via the ADB website:

- (i) The final EIA or IEE.
- (ii) New or updated EIA/IEE, supplementary reports and/or corrective action plans, if prepared during project implementation.
- (iii) Environmental monitoring reports, also during project implementation.
- (iv) In the case of a Category A project, the draft EIA (including the draft EMP) must be provided at least 120 days before ADB Board consideration.

### 3 DESCRIPTION OF THE PROJECT

#### A. Location of the project

40. The following road section has been proposed to rehabilitate and maintain under the Integrated Road Investment Program – Road Management Contract (RMC) package.

#### 1. Rehabilitation and Improvement of Peliyagoda - Puttalam Road (A003) from Chilaw to Puttalam (76 km to 126.8 km)

41. This road section, which is 50.8 km in length, connects Chilaw at 76<sup>th</sup> km (7°35'28.6"N 79°48'02.8"E) near Akkarayankotuwa on A003 road and Puttalam at 126.8 km (8°01'48.7"N 79°49'43.1"E) on A003 road (Puttalam Roundabout).

**Table 3-1: The administrative location of the proposed section of A003 Road proposed for improvement**

Province	District	DS Division	GN Division
North Western Province	Puttalam	Arachchikattuwa	Anavilundawa (590) Arachchikattuwa East (585C) Arachchikattuwa West (585) Bangadeniya (573) Battaluoya (591) Diganwewa (574B) Ilakkattuwa (592C) Kottapitiya (584) Nalladarankattuwa (592) Rajakadaluwa (585A) Sengaloya (592E) Suruwila (589A) Weerakumandaluwa (574)
		Chilaw	Aluthwatta (576) Aluthwatta (576A) Deduruoya (579B) Ichchampitiya (580) Pitipana North (578B) Pitipana South (578) Thimbilla (579A) Wattakkaliya (579)

Province	District	DS Division	GN Division
		Mundel	Karathanvilluwa (610C) Kudirippuwa (610D) Madurankuliya (609) Mangalaeliya (610A) Mundalama (610) Pubudugama (609A) Pulichchakulama (593) Weerapura (608B)
		Puttalam	Palaviya (607) Pottuvilluwa (607D) Puttalam South (618) Rathmalyaya (618B) Thiladiya (618 A)

42. The location map of the road is shown in Figure 3-1 and Annex 1.

## B. Category of the project

43. Overall, the iRoad program is categorized as an Environmental category “B” project. The Rapid Environmental Assessment (REA) of the present study reconfirms this categorization for this sub-project too, See Appendix 1. Therefore, an Initial Environmental Examination (IEE) is required for this sub-project of RMC, to be conducted before the commencement of interventions.

## C. Need for the Project

44. The section of Peliyagoda – Puttalam road (A003) from Chilaw to Puttalam (76<sup>th</sup> km to 126.8<sup>th</sup> km) is the main highway connecting Colombo and Puttalam. Considerable traffic including public transport buses, heavy vehicles which transport goods and other traffic could be observed. On the other hand, the road provides connectivity between Colombo and Mannar, Colombo and Anuradhapura etc via Puttallam. The connectivity between these areas does not occur smoothly as inferior conditions of the A003 road, especially the selected section of the road do not support the steady flow of the traffic. This road section will be further degraded if not rehabilitated and maintained urgently.



Figure 3-1: Location Map of the section of Peliyagoda – Puttalam road (A003) from Chilaw to Puttalam (76th km to 126.8th km)



## **D. Analysis of Alternatives**

### **D1. No Project Alternative**

45. The present sub-standard conditions of the road section will worsen with the increased traffic flow with time if the selected road section is not be rehabilitated without further delay and maintained. The efficiency of transportation in A003 Road, will be severely hampered without the project. Moreover, the safety of road users will continue to be at risky levels with structural damages which are common along the selected road stretch. The present conditions of the road section will not support socio-economic development of the area as it disturbs livelihood activities of the project area, especially transport of agricultural produce for markets, tourism, conveyance of construction material, etc. 'No project alternative', therefore, is not a feasible solution.

### **D2. With Project Alternative**

46. The project proposes to rehabilitate the section of Peliyagoda - Puttalam road (A003) from Chilaw to Puttalam (76 km to 126.8 km). This 50.8 km stretch of the road will be rehabilitated and subsequently be maintained for five years. Under the proposed development, hard shoulders, roadside drains, and parking facilities will be provided where necessary. There are sections of road which are subjected to seasonal flooding, and special consideration will be paid for such sections which are prone to inundation. Improvements of roadside drainage facilities will be enhanced the quality of road by reducing the existing inundations in the area. Also, necessary mitigation measures will be incorporated into the design to prevent such natural occurrences which will disturb the flow of traffic from time to time during inclement weather. Also, the improvements and rehabilitation works will provide safe driving conditions and road safety for other road users such as cyclists, motorcyclists, and pedestrians. School children and other people using public transport can benefit from the provision of bus bays and bus shelters improving the safety and comfort. The unemployed people living in the subproject area will have the construction-related job opportunities during project implementation, and subsequently, they will have employment opportunities in the expanded commercial/industrial sectors. Development of the roads will provide better transport facilities for the people to access markets. The land value will also be increased due to the proposed road project.

47. The main purpose of iRoad program is to improve the rural villages having potential of economic growth with socio-economic centres. Therefore, the proposed rehabilitation and maintenance, will positively contribute to the enhancement of transport efficiency of the A-class road and better transport efficiency will be a catalyst for regional development and the socio-economic well-being of the people living in villages along the road, having access to the road and finally the North Western Province as a whole.

## **E. Magnitude of Operations**

### **E1. Proposed improvement**

48. The project comprises of carrying out of rehabilitation and improvement works along the section of Peliyagoda - Puttalam road (A003) from Chilaw to Puttalam (76 km to 126.8 km) as a Road Management Contract (RMC). The rehabilitation of A003 road from Chilaw to Puttalam involves a 50.8 km length of a road section. The project will not involve acquisition

of any additional lands, and all improvement activities will be restricted to the existing ROW. The proposed typical cross section consists of the carriageway, hard shoulder, soft shoulder, and side drains where necessary as given below:

- Carriage Width: 3.5 m x 2
- Hard Shoulder: 2.0 m x 2
- Soft Shoulder: 1 m x 2
- Drain: 0.9 m x 2
- Total : 14.8m
- Total ROW: 20.0 m

49. The proposed typical cross-section is shown in Annex 2. However, the typical cross section will be modified based on the location specific contexts, keeping the major components unchanged.

## **E2. Project activities**

50. The scope of work proposed under the RMC include the following: clearing and grubbing; roadway excavation; channel excavation; excavation and backfill of structures; embankment construction; sub bases, capping layers, and bases; shoulder construction, asphalt overlay; roadside and leadaway drains; cleaning, desalting, and repairing of culverts.

51. The improvement works for the selected road section under iRoad Project will be as follows:

- Road will be overlaid with the AC (01 Binder layer and 01 surface layer of Asphalt Concrete).
- The base correction will be carried out if base failures are found along the road.
- The built up drain provided for required areas. Otherwise, the earth drain will be provided.
- Finally, road marking will be carried out.

*(Source: PIU, iRoad Program, RDA)*

52. Further, an improvement on the cross- and side-drainage of the road will be considered in locations where structures have been badly damaged, or rectification of the drainage is significantly required. The components of RMC are described in Table 3-2.

**Table 3-2: Typical interventions proposed in Road Management Contract (RMC) of iRoad Project**

Type of Intervention	Description	Items*
Rehabilitation	Maintenance aimed at restoring the deteriorated road surface to	Patching, maintenance of hard shoulders, double bituminous surface treatment, asphalt concrete

Type of Intervention	Description	Items*
	its original condition	treatment, re-surfacing, continuous maintenance of hard shoulders, painting traffic signs and guard railings, maintenance of side ditches, etc.
Periodic Maintenance	Maintenance aimed at restoring the condition of partially deteriorated pavement to a certain level	
Routine Maintenance	Maintenance work performed on a daily basis to maintain the condition of road surfaces and delay their deterioration	Cutting back foliage along hard shoulders, patching cracks, laying earth on hard shoulders, repairing potholes, using the sand sealing method to repair pavement, etc.

\* There is no clear distinction among the three types of maintenance, and details of the work involved vary only marginally between projects.

53. In addition, road furniture and markings will also be appropriately provided where necessary.

54. The general scope of work for the road includes:

- **Initial repairs to the existing road surface:** These are carried out to prepare the road surface for resurfacing or overlay: these repairs may include bituminous patching, crack sealing, carriageway edges and shoulder repairs where traffic damage or erosion has occurred, cleaning of side drains and road culverts.
- **Overlay:** In all cases, the recommended improvements entail overlaying the existing pavement with a base or leveling course, designed for the projected number of Equivalent Standard Axles (ESA's) over the design life of the road, and resurfacing. Where a pavement is found to be severely deteriorated, broken, or uneven, the existing surface would first be scarified and reshaped before applying the pavement surface.
- **Construction of Pavements:** This will involve earthworks, pavement construction, overlaying of the existing pavement and bitumen surfacing. Work will also include cleaning of roadside drains; culverts; cleaning of outlet drains and repairs to road furniture. Road pavements are constructed by Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka). Road pavement consists of granular soil subbase, aggregate base course, and Asphalt concrete wearing course.
- **Road Alignments:** In general, minor realignment may be made to alleviate small curves in the existing horizontal and vertical alignments. The widening will be carried out on the insides of curves for the roads. The only minor changes are applied to the horizontal alignment for very short sections to enhance road safety, to ease the radius of curves, or minimize blind spots (within the ROW). The road safety aspects relate mostly to localize sections of the road alignments. In densely populated areas, roads, bridges, and associated sidewalks are made accessible for all, including the disabled. Known black spots will be alleviated, and in some cases, minor adjustments may be made to the vertical alignment if visibility is considered a problem. This will include approaches to bridges and railway crossings on embankments.



- **Correction of Undulations in the Longitudinal Profile:** Improvement work will include where technically appropriate the correction of irregularities in the road cross-section and severe undulations in the longitudinal profile.
- **Roadside Drains:** To minimize stormwater flooding or ponding, roadside drains are reconstructed to direct surface flows away from road pavements and divert to streams or watercourses. Built up drains are provided for urban and suburban areas and for rural areas, earth drains are provided. For existing built-up drains, which can be retained with minor repairs (retained or repaired), the waterways are restored by removing sediment materials and debris.
- **Culverts and Bridges:** Improvement will be carried out to roadside drains, culverts, and bridges. Where existing structures are sound, then culverts will be lengthened, and bridges widened to suit the new road width. Where the condition of culverts and or bridges is poor, the structure will be replaced. Repairs, re-decking, widening and in some cases replacement of the structure of a bridge/culvert are the main rehabilitation activities concerning structural modifications. Improvements comprised of repairing and or replacing existing culverts and bridge structures, depending on hydraulic and structural requirements. These interventions include structural renovation of substructure and superstructure elements together with installation or repair of guardrails and improvement of causeways and vented drifts. Depending on the terrain and outcome of hydrological studies, few new culverts may be introduced to improve drainage. Materials and construction methods are by Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka), modified to suit project requirements.
- **Earth Retaining Structures:** When the road is in the embankment, retaining walls are introduced to get required additional road widths. Gabions, random rubble masonry, and reinforced concrete retaining walls are used, and Materials and construction methods are by Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka), modified to suit project requirements.
- **Road Safety:** The road safety aspects are related mostly to localized sections of the alignments. Based on the road safety inspections, carried out on the road sections during the field evaluation, the detailed design, wherever possible, incorporates improvements to road width and alignment, including installing precautionary sign boards, direction boards, and speed signs to slow down for oncoming curves or low-speed areas.

55. The following specific design standards and guidelines are applicable to the interventions proposed by the RMC of the iRoad Project:

**Roads:**

- i. Road Design Manual and Bridge Design Manual - RDA's standard
- ii. AASHTO – Geometric Design of Highways and Streets 5th edition (2004)
- iii. TRL – Overseas Road Note 6, A Guide to Geometric Design (1988), and
- iv. Austroads –Rural Road Design (2003)

**Bridges:**

- i. RDA's Sri Lanka Bridge Design Manual of 1997, based on the British Standards Code of Practice for Bridge Design (BS5400:1990)

**Road Pavements:**

- i. Transport Research Laboratory's Road Note 31, 4th Edition (TRL-RN31), basis of RDA's pavement design process
- ii. AASHTO Pavement Design Guide, and
- iii. Design life for new pavements: 10-year life with a provision for overlays during or at the end of that period to extend the life to 15-20 years

**Drainage:**

- i. RDA's standards incorporating relevant standards from AASHTO and the British Standard Design Manual for Roads and Bridges

**E3. Extraction of Construction Material**

56. Depending on Contractor's preference, construction material will be sourced from various locations to reduce haulage costs. The main materials required for construction of the roadworks are soil and gravel and aggregates. The soil is used for embankment construction. Gravel is used for sub-base construction. Aggregates, which are crushed stone, requiring blasting, crushing, screening, and at times blending, is used for base-course construction and for bituminous surfacing. Sand, aggregates, cement, and steel are needed for structural work, such as culverts and repair work of bridges, and for drainage canals and concrete embankments if any. Approximate material quantities required for the civil works of the project are presented below.

**Table 3-3: Estimated quantities of material required for RMC package in NWP**

Type of material	Unit	Estimated quantity
Sand	m <sup>3</sup>	11,540.00
Earth	m <sup>3</sup>	377,545.00
Cement	MT	5,380.50
ABC	m <sup>3</sup>	178,821.00
Rubble	m <sup>3</sup>	95.00
Metal	m <sup>3</sup>	54.00
Bitumen	MT	6,179.00
Steel	MT	1,136.00

(Source: PIU, iRoad Program, RDA)

Sources of material are yet to be selected and approved by the RDA once the Contractor is selected.

## 4 DESCRIPTION OF EXISTING ENVIRONMENT

### A. Existing land use along the road

#### A1. Land Use

57. The selected section of A003 road is from Chilaw (76 km) to Puttalam (126.8 km) covering a length of 50.8 km. The whole section of the road falls within Puttalam district and traverses through flat terrain within 5 km from the Western coastal zone of the country. The road passes areas of urban, semi-urban and agricultural in nature. The road crosses several rivers and streams and the largest waterway intersected by the road section is Deduru Oya. The economy of the area is mainly dependant on fishery, agriculture, and industries. Coconut farms, other agricultural land can be seen on either side of the road.



**Figure 4-1: Existing land use along the A003 road from Chilaw to Puttalam**

#### A2. Existing condition of the carriageways and the pavements

58. The existing carriageway of the A003 road (from 76<sup>th</sup> km to 126.8<sup>th</sup> km) varies from 3.2 x 2 m to 3.5 x 2 m in width the corridor and falls through a flat terrain. It was observed a poor carriageway conditions in some sections along the road and the shoulders are 'soft' which has resulted in pavement edge erosion presenting a safety hazard to traffic and to pedestrians who must use the shoulder as a walkway.

**Table 4-1: The conditions of the road**

No	Road Section Name	Route No.	Existing Single Carriage Width (m)	Proposed Single Carriage Width (m)	Section length (km)
1	Chillaw - Puttalam	A003	3.2–3.5	3.5	50.80

### **A3. Existing condition of culverts and bridges**

59. The inventory of existing bridge structures (bridges being defined as any structure with a span > 3 m) are given in Appendix 6. Almost all of them were found to be in satisfactory condition from a structural point of view by the field evidence collected – this assessment has since been checked visually only, and detailed structural assessments are needed.

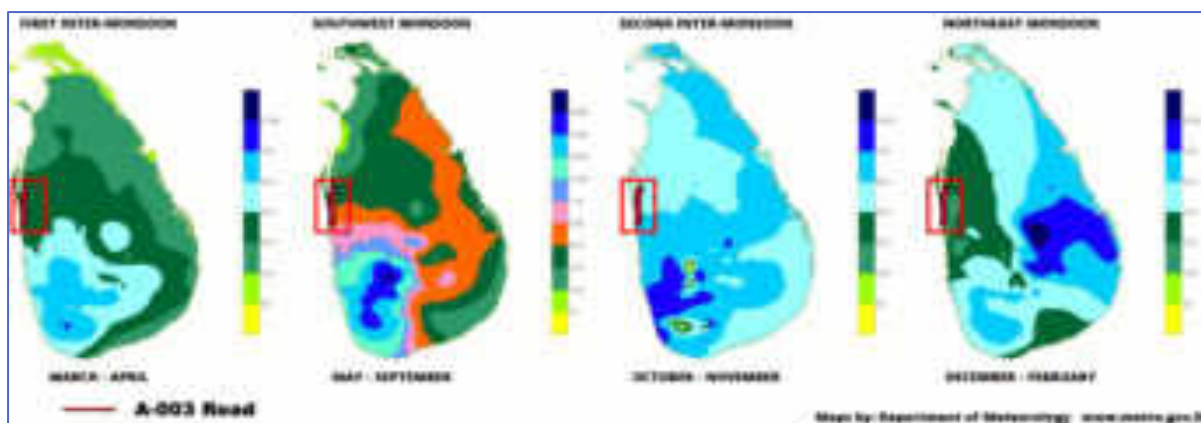
60. The existing cross culverts were identified within the subject corridor and assessments made of present conditions and improvements needed at each site are provided in Appendix 6.

61. Details of the hydraulic condition and of the recommended treatments at each location to address both reported and perceived problems shall be contained in Engineering Assessment Reports. A visual inspection showed that the majority of the existing culverts were deemed to be hydraulically and structurally satisfactory, many of them were found to be silted and partially blocked. Most inlet/outlet openings need to be cleared. It was also observed that most of the lead away drains of the culverts were similarly affected by silt deposits, vegetation or otherwise restricted by encroachments – most of them being in need of at least, clearing and cleaning.

## **B. Physical Environment**

### **B1. Climate, land use, terrain, and soil**

62. Based on major climatic zones of the country, the candidate road section of A003 Road falls within the area classified as the Intermediate Zone where the annual average rainfall is between 1,750 mm and 2,500 mm, and Dry Zone where the annual average rainfall is between 1,200 mm and 1,900 mm.



**Figure 4-4-2 : Rainfall patterns of Sri Lanka. The road trace proposed for rehabilitation is inserted.**

63. The climate of the project area is further categorized into Agro-ecological Zones (AEZ) which are categorized based on climate, soil, natural vegetation, and land use pattern of an area. The AEZ nomenclature is alphanumeric where the first upper case letter denotes the climatic condition (W-wet, I-intermediate, D-dry), the second upper case letter indicates elevation (L-low, M-medium, U-upper), the first number describes the moisture regime, and the last lower-case letter indicates the rainfall distribution and other environmental factors where the degree of wetness degrades from letters *a* to *f*.

64. The general climate that prevails in Puttalam area in the North Western Province where the proposed candidate road A003 is situated is characterized by hot and dry weather for the most part of the year. The region's rain climate follows the typical pattern that is found in the intermediate and dry zone of Sri Lanka. The region remains dry from October to March. Heavy rains occur during the inter-monsoon months of October and November followed by southwest monsoon rains from May to September. Rainfall distribution is influenced by monsoon winds from passing over the Indian Ocean southwest of the country.

65. The general topography of Sri Lanka comprises of three distinctive peneplains or erosion plains made up of a central highland massif rising above 2,500 m in altitude and a low gently undulating plain surrounding it and extending to the sea. The lowest peneplain extends from the coastline to approximately 20–30 km inland in a steep step of about 300 m above mean sea (MSL). The middle peneplain is characterized by rising undulating terrain and isolated hills with a maximum elevation of about 800 m above MSL. Located within it and rising from it in another step of 1,000 m to 1,300 m is the highest peneplain at a general level of about 2,000 m above MSL but rising in places to 2,300 m to 2,700 m in the form of isolated hillocks and mountain ranges towards further inland.

66. The proposed candidate road section of A003, situated in Puttalam District in the North Western Province, lies within the first peneplain/lowermost.

67. The specific agro-ecological zones (AEZ) and other characteristic land use, terrain and soil details related to candidate road section and their characteristics are presented in the following Table 4-2.

**Table 4-2: Climatic characteristics of the candidate road**

Section of the Road	Agro-ecological Zone	75% Expectancy Value of Rainfall (mm)	Description		
			Land-use	Terrain & Peneplane	Soil Groups
Chilaw – Pulichchakulama (A003)	IL <sub>1b</sub>	762	Coconut, Perennial Crop, Lowland Crops, Paddy, Scrub, Mixed, Home Gardens	Flat First Peneplane	Red Yellow Pozzolic soil, Red-soils, Reddish Brown Latosols, Reddish Brown Earth, Low Humic Gley Soils and Regosol soils
Pulichchakulama – Puttalam (A003)	DL <sub>3</sub>	798	Coconut, Perennial Crop, Paddy Lowland Crops, Scrub, Mixed, Home Gardens	Flat First Peneplane	Reddish Brown Earth and Low Humic Gley Soils

68. Monthly histogram of 75% rainfall probability (in mm) and 75% of expectancy value of annual rainfall (in mm) for IL<sub>1b</sub> is presented in Figure 4-3 below.



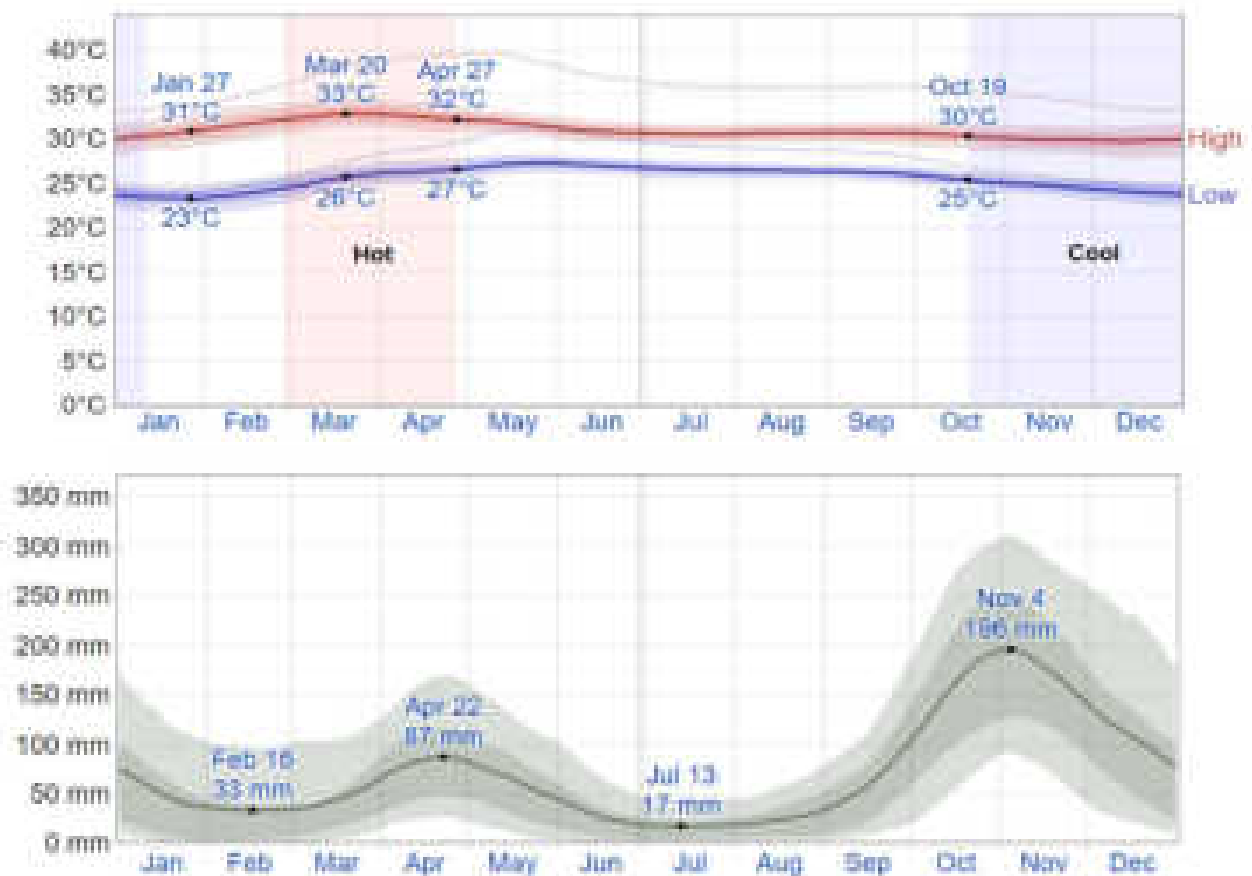
**Figure 4-3: 75% probability histogram and 75% probability rainfall in the agro-ecological zone of IL1b.**

(Source: NRM, 2003)

## B2. Hydrology

69. **Surface Water Resources:** Figure 4-4: illustrates the rainfall and temperature variation of Puttalam District and Figure 4-5 illustrates the location map of the candidate road section of A003 from Chilaw to Puttalam (76.0 km to 126.8 km) with its hydrological setting including the location of major river basins, rivers/streams, and reservoirs. The candidate road section is situated within the Dry Zone and Intermediate Zone of the country.

70. The candidate road section, Chilaw – Puttalam Road (A003), crosses Deduru Oya (Stream) Rathambala Oya (Stream), Kalagamuwa Oya (Stream), Sengal Oya (Stream), Madurankuli Oya (Stream) river basins and several other small coastal/inland floodplain basins.



**Figure 4-4: Rainfall and temperature variation of Puttalam District**  
(Source: Meteorological Department, Sri Lanka)

71. Agriculture is comprehensively practiced in the project area situated within Dry/Intermediate climate zones. Therefore, irrigation tanks built to collect rainwater during monsoonal months with their associate channel networks are commonly observed. Some road sections are located in the close proximity of these irrigation tanks and their associated distributary canal networks (see Figure 4-5 with 500 m buffer and main river basins and waterbodies). The particular locations at which stream tributaries are crossed by the road and water bodies located along A003 road are given in Table 4-3 below.

72. **Groundwater Resources:** Dug wells are commonly observed within home gardens along the road, and shallow groundwater is used to fulfill domestic requirements by the households.



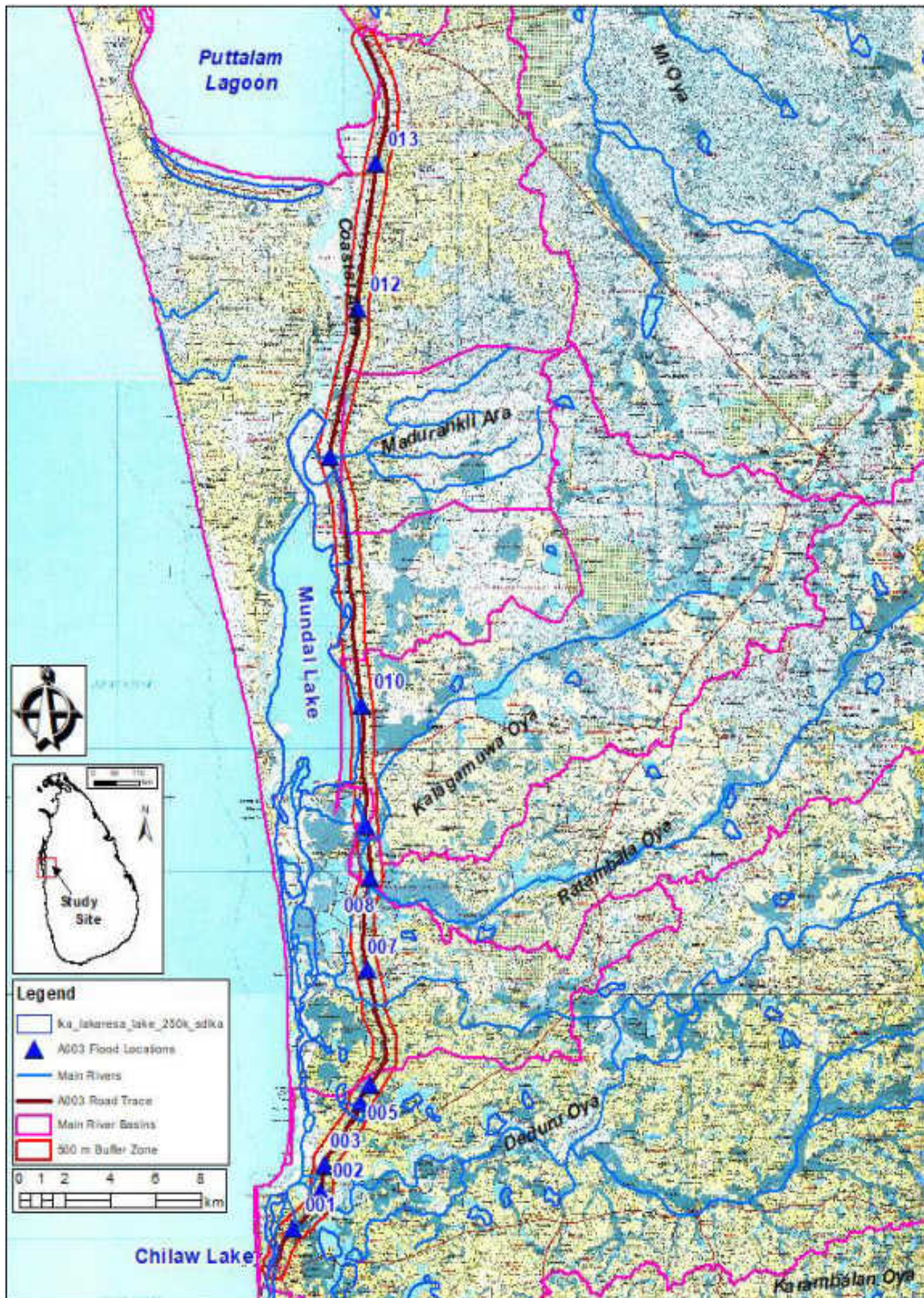


Figure 4-5: Location Map of candidate road sections with their hydrological setting  
(Base Map: 1:50,000 Topographical Maps, Survey Department, Sri Lanka)



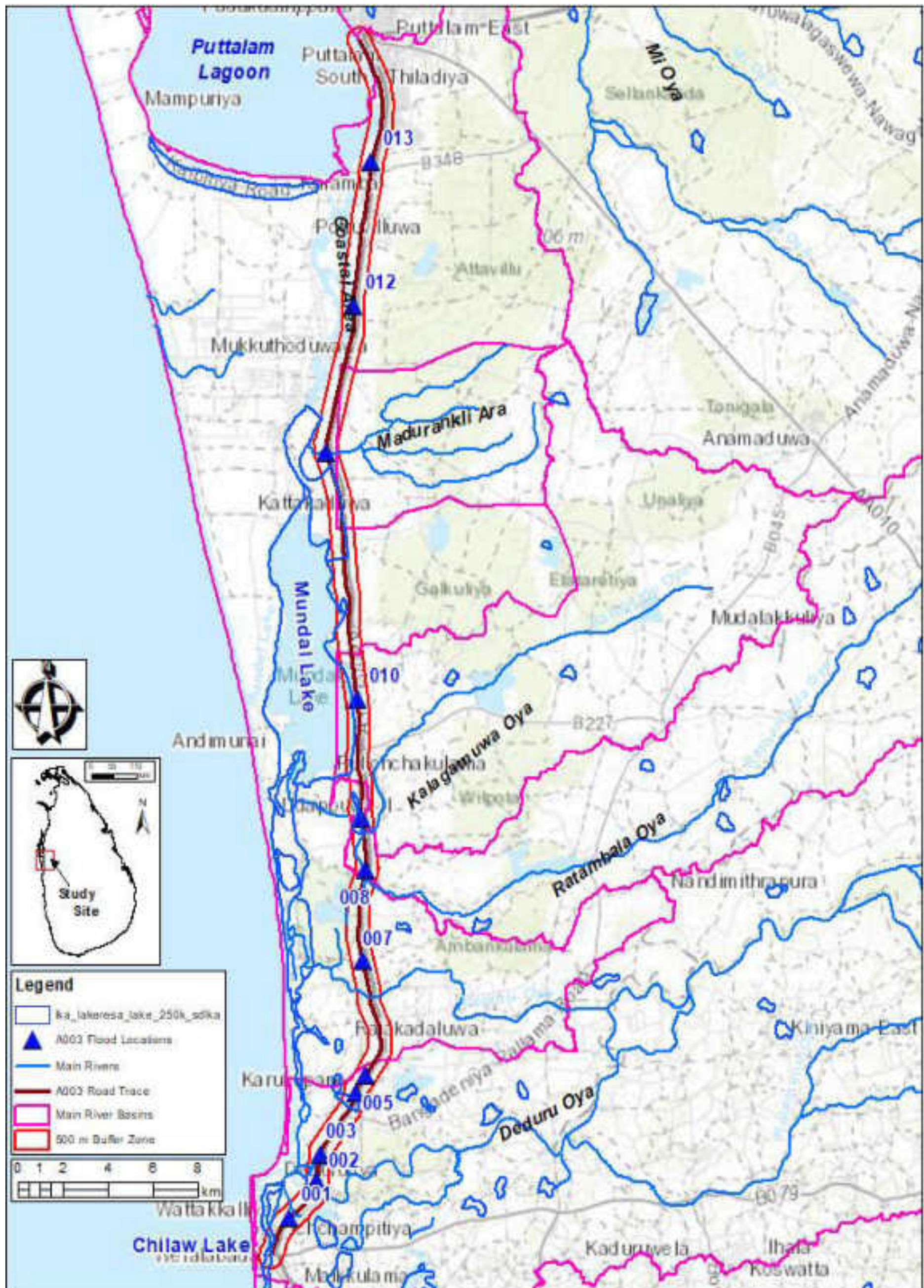


Figure 4-6: Location Map of candidate road sections with their hydrological setting  
(Base Map: World Terrain Maps, USGS/USDA)



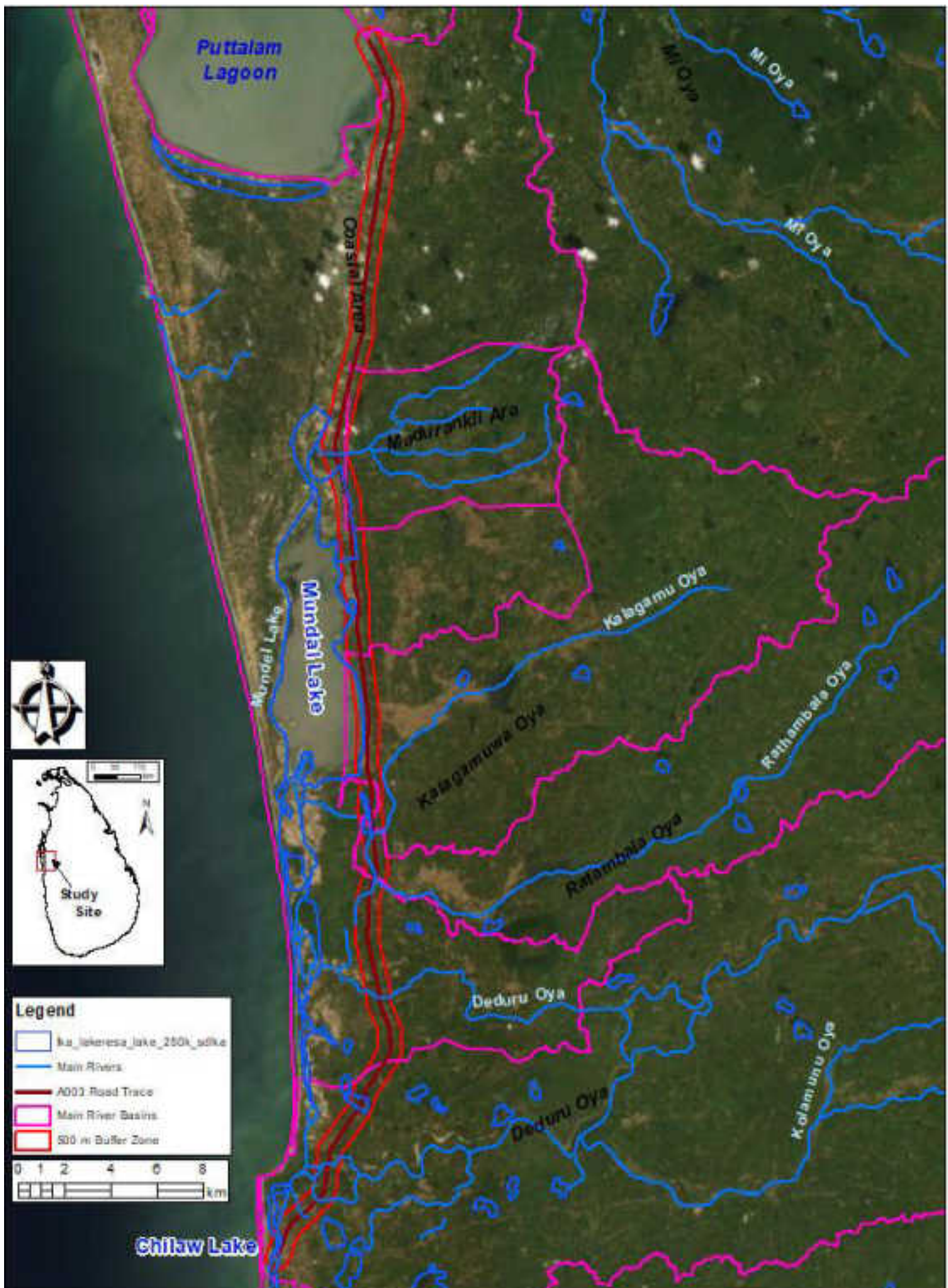


Figure 4-7: Location Map of candidate road sections with their hydrological setting  
(Base Map: Google Satellite Maps, Google Inc., USA)

















Figure 4-11: Location Map of candidate road sections with their hydrological setting  
(Base Map: 1:50,000 Topographical Maps, Survey Department, Sri Lanka)



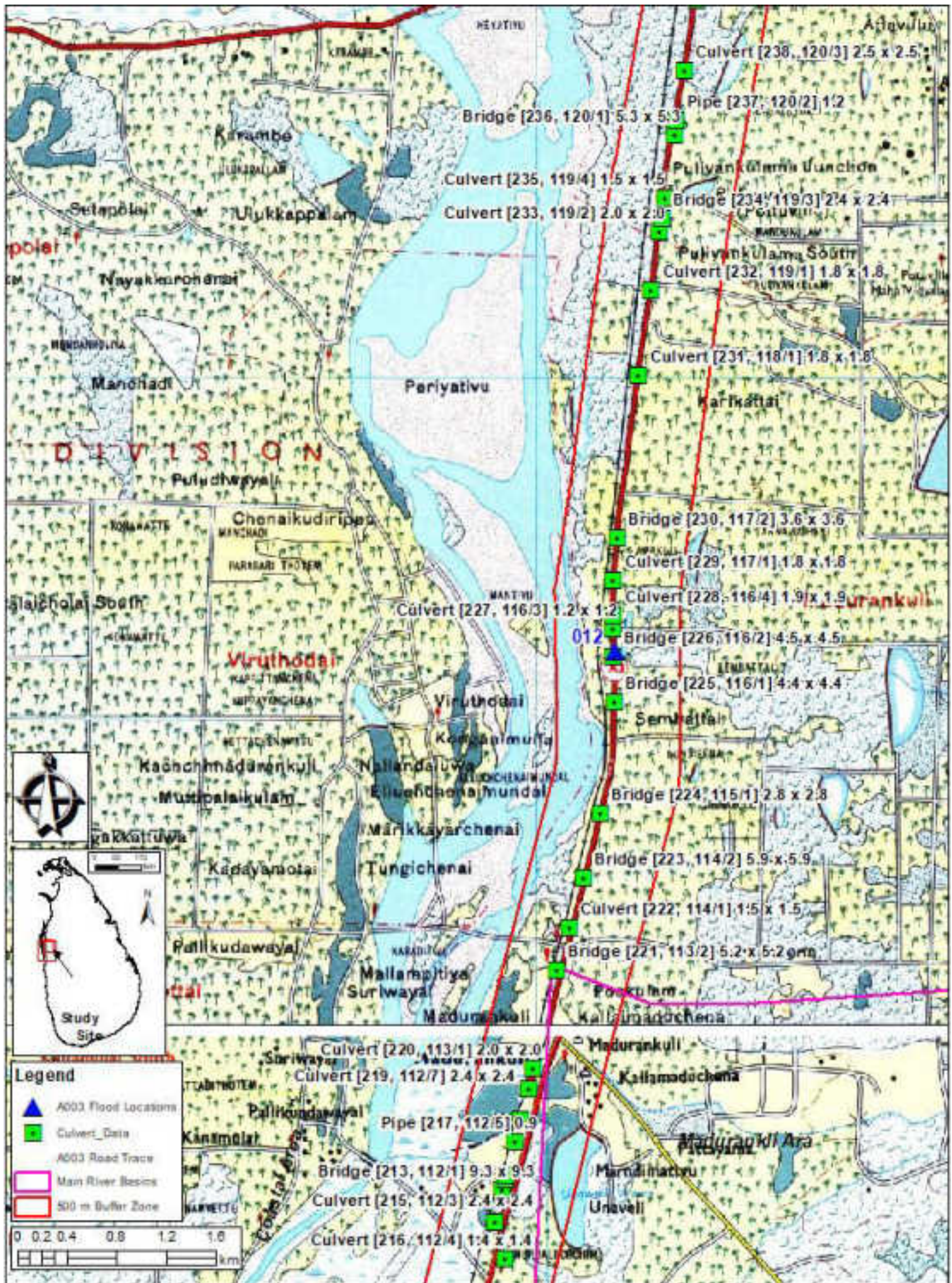


Figure 4-12: Location Map of candidate road sections with their hydrological setting  
(Base Map: 1:50,000 Topographical Maps, Survey Department, Sri Lanka)







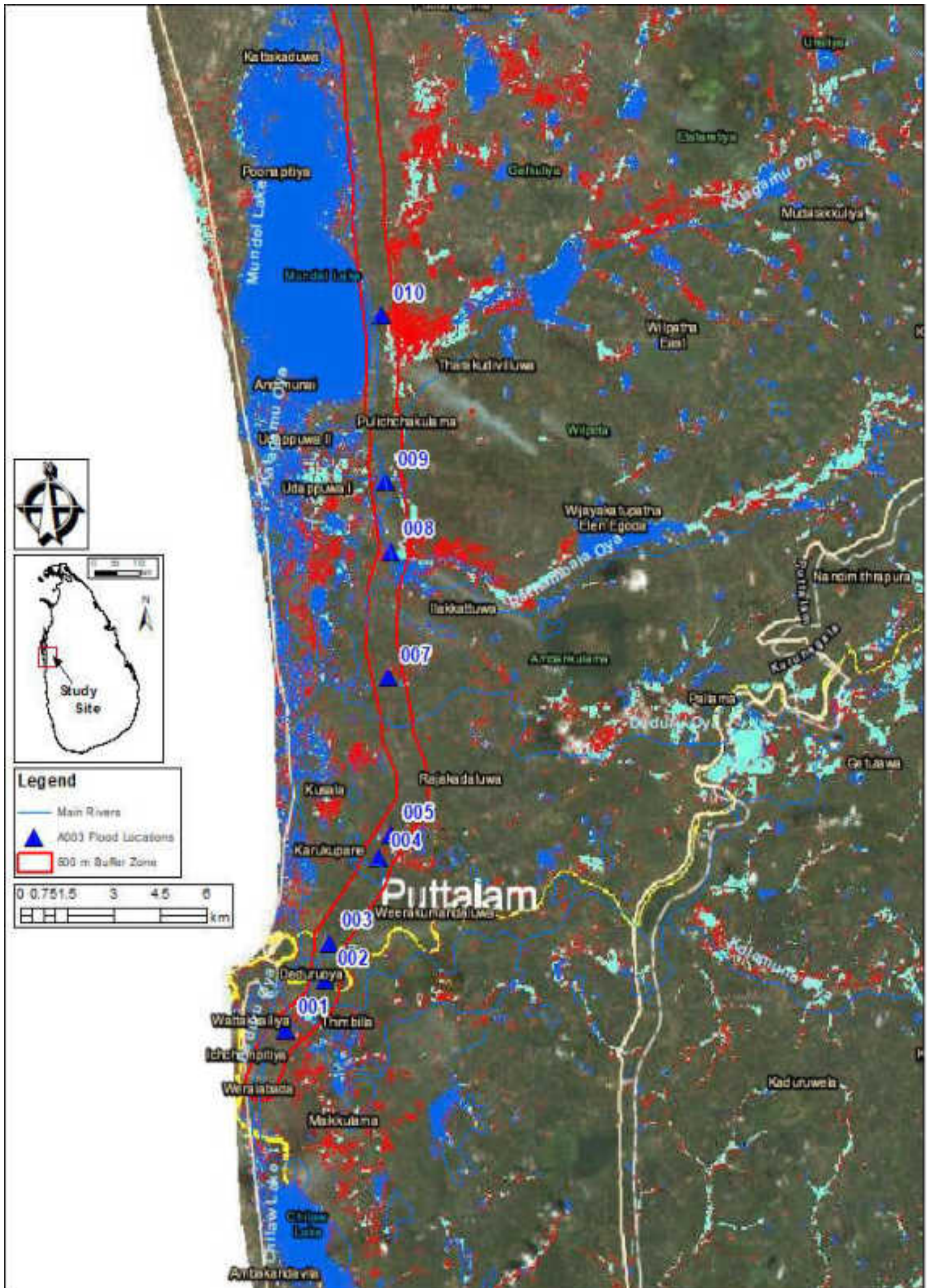


Figure 4-14: Identified Flood Location Map along the trace of candidate road section  
(Base Map: ALOS-PALSAR Satellite Flood Maps, UN-SPIDER/JAXA)



**Table 4-3:Location of tributary crossings and water bodies along A003 Road**

No.	Water Body/Stream	Location with respect to the road	Structure available and its present condition
1	Chilaw Lake Outlet	Located within 500 m buffer but no direct impact	Acceptable condition
2	Nallan Wewa/ Munneswarama Wewa/ Wewa/Timbilla Wewa Spill Channel	Road trace crosses the spill channel and a Bridge 9.0 m width is provided (77/1)	General maintenance
3	Deduru Oya (Stream/River) main channel	Road trace crosses the stream main channel. A 185 m Bridge is provided (78/3)	General maintenance. Low-lying stretches are subject to flooding
4	Waterway linked to Muttuwa lagoon	Road trace crosses the waterway main channel. A 46.3 m Bridge is provided (80/2)	General maintenance
5	Water ponding either side of the road	Low-lying spots are connected for water balancing using 3 culverts 81/1, 81/2, and 81/3	General maintenance
6	Kattapitiya Wewa outlet and floodplains	Altogether 7 Culverts including 82/1 to 83/2 are provided for flood conveyance and water balancing	General maintenance
7	Mahamariaweriya Wewa outlet and floodplains	Altogether 2 Culverts including 83/3 and 83/4 are provided for flood conveyance and water balancing	General maintenance
8	Floodplain linked to Archchikattuwa Wewa (Tank)	Culvert 87/2 is provided.	General maintenance
9	Sengal Oya (Stream) crossing	Road trace crosses the stream main channel. A 41.0 m Bridge is provided (88/1)	General maintenance
10	Illakkattuwa Wewa (Tank) spill channel and floodplain	Road trace crosses the spill/irrigation channel. A 41.0 m Bridge is provided (88/1)	General maintenance
11	Rathambala Oya (Stream) crossing and Anawilundawa Floodplains	Road trace crosses the stream main channel and a 40.4 m width Bridge is provided. Additional 4 culverts (92/1, 92/2, 92/3 and 93/1) are there for water balancing	General maintenance
12	Baththulu Oya/Kiriankalliya Oya stream outlets	Road trace crosses the stream main channel and 120 m width Bridge is provided. Additional 4 culverts (94/1, 94/2, 94/3 and 95/1) are there for floodplain drainage	General maintenance
13	Akkarawelliya and	Road trace crosses the spill/outlet channel. Altogether 3	General maintenance

No.	Water Body/Stream	Location with respect to the road	Structure available and its present condition
	Palliwasala Wewa outlets	Culverts are provided (98/1, 98/2 and 98/3)	
14	Anawilundawa and Mundel Lake Coastal Floodplains	The entire section of the A003 Road alignment after ~88 km up to Puttalam Lagoon (126.8 km) are running alongside with these important waterbodies and a large number of culverts are provided to facilitate drainage and water balancing	General maintenance
15	Mundalama Wewa inlet canal	Road trace crosses the inlet channel. Culvert 102/2 is provided across this	General maintenance
16	Madurankuli Ara and associated floodplain	Low-lying road stretch. A 4.1 m width Bridge (110/1) 2 is provided (identified flood location)	Adequacy check is recommended.
17	Unawelliya Wewa spill/outlet canal and associated floodplains	Road trace crosses the outlet channel. Altogether, 8 Culverts (111/1 ~ 113/1) are provided for drainage/water balance	General maintenance
18	Sembattai Floodplain Outlet	Road trace crosses the floodplain outlet channel. Altogether, 6 Culverts (116/1 ~ 117/2) are provided for drainage/water balance (identified flood location)	Adequacy check is recommended.
19	Kuruvi Kulam/Wewa outlet canal	Road trace crosses the outlet channel. A 2.4 m width Culvert 122/1 is provided across this (identified flood location)	Adequacy check is recommended.
20	Puttalam Lagoon and Inlet canals/flow paths to Puttalam Lagoon	The last stretch of A003 road (Puttalam End) is situated adjacent to Puttalam Lagoon and inlet flow paths are intercepted by the road trace. Culverts/Bridges 121/1 to 127/3. Low-lying section.	Adequacy check is recommended.

### B3. Water Quality

#### Surface Water Quality

73. Surface water includes rivers, streams, and canals and stagnant water bodies (lakes, ponds, tanks, lagoons, and other impounded water bodies). The project road traverses near to the western coastal zone of the country and almost flat terrains with several surface water bodies, where perennial water and rainwater runoff are collected. Sometimes the storm runoff is accompanied by large quantities of debris from upstream side. The water quality measured in Deduru Oya in March 2019 is included in Table 4-4:

**Table 4-4: Surface water quality measured in Deduru Oya (date of sampling: March 2019)**

Name of River	Location	Water Quality Parameter					
		pH	COD	BOD	TSS	Turbidity	Oil & Grease
Deduru Oya	7°37'01.5"N 79°54'17.3"E	6.70	30	< 2.0	20	20	< 2.0

The above values should be compared with National Environmental (Ambient Water Quality) Regulations, No. 01 of 2019 to determine the level of ambient quality of surface water for these water bodies.

Source: Draft Initial Environmental Examination, October 2019, SRI: Integrated Water Supply Investment Project: Chilaw Water Supply Scheme Phase II, Prepared by the National Water Supply and Drainage Board (NSW&DB).

### Ground water Quality

Chilaw to Puttalam section of the A003 road corridor mainly covered with the alluvial aquifer. These alluvial deposits occur over several diversified alluvial landforms such as coastal and inland flood plains, dissected and depositional river valleys and stream beds with shallow alluvial deposits, and inland valleys of varying shape, form, and size with fine and coarse depositional in-fill materials. The rivers such as Deduru Oya and Mi Oya, have broad and deep alluvial beds of variable texture and gravel content in their lower reaches (Ref. Ground Water Resources of Sri Lanka by CR Panabokke, January 2005)

**Table 4-5: Groundwater quality of grab samples collected at several locations within the project area**

Parameter	Method of analysis	Location with GPS Coordinate		
		Chilaw 7°34'56.52"N, 79°47'46.85"E	Kiriyankalli 7°45'50.01"N, 79°49'43.76"E	Rathmalyaya 7°59'53.73"N, 79°50'15.46"E
1. Electrical conductivity at 25°C (µs/cm)	APHA 2510 B	1,416	394	2,820
2. Total Alkalinity (mg/l as CaCO <sub>3</sub> )	APHA 2320 B	95	178	427
3. Total dissolved solids (mg/l)	APHA 2540 B	950	250	1,900
4. Total Hardness (mg/l as CaCO <sub>3</sub> )	APHA 2340C	255	168	273

Parameter		Location with GPS Coordinate		
5. Colour (Hazen Units)	APHA 2120 B	< 5	< 5	< 5
6. Free Ammonia (mg/l as NH <sub>3</sub> )	SLS 614: 2013 Appendix A	0.08	0.1	< 0.02
7. Turbidity (NTU)	APHA 2130 B	< 1	< 1	< 1
8. Nitrate (mg/l as NO <sub>3</sub> -)	APHA 4110 B	13.4	11.5	163
9. Chloride (mg/l as Cl-)	APHA 4110 B	486	16	201
10. pH	APHA 4500 H	7.64	7.19	7.71
11. Phenolic compounds (mg/l as phenolic OH)	APHA 5530 B&D	< 0.1	< 0.1	< 0.1
12. Grease & Oil (mg/l)	APHA 5520B	< 2	< 2	< 2
13. COD (Chemical Oxygen Demand) (mg/l)	Modified APHA 5220 D	11	27	12
14. Total Coliform /100 ml	APHA 9221 B	> 1,800	350	350
15. Faecal Coliform /100 ml	APHA 9221 B	12	7	50

*There are no standards available in Sri Lanka to compare the ambient quality of groundwater.*

*Source: Environmental Assessment (EA) for Peliyagoda - Puttalam Road (A003), Environmental Management and Monitoring Plan for National Roads in Sri Lanka, Final Report (March 2016), prepared by Consulting Engineers and Architects Associated (Pvt.) Ltd. for the RDA*

#### **B4. Air Quality and Noise**

74. Since the project area is free from large scale industries high emissions of air pollutants could not be observed. The major atmospheric emission source in the road influence area is accumulated vehicular emissions in Chilaw to Puttalam due to frequent heavy traffic. Other emission sources which can influence the road corridor are industrial emissions from tile factories located in Bangadeniya area, standby generators in the townships and few boilers operated in small scale industries etc. However, these are not in continuous operation.

75. The raw material required for the project will be obtained from existing quarries, metal crushes, asphalt plants and ready-mix plants at present according to the prevailing environmental regulations. Hence, ambient air quality will be monitored regularly in raw material supply sources.

76. Past records of air quality are available for two locations: Mundel and Madampe. Mundel is within the project corridor whereas Madampe is a highly populated area of which

characteristics are similar to urban sections of Chilaw. The ambient air quality was monitored for the parameters specified in the National Environmental (Ambient Air Quality) Regulations as per the Gazette No 1562/22 of 15/08/2008.

**Table 4-6: Past records of air quality monitoring**

Parameter	Monitoring Location		National Environmental (Ambient Air Quality) Regulations, 2008	WHO Guideline (As per EHS Guideline of IFC)
	Mundel (Sri Bodhi Rajaramaya) 7°48'15.34"N, 79°49'32.27"E	Madampe (Thaniwella Devalaya) 7°28'37.33"N, 79°49'48.92"E		
PM <sub>10</sub> in µg/m <sup>3</sup> (24h average)	21	25	100	50
PM <sub>2.5</sub> in µg/m <sup>3</sup> (24h average)	10	12	50	25
NO <sub>2</sub> in µg/m <sup>3</sup> (08h average)	14	17	150	200 (1-hr average)
SO <sub>2</sub> in µg/m <sup>3</sup> (08h average)	9	12	120	20 (24-hr average)
CO in ppm (08h average)	1	1	9	-

*Source: Environmental Assessment (EA) for Peliyagoda - Puttalam Road (A003), Environmental Management and Monitoring Plan for National Roads in Sri Lanka, Final Report (March 2016), prepared by Consulting Engineers and Architects Associated (Pvt.) Ltd. for the RDA*

The road section proposed for rehabilitation is located mainly within urban, semi-urban, residential, and agricultural areas. Large number of vehicles pass this road mainly during the daytime. Therefore, the noise levels may be higher than the permissible levels during busy hours. It is recommended that the present noise levels of the project area (appropriate locations in or around is measured before the construction begins, which can be left as monitoring stations during construction, if any further measurements are needed. The contractor is required to establish baseline noise levels at least at five locations along the selected section of A003 road prior to commencement of construction. Subsequently, noise levels during construction should be measured and compared with the established baseline noise levels.

**Table 4-7: Past records of noise quality measurements**

Date of Measurement	Measurement Location & GPS Coordinate		Noise level dB(A)	
	A003 road from Chilaw to Puttalam		Day	Night
10/03/2015	Puttalam (Near Buddhist Centre)	8°01'08"N, 79°50'03"E	66	57
10/03/2015	Erukkalampiddy (Near mosque, Nugawilluwa)	7°57'45"N, 79°49'50"E	61	57
10/03/2015	Mundel RDA Depot (Material Yard)	7°47'50"N, 79°49'31"E	64	62
10/03/2015	Bangadeniya (Near Church)	7°37'43"N, 79°49'21"E	66	62
10/03/2015	Jayabima, Chillaw (Near Sama Viharaya Temple)	7°35'41"N, 79°48'18"E	67	65
10/03/2015	Chilaw (Near District General Hospital)	7°34'21"N, 79°47'50"E	70	69

Source: Environmental Assessment (EA) for Peliyagoda - Puttalam Road (A003), Environmental Management and Monitoring Plan for National Roads in Sri Lanka, Final Report (March 2016), prepared by Consulting Engineers and Architects Associated (Pvt.) Ltd. for the RDA

77. According to Schedules I and II of National Environmental (Noise Control) Regulations, No.1 of 1996 (924/12), the study area within the Chilaw UC belongs to 'Medium noise area', and the remaining part of the road belongs to 'Low noise area'. Therefore, the maximum permissible noise levels at the boundary of the land in which any source of noise is located, shall not exceed (in  $L_{Aeq, T}$ ) of the area can be considered as 63 dB(A) during daytime (06.00 hrs–18.00 hrs) and 50 dB (A) night time (18.00 hrs - 06.00 hrs). For construction activities, the maximum permissible noise levels at boundaries of the land in which the source of noise is located (in  $L_{Aeq, T}$ ), are 75 (daytime) and 50 (night time). However, measured noise levels sometimes exceed the maximum noise levels, which is mainly due to the continuous traffic movement along this road during the period of measurement.

78. With reference to the National Environmental (Noise Control) Regulations, No.1 of 1996, noise sensitive areas include: an area in which a courthouse, hospital, public library, school, zoo, a sacred area, and areas set apart for recreation or environmental purposes. An area covered by a distance of 100 m from the boundary of these sensitive areas are referred to as Silent Zone, where the maximum permissible noise levels at the boundary of the land in which any source of noise is located, shall not exceed (in  $L_{Aeq, T}$ ) of the area can be considered as 50 dB (A) during daytime (06.00 hrs–18.00 hrs) and 45 dB (A) night time (18.00 hrs–06.00 hrs). Noise sensitive receptors along the road are given in Table 4-8.

**Table 4-8: Noise sensitive receptors along the road**

Chainage (km)	Noise Sensitive Receptor	Side of the road
<b>Chilaw - Puttalam Rd (A003)</b>		
76,650	Sri Sama Viharaya	LHS
93,680	St. Anthony's Church, Baththuluoya	RHS
99,950	Mundalama Sinhala Maha Vidyalaya	LHS
92,733	Divisional Secretariat Mundalama	LHS
106,605	Mangala Eliya primary school	RHS
113,625	Madurankuli Bank of Ceylon	RHS
113,710	Madurankuli Children Park	LHS
126,800	Our Lady of Velankanni Church	LHS

**B5. The occurrence of Natural Disasters in the Project Area**

The proposed section of the candidate road (A003) from Chilaw to Puttalam, traverse through flat terrain along with some low-lying areas. Seasonal floods and drought are the major disasters which have affected the project area in the past, while the tsunami also affected this area to some extent. Data available from the Disaster Management Centre (DMC) provides details of frequent disaster events for the period 1974 to 2014 as indicated in the table 4-9 below.

**Table 4-9: Disaster Recorded for A003 Road (Chilaw to Puttalam) - Disaster Data from 01.01.1974 to 31.12.2014**

District	DS Division	Disaster	No. of Events	No. of Houses Damaged	No. of People Affected
Puttalam	Arachchikattuwa	Flood	11	336	73,802
Puttalam	Chilaw	Flood	15	294	60,862
Puttalam	Mundalama	Flood	39	5	88,050
Puttalam	Puttalam	Flood	18	403	41,625
Puttalam	Arachchikattuwa	Drought	10	-	191,255
Puttalam	Chilaw	Drought	5	-	15,402
Puttalam	Mundalama	Drought	7	-	68,150
Puttalam	Puttalam	Drought	8	-	61,570
Puttalam	Arachchikattuwa	Tsunami	-	-	-
Puttalam	Chilaw	Tsunami	1	-	3,000



District	DS Division	Disaster	No. of Events	No. of Houses Damaged	No. of People Affected
Puttalam	Mundalama	Tsunami	-	-	-
Puttalam	Puttalam	Tsunami	-	-	-

Source: Environmental Assessment (EA) for Peliyagoda–Puttalam Road (A003), Environmental Management and Monitoring Plan for National Roads in Sri Lanka, Final Report (March 2016), prepared by Consulting Engineers and Architects Associated (Pvt.) Ltd. for the RDA

## C. Ecological Environment

### 1. General description of the project area

79. The road section of A003, Chilaw -Putlam approximately 50.8 km in length is runs mainly through the coastal area. Based on major climatic zones of the country, the road section falls within the areas classified as the Dry Zone and Intermediate Zone. In general, tropical mixed evergreen forests distributes within the zone and the study area is attributed to urban, semi-urban and agricultural set-up. The terrestrial and aquatic habitats in the proposed project area beside the road includes natural and manmade environment. The fauna & flora comprise majority of common species that are found associated with man modified habitats.

### 2. Major Habitat Types

80. Different type of aquatic habitats within the project area include Water bodies and associated habitats (Water bodies, Irrigation canals, Marshy areas, Water ways, wetland etc.). Five different terrestrial habitats beside the road include Road reservations, Home gardens and residences, cultivated lands, Scrub lands and Commercial areas.

#### 2.1 Aquatic Habitats

##### 1. Water bodies and associated habitats

81. A considerable extent of lands beside the road is covered with coastal ecosystem, marshy areas, aquatic water bodies, irrigation canals and water ways. Marshy areas comprise with water canals, some of which are completely open others are obstructed with vegetation. Majority of water bodies covered with native floating macrophytes {Nelum (*Nelumbo nucifera*) and Olu (*Nymphaea pubescens*)} and area with invasive alien plants such as water hyacinth (*Eichhornia crassipes*) and Salvinia (*Salvinia molesta*). Some marshy areas are periodically inundated by storm water which is rich in organic matter and sediments. During the intensive rainfall, marshy area acts as a flood retention area and helps in protecting the surrounding from flood risks. Some area beside the road going under flood during the intensive rainfall. The study area beside the road is comprised with number of water tanks and irrigation canals to supply water for agricultural lands. Water bodies and associated habitats provides feeding, breeding and nesting habitats for different species of water birds, freshwater fishes, reptiles etc. In addition, large number of invertebrates can be seen within these habitats.

82. Anawilundawa wetland is the important environment sensitive area located LHS at the vicinity of road between Chilaw and Baththuluoya.

## 2. Anawilundawa wetland

83. Anawilundawa is a sanctuary and Ramsar site which located coastal side of the road around 14km from the Chilaw. Chilaw to the south and Puttalam to the north are the nearest main towns beside the sanctuary. Anawilundawa is a wetland sanctuary, about 1400 ha in extent located between coast and the Negombo-Puttalam railway in Puttalam district. It is located LHS about 0.500m from the A003 road. The wetland consists of an ancient group of shallow cascading tanks, ranging from 12-50ha in extent. The system consists of 7 small irrigation tanks and the surface area of the tanks is about 188ha. Based on its unique bio diversity, cultural heritage, functional values as a feeding ground for migratory waterfowl and its contribution towards the sustenance of local livelihood, the Anawilundawa sanctuary was recognized as a Wetland of International Importance under the Ramsar Conservation in August 2001. Vast diversity of terrestrial and aquatic habitats located within Anawiludawa wetland with high diversity of flora and fauna including seasonal migration of waterfowl. Cascade system, water ways with riparian vegetation, marchers, paddy fields and seasonal inundated mosaic of vegetation include the fresh water habitats while mangroves, salt marsh and marine grasslands, brackish water canals, beach and sea shore vegetation include the seawater wetland habitats. Terrestrial habitats of the wetland represent by the tank bund vegetation and roadside vegetation. A total of 290 plants species representing 95 families were recorded from Anawilundawa. Among these was one endemic species Pupula (*Vernonia zeylanica*) and two nationally threatened species Kekatiya (*Aponogeton natans*) and Kaluwara (*Diospyros ebenum*). Of the 60 introduced species recorded, 9 were invasive alien species. A total of 281 vertebrate species belongs to 116 families were recorded from Anawilundawa of which, 10 (4%) were endemic species and 21 (8%) nationally threatened species (IUCN Sri Lanka, 2012). The vertebrates are comprised of 47 species of mammals, and amount to 34% of the total native inland vertebrate species recorded from Sri Lanka.

### 2.2 Terrestrial habitats

#### 1. Road reservations

84. Trees and vegetation located beside the road considered under this section. The roadside vegetation improves air quality, enhance the aesthetic beauty of the area, provide shade, food and roosting sites for fauna, retain soil moisture and conserve soil. Majority of big trees are located beside the road include cultivated species while some trees located close to the edges of the road and others distributed within reservation area up to fences of road side properties. Shading, ornamental as well as economically important trees belongs to different species such as *Terminalia catappa* (Kottamba), *Ficus benjamina* (Elu nuga), *Filicium decipiens* (Pihibiya), *Polyalthia longifolia* (Vilo), *Cassia fistula* (Ehela), *Schleichera oleosa* (Kon), *Azadirachta indica* (Kohomba), *Swietenia macrophylla* (Mahogani), *Samanea saman* (Para-mara), *Ficus benghalensis* (Maha nuga), *Ficus racemosa* (Attikka), *Ficus religiosa* (Bo), *Tectona grandis* (Thekka) etc., are located beside the road. Please refer to Annex 4, for the list of roadside trees.

## 2. Home gardens and residences

85. Home gardens and residences are common type of manmade habitats located beside the road. Some section of the road includes highly built-up areas with modern type houses and properly landscaped home gardens with both ornamental plants and common home garden species while some section includes densely arranged houses with small home gardens and lightly arranged residences in medium to large home gardens with large extent of coconut cultivations.

86. Common home garden species such as Jack (*Artocarpus heterophyllus*), Coconut (*Cocos nucifera*), Arricunut (*Areca catechu*), Mango (*Mangifera indica*), Banana (*Musa x paradisiaca*), Amberella (*Spondis dulcis*), Papaw (*Carica papaya*), Guava (*Psidium guava*), *Anacardium occidentale* (Cadju), etc., are frequently found in home garden habitats. In addition, commercially valuable timber species such as *Berrya cordifolia* (Halmilla), *Swietenia macrophylla* (Mahogani), *Azadirachta indica* (Kohomba), *Melia azedarach* (Lunu Midella), *Tectona grandis* (Thekka) can also be observed.

## 3. Commercial areas

87. The project affected area is mainly contain with ribbon type developed business premises, small, medium, and large-scale industries and other service providing locations. The considerable land area beside the main road covered with business and commercial structures as well as government and private sector buildings such as schools, banks, petrol sheds, vocational training centers, local authorities, religious places etc. Cultivated flora including economically important species, fruits and number of species belong to ornamental category are found in above premises with some big species of trees.

## 4. Cultivated lands

88. Considerable extent of coconut lands and paddy fields could be observed beside the trace. Both monoculture coconut cultivations as well as mix coconut cultivations mainly with cashew and economically important timber species at the periphery of lands are the common feature of the habitat.

89. Some of the paddy fields at the vicinity are abandoned and uncultivated. Several scattered trees, canal bund vegetation, different species of grasses, herbs and shrub communities are found within this environment. Abandoned paddy fields which are mainly concentrated in urban and sub urban sections have been converted to variety of constructions. Paddy (*Oryza sativa*) is the only cultivated species in paddy lands. At the end of rainy season aquatic and semi aquatic weeds colonize within some of the paddylands while during the drying those lands take over with different species of terrestrial weeds.

## 5. Scrub lands

90. Scrublands are found different locations beside the road mainly as small patches. The common species observed within the scrublands include Heerassa (*Cissus quadrangularis*), Indi (*Phoenix pusilla*), Muwakeeriya (*Sarcostemma brunonianum*), Kara (*Canthium coromandelicum*), Nawahandi (*Euphorbia tirucalli*), Malittan (*Salvadora persica*)

etc. Scrublands are thick, impenetrable, thorny or spiny, shrub vegetation growing up to 4-6 m in height with scattered trees up to 10 m and a layer of herbaceous plants. The ground layer flourishes with herbaceous life forms, as it receives direct sunlight. All the plants in scrublands well adapted to dry climatic conditions such as thick and small leaves with well-developed surfaces and succulent stems. The scrubland is completely different at the peak of the dry season, as leaves fall or dry out and brown in the heat. The major use scrubland species is consumption for firewood, housing and other domestic activities by adjacent communities. These thorn forests are deforested for different purposes such as creation of coconut, cashew and mix plantations, salterns and shrimp farms and are also encroached for settlement. The release of cattle and goats has also severely affected this habitat.

### Flora and fauna of the project area

91. A total number of 200 plant species belong to 64 families including 04 endemic {*Walidda antidysenterica* (Wal idda), *Garcinia quaesita* (Rat Goraka), *Argyreia populifolia* (Giri Tilla) and *Aporusa lanceolata* (Heen Kebella)} and 09 nationally threatened species were recorded from the study area during the field survey. All these species were recorded from the existing habitats beside the road. Therefore construction activities will not create any impact to the above species. Table 4-10: provides a summary of the flora species recorded during the field survey. A list of flora observed during the survey in all selected habitats is given in Appendix 7.1

**Table 4-10: Summary of the plant species recorded during the survey**

Number of family	Number of species	Endemic species	Indigenous species	Introduce species	Nationally threatened	Globally threatened
64	200	04	129	64	09	01

92. Altogether 150 species of animals were recorded including 08 species of Snails, 16 species of Dragon flies, 28 species of Butterflies, 08 species of Fish, 05 species of Amphibians, 19 species of Reptiles, 50 species of Birds and 16 species of Mammals. No endemic and threatened species recorded during the field survey. Table 4-11 includes a summary of faunal species recorded during the survey. A list of fauna observed during the survey in all selected habitats is given in Appendix 7.2.

**Table 4-11: Summary of the faunal species recorded during the survey**

Faunal group	Number of families	Number of species	Endemic	Exotic	Nationally or globally threaten			
					VU	EN	CR	NT
Snails	08	08	-	-	-	-	-	-
Dragonflies	02	16	-	-	-	-	-	02
Butterfly	04	28	-	-	-	-	-	-
Fish	07	08	-	02	-	-	-	-

Faunal group	Number of families	Number of species	Endemic	Exotic	Nationally or globally threaten			
					VU	EN	CR	NT
Amphibians	04	05	-	-	-	-	-	-
Reptiles	12	19	-	-	-	-	-	-
Birds	38	50	-	-	-	-	-	-
Mammals	11	16	01	-	-	-	-	-
<b>Total fauna</b>	<b>86</b>	<b>150</b>	<b>01</b>	<b>02</b>	<b>-</b>	<b>0</b>	<b>-</b>	<b>02</b>

## D. Socio-Economic Environment

93. Population in Puttalam District is recoded as 760,778, The selected road section for improvements originate from Chilaw town in Puttalam district and extends up to Puttalam town. The proposed section of the A003 road connects Chilaw, Arachchikattuwa, Mundel and Puttalam DS Divisions influencing 34 number of GND Divisions.

94. Industries in Puttalam District: About 99,781 persons in Puttalam district are involved in industry-related income generation activities, and it is the dominant industrial activity of the people in road catchment area, 27% of 247,595 people involved in different agricultural activities.

95. Population in Road relevant DSDs: The said road section fallen within Chilaw, Arachchikattuwa, Mundel and Puttalam Divisional Secretariat Divisions (DSDs). The population in the four DSDs is defined as the population in the road influential area. Therefore, the road influential area population is 247,595. This is about 32% of the total population in the Puttalam district. Puttalam DSD has the highest population out of the four DSDs. The details on the road influential area population are shown in Table 4-12.

**Table 4-12: The population in DSDs with Gender segregation**

DS Division	Male		Female		Total
	No	%	No	%	
Arachchikattuwa	19,723	48.10	21,276	51.89	40,999
Chilaw	29,918	47.86	32,597	52.14	62,515
Mundel	29,525	47.90	32,113	52.10	61,638
Puttalam	39,785	48.26	42,658	51.74	82,443

*Source: Resource profiles of relevant DSDs-2017*

96. **The ethnic diversity of population in DSDs:** Nearly 65% of the population in 6 DSDs is Sinhalese. The Muslim population is next to Sinhalese, and it is 21% of total population. The population under Tamil and others is 10% and 4% respectively.

**Table 4-13: Population with ethnic diversity**

DS Division	Ethnicity								Total Population
	Sinhala		Tamil		Muslim		Other		
	No	%	No	%	No	%	No	%	
Arachchikattuwa	20,470	50%	6,380	16%	9,046	22%	5,103	12%	40,999
Chilaw	39,391	63%	6,631	11%	12,831	21%	3,662	6%	62,515
Mundel	38,510	62%	6662	11%	12,690	21%	3,776	6%	61,638
Puttalam	63,165	77%	6,190	8%	16,973	21%	1,026	1%	82,443
Total	161,536	65%	25,863	10%	51,540	21%	13,567	4%	247,595

Source: Resource profiles of relevant DSDs-2017

97. **Education levels of DSDs population:** Information on education in 4 DSDs shows a considerable level among the population. The percentage with no formal education ranges from 2 % to 4% among 4 DSDs. The percentage of the population with G.C.E (A/L) qualification ranges from 4% to 8%. The percentage obtained degrees' ranges from 1% to 2%. The data on the education of the project influential area population is shown in Table 4-14.

**Table 4-14: Education levels of the population in project influential area**

DSD	Pre-School %	No formal Education %	Secondary %	G.C.E. (O/L) %	G.C.E (A/L) %	Graduated and above %
Arachchikattuwa	24.76	2.48	45.28	11.43	6.41	0.94
Chilaw	25.04	2.98	41.64	12.03	8.32	1.47
Mundel	32.16	4.28	38.99	8.90	4.32	0.69
Puttalam	25.38	3.85	38.74	12.09	7.21	1.58

Source: Resource profiles of relevant DSDs-2017

98. **Employment of the population in DSDs:** Industries Services and Agriculture are the main livelihood activities of the people in the project related 4 DSDs. Apart from those, the persons within employable ages are involved in other income generation activities. The highest percentages of people are involved public sector employment. The information related to different employments of people in 4 DSDs is shown in Table 4-15.

**Table 4-15: Employment categories of the people in 4 DSDs**

DS Division	Agriculture	Industries	Services	Total
Arachchikattuwa	10,865	13,612	16,523	40,999

DS Division	Agriculture		Industries		Services		Total
Chilaw	16,566		20,755		25,194		62,515
Mundel	16,334		20,464		24,840		61,638
Puttalam	21,847		27,371		33,225		82,443
<b>Total</b>	<b>65,613</b>	<b>27%</b>	<b>82,202</b>	<b>33%</b>	<b>99,781</b>	<b>40%</b>	<b>247,595</b>

Source: Resource profiles of relevant DSDs-2017

99. Nearly 28% to 44% of households in the sample are involved in the agriculture activities. The second highest income generation source is Public and Private sector Employment (18-33%).

100. Composition of income generation of sample households is shown in the table below.

**Table 4-16: Employment categories**

Employment	Percentage ranges of Male HHs	Percentage ranges of female HHs
Farmers	28-44	1-5
Public sector/private sector	18-33	1-2
Skilled labor	2-5	0-0.5
Business	11-15	0.09-2
Self-employment	3-20	0.5-1.4
Wage labor	0.9-4	0.09-0.5
Fishermen	0.7-5.5	0-0.9
Foreign Employment	0.5-0.0.8	0.09-0.2
Dependents	1-3	0.09-1.5

Source: Sample survey conducted in 2019/2020

## Infrastructure Facilities

### Roads

101. The proposed road for improvement is a section of a main national A-class road running across Puttalam district towards Gampaha and Colombo district in the country. This road section passes through 4 DS Divisions, namely Arachchikattuwa, Chilaw, Mundel and Puttalam influencing 34 Grama Niladhari Divisions.

### Sources of Energy

102. The percentage of households with no electricity facilities is negligible in the entire sample households (1.8 %). In Arachchikatuwa almost all the households have obtained electricity from the national grid. The information on sources of electricity of the sample households is shown Table 4-17



**Table 4-17: Source of electricity**

DSD	Source Electricity						Total
	National grid		Solar power and other sources		No Electricity		
	No	%	No	%	No	%	
Arachchikattuwa	992	99.9%	-	-	1	0.1%	993
Chilaw	924	99.8%	-	-	2	0.2%	926
Mundel	879	96.9%	-	-	28	3.1%	907
Puttalam	1,336	96.5%	-	-	49	3.5%	1,385
Total	4,131		-		80		4,211

Source: Sample survey conducted in 2019/2020

## Water

103. About 61% of sample households in road relevant DSD areas have access to pipe born water provided by the National Water Supply & Drainage Board (NWS&DB). Tube wells and Shallow wells are the main sources of drinking water in households (31%) located in interior areas of Surveyed GNDs. The data on sources of drinking water is shown in Table 4-18 However, according to the community members interviewed quality of water in shallow wells and community water supply schemes is good for drinking and they had no complaints about the quality of water

**Table 4-18: Source of Water**

DSD	Water source						Total
	NWS&DB		Well/Tube well		Community Well		
	No	%	No	%	No	%	
Arachchikattuwa	571	57%	399	40%	24	2%	993
Chilaw	756	82%	136	15%	34	4%	926
Mundel	454	50%	212	23%	242	27%	907
Puttalam	779	56%	105	8%	502	36%	1,385
Total	2,559		851		801		4,211

Source: Sample survey conducted in 2019/2020

## Sanitation

104. Except negligible percentage of sample houses (1%) all others have access to sanitary latrine facilities. About 69 % of the households in all the project relevant DS divisions have water sealed latrines in their households (water sealed latrines include flush type latrines as well). According to the interviews with community members during the socio-



economic survey it was found that establishment of water sealed latrine is considered as an essential need of the households. Therefore, in near future most of the households in the area will have water sealed latrines. The data on sanitary latrine facilities available in sample households is shown in the table 4-19 below.

**Table 4-19: Type of Sanitary system available**

DSD	Sanitary Condition								Total
	Flush		Water Sealed		Pit Latrine		None		
	#	%	#	%	#	%	#	%	
Arachchikattuwa	249	25%	550	55%	178	18%	16	2%	993
Chilaw	314	34%	583	63%	29	3%	-	0%	926
Mundel	260	29%	272	30%	367	40%	8	1%	907
Puttalam	240	17%	430	31%	689	50%	26	2%	1,385
Total	1,063		1,835		1,263		51		4,211

Source: Sample survey conducted in 2020

## Health

105. The communities in the road catchment area have access to hospital in Chilaw General Hospital for their needs. They also have facilities to be reached in Puttalam Base Hospital well equipped is available. Apart from these two hospitals people living in the road catchment have access to hospitals available in the local area e.g., Kuliapitiya Teaching Hospital etc.

## Historical Significance (Physical cultural resources)

106. It is identified the selected road section provide access to many places which contributes a religious and archeological importance. Major religious and archeological places are listed in the table below.

**Table 4-20: Religious Places/ Archeological Places in the vicinity of the road (within 100 m)**

Number	Road Name	Religious Place/ Archeological Places (within 100m)
1	Peliyagoda-Puttalam road (A003) from Chillaw to Puttalam	Moor Street Jumma Mosque, The Foursquare Gospel Church, St. Sebastian Church, Sangutattan Masjith, Gethsemane Church Chilaw, Sri Kannagee Amman Temple, Sri Saman Viharaya,, Hess Jumma Mosque, Sri Rathana Sevana Temple, Ayyanaar Kovil, Sri Nagarama Viharaya, Battulu Oya Mosque, Muhaidee Jumma Masjith Puthukkudriuppu, Mundel Temple, Sri Saranankaramaya, Sembattai Church, Hidayath Nagar Jumma Masjid, Thillayadi Murugan Kovil, Our Land Of Velankanni Church

107. **The project relevant Grama Niladhari Divisions (GNDs):** This road runs across 34 GNDs. The total number of families in road relevant GNDs is 20,929 comprising of 247,995 populations. The people in the GNDs can be defined as the population in the road corridor. About 65% of the people are Sinhalese. The percentage of Tamil population is 10%, and the Muslim population is 21%.

108. **Education levels:** The following data on education levels of people in 34 GNDs indicates a low level of education in the project affected area.

**Table 4-21: Percentage ranges show the situation of households interviewed**

Level of Education attainment	Total	%	Male		Female	
			No	%	No	%
01. Less than 5 years of age	742	5.4%	377	51%	365	49%
02. Never went to school	261	1.9%	122	47%	139	53%
03. Up to Grade 1 - 5	1,714	12.4%	797	47%	917	53%
04. Up to Grade 5 - 10	3,700	26.8%	1,812	49%	1,888	51%
05. Up to GCE O/L	3,949	28.6%	2,134	54%	1,816	46%
06. Pass GCE O/L	1,237	8.9%	630	51%	607	49%
07. Up to GCE A/L	1,368	9.9%	744	54%	624	46%
08. Pass GCE A/L	628	4.5%	323	51%	305	49%
09. Graduate	219	1.6%	118	54%	101	46%
10. Postgraduate	8	0.1%	5	56%	4	44%
<b>Total</b>	<b>13,827</b>	<b>100%</b>	<b>7,061</b>	<b>51%</b>	<b>6,766</b>	<b>49%</b>

Source: Sample survey conducted in 2020

109. **Employment:** Majority of the families in the road corridor area (GNDs) are involved in agricultural activities. The data in Table 4-22 includes the employment of people in road-related GNDs involved in other non-agriculture categories.

**Table 4-22: Employment of people in GNDs in other non-agriculture categories**

Head HH Income Source	DSD							
	Arachchikattuwa		Chilaw		Mundel		Puttalam	
		%		%		%		%
01. Farmer	136	13.7	15	1.6	30	3.3	101	7.3
02. Public Sector	111	11.2	84	9.1	67	7.3	60	4.3

Head HH Income Source	DSD							
	Arachchikattuwa		Chilaw		Mundel		Puttalam	
		%		%		%		%
03. Private Sector	433	43.6	189	20.5	268	29.6	726	52.4
04. Trained Workers	92	9.3	68	7.3	133	14.7	56	4.1
05. Unskilled Workers	6	0.6	5	0.5	48	5.3	22	1.6
06. Business	1	0.1	83	8.9	56	6.2	67	4.9
07. Self-Employment	79	7.9	70	7.5	91	10.0	94	6.8
08. Wage Labor	24	2.4	86	9.3	85	9.3	217	15.7
09. Animal Husbandry	12	1.2	100	10.8	18	2.0	7	0.5
10. Foreign Employment	30	3.0	57	6.1	18	2.0	4	0.3
11. Dependent	70	7.0	170	18.4	93	10.2	30	2.2
<b>Total</b>	<b>993</b>	<b>100</b>	<b>926</b>	<b>100</b>	<b>907</b>	<b>100</b>	<b>1,385</b>	<b>100</b>

Source: Sample survey conducted in 2020

110. **Income levels of the households in project related GNDs:** The data on income levels are available only in some GND offices. According to the observations of the field data collection team of the Social Assessment survey, the data available on income levels in GND offices is not so accurate. The data on income levels are recorded based on the figures provided by the householders of the families. The data available in 9 GND offices is shown in Table 4-23.

**Table 4-23: Households income in the GNDs relevant to the roads**

Income category	Average (SLR) Monthly Income	
	No	%
Less than 5,000	35	1%
5,001 - 14,999	441	11%
15,000 - 49,999	2,353	56%
50,000 - 74,999	621	15%
75,000 - 100,000	319	8%
More than 100,000	405	10%
<b>Total</b>	<b>4,174</b>	<b>100%</b>

Source: Sample survey conducted in 2020

## **5 ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES**

### **A. Identification of Potential Environmental Impacts and Mitigation of such Impacts**

111. Identification and assessment of impacts have been carried out by considering the proposed activities during pre- and construction and operational stages. Such impacts have been identified based on site observations, field surveys; information obtained from the stakeholders and also has been identified based on a value judgment. The impacts of the activities will be described separately on physical, biological, socio-economic, and cultural resources within the zone of impact. Impacts that may result from proposed road sub-projects can be both beneficial as well as adverse.

112. Mitigation refers to the measures that are designed to cope with adverse consequences and to enhance the positive impacts on the environment as a result of the sub-project implementation. Effective implementation of benefit maximization measures and adverse impacts mitigation measures would optimize the benefits expected from the sub-project and avoid/minimize the adverse impact from the sub-project. The impacts have been predicted regarding their magnitude (minor, moderate and high), extent (site-specific, local, and regional) and duration (short, medium, and long-term) and appropriate benefit enhancement and mitigation measures are suggested in following sections.

### **B. Impacts during Pre-construction phase and Mitigation**

113. The mitigation measures adopted during design or pre-construction phases are of preventive in nature with two basic objectives:

- Avoiding costly mitigation measures, and
- Increasing awareness among the stakeholders for environmental management of road construction, rehabilitation, and operation.
- By designing the culverts, drains and other hydraulic structures to withstand appropriate storm events will reduce the risk of an operational failure of the drainage system and regular maintenance will further reduce the chances of failure.

#### **1. Route selection and alternatives**

114. The project involves rehabilitation of existing road section, and therefore no alternative routes are considered.

#### **2. Acquisition of Encroached Land/Temporary Structures**

115. The proposed rehabilitation work along the road will not involve widening the existing ROW. All the interventions will be carried out within the existing ROW. Therefore, there will be no land acquisition.

116. However, the proposed construction activities will involve readjusting seven temporary structures which projects towards the existing ROW. The summary of these structures is provided in Table 5.1.

**Table 5-1: Temporary structures within 1 m of either side of the existing RoW**

A003 Chilaw - Puttalam			
Type of structure	No of structures in LHS	No of structures in RHS	Total affected structures
Vegetable stalls	1	1	2
Lottery selling stalls	1	1	2
Plastic item stalls	1	0	1
Tea	1	1	2
<b>Total</b>	<b>4</b>	<b>3</b>	<b>7</b>

Source: IR DDR survey 2020

### Mitigation of negative impacts

117. The following measures shall be taken to mitigate impacts associated with readjusting such encroached structures.

- Providing labour for shifting and resettling the structures outside the ROW.
- All occupants of these structures are willing to readjust with their own resources and they do not anticipate any income loss due to such shifting. Moreover, they welcome the project and expect that their income shall increase once the roads are improved.

### 3. Relocating Utility Supply Lines

118. There are utility supply lines, such as electricity and telecommunication lines, that are located within 1 m of the proposed RoW (See Table 5.2 for a summary and Appendix 5 for details). Some of these utility supply lines need to be shifted during pre-construction phase. Electricity poles, pylons, and telecommunication poles which are erected within the proposed RoW have to be removed before handing over the work to the contractor/s. It is important that shifting of these utilities shall be done with minimum damage to the existing poles, towers as well as lines, and wires. Utility institutions such as the Ceylon Electricity Board and Sri Lanka Telecom shall be informed as early as possible, and there shall be proper coordination with the respective line agencies to minimize the impacts.

**Table 5-2: Utility Poles within 1 m of the RoW for the road section**

Road	Number of Utility Poles			
	Electricity		Telecommunication	
	LHS	RHS	LHS	RHS
A003: Chilaw- Puttalam	710	692	671	589

**Mitigation of negative impacts**

119. The following are the measures to mitigate possible impacts:

- Advance notice to the public shall be given, with the details of the time and the duration of the utility disruption to minimize public inconvenience
- Proper coordination with respective line agencies is essential, and the schedules shall be prepared with their consent and approvals, especially during the removal of and reestablishment of the services to avoid accidental damage, unnecessary delays and thereby lessen the inconveniences to the general public. Locations and access to these utilities shall be clearly marked (possibly on ground) within the RoW during detailed design to avoid structural damage to the carriageway, shoulders, and drains in future.
- Provision of alternate sources and other utilities during the disruption period and re-establish the utilities as soon as practicable to overcome public inconvenience.

**4. Mobilization of resources and selection of sites for temporary usage**

120. Resources such as material, machinery and labour have to be mobilized before construction commences, which storage need space/yards, land/building for site office, labor camps, and for parking of construction vehicles and storing and sheltering of machinery. The contractor will pay special attention to avoid flood prone areas in selecting disposal sites, locations for material stockpiles, yards and other locations where chemicals and other construction material are stored. Proper planning can mitigate much of the impacts described in subsequent sections.

**Mitigation of negative impacts**

121. The site selection for temporary usage has to be done in close consultation with village leaders and the authorities of the LA. Such sites shall be located away (at least 500 m) from waterlogged areas, and flood-prone areas. Also, such sites shall be ideally located by the roadside, but clearly away from the proposed carriageway and the shoulders.

122. Such sites shall be located sufficiently away from socially sensitive areas such as schools, temples kovils, churches and mosques and, governmental offices and establishments.

123. Recruitment of laborers, both unskilled and skilled, from the locality, will reduce the need for having large labor camps and will lead to lesser impacts due to such labour camps during the construction stage. Also, approvals from relevant authorities must be obtained to use temporary lands to comply with National laws and regulations. Preparation of the temporary lands and access road must be carried out in a way to minimize disturbances to natural vegetation cover.

## **5. Natural hazards aggravated by the project and impacts to the road due to natural hazards**

### **Flood Impacts**

#### **Chilaw-Puttalam Road section (A003)**

124. There are locations where the road stretch passes adjacent to seasonal/ intermittent freshwater bodies, which includes floodplains of irrigation tanks and main/minor streams/rivers.

125. The road is located adjacent to Mundel lagoon (0.3 km), Karukkuliya maha Tank (1.5 km), Nawadankulama Tank(4km) and passes through Daduru oya main channel.

126. As mentioned above, sections of A003 road are prone to yearly floods during heavy rain periods and the road gets overtopped at these locations and water is stagnated for several hours to several days. Therefore, surface water hydrology along the road with special attention to these flood-prone locations shall be deeply studied during the detailed design stage and pre-construction phase. Possible mitigation for above issues shall be provided, and the type and sizes of cross drainage structures, RFL, adequacy of lead away / tail canals, flow connectivity issues and the surface treatment shall be decided accordingly in rehabilitating the road. The bridges/ culverts 79/2, 79/3, 102/1, 108/2, 112/1, 114/1, 116/1, 116/2 and 119/3, etc., in low-lying stretches and identified flood locations are suspected of under designed for cross drainage and peak flood conveyance and recommended to carry out relevant adequacy checks.

127. Close coordination with Department of Irrigation, Department of Agrarian Services and Disaster Management Center (DMC) shall be maintained in this regard to obtaining high flood levels, their return periods, respective retention periods and other recommendations to support the final design. The public consultation will also be used to verify the findings. Extra care should be paid when dealing with major streams/rivers (including Deduru Oya), and further to peak discharges due to design rainfall intensities, possible spill outflow discharges of upstream tanks and reservoirs should also be taken into account in designing opening sizes and RFL levels.

128. Contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drains.

## **6. Ecological Impacts during the pre-construction phase**

129. In pre-construction stage project activities may create number of direct and indirect ecological impacts. Clearing of road side vegetation including trees and land clearing will be undertaken for temporary facilities from identified locations mainly for stockpiles of aggregates, yards for machinery & equipment, vehicle parking and construction of labour camps etc. are the main impact during pre-construction phase. Loss of different tree species, land use changes, loss of ecosystem services and fugitive dust emissions is a direct impact during pre-construction phase of the project and this is directly link with the destruction and disturbance of roosting and foraging habitats of several avifaunal & mammalian species. In addition, aesthetic value of the area will be reduced due to removal of trees and green cover vegetation.

## **C. Construction phase**

### **C1. Physical Impacts and Mitigation**

#### **1. Anticipated impacts due to land preparation activities (removal of vegetation, land clearing, residue disposal, dredging, filling, etc.)**

130. During the construction period, especially during, excavation and dredging a large amount of debris or wreckage will be generated. If this debris is not properly disposed of significant negative impacts are anticipated on public health and safety and scenic beauty of the project area. If spoil material and vegetation collected during land preparation, construction and demolition waste and other types of waste are accumulated alongside the road, it will cause public inconvenience by dust dispersion, reduced visual quality, and safety and health hazard.

131. Other waste related issues may arise from, (i) municipal solid waste generated from labor camps and offices, and (ii) wastewater that is generated at labor camps and storage yards.

#### **Mitigation of negative impacts**

132. To avoid these impacts, such waste shall be removed from the project site immediately after the land clearing and construction work and dumped in an approved site according to the current rules and regulations. The contractor must identify and select suitable and safest locations for the dumping or landfill sites with sufficient capacity and approvals shall be obtained from relevant Local Authorities (also from CEA if applicable according to the Gazette notification No 772/22 of 24th June 1993). Proper engineering design (including drainage and erosion control facilities) shall be prepared by the contractor, and written approval shall be obtained from the PIC before dumping at the each identified site. Dumping shall be done only after receiving approvals from the necessary authorities and obtaining the PIC approval on the proposed engineering design of the site.



133. Construction debris and spoil disposal: Spoils shall be safely disposed and managed with minimum environmental damage re-using excavated materials and minimum quantity of earthworks. The following mitigation measures will be adopted:

- Re-use of debris is a good option to reduce the quantity of debris. Wherever possible, surplus spoil will be used to fill eroded gullies, quarries, and depressed areas, etc. Metal, soil, and sand are reusable raw materials, which can be used for backfilling, leveling and amenity planting at intersections. Wood debris can be used as a fuel for worker camps or distributed to local people free of charge.
- Excess spoils will be disposed of at specified tipping sites in a controlled manner, and the tipping sites shall be covered by vegetation through bio-engineering techniques after the surplus material is tipped.
- Spoils shall not be disposed on sloping areas, farmland, marshy land, forest areas, natural drainage path, canals, and other infrastructures. The temporary debris storage sites shall not be located closer to residential or ecologically sensitive areas.
- Necessary toe and retaining walls will be provided to protect the disposal of soil.
- Topsoil will be protected as far as possible. Excess soil will be stockpiled and will be used to fill in farmland for maintaining land productivity and also used during bioengineering for plantation and in fresh-cut slope.
- The remaining non-reusable construction debris shall be dumped properly in approved dumping sites. Prior approval for the disposal site shall be obtained from the LAs via Grama Niladhari of the area. After the disposal, the site will be provided with proper drainage, vegetation, and adequate protection against erosion.

134. Municipal solid waste: The contractor shall make every effort to handle and manage waste generated from the construction/labor camps without causing a nuisance to the neighborhood. MSW shall be properly collected in bins provided with lids and handed over to the garbage collection trucks of the LA. Garbage bins be provided to all worker camps, and construction sites, site inspections by Public Health Inspector (PHI) in the area shall be facilitated. Proper collection and disposal of waste will ensure avoidance of negative environmental and social impacts, apart from ecological impacts, public health, and negative impacts on scenic beauty. Degradable wastes also attract pests such as rats and flies which become unhealthy, dirty, and unsightly places to reside in. Labor camps, garbage disposal sites and material storage yards provide favorable habitats for vectors of diseases like mosquitoes and rats. Contamination of water bodies with wastewater, construction debris, and spoil will create a significant impact on the aquatic lives and people inhabited in the area.

135. Wastewater disposal and proper sanitation: Proper sanitation and sewerage facilities (drinking water, urinals, toilets, and washrooms) shall be provided to all site offices and construction/labor camps. Selection of the location for labor camps shall be approved by the Engineer and comply with guidelines/recommendations issued by CEA and LAs. To avoid waste generation and sanitation problems from labor camps, the majority of skilled and unskilled workers shall be selected from the project influence area. If migrant labor is brought for construction activities from different areas, there may also be conflict situations

among the workers and settlers near worker camps. Spreading of communal diseases is also possible due to migrant labors.

## **2. Road-side landscape**

136. Landscape degradation relates particularly to poorly designed or monitored activities resulting from indiscriminate dumping of spoil material, improper cut, and fill, borrow and quarrying operations. Road induced activities may lead to the generation and mismanagement of wastes in the roadsides and create scars on the landscape.

### Mitigation of negative impacts

137. All debris, piles of unwanted earth, spoil materials, temporary structures shall be cleared away from the roadsides and from other workplaces and disposed at locations designated or acceptable to the PIC. Road landscape activities have to be done as per either detailed design, or typical design guidelines are given as part of the bid documents. Road furniture items are provided as per the design given in the bid documents. The following mitigation measures will be adopted:

- Indiscriminate dumping of spoil material will be discouraged
- After the extraction is completed, the quarry sites and borrow pits will be rehabilitated to suit the local landscape.

## **3. Impacts on natural flow and existing drainage pattern and hydrology**

138. The rehabilitation or reconstruction of culverts (as indicated in Table 4.2) may require temporary diversion of streams, disturbing the natural drainage pattern and it may lead to creating flooding conditions in adjacent areas. Improperly stored construction materials can also block natural drainage pattern. Leveling, filling, excavations, and formation of temporarily or permanently raised embankments in the ROW may block natural flow patterns and cause localized flooding effects in the immediate downstream.

139. The contractor shall take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear at all times. Temporary storage of material will be made only in approved sites by the PIC where natural drainage is not disturbed. All wastes will be disposed at locations approved by the Local Authority. If flooding or stagnation of water is caused by contractor's activities, the contractor shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property.

140. The Contractor shall take precautionary measures to avoid any negative impacts on existing irrigation and drainage paths due to temporary coffer damming at constructional sites. Direct pumping out of the water into nearby marshy lands including paddy lands, blockage of irrigation canals crossed by the roads, stream bank erosion (increased) and collapsing of stream embankments shall be avoided.

141. Severe rain intensities are observed during inter-monsoon and monsoon seasons and thus timing of construction during dry flow period as a mitigation measure is highly recommended.

142. No material including excavated soil will be allowed to be disposed near water bodies, even on a temporary basis, to curtail any undue wash off of soil and debris to

nearby water bodies and agricultural lands. The contractor will ensure that not to damage or block any manmade drainage canal even on a temporary basis. If blocked, the contractor will remove such debris without any delay. Also, the contractor shall schedule his construction activities in compliance with the rainfall pattern of the project area and activities which will induce soil erosion shall be planned to avoid heavy rainy periods.

143. Therefore, contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drain. The contractor shall take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear of blockage at all times. If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to (a) prevent loss of access to any land or property and (b) prevent damage to land and property. Contractor's activities shall not lead to aggravating floods when working in flood-prone areas. Further, any recommendations laid down by the hydrological studies shall be adopted at flood-prone areas. Contractor shall not select land within flood-prone areas to dispose of excavated and unsuitable material, locations for material stockpiles, yards, and other locations where chemicals and other construction material are stored.

#### **4. Impacts on Water Quality due to Silt Runoff, Emissions and Spoil from Construction Related Activities**

144. The North Western Province, in general, receives a considerable amount of rainfall during the southwest monsoon and second inter-monsoon between October and November. Therefore, soil erosion, sedimentation, and siltation can occur any time during the rainy season due to construction activities such as material extraction and storage, land clearing, cut and fill operation, construction or reconstruction of new culverts, causeways, and construction of earth and line drains. The decrease of infiltration of rainwater, acceleration of surface runoff, lowering of the riverbeds and destruction of the riverbanks are the main impacts associated with soil erosion.

##### Mitigation of negative impacts

- Construction activities including turfing, earthwork and construction of cross drainages shall be conducted during the dry season (November to February).
- Only the shrubs and bushes will be cut, and the wetland habitat will not be disturbed.
- The cut material during the excavation of drainage canals will be used as fill material at the site. Fills shall be compacted as soon as they are laid to an appropriate degree of compaction
- Erosion of the soil brought for filling shall be controlled during rainfall and surface runoff. The soil heaps can be appropriately covered using tarpaulin sheets. They shall never be stored close to the watercourses and lagoon banks. Topsoil generated from the construction sites (not exceeding 150 mm) shall be stored properly (height not exceeding 2m) and reused for turfing activities.
- Erosion control practices shall be implemented during construction to limit turbidity and silt transport off the site premises. Temporary barriers such as soil mounds, temporary drains, silt traps will be considered to control soil washing away to the

streams. Suitable local drainage facilities shall be established properly to drain water in the construction areas.

## **5. Effect on the local road network**

145. It is expected that transportation through local roads, which are mainly provincial council roads and rural roads (some are gravel roads), will cause inconveniences to other road users and households living in these areas. Moreover, the carrying capacities of these rural roads are barely sufficient to cater to increased vehicular traffic and increased axial loads that can damage the roads, bridges, and culverts. Provincial council and rural roads, once damaged will need rehabilitation or immediate maintenance; however, lack of financial and other resources will be a constraint.

### Mitigation of negative impacts

146. The contractor shall be provided with any restrictions related to sizes and lengths of vehicles, allowable axial loads, speed limits, no entry zones and time limits (near schools). The contractor's written consent abiding him to follow these restrictions shall be mandatory. If construction vehicles are likely to cause damage to public roads, provision shall be made for their repair and restoration as part of the contract.

147. The contractor shall obtain a permit from LAs to use local roads before the transportation of construction materials, machinery and equipment. Construction materials shall not exceed the carrying capacity of the local road network. The contractor shall maintain all roads, which are used for transportation of construction materials and other activities in proper order.

148. Proper signage and advance notice to road users and roadside communities about the schedule of construction activities, provision of safe and convenient passage to the vehicles and passengers especially during construction of culverts, bridges and causeways, implement traffic management plans in construction areas according to the traffic rules and regulations if necessary in close coordination with local communities/authorities and local police by the contractor.

149. The signage used for traffic management shall follow accepted Standards and approved by the engineer/ police. Construction sites and excavated areas shall be barricaded with warning tapes, painted barriers, or traffic cones. Use of flagmen and/or temporary traffic signs for construction sites or temporary diversions, allocation of properly trained personnel provided with proper gear including communication equipment and luminous jackets for night use are other measures that have to be undertaken during the construction period.

## **6. Impacts due to Noise and Vibration, Dust and Air Quality due to construction**

150. Some areas where the project components are proposed, there have been high levels of background levels reported mainly due to the presence of high vehicular traffic, especially along the Chilaw-Puttalam Road and city limits of Chilaw, Bangadeniya, and Arachchikattuwa. Due to a project of this nature, it is anticipated that the flow of vehicular traffic either be diverted or blocked depending on the locality. In addition. during the

construction stage of road, dust, noise, and vibrations generated from the project activities will impact the roadside communities and people who inhabit around material extraction sites and other haulage roads. Vibration during compaction works could easily damage structures close to the roads.

151. Construction processes connected with demolition and removal of road and paved surfaces, excavations, handling, and material transportation, may cause increased noise levels. Since construction works require the use of heavy machinery (apart from the use of several construction vehicles), noise levels will be high, though the effects may be temporary (since the construction phase is confined to a shorter period). Equipment involved in demolition and excavation and mechanical compaction such as compactors are known to generate high noise. The total Sound Pressure Levels (SPL) will be high when several equipment and machinery are used. Concrete mixing and batching plants also could cause some undue noise and vibration. Therefore, noise levels generated from the machinery involved in construction works could drastically disturb nearby communities since the noise levels generated tend to exceed the permissible daytime (defined from 6.00 am to 9.00 pm) limit of 75 dB(A) stipulated in Schedule III of the National Environmental (Noise Control) Regulations No.1 1996.

152. Furthermore, if construction work is carried out in dry season dust emission is likely to be significant. Release of Volatile Organic Compounds, emission of small amounts of Carbon monoxide, Nitrogen dioxide and particulates from vehicular movements, blasting and dust generated from clearing, grubbing, excavating, backfilling, dumping, mixing concrete, transportation of materials, storage of soil and metal piles, etc. can be taken place in the surroundings due to wind.

### **Mitigation of negative impacts**

153. Construction-related activities closer to sensitive public locations have to be scheduled in coordination with the relevant authorities (community leaders, school principals, high-priests or other respective officers) to avoid disturbance to day to day activities of the people. Such work has to be completed as soon as possible.

154. No high noise generating machinery is encouraged. All machinery, equipment, and vehicles shall be maintained in good condition by engaging skilled mechanics and regularly maintained in compliance with National Emission Standards (1994). Noise control regulations stipulated by the National Environmental (Noise Control) Regulations No.1 1996. shall strictly be implemented for crushers, hot mixed plants, construction vehicles, and equipment.

155. If the contractor decides to operate crushers and hot mixed plants, they shall be placed with the approval of Engineer, CEA, and LAs and shall be located at least 500 m away from residential and environmentally sensitive areas or other public sensitive locations. Dust extraction units, exhaust silencers and noise reduction devices can be fitted to the roadside crushers, construction vehicles and hot mixed plants to reduce dust emissions.

156. All the neighbors will be informed of noise generating activities, times of operation, duration, etc. The maximum permissible noise levels at boundaries of the land in which the

sources of noise is located for construction activities are 75dB (A)  $L_{eq}$  and 50 dB (A)  $L_{eq}$  during daytime and nighttime respectively (Daytime: 6.00 am – 7.00 pm, night time: from 7.00 pm – 6.00 am). However, the contractor shall limit working time for activities that create noise from 6.00 am to 6.00 pm. Enforcing speed limits to the vehicles is necessary to control dust emissions during transportation of construction materials. Dust can also be controlled by providing of dust barriers to sensitive public locations (such as schools and houses located very close to the road), spraying of water to quarry sites, construction sites, roads which will be used for the transportation of construction materials at regular intervals. Tarpaulin covering is mandatory on trucks/lorries which are used for transporting materials, and all construction materials (sand, gravel, metal, cement) shall be stored with proper covering.

157. The contractor shall conduct a pre-crack survey on all structures along the road on a corridor agreed with PIC. Any complaint from public on development of cracks due to construction works shall be investigated keeping the crack survey records as reference source. If it is concluded that crack damages were caused due to the construction works then the contractor shall rectify the damages through a third party insurance or by repairing the damage on their own cost.

158. Water sprinkling will be necessary for any activity that causes generation of dust particles within the proposed site. Suitable actions shall be taken to minimize or avoid dirt and mud being carried to the road surface. The contractor shall also take actions to prevent bad odor and offensive smells emanating from chemicals, construction material processing or other construction activities.

## **7. Extraction, Transportation, and Storage of Construction Materials**

159. Construction materials especially sand, gravel, and aggregates for the project activities may not be available within the close proximity of the project area. Large-scale extraction of such materials can have negative impacts on the environment, notably noise, air, water, soil pollution and reduction of scenic beauty along with causing damage to ecosystems. Sand mining causes bank erosion, lowering of riverbed levels, destruction of riverine ecosystems, during the dry season. Metal quarrying causes nuisance from fugitive dust emissions, noise, and vibrations which will lead to health-related impacts apart from severe social disturbance to the households living close to quarry sites. Quarrying can also lead to cracking of structures (houses and other buildings). Stagnation of water in borrows pits (and metal quarries) that provide breeding grounds for mosquitoes. Such pits also pose a danger to people and wild animals who roam in such areas.

160. Transportation of construction materials may cause disturbances to other road users. Thus, loading and unloading together with transportation of construction materials can significantly cause disturbance to the general public, increase dust and noise nuisance and damages to the minor roads. Storage of material, especially gravel can erode away with surface runoff causing siltation of drainage paths. Also, storage of material will block drainage paths, hindrances to traffic and pedestrian movements, and damage road-side structures. Storage of material for longer periods will create aesthetically unpleasing surroundings.



### Mitigation of negative impacts

161. Selection of material suppliers who have proper EPLs will ensure proper environmental safeguards in material extraction. Extraction of construction materials shall only be from the approved mines and quarries by GSMB. Environmental requirements and guidelines issued by the CEA, GSMB, and LAs shall be followed with respect to locating material extraction sites and other operations including rehabilitation of the extraction sites at the end of their use. If new material extraction sites need to be located, those shall exclude places which are close to the sensitive public locations (schools, religious places, hospitals) and environmentally sensitive areas.

162. Machinery operators and drivers shall have obtained proper licenses for the category of machinery/vehicles they operate/drive. Drivers shall abide by the speed limits on roads based on the traffic rules and regulations. The quantities of material to be transported shall not exceed allowable axial loads along the roads, and especially when they are transported along bridges. Loading and unloading of construction materials and transport shall not cause a minimum nuisance to the people by way of noise, vibration, and dust. Trailers and trucks shall be covered properly with tarpaulin sheets, which will prevent dust emissions and slip away from the material, which will otherwise cause damage to pedestrians and other vehicles. Materials shall be piled sufficiently away from environmental (away from water sources, wetlands, etc.) and sensitive public locations (schools, mosques, offices, etc.). Sand, rubble, metal, bitumen, and cement shall be properly covered to ensure no dust is emitted and to avoid erosion and contamination. Construction materials shall not store around canals, cross drainage, and natural flow paths. All cement, bitumen (barrels), oil and other chemicals shall be stored and handled on an impervious surface above ground level (e.g., concrete slabs) and shall be enclosed ensuring that no stormwater flows into the structure. Adequate ventilation shall be kept avoiding accumulation of fumes and offensive odor that could be harmful.

163. A site restoration plan must be submitted by the Contractor to the PIC. Any retention of payments shall be released once the sites and yards are properly restored.

### **C2. Ecological Impacts and Mitigation**

164. During construction stage, soil erosion, water and air pollution, noise and vibration could be expected at the levels of low, medium, and high; therefore, negative impact on both flora and fauna in aquatic and terrestrial habitats is anticipated. However, the exact impact could be varying and depending on the construction plan. Since this is rehabilitation and improvement project of the existing road, most of the anticipated biological impacts are minor and can be mitigated with the appropriate mitigation action. The major biological impacts will be mitigated up to acceptable levels using proper mitigation measures. Any impact to the Anawiludawa sanctuary and their diversity will not be expected from the project activities.

### **1. Ecological Impacts due to loss / destruction / fragmentation of habitats**

165. The existing road traverses mainly through urban and sub urban areas and most of the existing habitats beside the road include commercial building in small, medium, and big scale, home gardens and residences, paddy fields, mix and monoculture cultivations. Although large number of roadside trees recorded within ROW, some of the trees which

located close to the edges of the carriageway will be removed for the proposed construction. Since most of the road section, road reservations are sufficient for the improvement destruction to the roadside habitats and fragmentation of habitats will not expected. However, clearing of vegetation, removal of trees and or trimming of trees will be required. Loss of different tree species is a direct impact to the surrounding environment and the existing biodiversity in the area. This may, in turn, result in loss of soil moisture and soil, reduction of aesthetic value and loss of shade. Destruction and disturbance to the roosting and foraging habitats of several avifaunal & mammalian species are the significant impact to the fauna.

### **Mitigation measure to loss of vegetation**

166. The following are the mitigation measures:

- Trimming of trees adjoining to the trace prior to commencing other construction activities be minimized structural damage to the roadside trees. Moving of construction vehicles and machinery will be restricted only to designated areas to avoid the loss of vegetation due to squash.
- Maintaining adequate vegetation clearance only within the RoW. The unnecessary removal of vegetation and felling of trees will be prevented by finalizing the tree list with the Environmental Specialist of PIC. Joint inspections by the contractor, design team together with the PIC are needed to take decisions as to what trees are cut, felled, or trimmed.
- To compensate the damage, tree planting program at least 1-3 ratios with native species is essential parallel to the project activities. This program should be planed during the detail design stage and allocation should be made to implement tree planting programs in suitable locations wherever possible around project affected area.
- Unless it is essential, removal of trees from temporarily use lands for the project activities should be avoided as much as possible.
- When conducting tree felling, it is important to confirm that eggs/ nestlings or roosting are not available on trees. Any guidelines and recommendations made by the CEA, DoF or other line agencies with regard to felling of trees should be strictly followed.
- All trees to be felled will be marked and handed over to State Timber Corporation for cutting and removal.

## **2. Impact on animal movement pathways**

167. Wild animal migration pathways are not recorded within proposed trace. However, roads can impede animal movements by direct mortality or avoidance behavior.

## **3. Impact on aquatic fauna and flora**

168. Roads construction have large, widespread effects on aquatic habitats. Roads typically adversely affect the density and diversity of plant and animal species and populations, especially locations of bridges over waterways that support healthy and diverse wildlife populations. Roads and their associated structure construction, bridges, culverts, and



other roadside structures, modify stream flows and sediment transport and often make passage for aquatic organisms more difficult or even impossible. There will be soil erosion from construction sites, stockpiles due to rain and wind, excavation, oil, and grease from construction vehicles. Accumulation of these materials in water bodies such as tanks, streams and irrigation canals will cause an increase in turbidity level lower the water quality. This will lead to a reduction of light penetration and make it an undesirable place for aquatic fauna and flora. Further, due to the reduced light penetration to the water body, the primary productivity of the water body will be reduced resulting in increased mortality of aquatic organisms. Also, when these particles settle on the bottom, it will affect the breeding ground of aquatic animals. Pollution of water bodies will also adversely impact the inland fishery. Paved roads are impervious, they increase runoff and otherwise alter hydrological patterns.

### **Measure to avoid/minimize the impact on aquatic fauna and flora**

169. The following are proposed as mitigation measures:

- Construction activities around water bodies should be restricted to the dry season to the extent possible.
- Cut and fill areas would be controlled by carrying out both temporary and permanent erosion control measures (silt trap basins, drains and sedimentation tanks) to reduce heavy sediment loads to the water bodies.
- Locate all hot mix plants, crushing plants, workshops, depots, and temporary worker camps and storing of toxic and hazardous materials at least 500 m away from water bodies, preferably, approved locations by relevant government agencies.
- Pollutants such as petroleum-based waste, wash water containing oil, grease or lubricants will be collected on- site and properly treated before being discharged.
- Recycling and dumping of solid waste matter at locations approved by the LAs.
- Maintenance of vehicles and equipment in good operable condition, ensuring no leakage of oil or fuel and the fitting of proper exhaust baffles.
- Awareness programmes shall be carried out for workers on solid waste management shall not be dumped into water bodies.

#### **4. Impact on flora and fauna due to local air pollution, noise, and vibration**

170. Noise, vibration and dust from heavy machineries and equipment, excavation and compaction have potential impacts on disturbing behavior of faunal species, especially avifaunal species inhabit in marshy areas and associated aquatic habitats. In addition, other related construction activities and civil works will potentially impact on the behavior of common species birds, reptiles, amphibians, and mammals inhabit in cultivated lands, water bodies, home gardens, marshy areas, and road reservations. Impact to the aquatic fauna especially fish is also possible due to construction activities over water bodies. Plant communities are affected by dust deposition can interfere with physiological functions

of trees including photosynthesis, respiration, transpiration and allow the penetration of phytotoxic gaseous pollutants.

#### **Measure to mitigate the impact on flora and fauna due to noise, vibration, and dust**

171. The following are proposed as mitigation measures:

- All construction vehicles, machineries and equipment shall be used in good condition, service and regularly maintenance in compliance with National Emission Standards.
- Project activities which are potential to have high noise, vibration, and dust specially during the construction phase should essentially be limited to acceptable levels.
- Perform all construction activities with appropriate construction methods or equipment's that will cause lowest level of ground vibration impacts, especially near residences and ecological sensitive areas.
- Construction vehicles and machinery shall be well maintained to reduce the noise and vibration disturbances.
- Dust emission will be controlled by frequent wetting or wet spraying of quarries, construction sites, dusty surfaces, any exposed earthwork surfaces, roads which use for transportation using sprinklers, tankers, or bowsers in regular intervals.
- Monitoring is essential during construction phase especially during vibration intensive activities are in place and if the ambient levels are far higher than the stipulated limits measures should be undertaken to avoid or minimize the impacts.
- The Client should ensure that the main contractor is an experienced enough to conduct this type of construction work and undertake well developed practices to minimize disturbance from noise, dust, and vibration to the neighboring habitats.
- Moving of construction vehicles and machinery will be restricted only to designated areas to save vegetation beyond the proposed project area due to trampling.
- Specific mitigation plans shall be prepared for borrows sites and quarry operation.

#### **5. Ecological disturbances by workers and their camp operations**

172. Chilaw- Puttalam road runs over number of natural water ways while some section runs close to the inland tanks including Anawilundawa sanctuary and close to the coastal habitats at the end section. During the construction stage, possibilities of water quality degradation due to establishment of labour camps. . Therefore, the establishment of labour camps may have adverse impacts such as dumping of refuse, sanitary waste, and sewage into waterways, clearance of vegetation for worker campsites, hunting of animal species and collection of firewood from scrub areas may be particularly intense at campsites. This may cause several adverse impacts. Open dumping of garbage at these sites could also increase threats of mosquitoes, flies and the spread of rats and crows. Such garbage dumps can attract wild fauna, posing some threats to both humans and wildlife.

### **Measures to mitigate ecological disturbances by workers and their camp operations**

173. The following are proposed as mitigation measures:

- Local labour will be recruited as much as possible to minimize this impact.
- The environment quality in the surrounding area shall not be contaminated or polluted due to camp operations.
- Strict labour supervision, provision of labour camps with electricity or LP gas for cooking, to eliminate them using the firewood from surrounding vegetation.
- Adequate supply of water shall be provided to the urinals, toilets, and washrooms of the worker-based camps.
- Proper drainage facilities shall be provided around labour camps to minimize stagnation.
- Fishing and poaching will not be allowed within the project area.
- Solid waste and sanitary waste arising from labour camps and other sites shall be properly collected and disposed of.
- Accepted sanitation methods (e.g., mobile toilets) with proper sewage disposal facilities shall be provided. Under no circumstances shall such waste be released untreated into the water bodies, near scrub areas.

### **C3. Socio-economic Impacts and Mitigation**

#### **1. Positive impacts of iRoad project**

174. Improvements of the road would bring obvious positive impacts for the road user community. The proposed road is belonging to A class road network, there for connectivity impacts of the road is significant. Apart from local agricultural community frequently using the road significant number of passengers travelling in public and private busses travel through these candidates' road section to reach their desired destination in North Western Province.

#### **2. Social impacts due to Establishment of labour camps**

175. The nature of the proposed project may not require large-scale labor camps to be established in the road area. Majority of the labors work in the construction sites may come from the local area itself, and therefore, there will be no need to provide them with accommodation facilities. However, if the needemerges to establish labor camps, they shall be established in suitable locations away from the houses, business establishments and other sensitive institutions such as schools, religious centers, etc. The labors shall be educated to behave in the camps decently without creating disturbances to others in the neighborhood. There can be conflicts between labors from outside areas and the local community members. This issue also shall be carefully handled by the contractors. The hiring of local people would be the most effective solution to avoid possible conflicts between external labors and the local community members.

### **3. Disruption to traffic/transportation**

176. This is the most possible and obvious negative impact during construction. This section is heavily used by public buses, and they will have serious disturbances. Chilaw-Puttalam road would be the most vulnerable road regarding traffic-related disturbances during the construction phase. Regular road users such as school children, employees will have disturbances. The traffic-related disturbances will create specific impacts to the business establishments in the townships located along the roads. Management of construction sites would be the most effective and pragmatic solution to the traffic problem. One side of the road may be used for construction at a time while the other side is kept for the road users. Regular/continuous arrangements to manage the traffic near construction sites shall be implemented methodically. Most of the road construction contractors are well experience in these aspects due to their long-term exposure to similar projects on road improvements.

### **4. Impacts due to extraction and transportation of construction materials**

177. Transportation of construction material will create impacts beyond the area of candidate road. The transportation of material in other roads in the area will contribute to the existing traffic congestion. The nature of construction activities in the road will not require huge quantity of material to be transported. The roads will be rehabilitated, and they are not new construction. However, the transportation of material will contribute to the traffic congestion in the candidate roads. This situation is well known to the contractors and to the material transporters. The most essential needs are the commitments to minimize the traffic through their decent behavior in driving their vehicles and the time of transportation. They shall be advised to avoid peak hours of the roads during transportation. They also shall follow all the rules that are required in transporting construction material to the sites.

### **5. Impacts to roadside structures**

178. The consultants identified 7 structures (3 on the right side and 4 on the left side of the candidate road) located facing the road edges that may have construction induced impacts. The consultants met all of the owners of these structures and made them aware of the intended work. All the owners are willing to cooperate and ready to shift their structures, if required during the construction phase. Most of these are temporary structures some are fixed to the ground and some are moveable Carts. All of them can be shifted or easily movable. All the structures are located within ROW. The RDA will inform them in advance (about 30 days in advance) about the project and its construction schedule and also the needs of the shifting of the structures if required.

179. Heavy vehicle movements, material sourcing (borrow material and quarrying operations) can lead to cracking of structures, especially old houses, and buildings. If such a situation is anticipated, the contractor has to carry out a crack survey and subsequent monitoring.

### **6. Impact to due to obstruction to access**

180. Access to the houses, business establishments, institutions and by-roads will be disturbed during the construction period. The contractors shall be instructed by the PIC to explore all the possibilities to minimize such disturbances based on the specific situation of

the road. The contractor shall be instructed by the PIC to support to the affected persons to establish temporary access to reach their houses, business locations, institution, or by-road. Steel plates can be used to create temporary access. However, the construction contractors of the roads are well experience in handling these types of situations in road construction projects. The most essential need is to monitor whether contractors fulfill these needs with commitments.

## **7. Impacts on the development activities in the vicinity**

181. The development activities such as construction of new houses presently carried in the area adjacent to the roads' edges will have disturbances. Possible disturbances to the access to such development sites would be the most critical impact. The road contractor can provide assistance to establish temporary access to the sites. However, the two parties, road contractor and the implementers of other projects shall get together and work out practical plan depending on the specific condition to create a win-win situation.

## **C4. Other Impacts and Mitigation**

### **1. Safety of Workers**

182. During construction, workers will be exposed to various risks and hazards. Potential impacts to health are respiration and eye diseases due to exposure to dust, the risk of accident during work. Extraction of construction materials, loading, transportation & unloading, construction of, culverts, bridges, causeways, surfacing, roadway excavation, removal of roadside structures, public utilities, use of hazardous substances (such as bituminous products) are the main causes associated with accidental risk.

### **Mitigation of negative impacts**

183. Three essential features of a safe construction site include (i) fully functional and well-maintained equipment, (ii) availability of emergency equipment and safety warnings, and, (iii) worker personal protective equipment (PPE) and a strong commitment to follow safety practices with proper supervision of labour with proper monitoring and feedback to support continuous improvement. Therefore, appropriate safety equipment, tools and protective clothing should be provided to workers, and the contractor must ensure that safe working method are applied.

184. Workers will be provided with first aid and health facilities. First aid training will be provided to field staff and social mobilizers and the foreman. The contractor shall organize awareness programs about the personal safety of the workers and the general public in the area with proper briefing and training on safety precautions, their responsibilities for the safety of themselves and others.

185. It is mandatory that the Contractor shall comply with requirements for the safety of the workmen as per the International Labor Organization (ILO) convention No. 62, Safety and Health Regulations of the Factory Ordinance of Sri Lanka and IFC EHS Guidelines on Occupational Health and Safety to the extent that applies to the contract. Other than that, the contractor has to comply with regulations regarding safe scaffolding, ladder, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.

186. Use of licensed and trained plant and vehicle operators, provision of protective footwear, helmets, goggles, eye-shields, face masks, ear plugged and clothes to workers depending on their duty (mixing asphalt, blasting, handling equipment) are the major steps that can be taken to reduce accidental risk. Provision of high visibility jackets to the workers when construction activities are taking place at night with necessary lighting arrangement, allocation of flagmen during the daytime and provision of two red lamps at night are also necessary. Provision of first aid facilities and emergency transport facilities to the construction sites and labor camps is also an important responsibility of the contractor.

187. Excavated areas for construction shall be barricaded using barricading tapes and signboards to ensure safety of workers. Quarry operations, roadway excavations and blasting shall be carried out and supervised by trained personnel.

188. Arranging regular safety checks for vehicles and equipment's, allocation of responsibility to the relevant personnel, prohibition of alcoholic drinks and other substances which may impair the judgment of workers engaged in construction activities, installation of warning signs, speed limits and signals to particular locations of the road.

189. Group accidental insurance shall be considered for the workers. In addition, conducting regular safety awareness toolbox meetings at least once in two weeks is needed.

## **2. Health and Safety of the Public**

188. Construction zones along roads present a significant hazard for the public including motorists, and pedestrians. This hazard is brought about by lack of safety procedures adopted at the site, high-speed limits, impatient drivers, and widespread traffic congestion. The construction zones, even though they are marked and signposted as areas where motorists must slow down and drive with extra caution, many drivers do not pay much attention and try to get through the construction area as quickly as possible. Accidents occur as a result of inadequate signposting and lighting and when drivers and pedestrians fail to notice construction work. Sometimes, the drivers do not pay attention to work zone signs or flaggers indicating they should slow down or come to a stop. Inadequate provisions for pedestrian pathways, circulation and road crossings also make individuals vulnerable and expose them to higher risks.

### Measures to mitigate the impacts

189. Construction work along public roads need to be carefully planned and administered to avoid accidents. Most accidents with minor plant and equipment are caused by improper usage and poor maintenance. Special attention should be paid to the safety of pedestrians, the general public, and onlookers of construction work.

190. Signs must be kept clean and well maintained if they are to be effective. Construction or maintenance zones will have roadway signs in advance to warn motorists that road work is being done. Active work zones are designated as such to notify motorists when they enter and leave the work zone. Unnecessary traffic control signs or road markings must be removed as they tend to confuse motorists and make them careless. A variety of devices and technology can provide information to motorists, including brighter, bigger electronic signs.

191. Barricading the construction areas is of vital importance, even at locations where minor construction work is involved. Delineation devices such as cones, lights, tubular markers, barricades tapes, warning signposts, etc. should be erected to inform road users about work zones. Dangerous warning signs should be raised to inform public of dangers and to keep them away from such hazards. This is especially important to ensure the safety of motor cyclists and three wheelers. A safe pedestrian pathway along the road sections



where construction work is progressing should be provided if regular pathways/pavements/walkways along with the road is blocked.

192. Workers who control traffic must be properly trained. Traffic controllers must know where to stand, how to slow or stop traffic, and how to coordinate public and construction traffic movements. Controllers should use two-way radio communication when visual contact between traffic controllers is not possible. Where the site is suitable, and they are available, arrangements should be made to use temporary traffic signals to control traffic. Traffic controllers and general road workers should wear suitable conspicuous clothing to ensure that they can be seen by motorists

193. Speed limits should be consistent with safe site operations and traffic movements. Compliance with reasonable speed limits will then be more likely; If motorists perceive a speed limit to be unrealistic, they are likely to disregard it.

194. Signboards and directions for any detouring and shifting of facilities should be placed in all the two local languages, at prominent locations and in large-sized lettering. The contractor should always keep in mind that the pedestrians and motorists are vulnerable and susceptible to risks. Therefore, slightest disturbances which are considered tolerable to certain persons should not be ignored. Proving safety precautions, therefore, is essential. Safety of the peripheral areas of the site and access paths should be ensured at all times, e.g., non-slippery surfaces, clear of any obstructions and dangers, maintaining a clean, tidy, and well-managed sites and activities, etc.

195. At all times, contractor's activities and movement of staff will be restricted to designated construction areas. Trespassing of private property by workers should be strictly forbidden and should be monitored. If anybody is found guilty, he/she should be appropriately punished. Should the construction staff be approached by members of the public or other stakeholders, staff shall assist them in locating the environment management specialist or contractor or provide a contact number through which they may contact the environment management specialist or contractor (this will facilitate the GRM process). The conduct of the construction staff when dealing with the public or other stakeholders shall be in a manner that is polite and courteous at all times. Failure to adhere to this requirement may result in the removal of staff from the site by the environment management specialist.

### **3. Other impacts related to workers and their camp operations**

196. The establishment of labour camps may have adverse impacts such as dumping of refuse, sanitary waste, and sewage into waterways, clearance of vegetation for worker campsites, however, these will not be significant. Open dumping of garbage at these sites could also increase threats of mosquitoes, flies and the spread of pests and vermin.

#### Measures to mitigate impacts related to workers and their camp operations

197. The following are proposed as mitigation measures:

- Local labour will be recruited as much as possible to minimize this impact. If there is a need to establish labour camps, they should be established in suitable locations away from sensitive areas with the consent from the neighbourhood. The labourers should be instructed to behave in the camps decently without creating disturbances to hospital users and others in the neighbourhood. There can be conflicts between labourers from outside areas and the local community members. This issue also should be carefully handled by the contractors. The hiring of local people would be the most effective solution to avoid possible conflicts between migrant labours and the local community members. This will also provide livelihood opportunities to the local community.
- Strict labour supervision, provision of labour camps with electricity or LP gas for cooking, to eliminate them using the firewood.

- Solid waste and sanitary waste arising from labour camps and other sites shall be properly collected and disposed of.
- Accepted sanitation methods (e.g., mobile toilets) with proper sewage disposal facilities should be provided. Under no circumstances should such waste be released untreated into the water bodies, near scrub areas.

198. *Municipal solid waste:* The contractor should make every effort to handle and manage waste generated from the construction/labor camps without causing a nuisance to the neighborhood. MSW should be properly collected in bins provided with lids and handed over to the garbage collection trucks of the LA. Garbage bins be provided to all worker camps, and construction sites, site inspections by Public Health Inspector (PHI) in the area should be facilitated. Proper collection and disposal of waste will ensure avoidance of negative environmental and social impacts, apart from ecological impacts, public health, and negative impacts on scenic beauty. Degradable wastes also attract pests such as rats and flies which become unhealthy, dirty, and unsightly places to reside in. Labor camps, garbage disposal sites and material storage yards provide favorable habitats for vectors of diseases like mosquitoes and rats. Contamination of water bodies with wastewater, construction debris, and spoil will create a significant impact on the aquatic lives and people inhabited in the area.

199. *Wastewater disposal and proper sanitation:* Proper sanitation and sewerage facilities (drinking water, urinals, toilets, and washrooms) should be provided to all site offices and construction/labor camps. Selection of the location for labor camps should be approved by the Engineer and comply with guidelines/recommendations issued by CEA and LAs. To avoid waste generation and sanitation problems from labor camps, the majority of skilled and unskilled workers should be selected from the project influence area. If migrant labor is brought for construction activities from different areas, there may also be conflict situations among the workers and settlers near worker camps.

200. Spreading of communal diseases is also possible due to migrant labors. This should be avoided by practicing accepted health and sanitary habits. Obtaining regular advice from the PHI of the area should be practiced as a measure of good practice.

### **Emerging concerns on the safety of workers to prevent spreading of COVID-19.**

201. The contractor has to consult the PHI of the area where the civil works are proposed and have to formulate a Safety Plan to prevent spreading of COVID-19 before mobilization of workers for civil works.

202. This safety plan should consist of the information as proposed in Appendix 11.

## **D. Operational Phase**

### **D1. Physical Impacts and Mitigation**

#### **Impacts on Water Resources and Hydrology**

200. Improvements to the road drainage will result in improved stormwaterflows and reduce the tendency of blockages to occur in roadside drains. Risks to the public health caused by such stagnant water bodies by acting as disease vector breeding places will be reduced.



201. Also, improper handling of chemicals used for maintenance works such as paints, asphalt, etc. will also degrade water bodies located nearby to the road. Proper handling of such chemicals under strict supervision will help to minimize the water pollution during the maintenance period.

### **Mitigation of negative impacts**

202. By designing the drains to withstand appropriate storm events will reduce the risk of an operational failure of the drainage system and regular maintenance will further reduce the chances of failure.

203. Regular maintenance of all drainage related structures and monitoring especially prior to/in the aftermath of major storm events/monsoonal seasons by the RDA/Local authority will be required to ensure proper functioning of the drainage structures and to avoid blockage to the channels, culverts, roadside drains, tail/leadaway canals due to siltation, debris accumulation, nuisance vegetation growth, etc.

### **Pedestrian and Commuter safety**

204. Inadequate provisions of road safety measures like no provisions of signals and lack of enforcement of traffic rules during operation period may invite accidents. Rehabilitation of the roads will provide easy access to the area, however, will increase the number of vehicles and their speed due to the improved condition of roads. These conditions will raise the issues of road safety for both pedestrians as well as for vehicular traffic. It is essential that enforcement of the speed limits, traffic rules, and regulations as well as the installation of warning signs, marking of center lines, pedestrian crossings, bus halts, etc. shall be incorporated to minimize road accidents and enhance the safety of the vehicles and road users.

### **Mitigation of negative impacts**

205. The following are proposed as mitigation measures:

- Enforcement of speed limits, traffic rules and regulations and Installation of the warning signs, regulatory signs, and information signs
- Applying appropriate road safety measures with the help of 3-Es, i.e., Engineering, Enforcement, and Education.
- Appropriately designated locations for bus stops, zebra crossings, vehicle parking and curbed footpaths within urban areas, etc. to ensure the safety of both pedestrians and other road users including drivers. Maintenance of road furniture and markings is important during the operational period.
- Designated locations for garbage collection, so as not to disturb pedestrians and vehicle movements.

### **Noise, Air and Water Pollution**

206. During the operation period, the noise level will increase due to the increased movement of vehicles. It is a general habit that the motorists tend to drive faster when the road condition is good. However, this will cause higher noise levels. Movement of three-wheelers and motorcycles are relatively higher than other vehicles, and these two types of vehicles emit more noise than bigger vehicles. Higher levels of noise will be a disturbance to the household, especially for vulnerable persons such as babies, children, and elderly. Schools, religious places, and offices will also be disturbed by such high levels of noise and vibration.

207. The major factor that contributes to poor air quality in the project area at present is dust emission from gravel and sandy roads. Rehabilitation of roads will significantly reduce the existing dust emission after the proper surfacing of the roads. Air pollution due to vehicle movement, especially diesel vehicles will be of concern. However, as compared to the present number of vehicles, the incremental numbers will not be significant even after rehabilitation. Therefore, air pollution due to vehicle emissions cannot increase after the project. On the other hand, rehabilitation work such as alignment of roads, widening and re-surfacing will allow considerably higher speeds for vehicles with minimum accelerations and decelerations which in turn reduce the vehicular emissions and sound pollution compared to the current situation. Therefore, quality of air in the area will improve due to less dust and fugitive particles, which will cause positive impacts on human health in the area. Introducing green areas and corridors and tree plantation will also help to curtail both dust and noise as experienced by households living along the roadside.

208. The disposal of household waste and wastewater to roadside drains, oil, and grease from vehicles into water bodies may cause water pollution. Similarly, with the careless disposal of spoil and other construction material into water bodies during maintenance of road may also degrade the water quality. However, enforcement of strict control on wastewater disposal and proper collection of MSW will alleviate the problems associated with water pollution.

### **Mitigation of negative impacts**

209. The following are proposed as mitigation measures:

- Community and road user awareness program will be organized to enhance public understanding on proper maintenance of roadside drains and importance of proper MSW and wastewater disposal.
- Maintenance of green corridors and their beneficial impact on air and noise pollution control
- Speed limits shall be strictly enforced together with restriction in the use of horns shall be restricted near mosques, hospital, schools, and densely populated settlements.

## **D2. Ecological Impacts and Mitigation**

210. If the animal's crossroads, mortality is the often result and road mortality may be the leading source of motility of domestic and wild animals in the country. Due to the improvement of road, during the operation, traffic volume and speed of the vehicles strongly influence for the movement of animal. Consequently, there is a potential of collision of animals such as reptiles, amphibians, bird, and mammals. Moreover, there are some

domestic animals frequently approaching the roads during the nights. Some kind of animal behavior increase the risk of mortality as they cause animals to spend more time around the road. Some species of animals such as reptiles attracted to the road surface, worm asphalt on the road to regulate their body temperature. Scavengers prey on the carcasses of animals that have been killed on the road. The rate of mortality due to collision severely threaten to animals and leading cause of decline some population of reptiles, amphibians, and mammals. Improvement of the roads, will result in the increasing number of animal accidents, road kills and disturb their natural movement.

#### **Measures to avoid accidents at animal corridors**

211. Number of mitigation strategies are needed to develop for decrease the harmful impacts of roads on wildlife. To reduce the mortality of animal speed limit reductions are essential for environment sensitive locations. Barriers beside the road in environment sensitive areas are needed to construct to guide animals to the culverts and other cross drainages. Increase the number of culverts is also essential for smaller animals, under roads that can allow for safe passage.

### **E. Positive Impacts of the Project**

#### **E1. Socio-economic benefits**

- The improvements to this road would bring a contribution to the local economy.
- Availability of roads without dust and mud during dry and rainy seasons.
- Possible enhancement of time efficiency of transportation.
- The potential increase in property value.
- Remarkable reduction of vehicle maintenance cost

## 6 CLIMATE CHANGE ADOPTION (IMPACT AND MITIGATION)

212. Growth in vehicular traffic and energy use are considered as main contributors of increased Green House Gas (GHG) emissions which directly affect global warming. According to “International Energy Outlook 2016” (IEO2016) prepared by U.S. Energy Information Administration, the energy use in the transportation sector includes energy consumed in moving people and goods by road, rail, air, water, and pipeline. Transportation sector has accounted for 25% of total world delivered energy consumption in 2012. And it is forecasted that transportation energy use to increase by 1.4% per year from 2012 to 2040 in the IEO2016 Reference case.

213. The evaluation study by ADB’s Independent Evaluation Department (IED) in year 2010 (Evaluation Knowledge Brief, July 2010 – EKB) on reducing Carbon emission for transport projects has indicated the need of a shift in ADB’s investments on transport sector into low Carbon growth across Asia and the Pacific regions.

214. Improving the surfaces (pavements) of existing urban road(A3) in North-Western Province may increase the traffic volume in these roads. However, changes in vehicle operation speeds with respect to present conditions will have an impact on emission levels of the gases emitted by such vehicles. Most common types of vehicles that would move on these roads are motorcycles, three wheelers, cars, vans, buses, light, and heavy commercial vehicles. Thus, emission of Carbon Dioxide (CO<sub>2</sub>) from motorized vehicles which is a GHG needs to be analyzed to evaluate the overall contribution of this investment program in terms of the change in CO<sub>2</sub> emissions.

215. The EKB has developed a set of spreadsheet-based models to evaluate the CO<sub>2</sub> impacts of rural roads, urban roads, bikeway projects, expressways, light rail, and Metro Rail Transit (MRT) projects, Bus Rapid Transit (BRT) projects, and railways. These Transport Emissions Evaluation Models for projects (TEEMPs) consider passenger and freight travel activity, the shares of trips by different modes and vehicle types (structure), fuel CO<sub>2</sub> efficiency (intensity), and fuel type, validated by more detailed emission factor models. The models directly estimate CO<sub>2</sub> emissions for a business-as-usual case (a no-action alternative) vs. one or more alternative modal investment interventions (including improvement to road pavement) and calculate scenario differences. The models consider induced traffic demand generated by changes in the generalized time and money cost of travel by different modes, building on best practice analysis techniques.

216. The TEEMP model for urban roads was used for the analysis with using default parameters for base fuel consumption, emission factor and upstream emission percentage. Occupancy-loading, average trip lengths of each type of vehicle, vehicle type growth and roughness factors (before and after improvements) were fed to the model based on the details of traffic and economic analysis for roads in North Western Province. A summary of these input parameters is presented below.

**Table 6-1: Input parameters for TEEMP model for roads in NWP**

Parameter	Input value
<b>Occupancy/loading</b>	
Two-wheeler	1.7
Three-wheeler	2.0
Passenger car	3.0
Light Commercial Vehicle	2.5 Ton
Bus	30.0
Heavy Commercial Vehicle	7.5 Ton
Bullock cart	0
Bicycle	1.0
<b>Roughness</b>	
Before improvement	8.0 m/km
After improvement	3.0 m/km
<b>Lane configuration</b>	
Before	Single lane @ 3.5 m pavement
After	Single lane @ 3.5 m pavement

**Model predicted CO<sub>2</sub> emission levels**

217. Three case scenarios were analyzed using the model based on the traffic analysis in North Western Province which categorized the traffic levels as rural, urban, and provincial. Model output includes CO<sub>2</sub> emissions at Business as Usual (BAU) or without project; with project (i.e. with improvements) and with induced traffic; and with project and without induced traffic.

**Table 6-2: CO<sub>2</sub> emission for Project & induced traffic and Project without induced traffic with compared to BAU**

	Emission of CO <sub>2</sub> in Ton/km/year (net change in emission)
	<b>Urban</b>
BAU	22.2
Project with induced traffic	24.9(5.5)

	Emission of CO <sub>2</sub> in Ton/km/year (net change in emission)
Project without induced traffic	18.5(5.5)

218. As indicated in the model output and summarized in above table the proposed improvement to existing road pavements will bring a reduction in CO<sub>2</sub> emission even with a growth of traffic. However, this analysis is based on the assumption that the roughness of improved road surface will be maintained during the project life. Therefore, it is important that the road maintenance program is maintained throughout the project span (i.e. during operational stage). The total length of roads to be improved in this project is around 50.8 km and based on the minimum (0.4 T/km/year) and maximum (5.5 T/km/year) net change in CO<sub>2</sub> emissions or CO<sub>2</sub> savings of the proposed investment program in NWP will be between 480 and 6,600 Tons/year.

#### **Mitigation measures for floods**

219. Climate change in a global perspective has brought about a change in rainfall patterns and especially the intensities of rainfall. Therefore, special attention shall be paid to roadside drainage and cross drainage in designing of the improvements for these roads. Structures such as culverts, causeways (not applicable in A003, but may be in associated local link roads) and bridges with small spans will be constructed along with road side drains (either earth or concrete based on the requirement) to facilitate the existing flow regime as well as future discharge volumes as predicted by drainage analysis during level one designs. All hydraulic structures constructed on these main and local roads will be of reinforced concrete. Considering the percentage of allocation (which is generally 5% - 10% of construction cost) for Environment Management plan which includes mitigation of flood impacts this allocation will be sufficient to mitigate impacts due to floods in the selected road for RMC in NWP. All old culverts designed with minimum opening sizes of less than 1.0 m x 1.2 m (Depth x Width) for box culverts and less than 1.2 m for pipe culverts are to be replaced with minimum size box culverts of 1.0 m x 1.2 m (Depth x Width) to avoid clogging due to siltation/sedimentation and difficulties in regular maintenance activities. All culverts/bridges and low lying road stretches identified as flood prone areas should be re-analyzed for the adequacy of opening sizes and RFL/soffit levels (freeboard) during preliminary design phases.

## **7 INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM**

### **A. Institutional Arrangements**

220. The Ministry of Roads and Highways is the Executing Agency (EA) for the project and the RDA is the Implementation Authority (IA) who has the responsibility of implementing the overall EMP. The Project Implementation Unit (PIU) will be established by the RDA. The PIU will be responsible for overall contract administration and the supervision of the contractor regarding the implementation of environmental specifications and special environmental safeguard provisions included in the Contract Document. In practice, the detailed implementation of EMP will involve EA, IA, PIU, PIC and Contractors.

221. The PIU will be headed by a full time Project Director (PD) and supported by a team of engineers from the RDA. The PIU will have a safeguards team with sufficient social and environment safeguards officers to cover the quantum and geographic distribution of works in all provinces under the investment program. The Project Implementation Consultants (PIC) will support the PIU for supervision of the design and construction works by the civil works contractor. The PIC team will include an environment specialist for conduction of regular monitoring of safeguards implementation on site.

222. Safeguard team of PIU, PIC and the contractor is primarily responsible for safeguards compliance of all activities carried out for rehabilitation and maintenance of the three candidate roads. Their specific roles and responsibilities of each party are given in chapter VI of the EARF.

### **B. Environmental Management Plan and Monitoring**

#### **B1. Environment Management Plan (EMP)**

223. The Environmental Management Plan (EMP) was developed to avoid/ minimize the adverse impacts to the physical, biological, and social environments during pre-construction, construction, and operational stages of the project. EMP, prepared as a matrix, is attached as Appendix 8.1, 8.2 and 8.3. This was developed based on best practices for environmental management. The EMP includes the potential impact as a result of project activities, proposed mitigation measures, the responsible party to implement and supervise those impacts and the feasible cost measures to be taken to reduce the potentially significant adverse impacts in an acceptable level.

224. This EMP covers all impacts and mitigation measures identified within the project. However, contractor will be responsible for preparation of Site Specific Environmental Management Action Plan (SSEMAP) based on the EMP given in this IEE. SSEMAP is supposed to include site specific impacts related to site specific construction activities and relevant mitigation measures proposed to the particular locations in order to minimize relevant impacts. SSEMAP will be supported by site plans in which proposed mitigation



measures are presented. Separate SSEMAPs will be prepared for each contract packages if the A011 road will be contractually subdivided. All costs for implementing the mitigation measures must be included in the Bill of Quantities (BOQ) by the

225. contractor as implementation of the SSEMAP will be the responsibility of the contractor and the PIU will oversee the effectiveness of the implementation with the assistance of the PIC. In addition, in compliance with the EARF, ESDD is also responsible for monitoring of implementation of the SSEMAP biannually. ESDD also assists PIU in meeting safeguards compliance and will conduct training sessions to the safeguards staff of the contractor on safeguards considerations of iRoad.

226. Contractors who implement RMC package will be responsible to keep the road in operational condition for a period of 5 years after rehabilitation. Therefore, the EMP has been modified accordingly paying more attention on the environmental impacts and mitigation measures during the operational stage together with rehabilitation stage. The EMPs prepared for the road are attached in Appendix 8.1, 8.2 and 8.3.

227. Monitoring of EMP implementation will be carried out during the preconstruction, operation, and maintenance stages of the project. As specified in the EARF (chapter VII), Environmental Monitoring Checklist (EMC) shall be prepared by the PIC based on the EMP for each of these stages. The EMC monitors the degree of compliance of the mitigation measures proposed in the EMP in all three stages. At least one EMC shall be completed during pre-construction, bi-annually during operation and maintenance period. Records of these completed monitoring checklists must be systematically maintained within the PIC and/or PIU office. Based on these records and site visits, monitoring reports will be prepared during the construction and operation stage on an annual basis and submitted to ADB for disclosure on the ADB website.

## **B2. Environmental Monitoring Plan (EMoP)**

228. There will be an Environmental Monitoring Plan (EMOP) based on the project cycle to monitor EMP implementation by measuring environmental parameters. Environmental monitoring is required to make sure that the anticipated adverse impacts are kept minimal with the implementation of mitigation measures as and when required. The monitoring objectives are therefore focused on the mitigation of likely impacts. Also, compliance with the existing regulations and legislation is also guaranteed.

229. During the pre-construction phase baseline data on air, water quality and noise levels will need to be collected. This data will provide baseline information on the existing conditions which could be used to compare the changes in quality levels during construction and operational phases. Such a comparison will reflect how effective the EMP is and help to revise it to rectify any shortcomings that will cause any adverse impacts. Appendix 9 presents the EMOP prepared for the Road. Based on the EMOP, the contract will be required to prepare contract package specific EMOPs.



230. Furthermore, the contractor will also be responsible for updating/modifying the EMP, EMC and EMOP if there are any significant changes in the project site, activities, conditions, engineering design or if any unpredicted impact will arise with the approval of PIC.

231. The EMoP (Appendix 9) includes information on:

- Parameters to be monitored
- Proposed locations of sampling points
- Frequency of monitoring
- Responsible agency / agencies
- Facilities available with such agencies
- Availability of funds, expertise, and facilities

232. The EMoP will be a useful tool to monitor the implementation of mitigation measures included to the EMP. Monitoring of the quality of water, air, and noise during the construction stage is a responsibility of the contractor by the approved Government Agency. All the monitoring activities such as site supervision, removal of trees, material extraction, verification of permits, etc. by the contractor will be supervised by the PICs. The environmental monitoring report will be submitted to the PIU, which will include the results of environmental monitoring into its environmental report that will be reported to the PD of the iRoad Project.

## **B. Grievance Redress Mechanism**

233. A project-specific grievance redress mechanism will be established to receive, evaluate, and facilitate the resolution of affected persons (AP) concerns, complaints, and grievances about the social and environmental impacts at all levels of the project. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. Expected issues from the road is mostly from the construction activities which can be amicably settled by both parties. In the case of grievances that are immediate and urgent in the perception of the complainant, the contractor and supervision personnel from the PIC on site will provide the most easily accessible contact for quick resolution of such grievances. Contact phone numbers and names of the PIU Social Development/Safeguards and contractor's site engineer will be posted at all construction sites in visible locations.

234. Grievances from the affected people on social and environmental issues during project implementation will be addressed mainly through the existing local administrative system. Depending on the nature and significance of the grievances or complaints, grievances will be addressed at three levels. The first will be at the grassroots level where complaints will be directly received and addressed by the contractor, PIC or PIU representative on site. Grievances which are simple but still cannot be addressed at the grassroots level will be addressed at the Grama Niladhari (GN) level. More complex grievances which cannot be addressed at the GN level will be addressed at the Divisional

Secretariat (DS) level. There will be a Grievance Redress Committee (GRC) at the GN and DS levels.

235. At the GN level the GRC members will be:

1	Grama Niladhari of the area	Chairman
2	Representative of PIU	Secretary
3	Representative of supervision consultant	Member
4	Representative of contractor	Member
5	A community member/ religious leader	Member
6	Woman representative from the local community	Member

236. At the DS Level GRC members will be:

1	Divisional Secretary of the area	Chairman
2	Representative of PIU	Secretary
3	Grama niladhari of the area	Member
4	Representative of supervision consultant	Member
5	Representative of contractor	Member
6	Representative of social organization (NGO/CBO)	Member
7	A community member/ religious leader	Member
8	Woman representative from the local community	Member

237. To make the GRM process gender responsive the GRC will include one-woman member to represent the local community women. Further, when grievances or complaints are submitted to the GRC, both women and men complainants will be treated equally, and necessary measures will be taken to address the grievance in the best way possible.

238. Recommended steps with a timeline on the operation of the GRM are provided in Figure 7.1. Adjustments may be made to the GRM during processing of succeeding tranches if necessary and accordingly described in the respective IEE. In addition, a complaints contact person will be designated within the PIU to help address all concerns and grievances of the local communities and affected parties. Contact details of this person will be provided in the project information display board that will be placed at the project site.

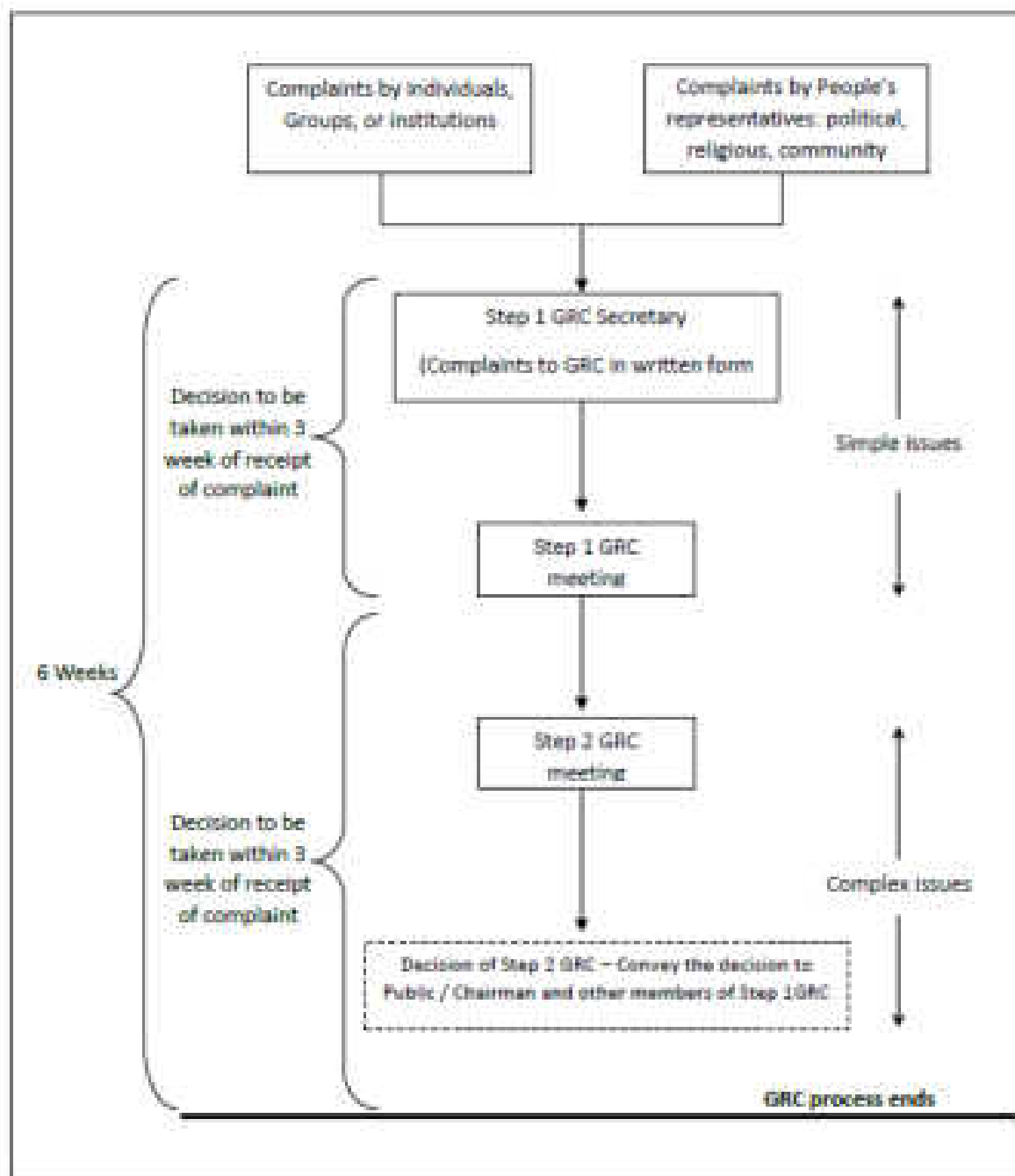


Figure 7-1: Summary of GRM procedures (Source: EARF: SRI: Integrated Road Investment Program submitted by the RDA to the ADB, May 2014)

## 8 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

### A. Public Consultation

239. Public consultations were carried out covering all 4 DSDs falling under the road influenced areas. The methods used for public consultations includes one on one interviews with above 60 road users and 4 Focus Group Discussions (FGDs). The main aim of these consultations was to obtain the perception of the community about the project, any environmental and social problems prevailing in the project area. It shall be noted that during these interviews equal focus was paid to male and female members.

### B. Focus Group Discussions (FGDs)

240. The following descriptions are the summary reports for the Focus Group Discussions conducted during the field visits. The issues emerged from FGDs under the project are mentioned below as summaries.

#### B1 Summary of the issue discussed

##### Arachchikattuwa DSD-22/07/2020

- The GNs proposes to upgrade the access roads connected the main road level at least up to some distance from the main road (if possible under iRoad program.
- Need for additional culvert/s near Hela Bojun Hala was highlighted by the participants to address the storm water stagnation issues.
- The roadside debris and the soil particles flow towards the road during rainy period. This is mainly due to non-availability of proper drainage system in areas around Bangadeniyya, Police Check Point, Rajaluoya Post Office and Dewalaya.
- Storm water drainage capacities of existing culverts around Anawilundawa are not adequate.
- Culverts near Baththaluoya Railway Station are blocked and but they are not maintained.
- Reasonable drainage system is required around Lunuoya Bridge.
- Baththaluoya Bridge (Near 92km mile post) is damaged and must be renovated.
- Road gets inundated at Rajaluoya area
- Pedestrian crossings and the white strips marked to indicate road edges are not properly visible in the road in general
- The Reflective Knobs at the road center line are not functioning and therefore, they are to be replaced.
- At present no dedicated bus halts and parking bays are available and the participants proposed to mark the bus halts with bus bays separately to the road.
- Height of the railway level crossing is higher than the level of road surface and this has created difficulties for the riders of motor bikes.
- Road edges are not maintained/sealed Properly.
- iRoad projects partially implemented in areas such as Sengalla, Nelumkuliya, Wendakanda area were kept on hold since 2017 and road in that area was damaged and excavated and kept for long time. Two fatal accidents in that road took place as participants remembered. Incidents such as falling of motor cyclists into excavated culverts are frequently heard.

- Space of the existing shoulder can be used for traffic management during construction of this candidate road section (from Chilaw to Puttalam).



**Figure 8-1: Photographs taken during the Focus Group Discussions  
Puttalam DSD – 22/07/2020**

- Openings of culverts are blocked due to some unauthorized buildings (Commercial) near Al Kasim City.
- It was proposed to have some new culverts near Thalladiya bridge as the storm water get in to the road during rainy days.
- The Railway gate on the road is closed 28 times per day and nearly 20 times of 28 are for the cement trains of Cement factory ( Puttalam) . It has created traffic and therefore participants proposed to have a flyover to address this existing problem.
- Cement factory road can be used as a bypass road during construction of the candidate road
- RDA Road reservation is not cleared and many unauthorized permanent shops are built on the road reservation.
- The Strip of land between the road reservation and the railway reservation is not utilized and that can be used for bus bays and parking space in that that area.
- Road pavement at helabojunhala and Buddhist Center is damaged.
- Speed limits should be strictly maintained due to significantly high number of lorries and busses run on this road.
- Short distance busses are not operating with regular frequency and the passengers need to travel short distances are not entertained by long distance rung buses.



**Figure 8-2: Photographs taken during the Focus Group Discussions**  
**Mundal DSD – 22/07/2020**

- This is an important road which connects several townships and therefore, it needs renovation.
- Main issue of the road section is non-availability of proper drainage system. This The Towns along the road, Police station at Mundal, Church, Hospital, and the place called Jinnawatta frequently experience the problem of storm water stagnation.
- Earth drains are available but they are not maintained properly and heavily grown vegetation on drains are observed.
- Potholes can be seen on the road and even after informing the relevant authorities through DS, no action was taken at least to fill these potholes.
- Large number of long-distance travelling vehicles use this road and due to the straight geometry of the roads section accidents occur due to tiredness and careless of the drivers. In this context the participants proposed to create a place to rest for long distance travelling drivers.
- Road shoulders are washed away and it has created difficulty for for the pedestrians
- Speed barriers or humps are needed at Madurankuliya Temple Junction and School to slow down the speed of the vehicles.
- Lack of space for parking vehicles at the town area was reported another significant issue.
- Buses stop at the middle of the roads and the requirement of bus shelters with a bay was highlighted.





**Figure 8-3: Photographs taken during the Focus Group Discussions  
Chilaw DSD – 22/07/2020**

- Access difficulties to the houses and other establishments can occur during construction/rehabilitation of the road.
- Improvement to this road is a felt need and must be given top priority to rehabilitate it under the proposed iRoad program.
- Heavy traffic congestions can be observed at the section from Chilaw town to railway crossing.
- The road width for the section up to 2 Km from Chilaw is not adequate and road widening is a need to reduce the traffic.
- At Railway crossing area the road should be raised to match the railway level.
- Earth drains are available but not functioning properly.
- public transport facility is good in this road but bus halt locations need to be marked properly.
- There are many unemployed people in the area due to the closure of garment factories due to Covid and if this project starts it will provide some opportunities for the local people to work in the construction sites during construction period of the project.

### **C. Disclosure of information**

241. According to the requirements of the ADB SPS, for Environment Category B project roads the respective draft IEE will be disclosed before the Management Review Meeting (MRM) or equivalent meeting or approval of the respective project if there is no MRM. Signboards with project information including details on nature of construction works, road length, construction period, the name of the contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil, and English). In addition, an information flyer could be distributed among residents who live along the route providing information on how they could assist the project. For the national RMC roads, there will be sign boards on the period of works and contact information for reporting complaints or grievances in three languages.

During project implementation, annual environmental monitoring reports will be prepared for the entire RMC package of iRoad and submitted to ADB for disclosure on the ADB website.

## 9 CONCLUSION AND RECOMMENDATIONS

### A. Findings and Recommendations

242. The proposed rehabilitation and construction activities on Peliyagoda – Puttalam road (A003) from Chilaw to Puttalam shall be carried out within the existing RoW and road reservation boundary lines to avoid any land acquisition and/or resettlement of households. Anticipated positive socio-economic impacts of the project include reduction of transport costs and vehicle operation cost due to better road conditions and reduced travel time, an increase in income-generating activities and enhancement of road safety. With proper implementation of the EMP and the EMoP, environmental benefits include less noise and air emissions due to improved road condition, reduced soil erosion and improved water quality due to better drainage facilities, etc. Facilitating better drainage (cross drainage and along the road) and raising the road surface to levels above frequent flood levels would ensure continuous, uninterrupted road use. Proper drainage will alleviate problems of flood inundation of road surfaces thereby avoiding damage to the roads, thus ensuring the continued structural strength of the road and other structures.

243. Negative environmental impacts are mostly restricted to the construction stage. Extraction of construction materials, transportation, and storage of material and disposal of debris needs careful planning and to follow good practices to avoid environmental impacts. Deterioration of water quality is possible due to washing away of material, especially soil and gravel, with surface runoff and wastewater discharges. Nuisance caused by way of high levels of dust and particulate matter in the air due to material extraction, transportation and storage, and construction activities is another negative environmental impact. Also, fumes and smoke from vehicles and machinery are identified as negative impacts. Noise and vibration can be expected from vehicular movements and construction activities which needs mitigation. Vehicle fumes, black smoke, vibration, etc. Temporary blockage or alteration of surface runoff is the other anticipated impacts during the construction of bridges, culverts, and causeways. Realignment of services such as electricity, telecommunication, and water lines would cause inconveniences to the residents.

244. The fauna and flora observed are common species that are found in rural and suburban areas. Only a few endemic and threatened species were recorded at the project site. None of the recorded endemic species are restricted to the project area. Therefore, the project will not have major adverse impacts on the habitats or fauna and flora in the proposed project site. Since all these species were recorded from the habitats located beside the road, these species will not be directly affected due to proposed construction without land acquisition from the road side properties. survival of faunal species is negligible. since they have ability to move quickly from one location to another.

245. Establishing baseline environmental parameters is necessary to implement the Environmental Monitoring Plan. Monitoring of baseline quality of water, air and noise/vibration levels is recommended to carry out at sampling locations as outlined in the Environmental Monitoring Plan during the pre-construction stage. Establishment of baseline parameters is essential to monitor changes in the quality of water, air, and noise during the construction and operation periods. Repeated sampling during the construction and



operational periods shall be done at the same locations which were used to establish baseline parameters. Thus, changes can be easily compared to assess and evaluate the effectiveness of the mitigation strategies as outlined in the Environmental Management Plan.

246. A long-term maintenance program is essential for sustaining road in good condition. Thus, periodic inspection, assessments, and proper maintenances strategies shall be implemented during operation stage. It is recommended that detailed design team shall be properly coordinated with future schedules regarding infrastructure development of line agencies to minimize structural damages to the road.

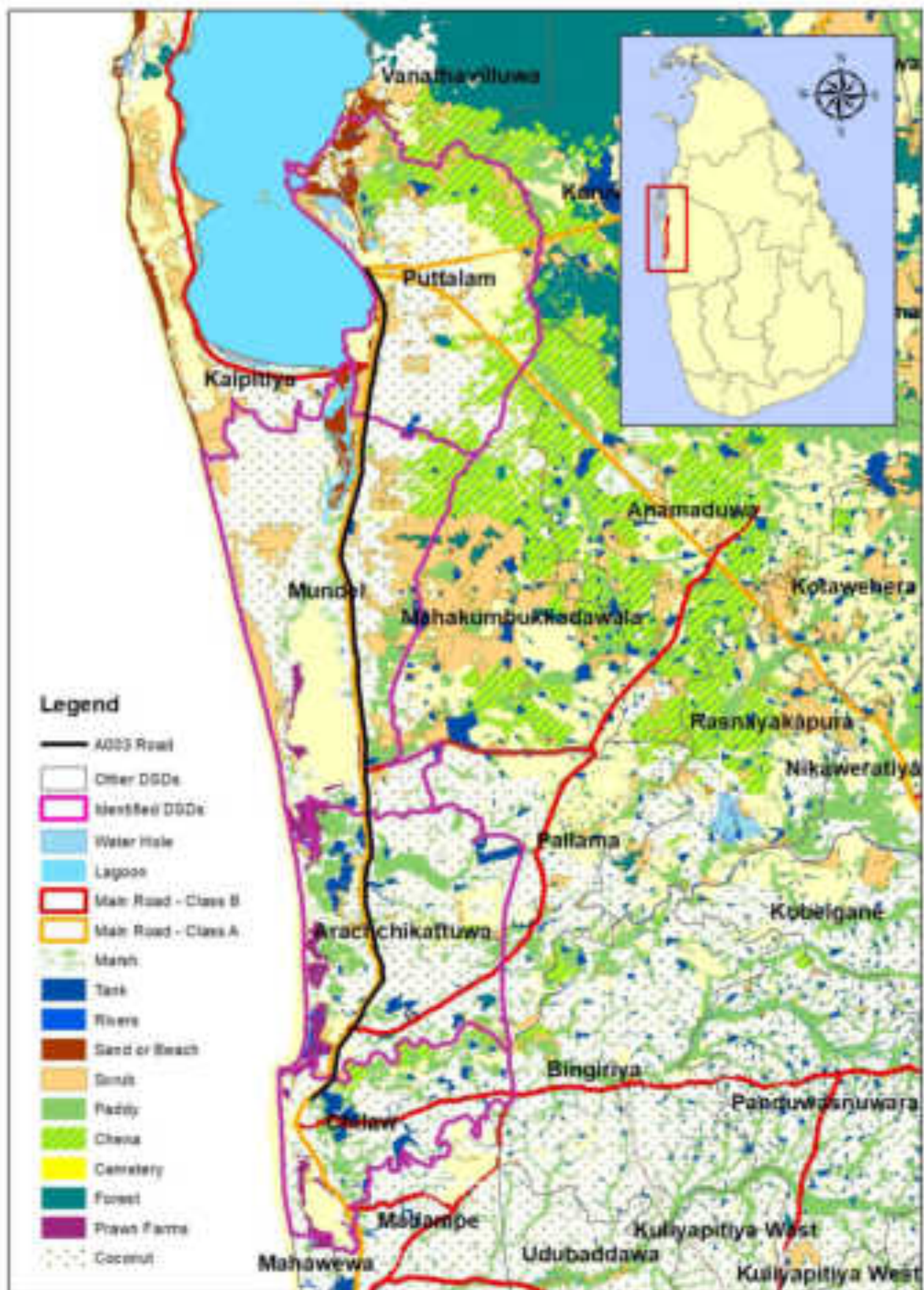
## **H. Conclusions**

247. The proposed activities involve rehabilitation of the A003 road from Chilaw to Puttalam and other road-side-structures. The proposed project will not cause significant negative impacts on the existing socio-economic environment in the area (project-affected area and its immediate vicinity). The potential environmental impacts that have been identified during the study are temporary, manageable and will occur only during pre-construction and construction stage of the project. The proposed road rehabilitation and construction activities shall be carried out within the existing RoW and road reservation boundary lines. There is no need for land acquisition or resettlement of persons. Therefore, the proposed rehabilitation work activities of the road are environmentally acceptable.

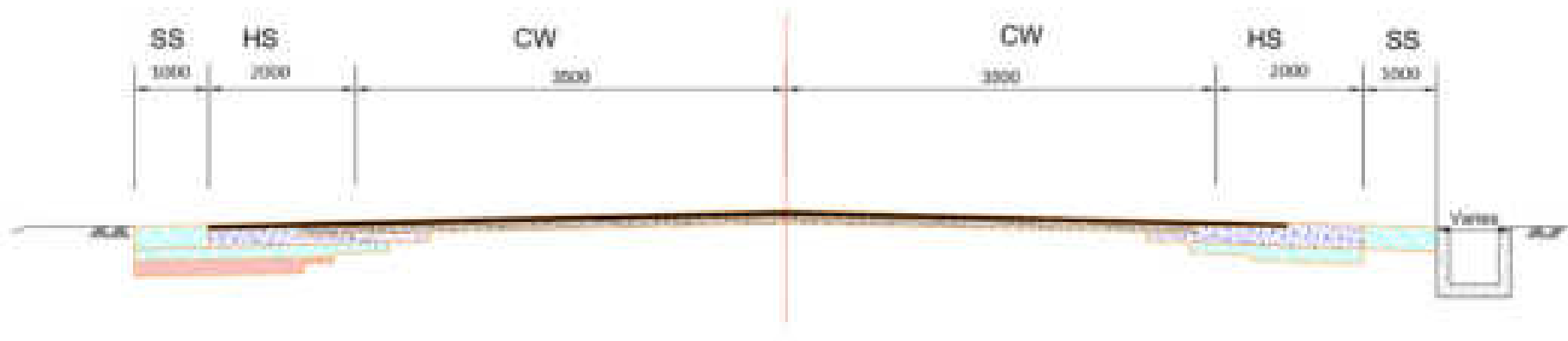
248. According to the analysis of existing baseline data and prediction of impacts, the proposed road rehabilitation, and construction activities fall under Environmental Category B based on the ADB Guidelines. Thus, a full Environmental Impact Assessment (EIA) for the project is not required. Concerning the National Environmental Act, No.47 of 1980, amendment No.56 of 1988, and subsequent amendments, the project does not fall under the Prescribed Project Category, and therefore may not need an EIA or an IEE to be carried out. However, it is advisable to seek the advice of the Central Environmental Authority and confirm this, and further obtain any guidelines that must be adhered to.

## 10 ANNEXES

Annex 1- Map of the road and connectivity to other major roads



## Annex 2- Proposed Cross Sections of the rehabilitated road





### Annex 3- Locations where water samples were collected for quality analysis





## Annex 4- Locations where noise levels were measured

